Plate 9-4: Golden Eagle nest, Hope Bay Belt.

Two more species, Snowy Owl and Short-eared Owl, were recorded during these surveys.

Results of the GNWT raptor survey were not available at the time this report was prepared. Therefore, the description of raptor nesting activity for the northern portion of the study area is incomplete. Raw data from the GNWT survey have been included where possible.

Occupied raptor nests were more common in the northern half of the study area (Figure 9.1-14). Suitable nest sites (*i.e.*, cliffs) were much more prevalent there than in the south. In the southern portion, cliffs occur occasionally along rivers and lake shores, but in few other places. However, a high proportion of sites that appeared to be suitable were, in fact, occupied by nesting raptors.

A few sites were particularly noteworthy. The sill located at the north end of Doris Lake was the site of at least four active raptor nests in 1996. These included Gyrfalcon (2), Peregrine Falcon (1), and Golden Eagle (1). Due to its proximity to the proposed bulk sample site at Doris Lake, consideration will be required to ensure these birds are not displaced by human activity in 1997. However, industrial activity, including many take-offs and landings of aircraft, was prominent at the Doris Lake camp in 1996, and raptors continued to use nest sites in the immediate vicinity. There were two Rough-legged Hawk nests and one Gyrfalcon nest within 1.5 km of the camp site in 1996, as well as another Rough-legged Hawk nest and a Peregrine Falcon nest further north along Windy Lake.

The dyke immediately south of Windy Lake (north end is about 3.7 km south of the Doris Lake Property camp situated on Windy Lake) is another heavily used area. Two Gyrfalcon nests were observed at this site, and the GNWT found several more raptor nests along this structure (Shank 1996, pers. comm.).

Cliffs adjacent to Stickleback Lake, about 2.5 km south of Boston campsite, were occupied by a pair of Peregrine Falcons in 1995. There was no sign of falcon activity at this site during 1996.

Gyrfalcon

Eight Gyrfalcon observations were recorded on the July 18 aerial survey. Six of these involved nests occupied by one or more fledglings. A total of three adults

comprised the remaining two observations. One of these was a pair which may have had a nest nearby which was not located. Fledging from the nest for one Gyrfalcon brood was known to occur between July 18 and 20.

Gyrfalcon nests are particularly common on the cliffs in the northernmost part of the Hope Bay Belt, north of Windy Lake. This area was surveyed primarily by GNWT, and results of that survey were not available at the time this report was prepared. However, Gyrfalcon nests were observed on the sill at the north end of Doris Lake (two nests), and on the cliff at the south end of Windy Lake (one nest).

Peregrine

Thirteen observations of Peregrine Falcons were made on July 18. Eight of these included nests, and an additional three involved adult birds that were behaving in a defensive manner. Nests contained one to four nestlings. One nest held a single egg.

Like Gyrfalcons, Peregrine Falcons commonly nest in the cliffs in the vicinity of Hope Bay, especially north of Windy Lake. This was the area surveyed by GNWT; those results were not available at the time this report was prepared. One Peregrine Falcon nest was observed on the sill immediately north of Doris Lake.

Probable Peregrine Falcon nests, presumed because of territorial-defense behavior of adult birds, were located in cliff bands at several sites along the Koignuk River south of Windy Lake. These sites, however, were never visited specifically to confirm the existence of nests.

Rough-legged Hawk

Rough-legged Hawks are also a common raptor species in the study area. Ten observations of Rough-legs were recorded, and all included occupied nests. Nests held three to four nestlings. Two nests within 1.5 km of the Doris Lake Property camp situated on Windy Lake were occupied in 1996. One nest contained three nestlings and a ground squirrel carcass.

Cad No. a2218s | Scale: 1:200 000 | Job No. 526-1 | 14/03/1997-11:58am | RES_BF

7,560,000m N

7,540,000m N

7,520,000m N

7,500,000m N

N

Windy Lake Camp

Boston Camp

440,000m E

420,000m E

Spyder Lake

Koignuk River

Doris Lake

Hope Bay

MELVILLE SOUND

P7 P8 P6 P9 P4 P3 P2 P10 P5 P11 E1

R1 G6 H8 G8 H6 H7 G7 H3 H9 H2 G5 P12,G4 P1 H10 G3 E3 P13 G1,H1 G2 E2 H5

LEGEND :

G = gyrfalcon

P = peregrine

H = rough-legged hawk

E = golden eagle

R = raven

0 5 10 15 km

BHP

Raptor Observations

Rescan

Fig. 9.1-14

Golden Eagle

Golden Eagle nests appeared to be relatively uncommon south of Windy Lake. Aside from the sill north of Doris Lake (where there was one occupied nest), only a single eagle nest was found. This nest contained two fledgling eagles. Eagle nest observations from the coastal portion of the study area (GNWT survey) were not available when this report was written.

Golden Eagles were commonly seen in the study area in 1994, 1995, and 1996. Eagle observations were recorded during surveys as early as May 31 and as late as November 27. From this, it seems likely that some Golden Eagles remain in the area all year.

Common Raven

Ravens were observed infrequently in the study area during 1996. Singles were occasionally observed incidentally in most parts of the study area during spring-fall. There were no occupied nests found on July 18. However, two adults with a brood of six juveniles were observed. These birds were moving across the ground, and may have been close to the site of their nest. The juveniles appeared capable of only rudimentary flight.

Snowy Owl

No Snowy Owls were observed on the July 18 survey. This survey concentrated on cliff areas and was therefore not likely to locate Snowy Owl nests which are typically on open tundra.

Few Snowy Owls were observed in the study area in 1996. Incidental records totaled four owls and no nests. Observations occurred near the Boston claim block (2), near Windy Lake (1), and near Hope Bay (1). One nest containing eight eggs was reported in the Doris Lake wildlife log for July 1.

Short-eared Owl

Short-eared Owls were not observed during the July 18 survey. However, they were recorded incidentally to other surveys during 1996.

One Short-eared Owl was observed south of the Boston camp on July 21. A Short-eared Owl was recorded in the Doris Lake wildlife log for August 12. This bird was seen northeast of Windy Lake.

Other Species

No other raptor species were recorded during any survey in 1994, 1995, or 1996. The Doris Lake wildlife log, however, contained a record of a pair of Ospreys at a nest containing three young. The location of this observation was not confirmed. However, given the known distribution of this species (generally within treed habitats), it is unlikely that this identification was correct. Most likely, this was an observation of Rough-legged Hawks.

9.1.3.4 Breeding Bird Census Surveys

Breeding bird census plots were surveyed during June 21 to 24. The area of the eight plots surveyed totaled 252 ha. Four plots (B1-B4) were located within 13 km of the Boston camp, and four (D1-D4) were within 16 km of the Doris Lake Property camp situated on Windy Lake. Within each group, one plot (designated the "treatment" plot) was located within one kilometre of the camp (plots B1 and W1).

Numbers, Density, and Species Diversity

A total of 403 "adult" (fully fledged) birds was observed on transect, comprised of 15 or 16 species (most redpolls were not identified to species; they could have been hoary or common redpolls; Table 9.1-5). Thirteen nests containing eggs or young were found, although no particular effort was made to locate nests, in order to minimize disturbance by field personnel. Overall density was 1.60 birds/ha, and ranged between plots from 0.54 to 2.68 birds/ha. Between five and nine species of birds were identified on each plot, and species Diversity Indices (number of species per hectare) ranged from 0.11 to 0.35.

There were no apparent differences between the Boston plots and the Doris Lake plots in total number of species recorded, number of nests found, or observed bird density. Diversity Index rating was slightly higher for the Boston Project plots than the Doris Lake plots.

Table 9.1-5

Number of Adults[1] and Nests of Bird Species Observed on Breeding Bird Plots Surveyed in the Hope Bay Belt Area, June 1996

	Plot Number																	
	B1		B2		B3		B4		D1		D2		D3		D4		Total	
Species	Ad[2]	Nest	Ad	Nest	Ad	Nest	Ad	Nest	Ad	Nest	Ad	Nest	Ad	Nest	Ad	Nest	Ad	Nest
Redpoll spp.	4		12		1				8		48	1	8		1		82	1
American Tree Sparrow	7	1	5						8	2	1						21	3
Lapland Longspur	21	1	13		34	1	8		18	1	12		12		42	1	160	4
Willow Ptarmigan			1		1												2	
Rock Ptarmigan			1														1	
Ptarmigan spp.	1								1								2	
Horned Lark	15	1	3		5	1			13		7	1	4		21	1	68	4
Savannah Sparrow			17		2				2		7		5		3		36	
Semipalmated Sandpiper							1		1						6		8	
Lesser Golden Plover			6				2										8	
Long-tailed Jaeger			1		2		3										6	
Spotted Sandpiper	1												2				3	
Semipalmated Plover															2		2	
American Pipit															2		2	
White-crowned Sparrow															1		1	
White-fronted Goose							1	1									1	1
Total birds	49		59		45		15		51		75		31		78		403	
Total nests		3		0		2		1		3		2		0		2		13
Total species	6		9		6		5		7		5		5		8		16	
Plot area (ha)	25		26		25		28		25		28		25		70		252	
Bird density (# birds/ha)	1.96		2.27		1.80		0.54		2.04		2.68		1.24		1.11		1.60	
Diversity Index (# sp/ha)	0.24		0.35		0.24		0.18		0.28		0.18		0.20		0.11		0.06	

1: Adult birds include all fully-fledged birds.

2: Ad = Adult.

Similarly, there were no apparent differences between the treatment plots and the reference (more remote) plots in number of species recorded, number of nests found, observed bird density, or species Diversity Index, at either of the Boston Project or Doris Lake Properties. In all cases, sample sizes were too small to statistically test for differences.

Habitat Association

Because ecological mapping had not been completed at the time of this survey, plot locations were irrespective of ecological mapping units. Consequently, habitats within plots were described using dominant vegetation types assessed on the scale of the plot itself.

Mesic tundra was the most prevalent habitat type surveyed in the breeding bird census (Table 9.1-6). It was present on each plot, at between 20 and 70% occurrence. Within this type, no vegetation exceeded 15 cm in height, and plants above 10 cm were sparse. Some birds, notably Lapland Longspurs, nested directly on the ground within this habitat type. Other nests were found within patches of broken rock cover (*e.g.*, horned larks).

Table 9.1-6
Habitat Descriptions of Breeding Bird Census Plots Surveyed in the Hope Bay Belt Area

	Plot Number and % of plot covered by habitat							
Habitat type	**B1**	**B2**	**B3**	**B4**	**D1**	**D2**	**D3**	**D4**
Mesic tundra	70	30	50	50	50	40	20	60
Moist birch tundra	20	60	40		25	25		10
Riparian willow		5				25		5
Moist tundra				20	15			
Shoreline				10				
Wet sedge							30	
Rock/xeric tundra							50	25
Gravel		5		20				
Rock	10		10		10	10		

Most nests, however, were found suspended in above-ground vegetation 30 to 70 cm tall. Nests found in shrubs included those of American Tree Sparrows, White-crowned Sparrows and Redpolls. Within each plot, more birds were observed within shrubby vegetation types (moist birch tundra and riparian willow habitat types) than other areas. There was a direct relationship between the prevalence of shrubby vegetation on a plot and the bird density observed; the amount of shrub cover on plot explained about 71% of the variability in observed bird density (Figure 9.1-15). The highest and second-highest observed bird density values were for transects D2 and B2, which comprised 50 and 65% shrub types, respectively. The lowest observed bird density occurred on transect B4, which followed an esker east of the Boston claim block, and which sampled mostly dry esker materials and no shrub areas.

Shrub areas with vegetation >30 cm tall are relatively uncommon in the Hope Bay Belt. River valleys, lake verges, and other riparian zones provide some of the few extensive shrub stands. Because of their high degree of use by breeding birds, these areas must be considered important habitat for these species. Additionally, because large expanses of the Hope Bay Belt lack any shrubby cover at all, even small stands are likely of relatively high value.

9.1.3.5 Waterfowl Surveys

Two aerial waterfowl surveys were conducted in 1996. The first was flown on July 20, then a replicate was flown on July 22. Results were tabulated by species for the Boston Project and Doris Lake survey blocks (Tables 9.1-7 to 9.1-11). For each species within each of the survey blocks, the higher count from the two surveys was used for analyses. This presumes that there was no significant migration between the Boston and Doris Lake blocks between July 20 and July 22.

Eleven species of waterfowl were recorded, including Sandhill Cranes. Most prevalent were Canada Geese, followed by White-fronted Geese and Pacific Loons. Species which were rarely recorded included Red-throated Loon, Northern Pintail, and Yellow-billed Loon. Broods were documented for all species except Red-throated Loon and Yellow-billed Loon. However, breeding Red-throated Loons were recorded during other surveys in 1996.

Species diversity, indicated by the number of species recorded on transect, was similar between the two areas. Pintails and Red-breasted Mergansers were not recorded on the Doris Lake block, whereas no Yellow-billed Loons were observed in the Boston claim block area.

More than twice as many total adult birds were observed on the Boston claim block than on the Doris Lake claim block. This difference was most evident with Canada Geese, which were 4.6 times more abundant around the Boston block than further north. Oldsquaws were also more prevalent in the south. By contrast, three times as more Greater Scaup were recorded on the Doris Lake block than on the Boston block.

Canada Goose

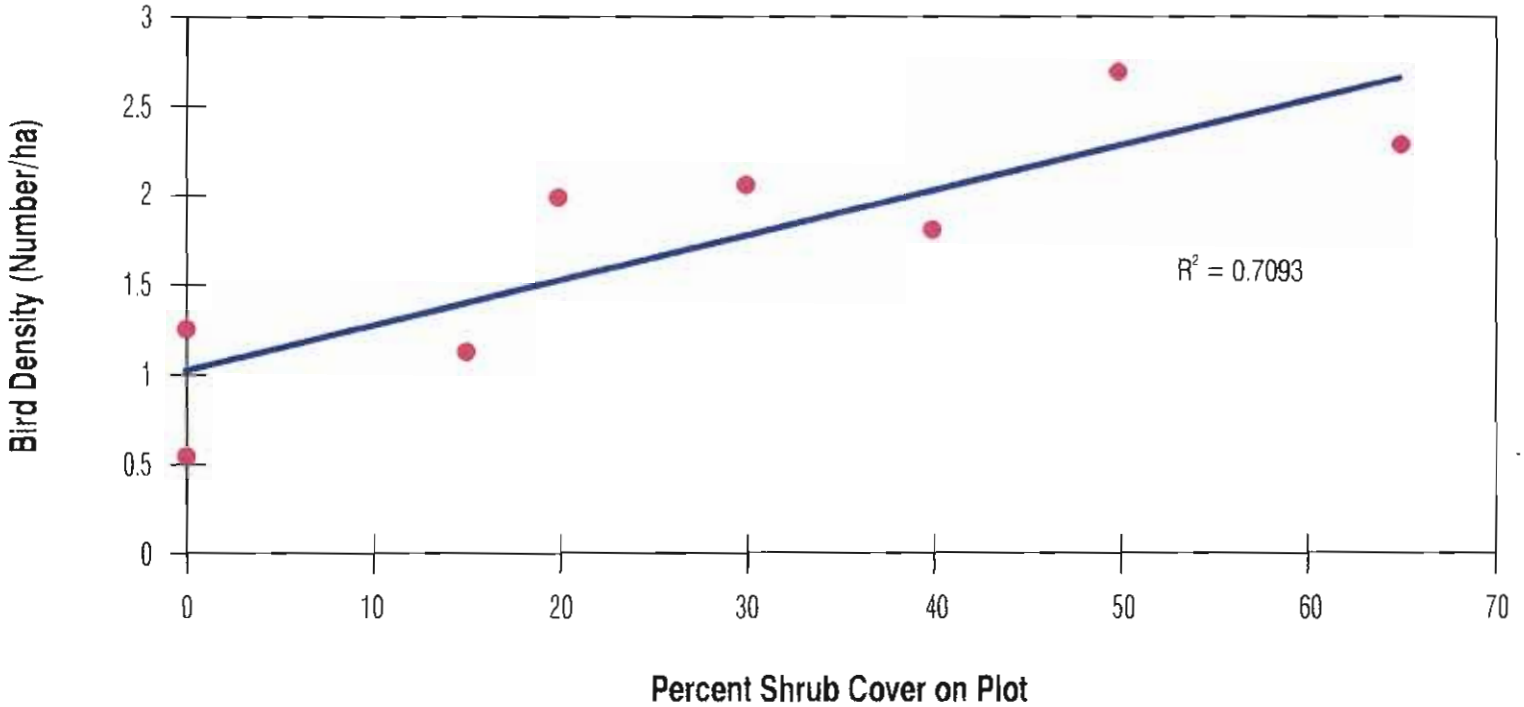
Canada Geese were the most prevalent waterfowl recorded on this survey. A total of 208 adult Canada Geese was recorded, totalling 52% of all adult birds recorded during Survey 1, and 59% of adult birds recorded during Survey 2. They were also widespread, and were recorded on all eight survey lines in the Boston area, and on four of the Doris Lake lines.

Canada Geese breed commonly within the study area as well. A minimum of 14 broods was recorded on surveys, more than for any other species. Although quantitative data are not available, the study area is also used by large numbers of Canada Geese during spring and fall migrations.

Greater White-fronted Goose

White-fronted Geese were the second most-common waterfowl species recorded on the aerial surveys, with a total of 72 adults observed. They comprised 20% and 15% of adult birds observed on Surveys 1 and 2, respectively. White-fronted Geese are also widely distributed, with observations recorded on five of the Boston Project lines and six of the Doris Lake lines.

White-fronted Geese are also common breeders here; at least 12 broods were recorded on this survey. Large numbers of White-fronted Geese were recorded staging in the study area during fall (August-early September) in 1994, 1995, and 1996.



Note: Data are from 8 breeding bird census plots surveyed in the Hope Bay Belt Area, June 1996

BHP

Relationship Between Percent Shrub Cover on Plot and Observed Bird Density

FIGURE 9.1-15

Rescan

Table 9.1-7

Number of Adult[1] Birds and Broods Observed in the Hope Bay Belt Area, July 20, 1996

	Species[2]																					
	C. Goose		WF Goose		T. Swan		G. Scaup		Oldsquaw		Pintail		Merganser		P. Loon		RT Loon		YB Loon		S. Crane	
Line No.	Ad[3]	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood
B1	7	4					1								4	1						
B2	37		4	1											1							
B3									2	2			2	1	2							
B4	6	1	2	1	2	1									2	1						
B5	6		8	2	4										1							
B6	41	2							2						2		2					
B7	1	1							2	1					2	1					4	1
B8	14	1	20	2	3								2		2							
D1							1															
D2			10	2											5						2	1
D3	2		3	1	2	1																
D4	4	2	3	1																	2	
D5					4	2									2	1						
D6																						
D7	31	1	6	1			5		4													
D8			2	1			8												1			
TOTAL	149	12	58	12	15	4	15	0	10	3	0	0	4	1	23	4	2	0	1	0	8	2

1: Adult birds include all fully-fledged birds.

2: C. Goose = Canada Goose, WF Goose = White-fronted Goose, T. Swan = Tundra Swan, G. Scaup = Greater Scaup, P. Loon = Pacific Loon, RT Loon = Red-throated Loon, YB Loon = Yellow-billed Loon, and S. Crane = Sandhill Crane.

3: Ad = Adult.

Table 9.1-8

Number of Adult[1] Birds and Broods Observed in the Hope Bay Belt Area, July 22, 1996

	Species[2]																					
	C. Goose		WF Goose		T. Swan		G. Scaup		Oldsquaw		Pintail		Merganser		A. Loon		RT Loon		YB Loon		S. Crane	
Line No.	Ad[3]	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood
B1	15	1			2		2	1	4						1							
B2															1							
B3	24	3	2		2				11						4							
B4	9				1		3	1	2													
B5	17	3			4																	
B6	15														5							
B7	86	2																				
B8	5	2	8	4			1		1	1	1	1			3							
D1			34		2	1									2	1					2	
D2															3							
D3					2	1			2	1												
D4	10	1																				
D5					2										2							
D6	4	1			1										2							
D7			4	1			1	1	3	1					1		1					
D8					2	1	5	2	1										1			
TOTAL	185	13	48	5	18	3	12	5	24	3	1	1	0	0	24	1	1	0	1	0	2	0

1: Adult birds include all fully fledged birds.

2: C. Goose = Canada Goose, WF Goose = White-fronted Goose, T. Swan = Tundra Swan, G. Scaup = Greater Scaup, P. Loon = Pacific Loon, RT Loon = Red-throated Loon, YB Loon = Yellow-billed Loon, and S. Crane = Sandhill Crane.

3: Ad = Adult.

Table 9.1-9

Number of Adult[1] Birds and Broods Observed in the Boston Property Area, July 20 (1) and July 22 (2), 1996

	Species[2]																					
	C. Goose		WF Goose		T. Swan		G. Scaup		Oldsquaw		Pintail		Merganser		A. Loon		RT Loon		YB Loon		S. Crane	
Line No.	Ad[3]	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood
B1-1	7	4					1								4	1						
B2-1	37		4	1											1							
B3-1									2	2			2	1	2							
B4-1	6	1	2	1	2	1									2	1						
B5-1	6		8	2	4										1							
B6-1	41	2							2						2		2					
B7-1	1	1							2	1					2	1					4	1
B8-1	14	1	20	2	3								2		2							
TOTAL	112	9	34	6	9	1	1	0	6	3	0	0	4	1	16	3	2	0	0	0	4	1
B1-2	15	1			2		2	1	4						1							
B2-2															1							
B3-2	24	3	2		2				11						4							
B4-2	9				1		3	1	2													
B5-2	17	3			4																	
B6-2	15														5							
B7-2	86	2																				
B8-2	5	2	8	4			1		1	1	1	1			3							
TOTAL	171	11	10	4	9	0	6	2	18	1	1	1	0	0	14	0	0	0	0	0	0	0
Maximum	171	11	34	6	9	1	6	2	18	3	1	1	4	1	16	3	2	0	0	0	4	1

1: Adult birds include all fully fledged birds.

2: C. Goose = Canada Goose, WF Goose = White-fronted Goose, T. Swan = Tundra Swan, G. Scaup = Greater Scaup, P. Loon = Pacific Loon, RT Loon = Red-throated Loon, YB Loon = Yellow-billed Loon, and S. Crane = Sandhill Crane.

3: Ad = Adult.

Table 9.1-10
Number of Adult[1] Birds and Broods Observed in the Doris Lake Property Area
July 20 (1) and July 22 (2), 1996

	Species[2]																					
	C. Goose		WF Goose		T. Swan		G. Scaup		Oldsquaw		Pintail		Merganser		A. Loon		RT Loon		YB Loon		S. Crane	
Line No.	Ad[3]	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood
D1-1							1															
D2-1			10	2											5						2	1
D3-1	2		3	1	2	1																
D4-1	4	2	3	1																	2	
D5-1					4	2									2	1						
D6-1																						
D7-1	31	1	6	1			5		4													
D8-1			2	1			8												1			
TOTAL	37	3	24	6	6	3	14	0	4	0	0	0	0	0	7	1	0	0	1	0	4	1
D1-2			34		2	1									2	1					2	
D2-2															3							
D3-2					2	1			2	1												
D4-2	10	1																				
D5-2					2										2							
D6-2	4	1			1										2							
D7-2			4	1			1	1	3	1					1		1					
D8-2					2	1	5	2	1										1			
TOTAL	14	2	38	1	9	3	6	3	6	2	0	0	0	0	10	1	1	0	1	0	2	0
Maximum	37	3	38	6	9	3	14	3	6	2	0	0	0	0	10	1	1	0	1	0	4	1

1: Adult birds include all fully fledged birds.

2: C. Goose = Canada Goose, WF Goose = White-fronted Goose, T. Swan = Tundra Swan, G. Scaup = Greater Scaup, P. Loon = Pacific Loon, RT Loon = Red-throated Loon, YB Loon = Yellow-billed Loon, and S. Crane = Sandhill Crane.

3: Ad = Adult.

Table 9.1-11
Number of Adult[1] Birds and Broods Observed in the Boston (B) and Doris Lake (D) Property Areas, July 20 (1) and July 22 (2), 1996

	Species[2]																					
Survey No.	C. Goose		WF Goose		T. Swan		G. Scaup		Oldsquaw		Pintail		Merganser		A. Loon		RT Loon		YB Loon		S. Crane	
and Block	Ad[3]	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood	Ad	Brood
B-1	112	9	34	6	9	1	1	0	6	3	0	0	4	1	16	3	2	0	0	0	4	1
B-2	171	11	10	4	9	0	6	2	18	1	1	1	0	0	14	0	0	0	0	0	0	0
D-1	37	3	24	6	6	3	14	0	4	0	0	0	0	0	7	1	0	0	1	0	4	1
D-2	14	2	38	1	9	3	6	3	6	2	0	0	0	0	10	1	1	0	1	0	2	0

1: Adult birds include all fully fledged birds.

2: C. Goose = Canada Goose, WF Goose = White-fronted Goose, T. Swan = Tundra Swan, G. Scaup = Greater Scaup, P. Loon = Pacific Loon, RT Loon = Red-throated Loon, YB Loon = Yellow-billed Loon, and S. Crane = Sandhill Crane.

3: Ad = Adult.

Tundra Swan

Tundra Swans are widespread throughout the study area at low densities. A total of 18 adult swans was recorded. This amounted to 5 and 6% of the Survey 1 and Survey 2 totals, respectively. Swans were documented on five of the Boston survey lines, and six of the Doris Lake survey lines.

Although on this survey a minimum total of only three broods was recorded, incidental observations indicated that Tundra Swans breed commonly in the study area. Swans are also frequently observed during spring and fall migrations. On June 2, 1996, a total of 44 Tundra Swans in eight groups (range one to ten swans) was observed flying north.

Greater Scaup

Scaup were not commonly seen on this survey, with a total of only 20 adults. They were more prevalent near the coast; only six of these birds were observed on the Boston block. A total of five scaup broods was recorded.

Oldsquaw

Oldsquaws were the most common duck observed on transect. A total of 24 adults was recorded. They were three times as abundant on the Boston block as on the Doris Lake block. The total of five broods recorded on this survey was not indicative of the level of breeding activity that was apparent through incidental observations. Oldsquaws are likely the most common duck within the study area, and the most common breeders.

Northern Pintail

During aerial surveys, pintails appeared to be uncommon within the study area. A single adult with a brood was observed on the Boston survey block.

During the follow-up ground survey, however, Northern Pintails were among the most commonly observed waterfowl. Despite the fact that the ground survey covered a relatively small area, six observations of pintails were recorded, and all six included broods. By comparison, the ground survey produced few other surprises in terms of relative abundance of adult birds or broods. One explanation

is that pintails with broods have a relatively strong affinity for dense weedy vegetation at this time of year, making them less visible from the air. Irrespectively, this finding reinforces the inadequacy of aerial surveys as a stand-alone technique for inventory of breeding waterfowl.

Red-breasted Merganser

Only four adult Red-breasted Mergansers were observed during this survey, all on the Boston block. One pair was accompanied by a brood. During other surveys, mergansers were occasionally recorded, but in small numbers and with few broods.

Pacific Loon (previously called Arctic Loon)

The Pacific Loon was common and widespread in the study area. A total of 26 was observed on transect. Sixteen were on the Boston block, and ten were observed in the Doris Lake block. Pacific Loons were recorded on each of the eight Boston transect lines, and on five of the Doris Lake lines.

Pacific Loons are among the most common breeders in the area. A minimum of four broods was recorded during this survey, but incidental observations indicate that breeding was much more widespread than this value indicates.

Red-throated Loon

Red-throated Loons were rarely observed during this survey. A pair was observed on the Boston block, and a single was recorded on the Doris Lake transects. Successful breeding for this species was not documented. However, during another survey in late July 1996, a Red-throated Loon was observed sitting on a nest.

Yellow-billed Loon

There were two observations of single Yellow-billed Loons on this survey. Both were in the same location (Hope Bay), two days apart, and may have been the same individual. These were the first observations of Yellow-billed Loon in this study. Breeding has not been documented in this study.

Sandhill Crane

As mentioned previously, Sandhill Cranes were classified as waterfowl for this survey, because of their affinity for wetlands, and because no other survey specifically addressed them.

Sandhill Cranes were widespread at low densities in the Hope Bay Belt area. Four cranes were observed in the Boston area, and another four in the Doris Lake area. Cranes appeared on three of the Doris Lake transect lines, but just one of the Boston lines.

Breeding has been documented in the study area. A single brood was recorded on this survey. However, all eight adult cranes observed were in pairs, so additional broods may have been present but missed. Nesting cranes and broods were observed incidentally several times in 1996.

Other Species

Other species of waterfowl have been recorded in the study area, but were not detected during this survey. Snow Geese were recorded during spring and fall migrations in 1994, 1995, and 1996. Flocks of >100 birds have been observed. However, no Snow Geese were observed in the study area between June 20 and August 24, and it is unlikely that they bred here in 1996.

Ross' Goose may also occur within the study area, although none were recorded during site visits in 1994, 1995, and 1996. Some white geese that were observed from aircraft and were classified as Snow Geese may have been, in fact, Ross' Geese.

Common Eiders and King Eiders were not recorded on any surveys of the study area. However, King Eiders are commonly seen and hunted on Bathurst Inlet by residents of Omingmaktok (Stern 1996, pers. comm.).

One gull species, one tern, and two jaegers are common residents. Herring Gulls and Arctic Terns are seen throughout the study area during summer. In addition, Glaucous Gulls are observed occasionally, especially in the north near the coast. Long-tailed and Parasitic Jaegers may be seen throughout the study area during summer.

9.1.3.6 Small Mammal Surveys

Small mammal surveys were conducted in 1996 by trapping (Plate 9-5) during August 14 to 24. Of a potential total of 2,000 trapnights, 1,980 were logged. In total, 84 small mammals were captured, comprised of five species (Table 9.1-12). Four microtine species were captured in similar numbers (range 17 to 23), and a single shrew was trapped. Summaries of the trapping program are presented in Tables 9.1-13 to 9.1-15 and Figure 9.1-16.

Two species of lemming (collared and brown), two species of vole (northern red-backed and tundra), and one shrew (Arctic) were captured. This is close to the full complement of species which might be expected to occur in the Hope Bay Belt area. According to range maps in Banfield (1974), the masked shrew occurs here and the distributions of meadow vole, and root vole are marginal to this area.

Results of the trapping program may have been influenced by extreme weather conditions during the session at the Doris Lake claim block. A heavy, wet snowfall, about 15 cm, accompanied by very strong winds occurred on August 21, the second day of trapping at Doris Lake. All traps were snow-covered, and some were buried in drifts >50 cm deep. Although the snow began to melt immediately, snow still covered the ground at some sites for the balance of the trapping period. In other areas, meltwater inundated some trap sites. Each of these factors affected the performance of traps and likely influenced the movements and distribution of small mammals, and therefore the results of the trapping program.

Two other species of small-medium sized herbivores—Arctic ground squirrel and Arctic hare—were also present in the study area, but were not sampled by the trapping program or any other systematic survey.

Collared Lemming

Collared lemmings were the second-most commonly captured species in the Boston area. However, only a single, juvenile was captured at the Doris Lake Property. Collared lemmings appeared to have a strong affinity for dry habitats with short vegetation cover. They were by far the most common small mammal captured on the treatment line near Boston camp site. This line was comprised primarily of the mesic birch-bearberry/heath-rock habitat type. This habitat type,

or similar ones, were not sampled during trapping in the Doris Lake area. Of all collared lemmings trapped, 85% (17/20) were juveniles.

Brown Lemming

Brown lemmings were tied for the most-commonly trapped species. They were particularly abundant on the Boston reference line, and accounted for all captures made on the Doris Lake reference line. Their strongest habitat association was for moist areas dominated by sedges with sparse shrub cover. Adults comprised 39% of brown lemming captures, the highest proportion of any species.

Northern Red-Backed Vole

The red-backed vole was the most commonly-captured small mammal, tied with the brown lemming. All captures, however, were on the Boston traplines, and most were on the reference line. All red-backed voles were trapped in moist habitats, primarily those dominated by sedge and birch-sedge cover. Similar habitats were sampled at the Doris Lake Property, so it is possible that the species is simply less common there than at Boston. Almost all (91%) red-backed vole captures were of juveniles.

Tundra Vole

Tundra voles were the most widely-distributed species captured; they were trapped on three of the four lines. They were associated most with shrub-dominated moist habitats, particularly on the Doris Lake treatment line. Juveniles comprised 71% of tundra vole captures.

Arctic Shrew

A single Arctic shrew was captured. This occurred in a moist sedge-birch habitat near the Boston Property. This individual was a juvenile (total length 8.0 cm).

The Hope Bay Belt is outside of the distribution of the Arctic shrew as reported in Banfield (1974). Identification of this specimen was confirmed based on dental characteristics and the morphology of the mandible. Because of their small size, shrews are difficult to capture with the Museum Special snap trap, so they may

Plate 9-5: Small mammal trapping site.

Table 9.1-12

Small Mammals Captured During Trapping on Treatment (T) and Reference (R) Lines in the Boston (B) and Doris Lake (D) Property Areas, August 1996

		Species[1]									
		CL		BL		RBV		TV		Shrew	
Date	Line No.	Ad.	Juv.	Ad.	Juv.	Ad.	Juv.	Ad.	Juv.	Juv.	Total
Aug 15	BT	2	4					1			7
	BR			1	3	1	6		1		12
Aug 16	BT	1	4				1	1			7
	BR			3	1	1	3				8
Aug 17	BT		6				2				8
	BR				3		2		1		6
Aug 18	BT		2								2
	BR			2	3		1				6
Aug 19	BT						1				1
	BR						5	1	1	1	8
Aug 20	DT							1	1		2
	DR										0
Aug 21	DT		1						1		2
	DR			1							1
Aug 22	DT								1		1
	DR			1							1
Aug 23	DT							1	4		5
	DR			1	3						4
Aug 24	DT								2		2
	DR				1						1
Total		3	17	9	14	2	21	5	12	1	84

1: CL = Collared lemming, BL = Brown lemming, RBV = Northern red-backed vole, TV = Tundra vole, Shrew = Arctic shrew , Ad = Adult, Juv. = Juvenile.

Table 9.1-13
Summary of Small Mammals Captured During Trapping on Treatment (T) and Reference (R) Lines in the Boston (B) and Doris Lake (D) Property Areas, August 1996

	Species[1]										
	CL		BL		RBV		TV		Shrew		Number of
Line No.	Ad.	Juv.	Ad.	Juv.	Ad.	Juv.	Ad.	Juv.	Juv.	Total	Trapnights
BT	3	16	0	0	0	4	2	0	0	25	497
BR	0	0	6	10	2	17	1	3	1	40	498
DT	0	1	0	0	0	0	2	9	0	12	490
DR	0	0	3	4	0	0	0	0	0	7	495
Total	3	17	9	14	2	21	5	12	1	84	1980

1: CL = Collared lemming, BL = Brown lemming, RBV = Northern red-backed vole, TV = Tundra vole, Shrew = Arctic shrew, Ad = Adult, Juv. = Juvenile.

Table 9.1-14
Number of Small Mammal Captures Per 100 Trapnights During Trapping on Treatment (T) and Reference (R) Lines in the Boston (B) and Doris Lake (D) Property Areas, August 1996

Trap Line	Number of Trapnights	Species[1]											
		CL		BL		RBV		TV		Shrew		Total	
		Number	Index	Number	Index	Number	Index	Number	Index	Number	Index	Number	Index
BT	497	19	3.82	0	0.00	4	0.80	2	0.40	0	0.00	25	5.03
BR	498	0	0.00	16	3.21	19	3.82	4	0.80	1	0.20	40	8.03
DT	490	1	0.20	0	0.00	0	0.00	11	2.24	0	0.00	12	2.45
DR	495	0	0.00	7	1.41	0	0.00	0	0.00	0	0.00	7	1.41
Total	1980	20	1.01	23	1.16	23	1.16	17	0.86	1	0.05	84	4.24

1: CL = Collared lemming, BL = Brown lemming, RBV = Northern red-backed vole, TV = Tundra vole, Shrew = Arctic shrew.

Table 9.1-15
Percent Occurrence of Habitat Types Found on Treatment (T) and Reference (R) Small Mammal Traplines in the Boston (B) and Doris (D) Property Areas, August 1996

	Trapline[1]			
Habitat Type	**BT**	**BR**	**WT**	**WR**
Mesic birch-bearberry/heath-rock	78	12		
Mesic willow/birch-saxifrage			20	
Mesic Ledum/willow-bearberry			8	6
Moist sedge-birch/willow	10	26	22	76
Moist birch-willow	12			
Moist birch-sedge tussocks		50		
Moist willow-sedge			38	
Wet sedge		12	12	18

1: Values refer to percent occurrence of each type.

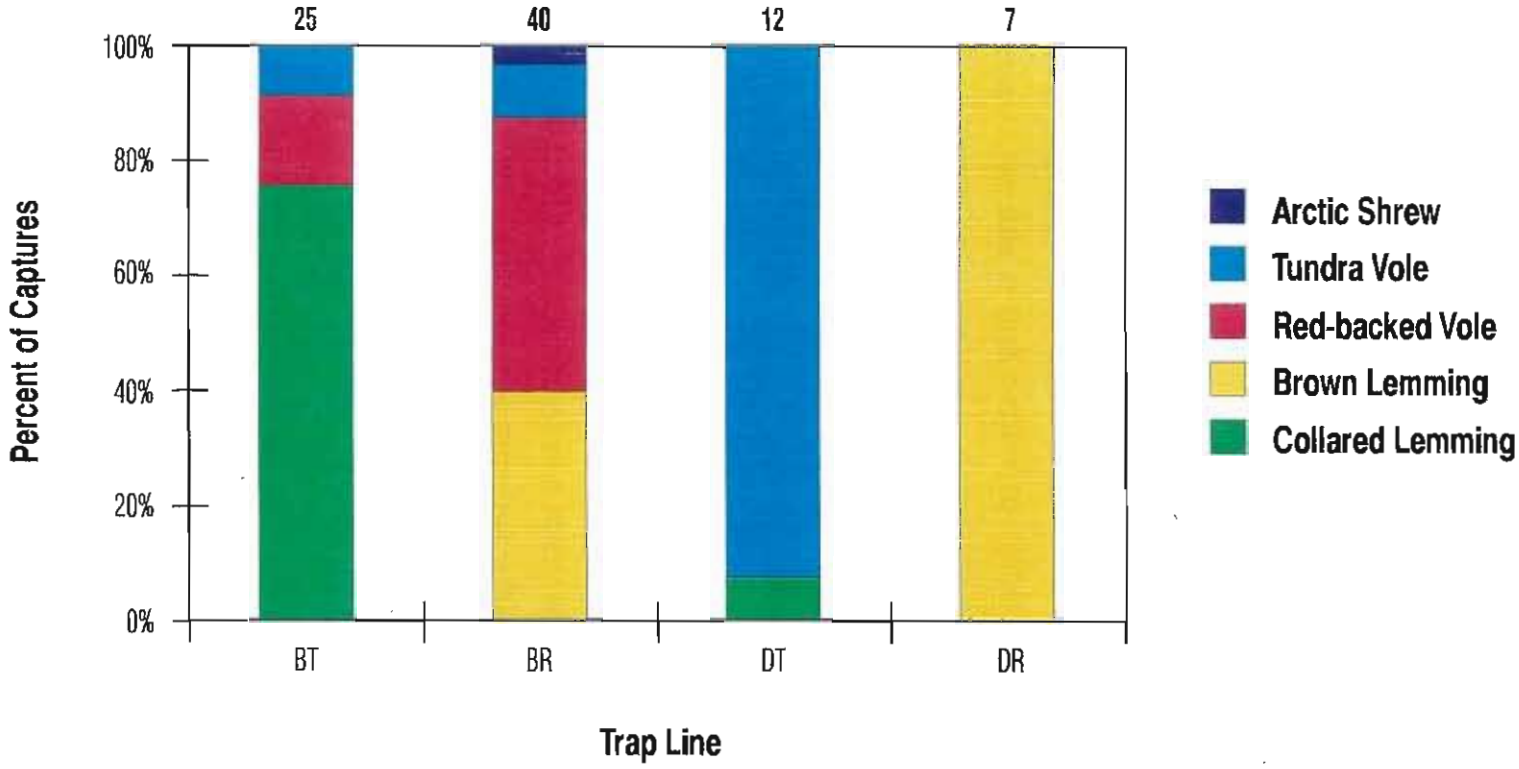
have been more abundant than is indicated by their low capture rate. It is interesting to document this species' occurrence in the area.

The distribution of the masked shrew does include the Hope Bay Belt. However, this species was not detected during the 1996 trapping program.

Arctic Ground Squirrel

Arctic ground squirrels are common throughout the study area. A detailed habitat-use analysis was not conducted for this species. However, burrows can be found in most suitable substrates (*i.e.*, well-drained sand or gravel slopes). Arctic ground squirrels were particularly evident around Doris Lake Property camp, situated on Windy Lake, where they enjoyed artificial food sources and reduced predation pressure.

Arctic ground squirrels are an important food source for predators. Evidence was found in the study area for predation by Rough-legged Hawks, red foxes, and grizzly bears.



Note: Numbers over columns are sample sizes (total number of captures)

Proportion of Small Mammal Captures on Treatment (T) and Reference (R) Traplines in the Boston (B) and Doris Lake (D) Areas, 1996

FIGURE 9.1-16

Arctic Hare

Arctic hares are widespread throughout the study area. No attempt was made to determine habitat-use patterns for this species. During 1996, hares appeared to be fairly abundant, although they can be inconspicuous against most backgrounds.

9.2 Marine Mammals

Should one of the exploration targets in the Hope Bay Belt area be proposed for development, a barge loading facility will be required at Roberts Bay on the south shore of Melville Sound (Figure 9.2-1). Vessels would traverse outer Bathurst Inlet and Melville Sound en route to and from Roberts Bay. A knowledge of the marine mammals of the area is thus needed to enable the assessment of potential effects of BHP's planned activities and to design appropriate mitigation measures. As a contribution to the understanding of the marine environment of the region, aerial surveys for seals were conducted in June 1996. In addition, information was reviewed on other marine mammals that may be encountered.

9.2.1 Previous Research

The primary purpose of these surveys was to determine the distribution and relative abundance of ringed seals. To accomplish this, three aerial surveys were flown during June, when it was expected that many seals would be hauled out for their annual molt. There has been little previous work on the marine mammals of this area, and this was the first aerial survey conducted specifically for seals. Similar seal surveys have, however, been conducted elsewhere in the Canadian Arctic.

Marine mammals expected in the study region include:

- ringed seals - Phoca hispida;
- bearded seals - Erignathus barbatus;
- polar bears - Ursus maritimus;
- beluga whales - Delphinapterus leucas;
- narwhal - Monodon monocerus; and
- bowhead whales - *Balaena mysticetus*.

9.2.1.1 Ringed Seals

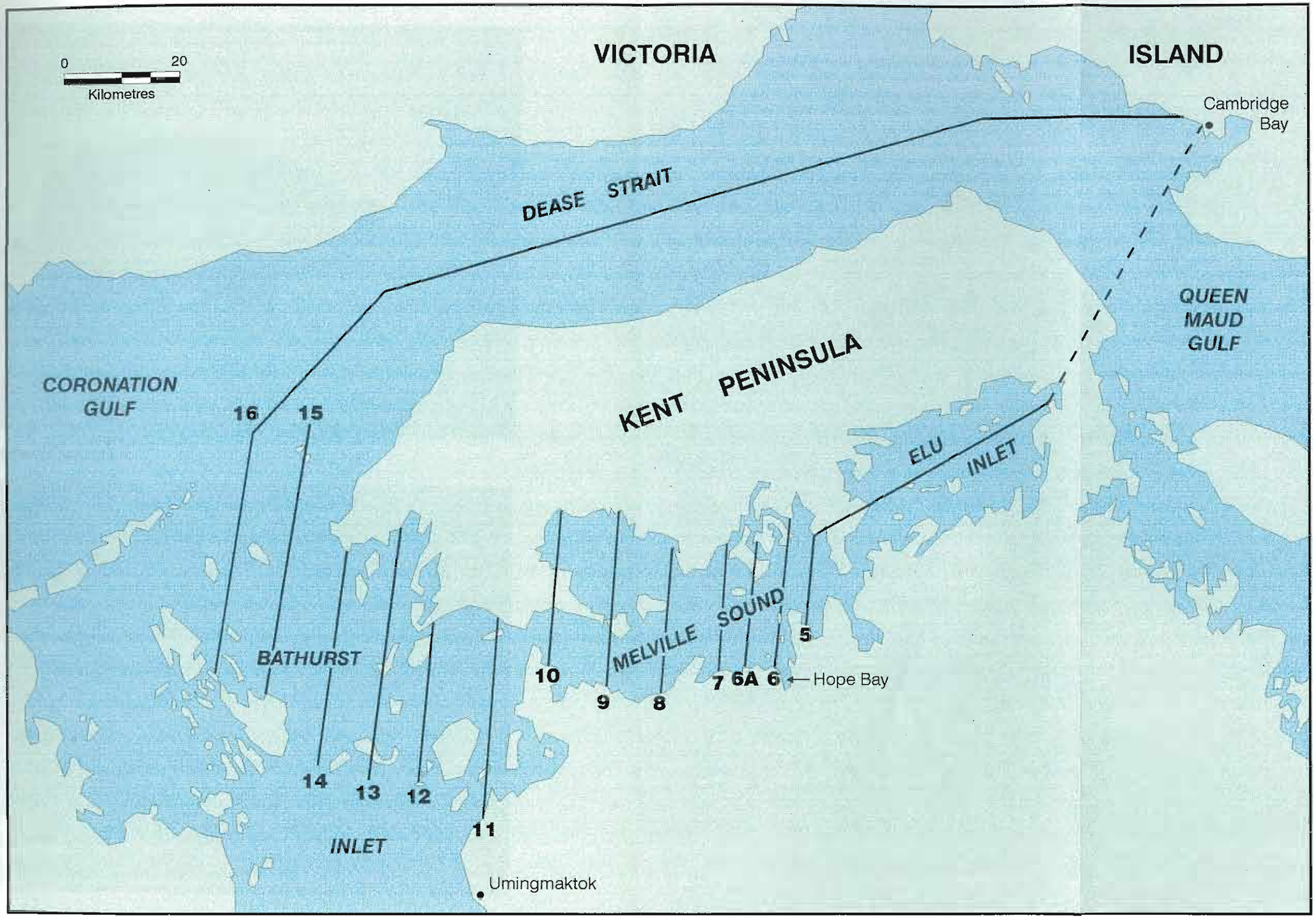
Ringed seals are by far the most abundant and widespread marine mammal in the Arctic, and specifically in the Cambridge Bay region. While population estimates vary considerably, it is clear that the numbers in the Canadian Arctic are in the millions (Stewart *et al*. 1986). They are the primary prey of polar bears and the primary source of food (mainly as scavenged carrion) for arctic foxes that winter on sea ice.

Ringed seals are dark gray, with lighter circular markings, from which their name is derived (Plate 9-6). A typical adult, male or female, is about 1.15 m long and weighs about 50 kg. Their front claws are specialized to enable them to penetrate ice to create and maintain breathing holes.

Ringed seals are relatively sedentary, making only local movements during the year. As the ice forms in the fall, adults occupy territories where they create and maintain holes to access air (Plate 9-7). Mature animals tend to occupy areas of stable ice, while immature seals tend to be relegated to areas of relatively unstable ice. Pressure ridges in stable ice areas are the preferred breeding habitat. Snow accumulates in the lee of the ridges in which the females create birth lairs there. Pups are born in March and April and are nursed for five to seven weeks, during which time they accumulate a blubber layer and shed their infantile lanugo fur. The lanugo fur, which is a good insulator in air, keeps the pup warm until the insulating blubber layer is acquired. Thus, although ringed seal pups are competent in water at birth, they are vulnerable to hypothermia until they acquire adequate blubber during the first few weeks of life.

In June, adult ringed seals haul-out onto the ice surface to molt their pelage. While they are lying on the surface of the ice they are most conspicuous and most easily censused. Later in the molting period, the ice begins to melt and create a puddled surface with dark melt holes. The best time to conduct a census is before the ice begins to melt, while the dark seals contrast most strongly with the light colored ice.

In the past, ringed seals have played an important role in the economy of northern residents, providing skins, meat, and blubber, and a source of cash income when skins have had commercial value. The Government of the NWT hopes to increase



BHP

Transect Locations for Seal Observation, June 1996

FIGURE 9.2-1

Rescan

Plate 9-6: Adult ringed seal on ice.

Plate 9-7: Seal breathing holes in ice cover, Melville Sound, June 1996.

the market for seal pelts, and thereby increase the commercial harvest and economic return to communities with limited access to cash income (Omilgoetok 1996, pers. comm.).

In the Cambridge Bay area, hunting ringed seals is not a major activity, and only 20 to 40 ringed seals per year are taken (Omilgoetok 1996, pers. comm.). Most seals are used locally. For example, in 1994/1995, only six pelts were sold and exported from Cambridge Bay (Omilgoetuk, pers. comm.); none were exported from Bathurst Inlet and only three were exported from Omingmaktuk (Erasmus 1996, pers. comm.). Hunting occurs mainly in late spring when seals are hauled out near their holes and along cracks in the ice. Most hunters approach the seals using a white canvas shield until they are within range of a .22 long-rifle or .22 rim-fire magnum rifle. Some seals are hunted from boats in the fall.

The NWT Department of Resources, Wildlife and Economic Development started a Fur Pricing Program in 1994 (Erasmus 1996, pers. comm.). The aim of the program is to stimulate harvest by guaranteeing a minimum price to hunters for certain species, including ringed seals. The minimum price for a prime ringed seal is $30. This effort does not appear to have increased harvests in the Cambridge Bay area, Bathurst Inlet, or Omingmaktuk.

9.2.1.2 Bearded Seals

The bearded seal, like the ringed seal, has a circumpolar distribution, but its populations may be less than ten percent of the size of ringed seal populations. Bearded seals are considerably larger than ringed seals, with an adult length of about 2.3 m and weight of 300 kg (Burns 1981).

They are less well adapted to a life in solid ice than are ringed seals, so they tend to spend the winter in areas where the ice is sufficiently active to maintain access to air. They are uncommon in the Cambridge Bay area. Small numbers of bearded seals have been observed in upper Wellington Bay and near Cambridge Bay in summer (Omigoetok 1996, pers. comm.). None were seen during these surveys.

9.2.1.3 Polar Bears

Polar bears occur only occasionally in the Cambridge Bay region (Taylor 1996, pers. comm.; Omilgoetok 1996, pers. comm.). Stirling and Øritsland (1995) examined the relationship between the densities of polar bears and their primary prey, ringed seals, in the Canadian Arctic. They show substantial populations of polar bears in the Beaufort Sea and other areas where the seal densities are similar or lower than were found during these surveys. Thus there would appear to be sufficient ringed seals in the general study region to support a polar bear population. The reasons why polar bears are rare in the study region is not clear (Stirling 1996, pers. comm.; Taylor 1996, pers. comm.).

Although polar bears are important to people of the region, hunting does not take place within the study area. The polar bear population closest to Cambridge Bay occurs to the east and north in McClintock Channel, numbering about 700 individuals (Omilgoetok 1996, pers. comm.). The annual community quota has been ten for several years. In 1995/1996, nine bears were killed, three by sport hunters and six by local hunters. Sport hunting is a source of income to the community. Each hunter must be accompanied by two guides, each of whom receives $5,000 per hunt. Thus, in the 1995/1996 season, the three sport hunters paid a total of $30,000 for the services of their guides.

9.2.1.4 Bowhead Whales

Bowhead whales are large baleen whales that were formerly abundant throughout the Arctic. For several centuries they were the mainstay of a whaling industry which greatly reduced their numbers and drove some populations to near extinction. In the eastern Arctic, a few hundred survive from the Davis Strait stock, while in the western Arctic, the Bering-Chukchi-Beaufort stock is estimated at 7,800 (Zeh *et al*. 1993). While some individuals may occasionally enter the study region in summer, from either the east or the west, there are no published records of these movements.

9.2.1.5 Beluga Whales

Beluga whales are abundant in both the western and eastern Arctic. Occasionally small numbers enter the waters of Coronation Gulf and Queen Maud Gulf in

summer. Sightings of small numbers of belugas have been reported near Cambridge Bay (Omilgoetok 1996, pers. comm.; Semotiuk 1996, pers comm.).

9.2.1.6 Narwhal

Narwhal are common in the eastern Arctic but have not been recorded near Cambridge Bay.

9.2.2 Methods

The aerial survey protocol was developed and has been applied in the Canadian Arctic since the mid-1970s by the Canadian Wildlife Service (*e.g.*, Stirling *et al*. 1977; 1981). The technique is based on the fact that many (but not all) ringed and bearded seals *(Phoca hispida* and *Erignathus barbatus)* haul-out onto the surface of the sea ice during their annual molt in June. There is a diurnal haul-out pattern with the largest number of seals on the ice from late morning to late afternoon (Burns and Harbo 1972; Smith 1973).

9.2.2.1 Survey Design and Procedure

Surveys were flown along north-south transect lines at about ten kilometre intervals, with an additional line added in the Hope Bay area (Figure 9.2-1). Transect strips were 400 m wide, one on each side of the aircraft (Figure 9.2-2). Table 9.2-1 shows the lengths of the lines.

The aircraft, a DeHavilland Twin-Otter (DHC-6), flew at an altitude of 152 m (500 ft) and an airspeed of 220 km/h (120 knots). The survey strips were defined on the ice using a clinometer. Observers periodically checked the location of the outer strip boundary during the survey and checked the location of particular seals that were near the edge of the strip. Surveys were flown during afternoon, since previous work has shown that the maximum number of seals are hauled out between late morning and late afternoon (Stirling *et al*. 1981).

9.2.2.2 Timing

Based on the results of surveys elsewhere in the Arctic and consultations with other Arctic marine mammal biologists, the period from June 11 to 22 was selected during which to conduct the surveys. It was hoped that this period would permit at least one day with excellent ice and weather conditions when the seals would be conspicuous. Because of variability in weather, ice conditions, and haul-out behavior, the survey was replicated three times on June 14, 17, and 20, 1996.

9.2.2.3 Geographical Scope

Because any shipping routes into and out of Roberts Bay will traverse Melville Sound and adjacent outer Bathurst Inlet, the study focused on these areas (Figure 9.2-1). Although transect lines were defined for Elu Inlet, it was decided to focus the survey more intensively on the probable shipping route and to cover Elu Inlet by flying the centre line. After the first survey, the sequence of survey lines was arranged so that the aircraft could return to Cambridge Bay by way of Dease Strait. To help identify any areas that might have particularly high or low densities, the data have been stratified into Elu Inlet, Melville Sound (lines five to ten), outer Bathurst Inlet (lines 11 to 16), and Dease Strait.

9.2.2.4 Data Collection

Two observers, one on each side of the aircraft, recorded data into a tape recorder. Data recorded were:

- number of ringed seals within the transect strip;
- date and time;
- aircraft altitude; and
- weather conditions.

The Principal Investigator was Mark A. Fraker. He was assisted by two residents of Cambridge Bay; Colin Amegainik assisted on June 14 and 17, while Ernest Pokiak assisted on June 20.

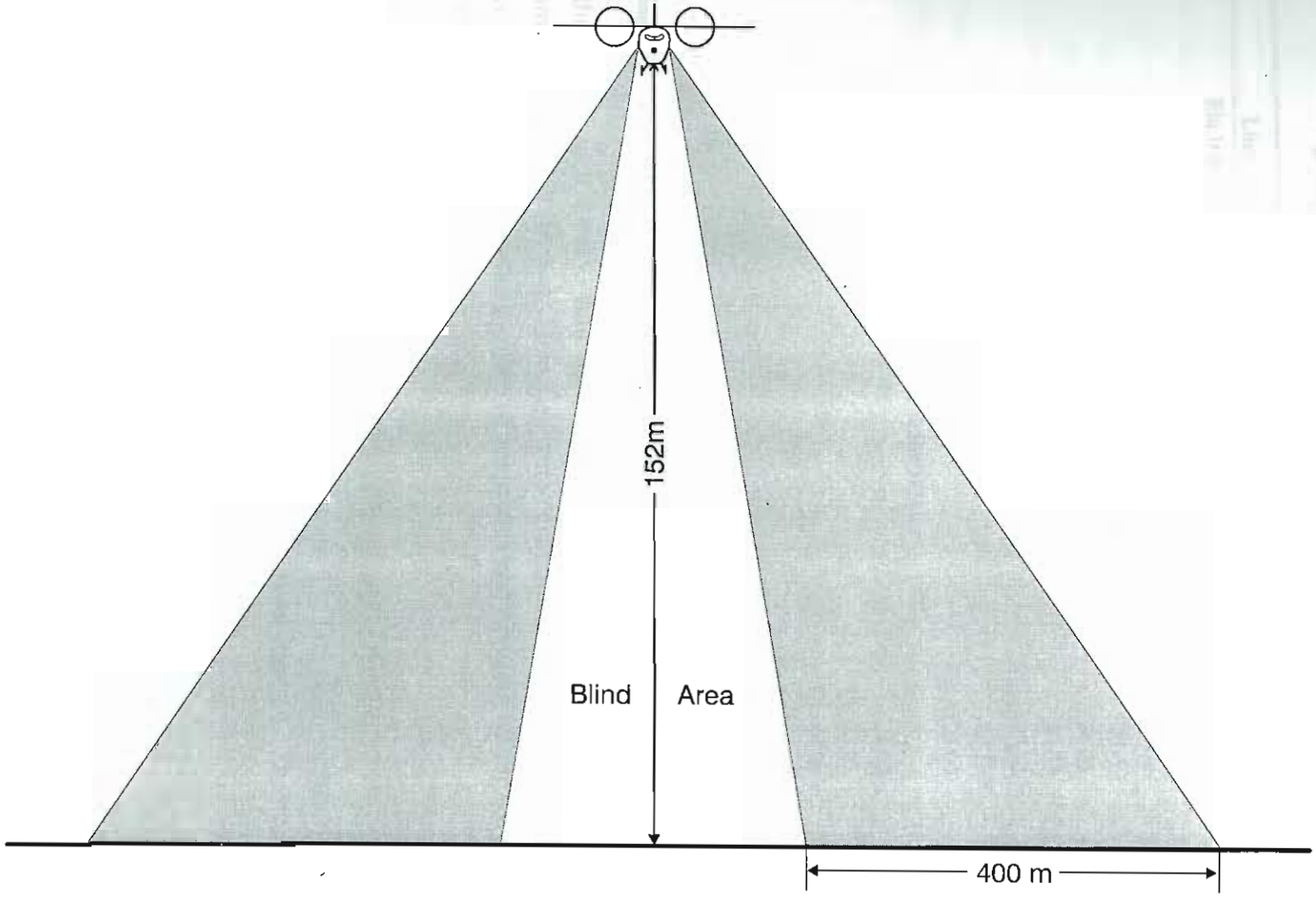


FIGURE 9.2.-2

Aerial Transect Strips

BHP

Rescan

Table 9.2-1
Lengths of Survey Lines in the Study Area[1]

Line	Length (km)
Elu Inlet	35.25
Melville Sound	
05	16.75
03	21.5
06A	24.25
07	24.75
08	27.75
09	27.50
10	23.00
Outer Bathurst Inlet	
11	31.00
12	33.25
13	44.00
14	40.25
15	44.75
16	44.00
Dease Strait	190.25

1: Lengths are of only water areas and do not include islands.

At the end of each survey, data were transcribed onto standard forms, and were summarized for each stratum. Densities were calculated for the different strata and survey dates by summing the number of seals seen and dividing by the survey area in each stratum.

9.2.3 Results and Discussion

The principal arrived in Cambridge Bay on June 11, but poor weather and the unavailability of the aircraft delayed the first survey until June 14. The second and third surveys were conducted on June 17 and 20.

9.2.3.1 Survey Conditions

The June 14 survey was conducted under excellent conditions. The sky was either clear or high, thin overcast. The ice surface was <50% puddled, meaning that seals were relatively conspicuous and that there were few dark-appearing objects (*e.g.*, shadows and dark melt holes) on the ice that could have been mistaken for seals.

The conditions for the June 17 survey were good to fair. Although the weather was again favorable, the ice surface was more heavily puddled and melt holes were more numerous than they were on the first survey. Elu Inlet and Dease Strait were the least changed. The melt holes forced the observers to focus on a number of dark objects to decide whether they were seals, thus preventing them from searching more widely across the transect. There were also a few relatively large areas of open water, which, of course, could not contain hauled-out seals.

The conditions for the June 20 survey were good to fair. As before, the weather was favorable, with clear or high overcast sky, but the ice had deteriorated further. Again, Elu Inlet and Dease Strait had changed the least.

9.2.3.2 Seal Counts

Seal counts and densities in each stratum are summarized in Table 9.2-2 and Figure 9.2-3.

Elu Inlet

Ice conditions in Elu Inlet changed the least over the course of the surveys, and the observed seal densities differed little between surveys, ranging only from 0.68 to 0.79 seals/km^2.

Melville Sound

The observed densities of seals in Melville Sound were highest (0.71 seals/km^2) on June 14, but subsequently dropped to < 0.30 seals/km^2.

Outer Bathurst Inlet

The pattern of density change in outer Bathurst Inlet was similar to that seen in Melville Sound. The highest density (0.82 km^2) was observed on June 14, with densities seen on later surveys dropping to < 0.40 seals/km^2.

Table 9.2-2
Estimated Densities of Ringed Seals in the Study Area

Survey Stratum	Area Surveyed (km^2)	Seals Observed		Mean Density ($seals/km^2$)
		aircraft left side	aircraft right side	
		June 14, 1996		
Elu Inlet	28	7	13	0.71
Melville Sound	166	80	38	0.71
Bathurst Inlet	237	87	55	0.60
Dease Strait		not surveyed		
		June 17, 1996		
Elu Inlet	28	6	13	0.68
Melville Sound	166	23	23	0.28
Bathurst Inlet	237	36	56	0.39
Dease Strait	95	data	43	0.45
		June 20, 1996		
Elu Inlet	28	6	16	0.79
Melville Sound	166	13	23	0.22
Bathurst Inlet	237	23	34	0.24
Dease Strait	190	29	34	0.33

Dease Inlet

On June 14 the observers were unable to survey Dease Strait owing to low fuel, however, they did survey this area as they returned to Cambridge Bay on June 17 and 20. The densities were 0.45 and 0.54 seals/km^2. Whether the observed densities would have been greater on June 14, as they were in Melville Sound and outer Bathurst Inlet, is unknown.

9.2.3.3 Comparisons to Other Surveys and Studies

To place these three June 1996 surveys in regional context; the results of several previous aerial seal surveys in the Canadian arctic were reviewed. Comparisons with data from other earlier studies showed that seal densities in this study area are relatively high.

Changes in Observed Density Between Surveys

Except for Elu Inlet and Dease Strait, where no survey was conducted on June 14, there was a clear tendency for the density of seals to decrease over the course of the study. Because it is unlikely that seals emigrated during this time, the decrease in the number of observations was probably a result of deteriorating ice conditions, which made it more difficult to distinguish seals from other dark objects, from a smaller proportion of seals hauling out on the ice, or both. Whether higher densities would have been observed had there been earlier surveys is unknown.

The ice in Elu Inlet remained stable and deteriorated the least over the course of these surveys, and most likely as a consequence, the observed density of seals did not change. The observed densities in Dease Strait were similar for both surveys.

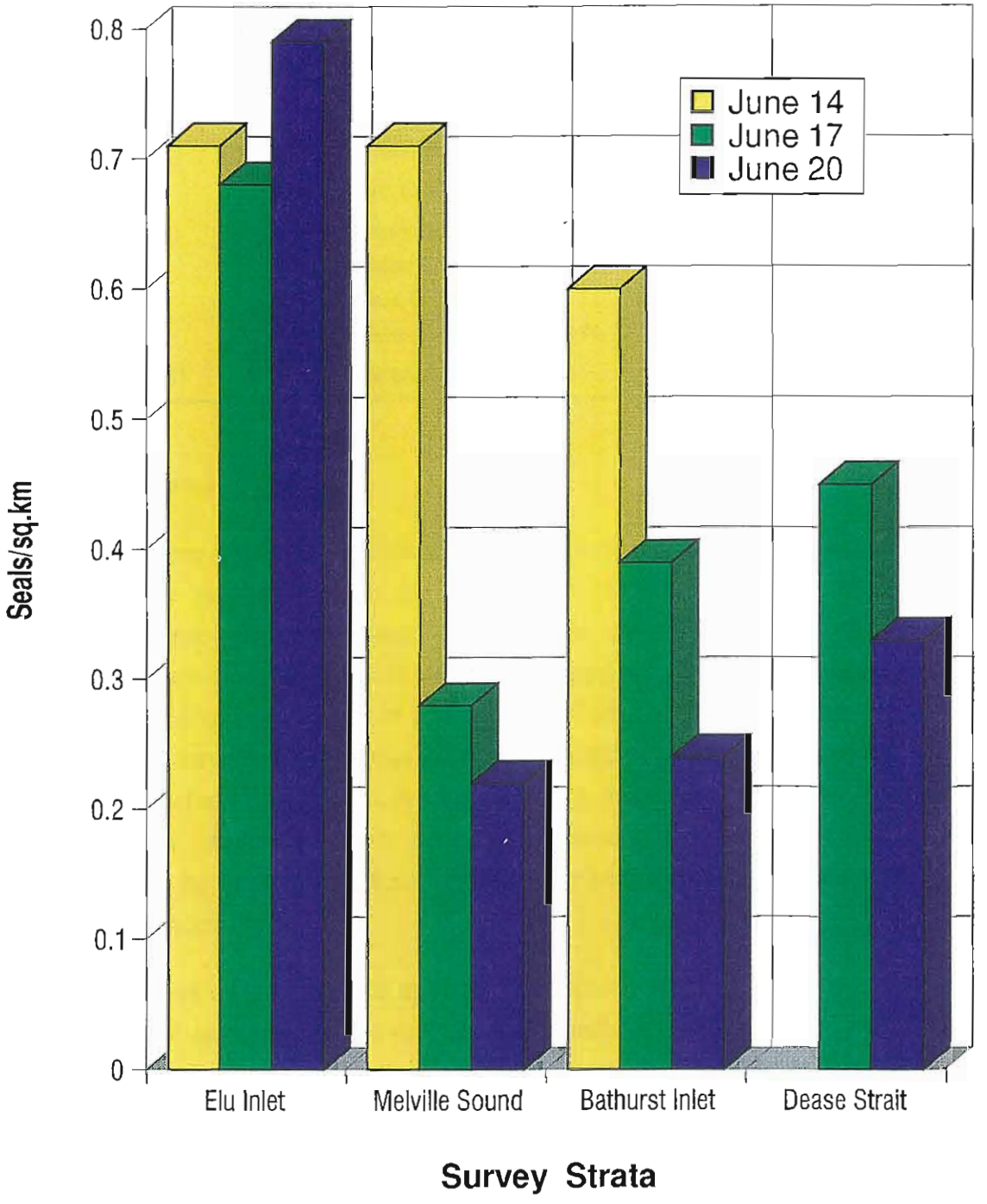
Comparison of Seal Densities in the Study Area and Other Arctic Areas

Several seal surveys were conducted in the Canadian Arctic during the 1970s and 1980s using the same methodology as was used in these surveys. Smith (1973) carried out surveys of eastern Amundsen Gulf and major inlets of southwestern Victoria Island (*i.e.*, Minto Inlet and Prince Albert Sound). Stirling *et al*. (1981a) conducted six years of surveys in the Beaufort Sea and western Amundsen Gulf. Kingsley *et al*. (1985) surveyed among the High Arctic Islands, including the area north of Victoria Island.

The densities observed during this study in Melville Sound and outer Bathurst Inlet were relatively high (Table 9.2-3). They were considerably higher than densities observed in the Beaufort Sea, but not as high as those seen in parts of eastern Amundsen Gulf and the inlets of western Victoria Island or certain parts of the High Arctic Islands.

Distribution

The distribution of seal observations failed to show any areas of conspicuously higher or lower densities (Figures 9.2-4 to 9.2-6). While there was some variability, no pattern is apparent.



Observed Seal Densities by Stratum and Survey Date

FIGURE 9.2-3

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Table 9.2-3
Comparison of Observed Ringed Seal Densities Recorded in This Study with Those Recorded in Other Surveys

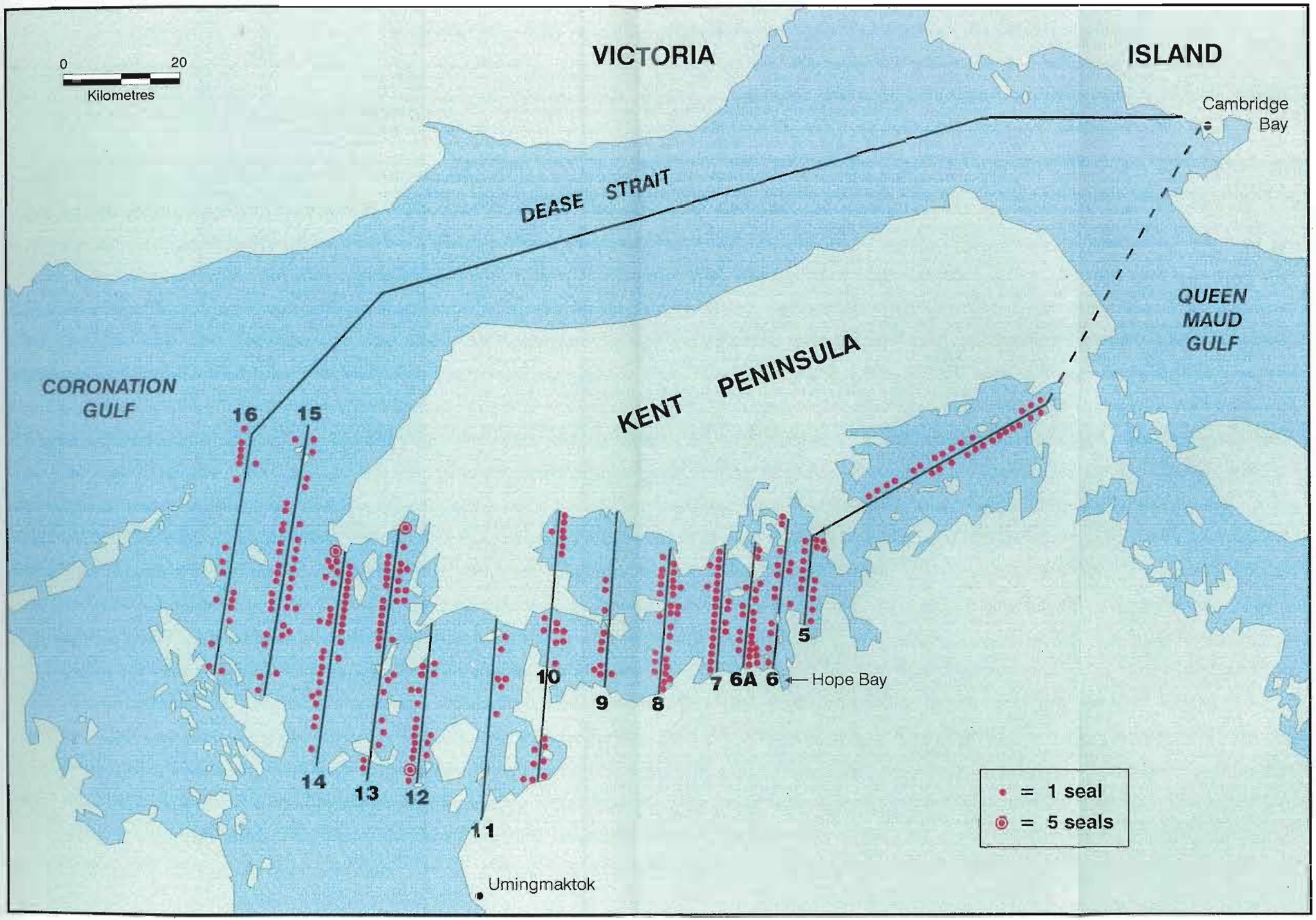
Source	Area	Density Range (seals/km^2)
This study	Melville Sound/Bathurst Inlet, June 14	0.60 - 0.71
Smith (1973)	E Amundsen Gulf/W Victoria Island inlets	0.18 - 2.13
Stirling et al. (1981a)	Yukon Coast to 160 km N 1974-79	0.0053 - 0.14
	NWT Beaufort Coast to 160 km N 1974-79	0.014 - 0.052
	W Amundsen Gulf 1974-79	0.0096 - 0.037
	W Banks Island to 160 km W 1974-79	0.0010 - 0.032
Kingsley et al. (1985)	High Arctic Islands 1980	0.21 - 1.16

9.2.4 Conclusions

Ringed seals were relatively abundant in the study region in 1996. The best survey conditions were encountered on the first survey, which was flown on June 14; later surveys were conducted under less favorable ice conditions. On the June 14 survey, densities ranged from 0.60 to 0.71 seals/km^2, which appears to be relatively high compared to other areas in the Canadian Arctic. They were not concentrated in any particular areas. Although bearded seals and polar bears might have been expected to be present in such an Arctic area, none were seen during the surveys, and all local informants agreed that these species are uncommon. Ice conditions may be unfavorable for overwintering bearded seals, but the scarcity of polar bears is puzzling.

The harvest level of ringed seals appears to be about 20 to 40 per year, with few pelts being sold at present. The most economically important marine mammal in the Cambridge Bay region is the polar bear, with sport hunters paying about $10,000 each for guide services for each hunt. However, polar bears are rare in the study region, so that hunting takes place well to the north and east of Cambridge Bay.

Three species of cetaceans, narwhal, beluga, and bowhead whale, might occur in the study region occasionally in the open-water period. Further east, narwhal and belugas are common during open water, and there is a small population of bowheads. To the west, in the Beaufort Sea and Amundsen Gulf, bowheads and belugas are common in summer.



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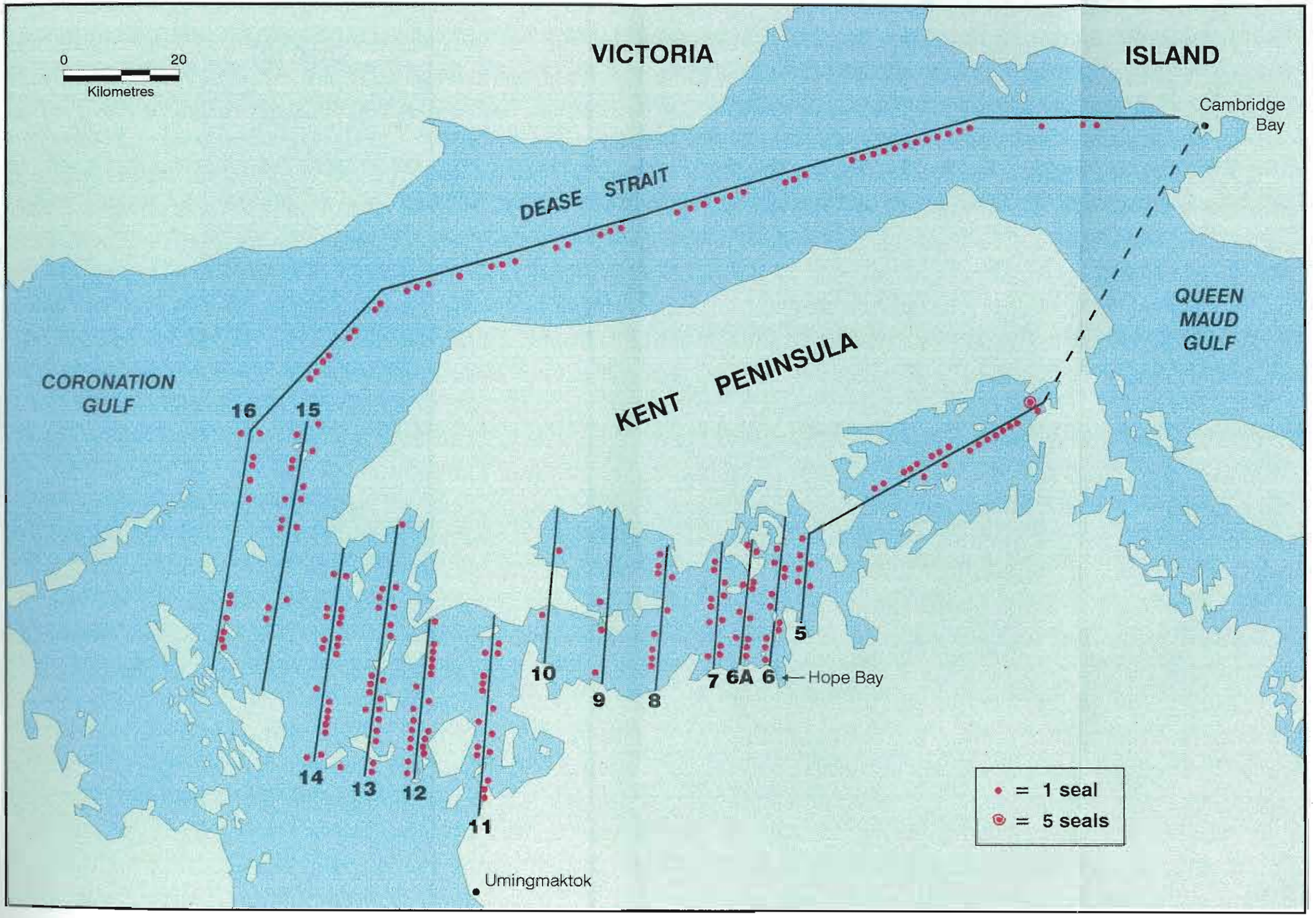
Distribution of Observed Seals, June 14, 1996

FIGURE 9.2-4

Rescan



BHP

Distribution of Observed Seals, June 17, 1996

FIGURE 9.2-5

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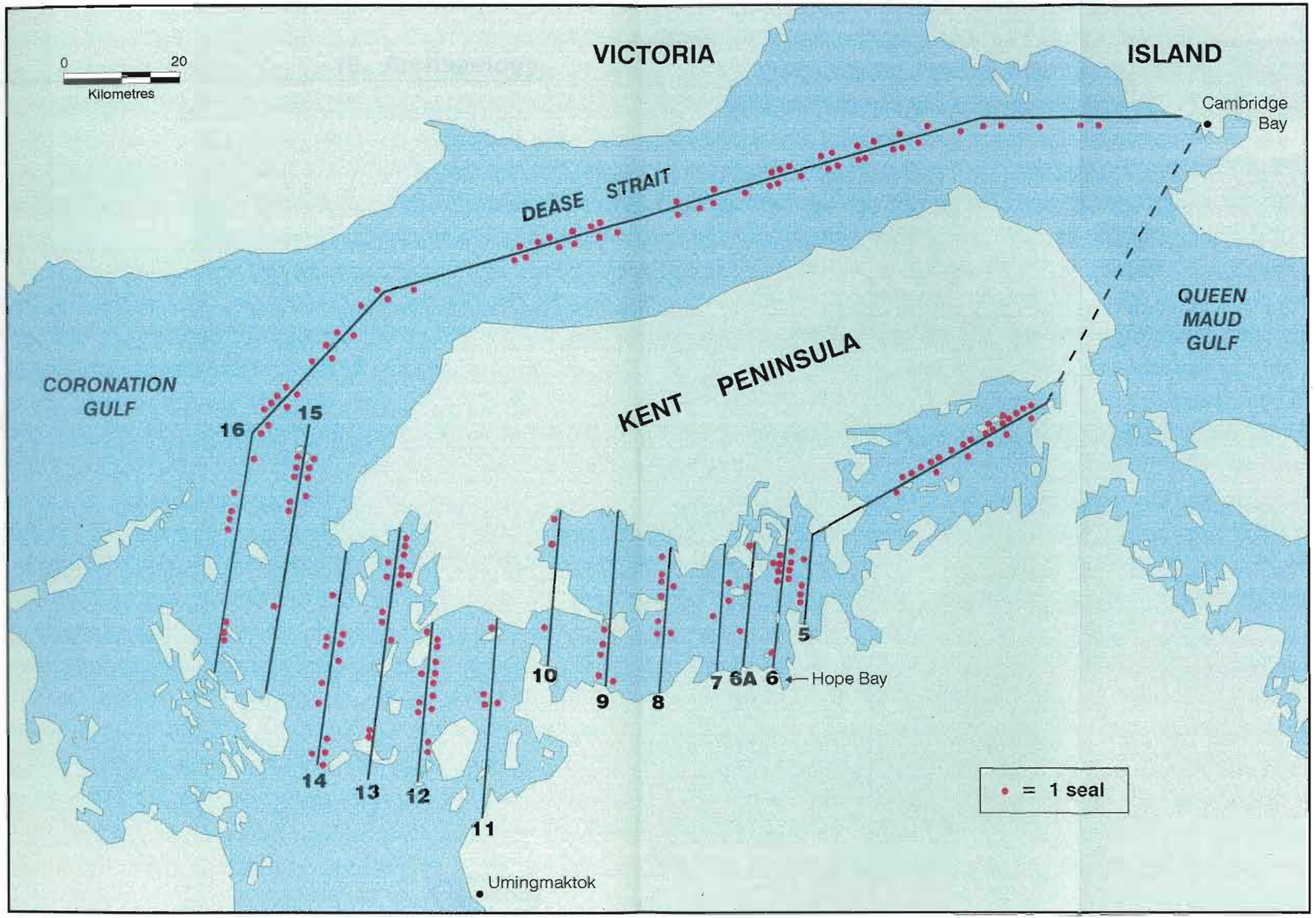

Distribution of Observed Seals, June 20, 1996

FIGURE 9.2-6

10. Archaeology

10. ARCHAEOLOGY

Archaeological investigations were conducted for three possible developments within the Hope Bay Belt Project area:

1) Boston bulk sampling project area;
2) Doris Lake exploration area; and
3) Roberts Bay proposed port/barge locations.

In addition, a potential winter trail route between the Boston Property and Roberts Bay was examined. The project was directed by G. Prager of Points West Heritage Consulting Ltd. Field assistance was provided by C. Rushworth and J. Franklin, a resident of Coppermine. Field studies were carried out between July 22 and August 1, 1996.

The locations of the Boston bulk sampling project and the Doris Lake exploration project is given in Figure 1-1. The study area for the archaeological investigations can be considered to be a corridor east of Bathurst Inlet from just south of the Boston Property almost directly north to the western edge of Roberts Bay, a distance of approximately 60 km. All environmental studies conducted in this region that relate to both BHP's Boston and Doris Lake projects are grouped together hereafter and referred to as the Hope Bay Belt Project.

10.1.1 Project Background

In 1995, a mitigative excavation of a tent ring site (MjNh-1) was conducted within the Boston Project development area. A preliminary assessment of an island in Roberts Bay was identified as a possible port location (Bussey 1995a). In the latter area, 13 archaeological sites were recorded, and additional field investigations were recommended for both areas.

For 1996, BHP requested that an inventory and impact assessment of planned development areas within the Boston and Doris Lake properties be performed; the boundaries were delineated on maps provided by BHP (Figure 10.1-1). In response to the high site yield found on the island in Roberts Bay (Bussey 1995a), BHP proposed several new possible port and barge landing locations on the west

side of Roberts Bay which required detailed archaeological assessments (Figure 10.1-1). In addition, a winter trail route was proposed between the Boston Project and Roberts Bay (Figure 10.1-1). Because the Doris Lake to Roberts Bay portion of this proposed trail was to be used this winter, this section required detailed assessment; the remainder of the trail was still in the preliminary planning stages, consequently, it was requested that high potential areas along the route be identified in order to assist in planning (Wuertz 1996, pers. comm). If time permitted a final component of the archaeological field work was to examine and record any sites that had been reported by various survey and geology crews working in the area.

An additional aspect of the 1996 project involved a revisit of one of the 1995 archaeological sites. A group of Inuit Elders were given a tour of the Boston and Doris Lake projects, which included a demonstration of some examples of archaeological sites found as a result of investigations for BHP. This was part of the traditional knowledge study being undertaken by another consultant (Hanks 1996, pers. comm.).

Section 10.2 of this report provides a discussion of the methodology, both general and specific, used in this archaeological study; Section 10.3 presents background data consisting of environmental information, human history of the region, as well as previous ethnographic, historical and archaeology studies relevant to the project area. Archaeological investigations are discussed in Section 10.4, by development project, and the proximity of recorded sites to potential development is noted. Section 10.5 provides individual descriptions of all sites recorded as well as a brief preliminary analysis of the sites and features. Section 10.6 contains a summary of the archaeological study and findings and presents recommendations. Because of the number of photographs and site maps, these have been placed in Appendices 10-1 and 10-2 to maintain the continuity of the text.

10.2 Methodology

This section presents the general methodology employed in the conduct of the archaeological research and investigations for BHP's Hope Bay Belt Project, as well as presenting the specific field methods used in each project area.

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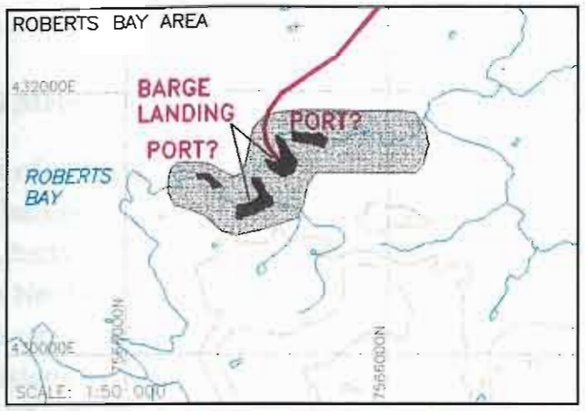
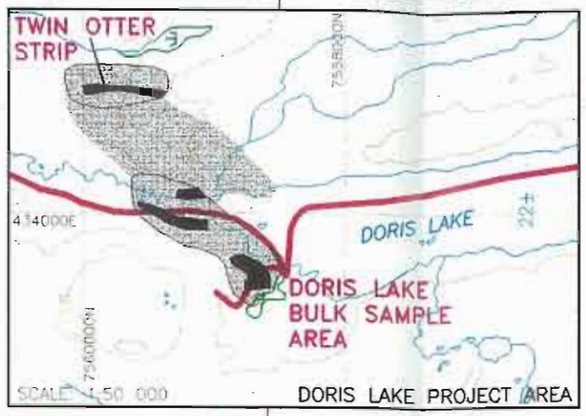
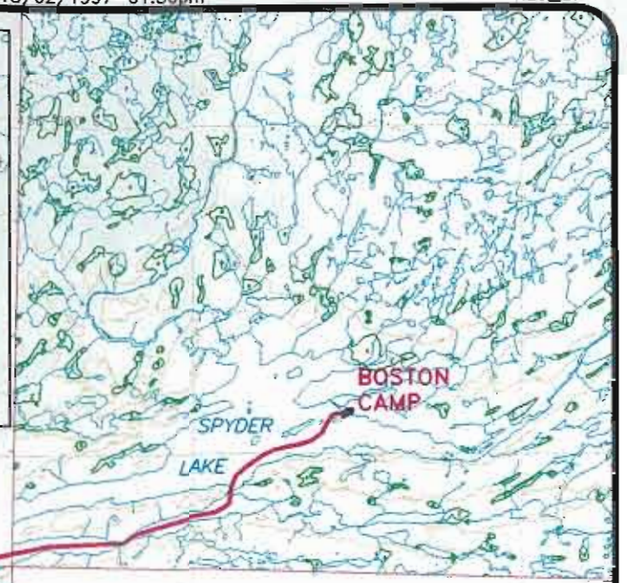
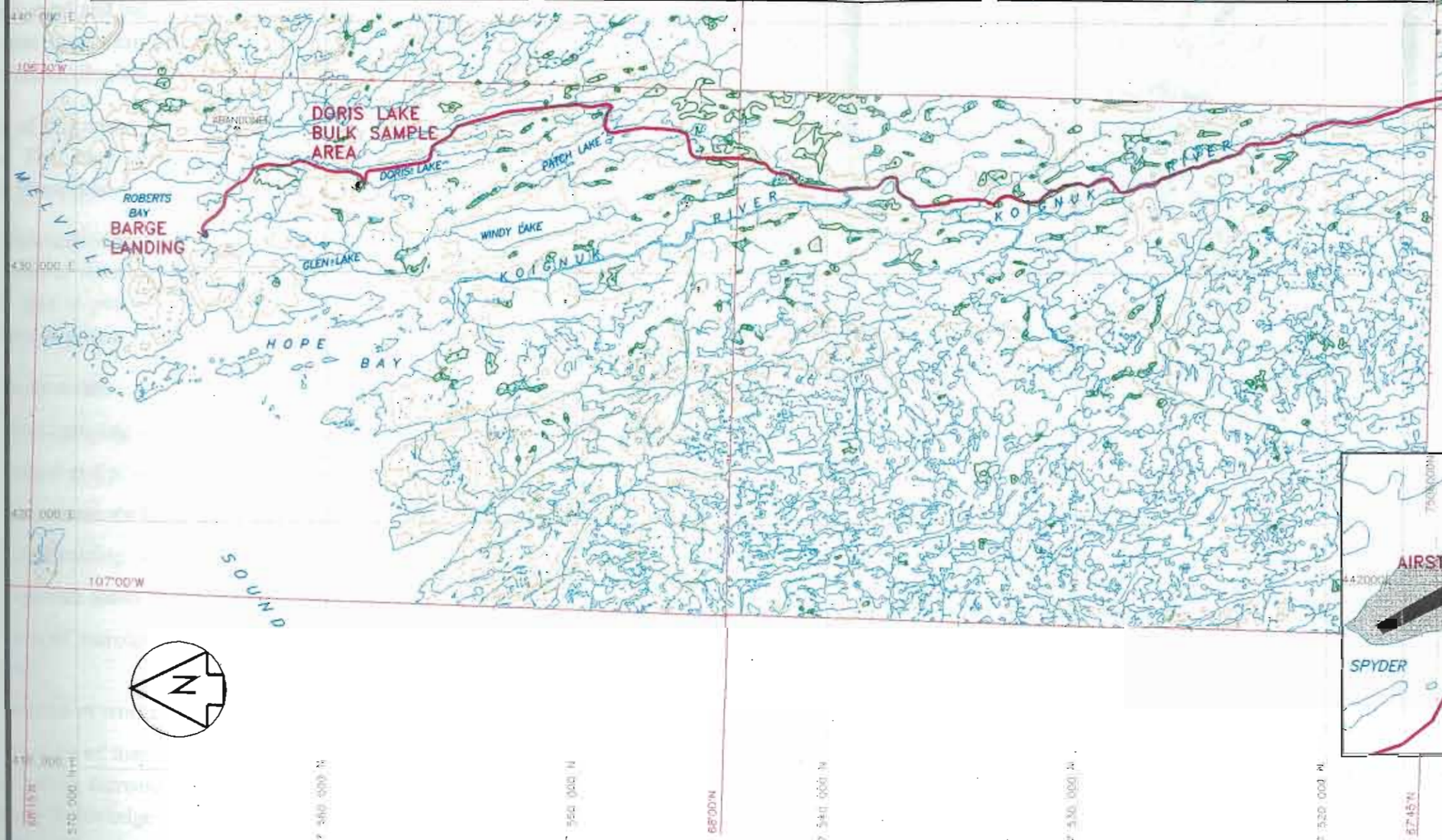


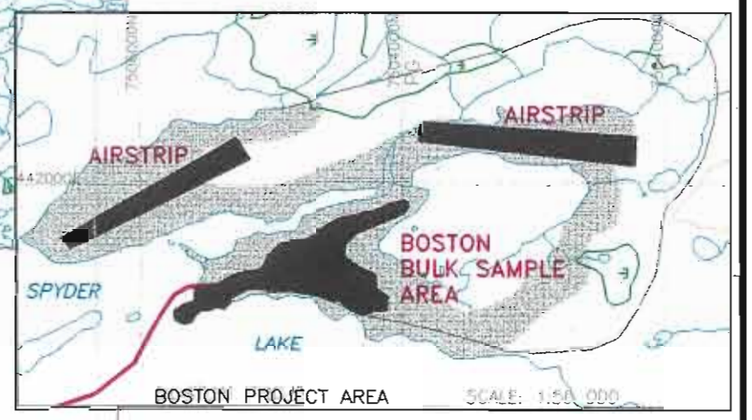






LEGEND:

- BOSTON WINTER TRAIL ROUTE EXAMINED
- OUTLINED AREAS TO BE EXAMINED
- AREAS SUBJECTED TO INTENSIVE ARCHAEOLOGICAL GROUND RECONNAISSANCE



BHP

Winter Trail Route with Areas Examined within the Hope Bay Belt

Rescan

Fig.10.1-1

10.2.1 General Methodology

The initial stage of archaeological investigations for BHP's Hope Bay Belt Project involved some background research at the Canadian Circumpolar Institute at the University of Alberta in Edmonton, the University of Alberta libraries, and at the Prince of Wales Northern Heritage Centre in Yellowknife. Such research consists of gathering any reports on archaeological work done in the general area as well as searching for historic or ethnographic documentary information. Any available environmental and paleoecological information was also gathered. These types of data assist in assessing the potential of specific areas and certain landforms to contain archaeological resources.

A copy of this report will be submitted to the Prince of Wales Northern Heritage Centre. That copy includes detailed text citations, which are also available from Rescan, if required.

The assessment of archaeological potential in any region is based on an assessment of the natural resources and landscape features and how these combine in any specific area to provide possibilities to meet basic human needs. The following factors are of primary importance in human location:

- fresh water;
- level camping area of suitable size or some other shelter possibilities;
- animal and plant food resources;
- fuel source for heating and cooking;
- travel routing possibilities;
- exposure (south facing generally preferred where possible);
- view of surrounding area (both for game sighting and defensive purposes); and
- sources of workable stone or other specific raw materials needed.

As the number of these factors that exist in any particular location increases, the potential rating increases. Additionally, historic, ethnographic, archaeological or oral history knowledge of human uses in a region can be incorporated to further adjust potential ratings. In general, a rating system of low, moderate and high

categories is used in most areas to assess archaeological potential; other systems, such as a two tiered system of some and high may be used in regions with little previous archaeological research or where little ethnographic or historic information is available.

In the central Arctic regions, the most important site location factors would probably be the availability of game resources and fuel sources. As observed by Stefansson, (1919) who directed one of the first explorations of the region in the early 1900s, fresh water can be found almost anywhere in the central Arctic heather was the preferred fuel for Coronation Gulf people, and their camps would usually overlook good game feeding grounds or lake or river game crossing points (Stefansson 1919). Hence, the locations which would provide the highest archaeological potential in this region would be elevated landforms providing dry ground, overlooking shallow lake, river narrows or grassy meadows. Waterlogged or sloped land would have low archaeological potential. The range of landforms and ground types in between these extremes would be variously rated as having low, medium or high potential, depending on the location's specific features and setting.

Standard archaeological techniques were utilized for the ground reconnaissance. The detailed inventory and impact assessment portion of the archaeological field study generally involved foot traverses supplemented by low level helicopter overflights to provide full visual inspection of the areas delineated on project maps. The foot traverses were conducted near terrain unit edges and/or those portions of a landform with potential or of an entire landform where limits were readily evident, supplemented by examination of ground exposures and subsurface shovel tests. Due to the high degree of ground exposure and limited soil development in this region, shovel tests were rarely necessary to locate sites. Subsurface tests were judgementally placed in the highest potential locations where there was significant soil development. The spacing and number of tests varied depending on the size of the landform, the amount of exposure and degree of soil deposition and the potential for archaeological resources. Tests were generally 40 x 40 cm, although occasionally they were larger or smaller, depending on local vegetation and soil conditions. The depth of the tests varied, but because of the generally poor soil development and extensive gravel deposits and bedrock outcrops characteristic of this study area, depths of subsurface tests usually ranged from 10 to 30 cm.

In those cases where archaeological resources were encountered, more detailed investigations were conducted. The site boundaries were determined through examination of exposures, by the limits of the landform or site features, or by subsurface testing. Recommendations as to whether more intensive investigations to determine site content, depth, *etc*. should be undertaken, were dependent on the potential for the site to be impacted, perceived importance of the site and various other considerations. For all sites recorded, archaeological site inventory forms were completed, site maps drawn and photographs taken. Completed site forms were submitted to the Canadian Museum of Civilization and the Prince of Wales Northern Heritage Centre for inclusion in the national and territorial inventories. Temporary site numbers were assigned in the field, and the permanent Borden numbers (based on latitude and longitude) were provided by the Canadian Museum of Civilization. The Borden system involves a series of capital and small case letters and a number, for example, MjNh-1. Numbers are usually consecutively assigned, in the order sites are discovered.

Only artifacts judged to be in imminent danger of direct impact by possible development were collected; all other artifacts were recorded and photographed *in situ*. This season, only two artifacts were judged to be in enough danger to require collection. These are currently being examined by a conservation consultant (Cross 1996, pers. comm), to determine the level of conservation required. After they have been treated, if necessary, they will be submitted to the Prince of Wales Northern Heritage Centre.

10.2.2 Specific Field Methods

The archaeological field work began with a contribution to a tour of BHP projects by Inuit Elders by visiting some good examples of archaeological sites recorded in the region. Because of the need to use a helicopter to reach the sites and the passenger limitations imposed by the size of the available helicopter, and therefore, only two Elders, John Akana and Steve Anavilok, could participate. They were taken to the island in Roberts Bay on which several sites were found last year (Bussey 1995a), shown some sites from the air and visited one site (NbNh-3). They examined the features and made comments about their significance. This information was incorporated in this year's study and is referred to in this report where appropriate. They also pointed out some features

which had not been identified last year; this emphasizes the value of discussions with local residents and opportunities to view archaeological features with them - useful information can often be forthcoming.

Archaeological field investigations began at the Boston Project. The field crew stayed at Boston camp for the investigation of that area as well as the southern section of the proposed trail route. The boundaries of the Boston study area were determined by the area delineated on the map provided by the BHP Resource Development office in San Francisco, (Figure 10.1-1) and focused on two possible airstrip locations as well as a large bulk sample area. In addition, one large site, MjNh-2, that had been preliminarily recorded last year (because it was outside of the planned developments), was revisited to gain a clearer picture of the extent of the site and the features present.

The proposed winter trail route (Figure 10.1-1) was observed by low, slow helicopter overflight from Boston camp to Doris Lake. The main goals were to identify landforms with good archaeological potential and to record any archaeological sites in the vicinity, that had been reported by survey crews last year. In addition, because of the good visibility of rock features on the landscape, several additional sites were observed during the overflight and were recorded, time permitting.

For the remainder of the field investigations, the archaeological team moved to Windy Lake camp, in the vicinity of Doris Lake. For the portion of the proposed winter trail route between Doris Lake and Roberts Bay, a more detailed assessment was necessary because that portion of the trail was to be used this winter. A low, slow helicopter overflight was followed by ground reconnaissance of high potential areas.

In the Doris Lake development area, selected portions, as delineated on the project map (Figure 10.1-1), were subjected to ground reconnaissance. These included the proposed camp location, a possible air strip location and a planned bulk sample area, all at the north end of Doris Lake. In addition, any possible development areas in the Doris Lake Project area identified while the archaeological investigations were going on were to be included in the detailed assessment. Only one possible exploration area (Madrid) near the north end of Patch Lake was identified, and that area was also subjected to ground

reconnaissance. Finally, because time permitted, several sites that had been reported by survey and geology crews in the general Doris Lake vicinity were also visited and recorded (Klohn-Crippen 1995).

The final development area requiring examination was on the west side of Roberts Bay and included two possible port and two possible barge landing locations. A larger area, delineated on the project map (Figure 10.1-1), was viewed by low, slow helicopter overflight, followed by foot traverses which provided good coverage of most of the landscape within the outlined area.

10.3 Background

This section includes background information on the regional environment, human history and archaeology. This information provides the setting necessary to place the archaeological study findings in proper context for interpretative purposes and assists in the determination of archaeological potential of various landforms.

10.3.1 Environmental Setting

The Hope Bay Belt study area is located within the north-central Arctic region, within the Back Lowland of the Canadian Shield (Rogers and Smith 1981). The entire region was covered by the Laurentide ice sheet; deglaciation is thought to have been nearly complete by about 9,000 years before present (B.P.). The landscape was formed by the scouring and deposition of glaciers and is dominated by smoothed and rounded surfaces (Stager and McSkimming 1984). Landforms and lakes are generally aligned north-south, signifying the direction of glacial movement. An important phenomenon in the Arctic is crustal rebound, the rising of the land surface after the glacial ice retreated. This has resulted in old beach ridges occurring many miles inland at heights of up to 150 m above present sea levels (Stager and McSkimming 1984). Curves have been developed measuring this process and most of the rebound occurred in the first several thousand years after ice retreat; consequently, this phenomenon is only relevant in the cases of the oldest archaeological sites in a region.

The landscape is characterized by low lying, gently rolling or flat land frequently interspersed by rocky bluffs, ridges or knolls. Bedrock often occurs at the surface, but in small depressed areas, soil has accumulated to provide an environment for

plant life. In larger depressions, formed by the melting out of glacial ice, water has accumulated to form the many lakes that dot the landscape and much of the low lying terrain is swampy. Frost heaving and shattering are the dominant processes that continue to modify the landscape and form the various types of formations. The surface is generally typified by boulders, rocks and gravel of various sizes.

The climate is classified as cold continental, with mean daily temperatures ranging from -30 °C in January to 10 °C in July (Stager and McSkimming 1984). The region has a low mean annual precipitation rate of less than 20 cm (Stager and McSkimming 1984) and is considered an Arctic desert. Most of the snow falls at the beginning of winter; after that time, little new snow is added but strong winds constantly cause drifting; this region is known as the windy belt of the central Arctic (Stager and McSkimming 1984). Because of the lack of climatic warming in the summer, the study area is within the continuous permafrost region (Stager and McSkimming 1984). The coastal waters of the study area are usually ice-free for between two and four months each year, but the summer pack ice can extend fairly close (Stager and McSkimming 1984).

The entire area covered by the Hope Bay Belt Project is within the tundra zone and is well above the tree line (Stager and McSkimming 1984). The Arctic ecosystem is characterized by a lack of biological diversity; few plant and animal species have adapted to the harsh environment (Freeman 1984). Vegetation is generally low growing, due to soil infertility and aridity, short growing season and high wind velocity. Lichens, mosses, and grasses dominate, with patches of dwarf birch and willow (Wilkinson 1970). Fields of grassy tussocks are common. Arctic cotton grass and Arctic poppy color the landscape. There are few plants that provide edible material in large enough consistent quantities to have been regularly exploited, and vegetal matter was almost non-existent in the local diet (see Section 10.3-3) until relatively recent transportation improvements provided goods from the south.

The primary large mammals in the region are caribou, muskoxen, wolves and grizzly bears (Wilkinson 1970). Ringed seals occur along the coast. Numerous small mammals include lemmings, foxes, hares, weasels, and the abundant “sik sik” (ground squirrels). Bird species include eagles, falcons, owls, ravens, ptarmigan, gulls, swans, ducks and geese. Arctic char is the primary anadromous

fish in the region, and various types of fresh water fish such as lake trout, grayling, cisco and whitefish are found in the many lakes and streams.

10.3.2 Human History

The study area is on the eastern edge of the Copper Inuit ethnographic territory, as it is currently identified (Damas 1984). This is one of the five groups classified as Central Eskimo, so designated because they live in the area that is the approximate centre of the region traditionally occupied by the Eskimo people who were the ancestors of current Inuit residents. The Copper Inuit traditional range is generally considered to be from Wise Point on the west, to the southern shore of Banks Island on the north, including most of Victoria Island, to a line running just east of Cambridge Bay to Perry River, and south almost to Back River and Contwoyto Lake (Damas 1984); a map by Jenness (1922) shows most of this territory as well as indicating locational and group names mentioned by other sources, thus, it is included here as a reference (Figure 10.3-1).

The central Arctic was probably the last region in the Arctic to experience extended contact with white culture. Ethnographically, the Central Eskimo represent the least studied of all Inuit groups; there seems to have been much more historically documented contact with western and eastern groups (cf. Wissler's introduction to Stefansson's (1919) report on the 1908 to 1912 explorations: "The region between Cape Bathurst and King William Island was formerly so little known that one could do no more than conjecture as to what groups of Eskimo lived therein"). This late investigation of the region may have been for a combination of several reasons:

1) greater difficulty in reaching the area;
2) fewer unique or interesting artifacts; and
3) a more marginal existence, which may imply simpler social organization and, consequently, may have provided less interest to ethnographers of the day.

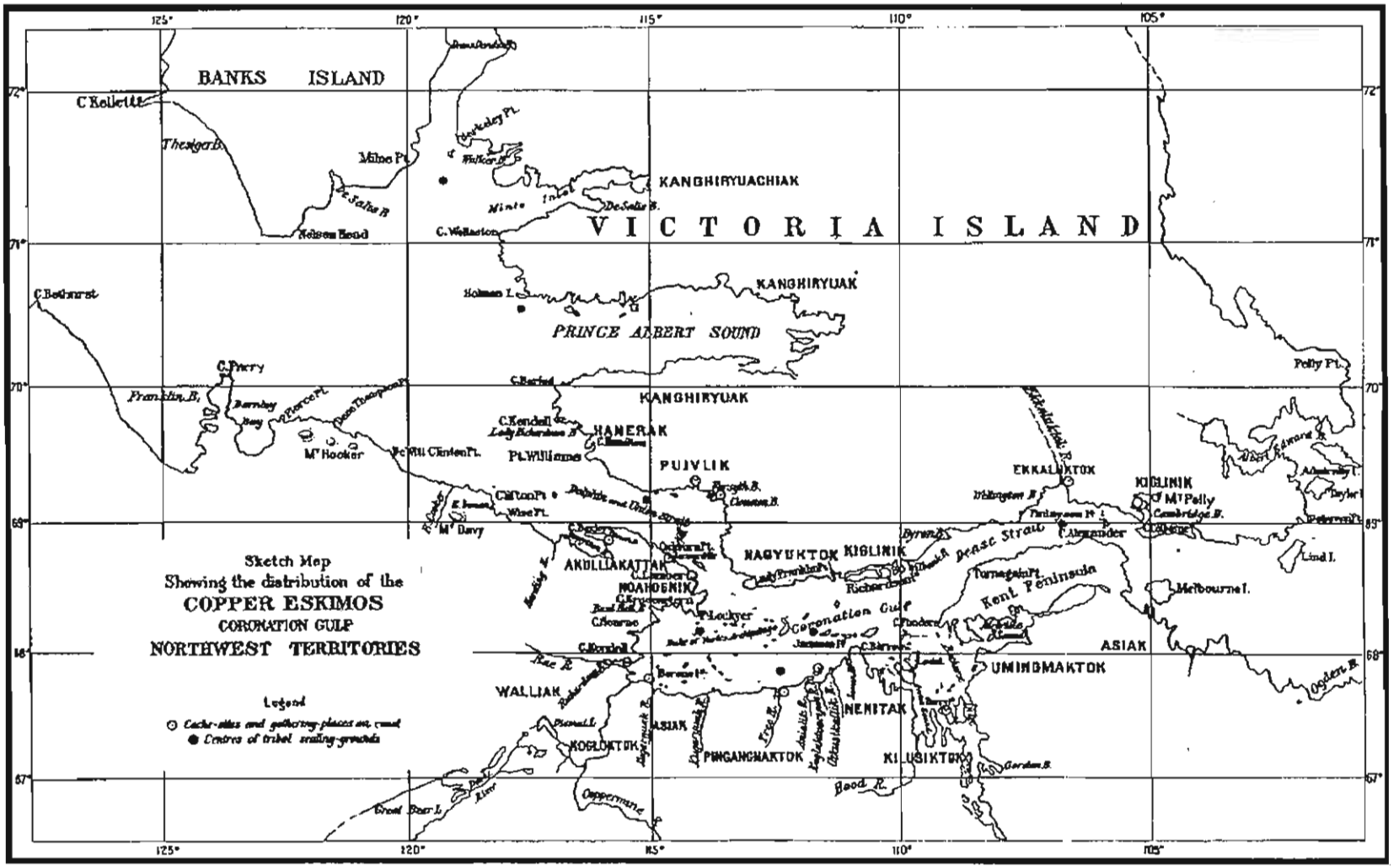
The central barrenlands and adjacent Arctic coast of the Mackenzie and Keewatin districts have been thought by some to have always had low population densities (Maxwell 1980). Part of the reason for this is believed to be a result of the relatively low biomass of the region, compared to the western, eastern and high

Arctic regions where marine environments provide a plentiful economic base (cf. Jenness's (1922) comment on the "greater resources and population west of Kent Peninsula").

The first person documented to have travelled through Copper Inuit territory was Samuel Hearne, who was hired by the Hudson's Bay Company to travel overland from Hudson Bay to the Arctic coast at the Coppermine River in 1770 to 1772 (Jenness 1922). In 1820 to 1821, Sir John Franklin was commissioned by the British government to explore the polar sea. He proceeded down the Coppermine River by canoe and travelled the length of Coronation Gulf, mapping the shoreline (Jenness 1922).

After Franklin's disappearance in the central Arctic in 1848 while conducting another exploration, several expeditions searching for him passed through and/or near the Coronation Gulf area (*e.g.*, M'Clintock and Simpson, Hall, and McClure), but it was not until the turn of the century that active exploration of this portion of the Arctic was revived. These included the Stefansson-Anderson explorations for the American Museum of Natural History in 1908 to 1912 (Stefansson 1919), the Canadian Arctic Expedition (1913 to 1918) of which the eminent ethnographer Diamond Jenness was a part (Jenness 1922), and the Danish Thule Expeditions (the Fifth [1921 to 1924] extended into the central Arctic; Rasmussen 1932). These are the primary references for Copper Inuit ethnography; although these studies generally focused on the western portions of the range, that is, west of Bathurst Inlet, it can be assumed that subsistence practices were similar throughout the territory.

Other prominent studies which have some relevance to the Central Eskimo include Boas' (1964) studies of eastern Central Eskimo groups in the 1880s and Smith's (1959) extensive comparative studies of various Inuit groups conducted in the 1920s. Later travellers consisting of explorers, traders, and missionaries wrote popular accounts of their times in the central Arctic; for example, the Oblate missionary Father Raymond de Coccola lived at Cambridge Bay and Burnside post, at the south end of Bathurst Inlet, from 1937 to 1949 and travelled extensively throughout Copper Inuit territory (de Coccola and King 1986).



Sketch Map Showing the Distribution of Copper Inuit on the Coronation Gulf Region, NWT

FIGURE 10.3-1

Source: Jenness 1922

The fur trade in this region began in the 1920s with the establishment of trading posts in the Bathurst Inlet/Kent Peninsula area (Usher 1971). Several were clustered along the coast between the Coppermine River and Bathurst Inlet. The early posts on Bathurst Inlet were located on the west side, at the Burnside River (operated between 1930 and 1964) and Hood River (between 1936 and 1941), and at the southern tip of the inlet at Western River (open between 1925 and 1927). Another early post was in operation on the southern shore of Kent Peninsula between 1920 and 1927. The only post on the eastern side of Bathurst Inlet was operating at Baychimo Harbour (now known as Umingmaktok), between 1964 and 1970; this replaced the Burnside River post. This influx of traders likely served to change the focus of subsistence activities and travel patterns, toward more fox hunting than was carried on previously (Jenness 1922), and increased the hunting pressures on caribou (cf. comment by Captain Bernard regarding the changes he had witnessed by 1920: "The Eskimo were leaving their winter sealing grounds about two months earlier than usual and devoting their attention to the trapping of foxes"; Jenness 1922).

10.3.3 Copper Inuit Life

The primary focus of the Copper Inuit was and is west of Bathurst Inlet; however, some have historically lived on the eastern shore of Bathurst Inlet. The evidence suggests that these eastern Copper Inuit did not frequently penetrate very far into the inland area east of the Inlet. Short distance incursions were made to hunt caribou and muskox (cf. Riewe 1992), and some trading expeditions were conducted to trade with the Netsilik people whose territory was immediately east. Some mention was also made in ethnographic literature of one-half to two year long journeys carried out to trade with the Caribou Eskimo to the south, most particularly for the very valuable wood resources (Jenness 1922).

According to Rasmussen (1932), the people living on the east side of Bathurst Inlet were known as the Muskox people because they hunted the muskoxen that frequented that area. He noted that the vicinity of Hope Bay (west of Roberts Bay) once abounded with muskoxen (Rasmussen 1932). The name "Umingmaktok," now applied to the settlement on the east side of Bathurst Inlet, means "where the muskoxen are many" (Rasmussen 1932). The end sheet maps in De Coccola and King (1986) show the names of several regional groups within

the Copper Inuit territory, all signifying locational or subsistence focus; they also record the “People of the Muskox” living on the east side of Bathurst Inlet. It is interesting to note, however, that in spite of the name, the subsistence focus of this group was the same as all other Copper Inuit, that is, caribou, and that muskox were only hunted occasionally. Even Rasmussen noted that the Muskox people hunted caribou from May to October, and large herds of caribou could be found scattered throughout the region (Rasmussen 1932).

The subsistence cycle of the Copper Inuit was based on seasonal movements to harvest specific resources within the region. From December until May, the main economic focus of the Copper Inuit was breathing-hole sealing. Because this activity involved the cooperative efforts of a number of hunters (one was stationed at each hole to wait until the seal rose) and their dogs (to find the holes), groups aggregated into winter snowhouse villages on the sea ice.

During the second half of May, the winter villages were abandoned and the people dispersed to the land and began to exploit resources such as caribou, fish, birds and small game. In spring and early summer, fishing through ice on lakes was more important, while caribou hunting dominated from about the beginning of August to November, when the animals were fairly fat and their skins most suitable for clothing. In late summer, fishing for Arctic char was carried out by using weirs in the streams to which the char returned after their time in the ocean.

For a period of two to four weeks beginning in November, the Copper Inuit subsisted mainly on cached frozen and dried foods. This was a period when summer hunting groups aggregated at traditional locations (known as “finishing places”) to permit the women to concentrate on sewing the winter garments (see Figure 10.3-1). It was also the time to wait for the sea ice to become solid enough to permit moving out to the winter snowhouse village locations (McGhee 1972).

In general, the Copper Inuit’s social focus was the nuclear family. No consistent larger groups, such as tribes, were known, nor was there a group hierarchy or leadership. In fact, it has been pointed out that, historically, the Copper Inuit believed in equality to the extreme, and anyone who stood out in any way was frowned upon, or dealt with in some manner to put him back in place (Stevenson 1997). Summer hunting groups generally consisted of the single family with

occasional “accidental” groupings when people gathered at particularly good fishing or caribou hunting locations. The sewing groups would represent a moderate sized aggregation, Damas (1984) estimates from 40 to 50 people. The winter villages would have been the largest gathering, which Damas (1984) estimates ranged between 50 and 166 people, averaging between 90 and 120 (1984). No constant group composition is discernible; sometimes related people came together, other times, friends or acquaintances gathered. Consequently, it could be concluded that kinship ties were loose, at best.

Technology of the Copper Inuit was composed primarily of bone and antler implements. Sealing was carried out with harpoons made of bone and wood. Caribou were hunted with bows and arrows, the former made of wood, antler or horn or, more often, a combination of these materials held together with sinew. Arrows were tipped with copper, iron, bone or antler. Sometimes converging rows of rock piles would be constructed and women and children would chase caribou toward the waiting hunters. Other times, caribou were intercepted at lake and stream crossing points.

Fishing through the ice utilized copper, iron or bone hooks attached to a line. A variety of household implements were made of bone, soapstone, wood and copper and include lamps, cooking pots, baskets, scrapers, needles and knives of various types. Clothing and bedding were made primarily from caribou skin, before the influx of cloth and sleeping bags. Transportation was by sled pulled by dogs and humans in winter and in summer, dogs and people would carry packs on their backs. In the Central Eskimo region, kayaks were used mainly for hunting caribou at lake and stream crossings, rather than as a form of transportation (Damas 1984).

The dispersal of family groups over the summer meant that many summer sites would simply consist of one or two tents, marked by rings of stone which were used to hold the edges of the tent down. Because the winter villages were composed of snowhouses, the only evidence of these may be increased concentrations of organic matter and, possibly, some artifact concentrations; obviously no surficial evidence would remain of the winter villages on sea ice. Sometimes two or more houses were joined, both in the cases of summer and winter houses; this could result in adjoining stone rings (Jenness 1922). Small stone rings may have served to hold down drying skins (Jenness 1922).

Other types of structures commonly constructed of rocks included hunting blinds, caches, traps, graves and signal rocks or inukshuit. Hunting blinds were semi-circles of large rocks or boulders, often formed by propping up large, flat slabs (cf. Jenness 1922). Hunters would lie on their bellies and peek through the cracks between the rocks or over the top edge to sight game. Traps were made by piling rocks or snow blocks and providing a small doorway into the inside. A flat slab was balanced at the entrance on a stick which was attached to a piece of blubber or meat at the far end of the interior opening. When the animal (usually a fox) entered the opening to get at the bait, it dislodged the stick and brought the roof down on itself (Jenness 1922). Jenness (1922) suggested that traps were a fairly recent development, linked to the fur trade.

Caches were locations where meat and/or extra winter clothing or other gear were temporarily stored (Jenness 1922) noted caches of blubber on the mainland coast). The meat was usually wrapped in skins and covered with moss or driftwood; this could be placed in a crevasse or on top of a steep incline or simply on the ground if there was no more suitable protective feature, then, large rocks would be piled on top so that animals could not get at the meat. Non-food caches could simply be skin covered goods placed on the ground and weighed down by a circle of stones to hold them in place (Jenness 1922).

During early contact times, graves built by Copper Inuit were apparently very simple. The body was usually wrapped in skins and placed on the ground, and may or may not have been surrounded by a circle of stones or snow blocks, or left inside the person's tent (Jenness 1992). Some of the person's possessions, or reasonable facsimiles were placed beside the body (Rasmussen 1932). More elaborate graves covered by stone cairns (that is, piles of rocks) that were found across the central Arctic were assumed to be from earlier times (Jenness 1922; see also McGhee 1972).

Lines of rock cairns were also sometimes constructed for funnelling caribou towards waiting hunters. The well known inukshuit, that is, rocks piled in a formation to look like a person, could also be constructed for this purpose, or they were used singly to mark locations or as guideposts; simpler signal rock formations were also used (Jenness 1922).

10.3.4 Previous Archaeological Investigations

Prior to 1995 (Bussey 1995a), there were no archaeological investigations conducted in the inland region immediately east of Bathurst Inlet. On the mainland coast, some previous work was carried out west of Bathurst Inlet, both on the coast and in southern regions of the inlet with particular focus on the Burnside River, as well as along the Back River south and east of the BHP study area. In addition, several studies have been conducted on Victoria Island and Banks Island, north of the project area.

Mathiassen (1927) conducted the first archaeological investigations within the Central Eskimo region, as part of the Fifth Thule Expedition. His excavations were carried out east of the Copper Inuit area (in Repulse Bay, Southampton Island and King William Island). No systematic work had been conducted in the region prior to that time and he was investigating the Central Eskimo with his ultimate aim being to examine problems relating to the origins of Inuit culture in general. Jenness (1922) mentions some archaeological work by Capt. Bernard at Cape Krusenstern, at the western end of Coronation Gulf, where a number of houses in several different villages were excavated. This is said to have extended the limits of the known range of semi-subterranean wood and sod houses (Jenness 1922).

Later archaeological investigations within the Copper Inuit region include survey and excavation by McGhee (1970, 1971, 1972) in the western portion of the Coronation Gulf area, Taylor (1967, 1972) on Banks and Victoria Islands, Hickey (1979) on Banks Island, and Stevenson (1992) in Amundsen Gulf, at the western limits of Copper Inuit territory. Slightly closer to the area of interest in this study, Morrison's (1978) survey at the southwest end of Bathurst Inlet resulted in the recording of 61 archaeological sites. On the Back River, south and east of the immediate study area, Stewart (1996) recorded features and related oral history concerning five traditional Inuit campsites; investigations of one site resulted in the recording of information on 61 features. A site survey conducted by Damkjar (1994) which extended into the southern and western portion of Copper Inuit territory resulted in 52 archaeological sites being recorded. These studies have provided data on the entire time period of probable Inuit occupancy in the region and provide the basis for the culture history sequence developed thus far.

There are few archaeological sites known in the study area east of Bathurst Inlet, virtually none recorded prior to the 1995 study for BHP (Bussey 1995a). The only previously recorded site in the immediate area is NaNi-1 which is an undetermined site on the northeast shore of Hope Bay, almost directly west of the south end of Roberts Bay.

The 1995 study involved the excavation of a stone circle site south of Boston camp (MjNh-1) and preliminary survey of the island and peninsula in Roberts Bay (Bussey 1995a). A large, reported site near the Boston Property was also examined and preliminarily recorded (MjNh-2). In Roberts Bay, survey resulted in the recording of thirteen archaeological sites (NbNh-1 to -13), nine of which were found on the island. The sites comprised rock features including circles of various sizes and shapes, traps and caches. Only a few artifacts were found at one site, and they represented historic period use. The remaining sites could not be assigned to a period of occupation, although some had features suggestive of earlier use and/or were partially buried or exhibited considerable lichen growth, suggesting some antiquity.

Numerous archaeological and/or traditional sites in the surrounding region have been reported by local residents to the Nunavut Planning Commission Transition Team (NPCTT 1996), by local residents. The NPCTT report identifies a number of campsites and inukshuit on eskers within 10 km east and 20 km south of Spyder Lake and local residents reported that this area was extensively used for caribou hunting in the early 1900s or earlier (NPCTT). It is certainly conceivable that some hunting was also conducted north of that area, and/or that people travelling to the coast (either to the west or north) passed through the study area. There are also a number of archaeological sites plotted on the Nunavut Atlas map for the northern portions of the study area, that is, along the Hope Bay and Melville Sound coast and some distance inland (Riewe 1992). These sites were reported by local residents who were asked to mark locations on maps which were known hunting and fishing areas, travel routes, campsites and archaeological sites (Riewe 1992) and the Koignuk River is indicated to be of considerable importance in resource gathering and is identified as the location of a year-round camp.

10.3.5 Culture History

The culture history for this section of the central Arctic region is in the initial stages of development. Fairly detailed culture history sequences have been developed for the northern, western and eastern Arctic areas but, because so little archaeological research has been conducted in this region, there is considerable debate about cultural developments in the central Arctic and its relationships with adjacent areas. There is no doubt that this is a complex subject, and there are currently two main schools of thought. McGhee (1972) hypothesized a preliminary sequence based on environmental changes, while Stevenson (1997) has postulated a variation based more on social factors. Whatever the reasons for the movements of people and the cultural and technological changes exhibited in the archaeological record, a basic sequence of events can be identified.

The earliest time possible for human occupation of this region was after 9,000 years ago, when the large glacial ice sheet that covered much of North America is thought to have retreated from this region. South of the study area and west of Hudson Bay, a Plano Indian culture is known between about 8,000 and 6,000 years ago. Besides this, little evidence of occupation of this region is known for the period between glacial retreat and 3,500 years ago.

The earliest dated archaeological sites within the Copper Inuit territory relate to the Paleo-Eskimo period, beginning approximately 3,500 years B.P. At that time, a cooling climate appears to have prompted a southward movement of a culture known as pre-Dorset (which is thought to have developed in the western Arctic and gradually moved eastward across the High Arctic at a slightly earlier time period). This pre-Dorset group followed a mixed terrestrial-marine subsistence pattern and used small stone tools and therefore pre-Dorset manifestation is known as the Arctic Small Tool Tradition (Maxwell 1984). It is characterized by the use of small stone tools, small oval tent rings and fire boxes formed of stone slabs (Maxwell 1984). The Paleo-Eskimo sites recorded closest to the study area occur on southeast Victoria Island (Buchanan) and on the mainland at the western end of Coronation Gulf (Bloody Falls and Dismal Lake).

There is a gap in the mainland central Arctic archaeological record between approximately 2,500 and 1,000 years B.P. at a time when the Dorset culture was flourishing in the Eastern and High Arctic (Maxwell 1984). Approximately

1,000 years ago, another eastward expansion resulted in the establishment of Thule settlements across most of the Arctic. McGhee (1984) has postulated that two waves of Thule expansion occurred, the first through the High Arctic islands, following the distribution of whales which provided the economic base of early Thule. The second westward expansion occurred approximately 100 to 200 years later, along the coastline through Coronation Gulf, and south from the High Arctic along Baffin Island to the Hudson Bay area. This second expansion is thought to have included a diversification of the economic base which permitted inland penetration. Consequently, some regional variations are recognizable (McGhee 1984). Whaling was the primary economic activity of Thule in most Arctic regions (emphasized by the extensive use of whale bone in house construction), but in the Coronation Gulf area, Thule subsistence appears to have been based primarily on ringed seals, caribou, and fish, as stated by McGhee (1984) as "the absence of whalebone house ruins in the central Arctic regions strongly suggests that whaling was never an important activity to populations in the area." It has been suggested that Thule people hunted seals from boats and on ice edges to accumulate stores to last the winter, in contrast to the breathing-hole sealing carried out by the later Copper Inuit (Stevenson 1997). This subsistence strategy fits with the identification of winter dwelling sites on the coastal shores. The Thule sites of most relevance to this study have been identified along the southern shore of Victoria Island and along the southern and western shores of Coronation Gulf.

Canadian Thule stone dwellings were generally round to oval in shape, with sleeping platforms of gravel or stone slabs; walls were heavily built of boulders or stone slabs and there was often an entry tunnel. These stone structures and semi-subterranean wood and sod house remains have been classified as autumn and winter dwellings (McGhee 1972). The technology consisted largely of bone and antler implements, and soapstone lamps were used for heat and light (Maxwell 1984). In the central Arctic, copper was an important part of the tool assemblage. Certain stylistic artifact attributes have been classified as Thule (cf. McGhee 1972); however, given the sparsity of artifacts found in this area to date, it is not deemed necessary to discuss specific artifact details at the present time. Furthermore, most Thule artifacts have been defined on the basis of variations in harpoon head styles (cf. Mathiassen 1930), and such a sequence is obviously of questionable utility in inland sites. Certainly, a more in depth study of artifact

attributes will become necessary if future archaeological investigations in this area uncover artifact assemblages.

Because McGhee (1972) believes that Copper Inuit evolved directly out of Thule, he has defined an "Intermediate Interval," in which he placed sites which do not seem to fit within the identified patterns of typical Thule culture or historic Copper Inuit culture. All sites that he has thus far identified as belonging to this period occur in the western portion of the Copper Inuit territory. The primary characteristic of these sites is an almost total lack of artifacts and bone, thereby creating problems in determining their placement within the cultural historical framework. Because of this lack of artifacts, the sites are identified largely on the basis of structural features. These structures include semi-subterranean houses without internal construction and heavy stone rings with stone platform edges (McGhee 1972). No sites assigned to this period have been definitely dated, but McGhee places them loosely within the "interval" between the latest Thule dates (about 500 years ago) and the beginning of the historic period, which he identifies as A.D. 1771 (Samuel Hearne's visit to Coppermine). It should be emphasized that this "Intermediate Interval" is a hypothesis that is not yet generally accepted. As Arnold (1983) has noted:

> Archaeological sites dating to the period during which the Thule to Copper Inuit transition is thought to have occurred have not yet received much attention. Here, too, the relationship between the culture of the historic Inuit and that represented by earlier Thule sites in the area remains speculative.

McGhee (1972) noted that no spring or summer Thule sites have been identified. Because the summer subsistence pattern is postulated to require more travel to follow caribou and other game resources, it is anticipated that summer sites would be occupied for shorter periods of time and, consequently, fewer artifact and bone remains would be left behind. It is, therefore, considered conceivable that the sites McGhee classifies as "Intermediate" may, in fact, represent summer Thule occupations, since the construction techniques of the dwellings are quite similar to those described as classic Thule. In any event, a resolution of this issue obviously requires more detailed research on these "Intermediate" sites.

Stevenson (1997) has postulated a third migration from the west into Coronation Gulf during late prehistoric times which he suggests was prompted by a need to find more resources to maintain trading networks with people to the west.

The climate began to deteriorate into a climatic stage known as the Little Ice Age (dated about A.D. 1650 to 1850), and the High Arctic whaling subsistence pattern became untenable. It is during this period that the different historic Inuit groups are thought to have developed from the various Thule variants: "There seems to be little doubt that [the culture of the Copper Inuit] can be traced back to the maritime oriented Thule peoples" (Arnold 1983). However, the mechanism of this development is currently being debated. While McGhee (1972) and Morrison (1983) believe in a direct, *in situ* evolution based on environmental changes, Hickey (1997, pers. comm.) and Stevenson (1997, pers. comm.) have postulated a movement of late Thule people away from the coast to inland areas, then another migration of people back to coastal areas in the early 18th century; Stevenson suggests that these movements were due to a combination of environmental, economic and social factors. Jenness (1922) also saw evidence to suggest to him that "Copper Eskimo were an inland people until a few centuries ago." Regardless of what factors may have prompted the developments, the economic base of people in the central Arctic shifted towards exploitation of a mix of terrestrial and marine resources, and the subsistence pattern exhibited by the Copper Inuit became established.

10.4 Archaeological Investigations

This section provides details of the archaeological field work completed in 1996 and the results of the investigations of specific development areas within BHP's Hope Bay Belt Project. Work within each development area is described, beginning at the south end of the study area, and results presented; general site locational information relative to proposed developments will be noted within each discussion, but details of site features are provided in Section 10.5, where each site is described individually. To maintain the continuity of the text, site maps and photographs have been placed in Appendices 10-1 and 10-2, due to the high number required.

As noted earlier, the visit with Elders John Akana and Steve Anavilok to site NbNh-3 resulted in the identification of some features not observed last year; these were

items difficult to identify, particularly given the preliminary nature of, short time available for, and adverse weather conditions during the island investigations. The 1996 trip to the island was conducted under ideal conditions with beautiful sunny, calm weather. The items pointed out by the Elders consisted of boulders set up to form kayak supports (subsequently observed at other sites) situated a short distance south of the tent rings, several wooden sticks which served as hide stretching pegs and a wooden scoop or bowl (similar to a bowl illustrated by Stefansson 1919) which was partially buried and filled with vegetation (Appendix 10-1, Photos 1 and 2). The site form was updated to note these new findings. The Elders also made some general comments about the island's use, suggesting caribou and seal hunting (the latter probably off the north end of the island in the summer), and confirmed that the stone traps on the island were for fox: "it was too hard to build traps strong enough to hold a wolverine or bear" (Akana 1996, pers. comm.). They also pointed out that circular tent rings probably predated the 1920s, when square canvas tents began to be used in the area.

10.4.1 Boston Project Area

The project map supplied by BHP was used to provide the focus for archaeological investigations. The map showed two possible air strip locations, the presently planned bulk sample area, and a larger surrounding area in which development or peripheral disturbance may occur (Figure 10.4-1). The entire outlined area was examined, mainly by foot traverse, and the remainder by helicopter.

The perimeter of the peninsula on which Boston camp is currently situated was subjected to foot traverses and ground examination (Figure 104-1). In addition, traverses crossed the width of the landform at several points, in order to examine landform rises and any other areas with some possible archaeological potential. In this manner, ground examination of the entire landform north of Stickleback Lake was virtually complete. Such complete coverage of this area was deemed necessary because, at the present time, it is the focus of development.

South of Boston camp, the surface of this landform is undulating and rocky with some wet portions in the interior of the landform. The western edge is fairly high with a substantial drop to the beach level, while the eastern edge slopes toward the lake/river channel which creates a swampy edge. The portion north of Boston

camp is a low gravel beach. Ground exposure was generally good. No archaeological sites were found.

The large peninsula to the east of Boston camp (across the lake/river channel) was also subjected to foot traverses of the perimeter (Figure 10.4-1). The central portion of the landform may be used for an airstrip. The western edge of this landform is fairly high, but it slopes toward a gravel beach along the lake/river channel. The eastern edge is lower and has a wide swampy border. The northern end is more rocky and drops sharply to a rocky/gravel beach. The interior of the landform comprises mainly tussocks interspersed with wet areas and some landform rises. The rises were also examined and were found to be gravelly or rocky. Ground exposure was generally excellent in those portions with archaeological potential.

Two archaeological sites were found. One site (MjNh-3), a stone circle, is situated on the western side of the peninsula. The other site (MkNh-1), also a stone circle, is located on the northern tip of the peninsula, on the northern edge of the height of land. No archaeological sites were found in the central portion of this landform, where the possible airstrip is proposed, and the potential for archaeological sites in this portion is judged to be low. MjNh-3 is not in direct conflict with the proposed northern air strip option, but MkNh-1 appears to be at or near the north end of the airstrip.

The perimeters of the two small lakes south of Boston camp were also examined. Foot traverses were conducted completely around Stickleback Lake, and the western edge of Trout Lake to the southeast was foot traversed; the landform between the two lakes was thoroughly examined. Site MjNh-1, which was mitigated last year (Bussey 1995a), is situated in this area. It was revisited this season and no new disturbance was evident.

The eastern edge of Trout Lake was visually inspected by low, slow helicopter overflight and found to be low lying and swampy for a considerable distance from the lake, consequently, the archaeological potential was judged to be low. The same is true of the land bordering the southern edges of both lakes, for at least that portion included within the delineated development area. It is low lying swamp with tussocks.

Cad No. a2199s | Scale: 1:50 000 | Job No. 526-5 | 18/02/1997-02:30pm | RES_BF

LEGEND:

▲ MkNh-2 ARCHAEOLOGICAL SITE

AREAS REQUIRING ARCHAEOLOGICAL GROUND RECONNAISSANCE

BOSTON WINTER TRAIL ROUTE EXAMINED

N

TROUT LAKE

▲ MjNh-4

STICKLEBACK LAKE

▲ MjNh-3

▲ isolated find

MkNh-1

BOSTON CAMP

▲ MjNh-5

▲ MjNh-6

SPYDER LAKE

▲ MjNh-2

▲ MkNh-3

MkNh-5

MkNh-4

MkNh-2

RIVER

KOIGNUK

BHP

Archaeological Resources
Boston Camp Vicinity

Rescan

Fig 10.4-1

The land between the two lakes was generally level, gently sloping down toward the lakes on both sides, and interspersed with some elevated rocky features and low lying areas characterized by tussocks. The edges overlooking both lakes and all elevated landforms were thoroughly examined. One stone circle site (MjNh-4) was recorded on the southwestern edge of Trout Lake. It is situated on an elevated rock outcrop, adjacent to the second possible airstrip location. The site appears to be out of the direct impact zone, but indirect impacts due to the close proximity are possible.

The western edge of Stickleback Lake is bordered by a high, rocky ridge, ranging in width from about 600 m in the southern portion to 200 m at the north end, and which descends on the other side to the long, southwestern arm of Spyder Lake. The ridge was ascended near the southwestern edge of Stickleback Lake, along an apparent trail. Near the eastern edge of the ridge top, an isolated artifact, a caribou antler which has been notched and grooved, was found lying on the trail. The surrounding ground was thoroughly examined and some of the surficial vegetation was scraped away, but no additional cultural remains were found. The location was recorded and photographed, and the artifact was left *in situ* because it was not judged to be in danger of impact at the present time (a Borden site designation number will be assigned to this location). A small lake and swamp occurred a short distance west of the location of the isolated find on the upper surface of the ridge; exposures in the surrounding area were inspected, but no cultural materials were observed.

The remainder of the ridge was traversed and all ground exposures and elevated portions were examined, but no additional sites were found on the rocky height of the ridge. One site with stone circles and a possible hunting blind (MjNh-5) was recorded on a slightly lower landform level on the west side of the ridge, overlooking Spyder Lake. This portion of the landform is fairly level and well vegetated, with some rocky and gravelly areas. The site occurs just inside the possible development area delineated on the project map and consequently, although no specific developments are planned there at the present time, if mining is expanded to include this area, this site may be in jeopardy.

An attempt was made to find a reported site south of the delineated development area. Several low level helicopter passes of the general vicinity failed to locate any site features; however, another site was observed north of the reported

location. This multiple feature site (MjNh-6) is situated on a well vegetated, low level landform which slopes gently toward the eastern shore of Spyder Lake. Although it is outside the currently delineated development area, the site will require additional investigation if future development plans are in closer proximity. This site includes a cairn feature that is suggestive of a possible grave, but it could also represent a cache (see site discussion in Section 10.5) and its function can only be determined by test excavation.

A site had been reported on a high ridge on the west side of the southwestern arm of Spyder Lake (MjNh-2). It was briefly observed last year by Jean Bussey of Points West, and some preliminary recording was completed (Bussey 1995a). Because this initial viewing suggested that the site was fairly large, a revisit was included in the 1996 field plan, if time permitted. This year's visit confirmed that this site is indeed very large, consisting of a complex of stone circles and caches with substantial quantities of bone remains extending over a large area, indicating that it was a fairly important hunting location. There is also an inukshuk to mark the location. Because it was found to contain numerous features, and because it is not within currently planned development areas and time was limited, examination of this site was aimed at determining the extent of the site, identifying and recording the major features, and producing a sketch map. The site is in no danger of direct development impacts at the present time; however, indirect impacts from increased human activity in the area are possible. Further investigations will be necessary if the site is to be disturbed at some future time.

10.4.2 Winter Trail Route

According to the map supplied by BHP (Figure 10.1-1), the winter trail is proposed to run from Boston camp across Spyder Lake, up the northwest arm of Spyder Lake to the confluence with the Koignuk River (Figure 10.4-1), along the Koignuk River for about 7.5 km (Figure 10.4-2), veer to the east and pass over swampy areas and small lakes for about eight kilometres, join the Koignuk River again for approximately four kilometres, and then proceed south and east over a complex of swamps and lakes to the east-central portion of Doris Lake (Figures 10.4-3 and 10.4-4). After crossing to the north end of Doris Lake, the route follows the low ground along the stream draining Doris Lake to Roberts Bay. It will then cross the bay to reach possible port and barge locations on the west side of Roberts Bay.

Cad No. a2198s | Scale: 1:50 000 | Job No. 526-5 | 18/02/1997-02:27pm | RES_BF

7 535 000 N | 7 530 000 N | 7 525 000 N | 7 520 000 N

106°30'

430 000 E

MkNh-9

MkNh-8

MkNh-7

MkNh-6

RIVER.

KOIGNUK

disturbed stone ring

LEGEND:

▲ MkNh-6 ARCHAEOLOGICAL SITE

AREAS REQUIRING ARCHAEOLOGICAL GROUND RECONNAISSANCE

BOSTON WINTER TRAIL ROUTE EXAMINED

BHP

Archaeological Resources
Koignuk River

Rescan

Fig 10.4-2

Cad No. a2197s | Scale: 1:50 000 | Job No. 526-5 | 18/02/1997-02:36pm | RES_BF

PATCH LAKE

NgNh-1

WOLVERINE LAKE

MINh-1

MUD LAKE

NaNh-5

WINDY LAKE

KOIGNUK RIVER

disturbed stone ring

LEGEND:

NaNh-5 ARCHAEOLOGICAL SITE

AREAS REQUIRING ARCHAEOLOGICAL GROUND RECONNAISSANCE

BOSTON WINTER TRAIL ROUTE EXAMINED

BHP

Archaeological Resources
Patch Lake - Koignuk River

Rescan

Fig 10.4-3

Cad No. a2196s | Scale: 1:50 000 | Job No. 526-5 | 22/02/1997-10:46pm | RES_BF

106°30'W

435 000 E

7 560 000 N

7 555 000 N

7 550 000 N

ABANDONED

NbNh-20

NaNh-3

NaNh-2

NaNh-4

NbNh-18

NbNh-19

NbNh-21

NbNh-4

NbNh-8

NbNh-3

NbNh-2

NbNh-5

NbNh-6

NbNh-1

NbNh-7

NbNh-12

NbNh-13

NbNh-11

NbNh-10

NbNh-9

NbNh-16

NbNh-17

NbNh-15

NbNh-14

DORIS BULK SAMPLE AREA

DORIS LAKE

PATCH LAKE

ROBERTS BAY

BARGE LANDING

WINDY LAKE

NaNh-6

NaNi-2

GLEN LAKE

KOIGNUK RIVER

HOPE BAY

LEGEND:

- NbNh-3 1995 ARCHAEOLOGICAL SITE
- NaNh-3 1996 ARCHAEOLOGICAL SITE
- AREAS REQUIRING ARCHAEOLOGICAL GROUND RECONNAISSANCE
- BOSTON WINTER TRAIL ROUTE EXAMINED
- REVISED ROUTE

BHP

Archaeological Resources
Roberts Bay - Patch Lake

Rescan

Fig 10.4-4

Two low level helicopter overflights were conducted of the proposed winter trail route from Boston to Doris Lake. At the request of BHP, the archaeological assessment of this section of the trail was preliminary because plans for the trail have not yet been finalized. The main intent of the archaeological assessment was to identify high potential areas along the route to assist in planning the trail so as to avoid as many of those areas as possible. In addition, sites that had been reported by the trail surveyors last year were to be recorded, as well as any sites that were observed during the overflight.

The section of the trail between Doris Lake and Roberts Bay was scheduled for use this winter; consequently, a more detailed assessment of this portion was conducted. The low level helicopter overflights were combined with foot traverses of all high potential landforms.

As it is presently planned, the trail will generally stay on low ground, following water courses and passing over swampy areas. Those portions of the proposed route on wet ground likely pose little direct threat to archaeological resources (although at least one site, OdPq-1, has been found in a bog on Victoria Island (McGhee 1972). The landforms with the highest archaeological potential are primarily the elevated ridges and knolls because these provide dry ground and good viewpoints. However, some lower landform levels are also known to contain sites, and therefore, such landforms with dry ground would have moderate potential for archaeological resources and would require some ground assessment. This is particularly the case in the vicinity of confluences, shallow narrows which would provide game crossings, or at good fishing locations.

Most of the sites observed and recorded during this inspection are situated on ridges or knolls adjacent to the waterbodies. Although the trail is not planned on those landforms, their close proximity presents the possibility of inadvertent or indirect impacts. All such landforms adjacent to the proposed trail route have been rated as having high archaeological potential and would require some ground reconnaissance. Low level landforms, although archaeological potential may not be as high, may be more prone to inadvertent or indirect impacts. Consequently, such landforms which provide dry ground adjacent to waterbodies, particularly confluences, would also require some form of field assessment. Low areas of particular concern along the proposed trail route are the southern point of land at the Spyder Lake narrows (Figure 10.4-1), both sides of the confluence between

Spyder Lake and the Koignuk River (Figure 10.4-2), and the land adjacent to the mouth of the creek at Roberts Bay (Figure 10.4-4). The first and third of these are to be crossed by the trail route, as currently proposed, and both those areas contain recorded archaeological sites.

This preliminary archaeological assessment resulted in the recording of ten new sites (MkNh-2-9, MlNh-1, and NaNh-1) adjacent to the trail route between Boston camp and Doris Lake. One isolated disturbed stone circle was observed from the air (Appendix 10-1, Photo 3) but not recorded due to shortage of time, degree of disturbance evident and the lack of other obvious features. This location should be examined on the ground during the detailed trail assessment. From Doris Lake to Roberts Bay, two sites were recorded immediately adjacent to or on the trail route (NaNh-4 and NbNh-19) and three more were recorded in the vicinity (NbNh-18, -20 and -21). The sites all consist of stone features including circles, caches, traps and blinds; most contain multiple features.

Three of the sites recorded are in direct conflict with the proposed trail route (MkNh-4, -5 and NbNh-19). Because NbNh-19 was on the portion of the trail planned for use this winter, steps were taken to re-route the trail to avoid the site features. A map and accompanying description were provided to BHP San Francisco, showing the location of the site and a suggested trail routing to avoid impacting the landform on which the site is situated. The suggested routing for the trail is over low, slightly wet ground which was examined and no cultural materials were observed.

The section of trail on which MkNh-4 and -5 occur is not finalized; routing the trail to avoid the sites is possible, but additional archaeological investigation is required once a final decision about the trail is made. It is particularly important to avoid site MkNh-4 since it contains a small biface and, thus, may represent the only Paleo-Eskimo site identified in the study area to date.

Because this phase of the archaeological work was preliminary, site locations and features were recorded and photographed, but detailed assessments were only conducted for those sites on the portion of the proposed trail north of Doris Lake. Assessments of other sites will be necessary when the remainder of the trail route has been finalized.

10.4.3 Doris Lake Project Area

Figure 10.1-1 shows a possible air strip, a camp location, and outlined a bulk sample area for the Doris Lake Project. One exploration area, known as Madrid, was identified as a possible area of interest during the field work and consequently, it was requested that it also be investigated.

The air strip location, on an esker with an undulating surface, in the interior portion of a high, large landform was crisscrossed by foot traverse. The ground surface was found to consist of wet, vegetated areas and tussocks, interspersed with small rocky outcrops and gravel patches. The frequent ground exposures were examined, but no cultural remains were observed.

An elevated landform between the air strip and the camp location was also examined. The camp is planned at the base of this high landform, and some impacts may be possible in the area between the air strip and the camp. Two sites, containing two features each, were recorded. Two rock traps occur near the western edge of the ridge, above the proposed camp (NaNh-2). Another rock trap and a stone circle are near the northern end of the landform (NaNh-3). Site NaNh-3 is less likely to be impacted since it is well north of the camp location, but NaNh-2 is within a direct line between the camp and the airstrip. Due to the steepness of the landform at that point, it is unlikely that such a direct route would be chosen. A much easier route of descent can be found at the south end of the landform. The vicinity of that possible route to the camp was also subjected to foot traverses and ground examination, but no cultural remains were observed.

The camp location and the vicinity of a small creek east of Doris Lake were also subjected to foot traverses (Figure 10.4-4). The camp is planned on a moderately sloping ground with low vegetation; examination of ground exposures revealed no cultural remains. Both sides of the eastern creek were examined, as was the northern end of the elevated landform south of the creek, and the shore of Doris Lake in this vicinity (Figure 10.4-4). The creek itself is in a valley between the two elevated landforms and the valley is characterized by wet ground and tall, thick vegetation. The archaeological potential of this site is judged to be low. The elevated landform surface was found to be similar to the one north of the creek examined previously, that is, rocky and undulating. Examination of exposures on the northern and western edges revealed no cultural remains. The west side of the

landform provides a rocky descent to a gravelly, sparsely vegetated surface which slopes gently toward the eastern shore of Doris Lake. Inspection of the land adjacent to Doris Lake did not result in any cultural materials.

The bulk sample area, as delineated on the map (Figure 10.1-1), was subjected to foot traverses. The southern portion, where exploration drilling was ongoing during the archaeological investigations, is characterized by high, undulating rocky outcrops and ridges with occasional patches of sparse low vegetation. The rocks extend to the edge of the lake in much of this area. There has already been considerable disturbance due to the exploration activities, but the area has generally low archaeological potential. Examination of those portions considered to have the best potential for archaeological resources (albeit low) did not result in the discovery of any cultural materials.

The northern portion of the delineated area exhibited better archaeological potential. The land is less rocky, is covered by low vegetation, and gently slopes toward the lake and creek draining from the north end of the lake. A small knoll is situated on the west side of the creek, near some small rapids. Cultural remains were found on the knoll (NaNh-4), but ground examination of most of the remaining area did not reveal any cultural remains.

NaNh-4 is a multiple stone feature site which extends over most of the surface of the knoll. A cache or trap has already been disturbed by survey activities by having a stake driven through it and some of the rocks rearranged to support it. Not only is this knoll within the camp/bulk sample development area, but the winter trail route is proposed directly to the west of it. Due to the close proximity of the development areas and because the knoll is such an obvious feature on the landscape, there is considerable potential for continued impacts. Because of this potential for additional disturbance, a grooved wooden stick found on the surface was collected, a detailed scaled map of the site was completed and two subsurface tests were conducted, but these did not reveal any additional cultural materials. Refer to Section 10.5 for more details on NaNh-4.

The Madrid area was added to the field program at the request of BHP and the area of interest is sketched on the map (Figure 10.1-1). It is near the south end of Patch Lake, almost directly east of the present camp on Windy Lake. The areas immediately adjacent to the lakeshore were foot traversed. The land examined

included low, wet areas, rocky ridges and knolls, and moderately sloped sections. The wet areas exhibit thick, relatively high vegetation, while much of the remainder has sparse vegetative cover. In general, the area would be rated as having low to moderate potential for archaeological resources. Ground examination did not result in the discovery of any cultural remains.

10.4.4 Roberts Bay Developments

Two possible port locations and two possible barge landings have been identified on the west side of Roberts Bay and are surrounded by a larger area of interest delineated on the map supplied by BHP (Figure 10.1-1). The port and barge landing locations were intensively covered by foot traverses, and the remaining area was viewed by low level helicopter as well as on the ground to provide virtually complete visual coverage of the area of interest.

The possible port locations are situated on high bedrock outcrops which extend into the ocean. Two sites were found within the northern port location, one (NbNh-14) on the highest level of the bedrock outcrop. This stone circle site contained an antler fragment carved into the shape of a sea gull adjacent to one of the circles. The artifact was collected because of the location within the proposed port and the close proximity of a barge landing which could be used this winter. The second site (NbNh-15) is an empty rock cache located within a crevasse below and south of NbNh-14. Both of these sites will require additional investigations if this port location is chosen.

The southern port location exhibits a more rocky, undulating surface, thus, providing lower archaeological potential. Thorough ground examination did not result in discovery of any archaeological remains.

Both barge landing locations are within gently sloping, horseshoe shaped bays between bedrock outcrops. They are characterized by wide expanses of gravel and grass covered, fairly level ground. Extensive ground inspection resulted in no cultural remains being observed on the level portions of the landings, but one stone circle site (NbNh-16) was found adjacent to the northern edge of the southern barge landing option. Because of the site's location within the rocks, together with the lack of obvious cultural remains, it is thought that the use of the area to the south as a barge landing is unlikely to result in direct impacts to the site.

The southern portion of the area of interest delineated on the Roberts Bay development map is a wide expanse of generally flat ground extending to the outlet of a small creek. It is partly vegetated, and the beach is gravelly. This area was covered by foot traverses, and visual ground inspection resulted in the discovery of an archaeological site (NbNh-17) containing two stone circles. At present, this site is a sufficient distance from currently proposed developments in this area to suggest little potential for direct impact.

10.4.5 Miscellaneous Reported Sites

Four additional rock feature sites (NaNh-5, -6, NbNh-21 and NaNi-2) were recorded. These localities had been reported by survey and geology crews working in the general area, both last year and this year. All occur in the general Doris Lake vicinity, from just south of Windy Lake to Roberts Bay. These sites were revisited because there was sufficient time remaining in the field schedule.

Although these sites are not in immediate danger of direct impacts, ongoing exploration activities in the general area could lead to direct or indirect impacts on archaeological sites it is important to record any sites found within the larger exploration area. In this manner, field crews could be made aware of the locations and of the importance of leaving all cultural remains where they are.

Two other reported sites were not relocated in spite of attempts to do so. One was a cache reported to be on the northern edge of the large unnamed lake on which NbNh-20 occurs, but intensive inspection of the rock outcrops in the area failed to reveal any cultural features. For the other reported site, only the location was noted, not the type of feature observed. Aerial inspection of the area did not reveal any obvious cultural features; there was an aggregation of very large boulders, but no pattern definitely suggesting cultural origin was apparent.

10.5 Archaeological Site Descriptions

This section provides a detailed description of each archaeological site visited during the 1996 field investigations for BHP's Hope Bay Belt Project. Photographs (Photos 1 to 57) and site maps (see Figures A through AB) can be found in Appendices 10-1 and 10-2.

10.5.1 Boston Project Area

MjNh-2 was initially recorded in 1995 following a brief inspection. Although it is not within the currently identified Boston development area, it is in relatively close proximity, and a revisit was planned in 1996, if time permitted, because it was suspected to be a fairly substantial site and a more complete assessment of the site extent was desired.

MjNh-2 is a large site on a high ridge, which represents the high point of land in this area, on the west side of the southwestern arm of Spyder Lake (Figure 10.4-2). The ridge is mainly exposed bedrock with much scattered rock and some patches of sparse vegetation and gravel. Site features recorded at MjNh-2 comprise at least four stone circles, five rock caches, and an *inukshuk* on the upper level of the ridge, extending over an area of about 150 m east-west (the full width of the ridge) by 300 m north-south (Figure A, Photos 4 and 5). More caches present on the lower slopes of the ridge. The circles occur on bedrock or gravel, average about three metres in diameter, and composed of angular rocks, fairly closely spaced (Photo 4). The caches average approximately one metre long by 80 to 90 cm wide, and are generally built in angular block outcrops, where only minor rearranging of rocks would be necessary to form the cache. One possible cache or hunting blind has rocks piled up to three courses on the west side. Several of the caches exhibit reddish discoloration, have some bone in the bottom and are up to 80 cm deep (Photo 5). The *inukshuk* is constructed of flat slabs and angular blocks piled up to a height of about 65 cm and is partially collapsed (Photo 6). There is much bone, mainly caribou, littering the entire site area, as well as some scattered shell. The site can be dated to the historic period on the basis of some scattered tin remains and a broken end of a wooden bow, although this location could also have been used earlier.

MjNh-3, a large stone ring, is found on a ridge which slopes gently down toward a narrow arm of Spyder Lake (Figure 10.4-1). It is situated about eight metres from the water's edge at a height of about four metres above the water. The ring is on a mostly gravel surface with some scattered patches of vegetation. The ring is composed of widely spaced rocks, approximately 5.5 m (E-W) by 4.5 m (N-S), with a smaller circle or horseshoe of rocks (about two metres in diameter) in the centre and an apparent opening facing south (Figure B, Photo 7). The surrounding ground provided excellent exposures which were thoroughly examined. Several

tin cans were scattered about, and one wooden hide stretching stick was found beside the circle, suggesting a historic period use.

MjNh-4 is located on a knoll type landform on the west side of Trout Lake, about 20 m from the lake edge (Figure 10.4-1). It is covered with a thin layer of soil and sparse vegetation among a few exposed boulders. The site comprised (Figure C, Photo 8). of two possible abutting rings, one about two metres across and the second about one metre across. There is an apparent narrowing between the two rings that has no rocks; this may simply be the result of rock displacement, may imply some sort of interior spatial organization, or may suggest two adjoining structures (cf. Jenness 1922). The smaller ring seems more deeply buried which could suggest earlier use. All ground exposures were examined, but no cultural materials were found, consequently, period of use could not be ascertained. Soil and vegetal cover provides some potential for buried cultural remains.

MjNh-5 is located on a height of land between Spyder and Stickleback lakes (Figure 10.4-1). The site has thin soil and low vegetative cover with some gravel patches and scattered rocks. It consists of three stone circles, and a possible hunting blind (Figure D, Photos 9 and 10) extending over a distance of approximately 100 m. The central stone circle (about 2.5 m in diameter) and the possible hunting blind (about 1.8 m in diameter) are abutting and are constructed of large rocks, including one very large boulder, very close together (Photo 9). A small ring of rocks abuts the southeast corner of the stone circle. About ten metres southwest of these structures is a flat slab circle, about 3 x 1.5 m, with a possible partition through the centre (Figure D, Photo 10). This central slab partition is suggestive of Thule period stone circles. To the north, the third rock formation may be a large partial ring or a double rock alignment (about six metres north-south and four metres east-west) with a smaller (two metre diameter) central ring (Figure D). Approximately 3.5 m south of the possible hunting blind is a flat slab which has muskox hair and feathers under it and has some staining suggestive of burning. It is uncertain whether this represents a hearth/windbreak (see Damkjar 1994 for comment regarding placing a flat slab over a hearth area to keep it dry) or a small, specialized cache (materials possibly representing kindling). A thorough examination of surrounding ground exposures revealed no cultural material, but there is potential for buried remains.

MjNh-6 is located on a low, flat to gently sloping, well vegetated area adjacent to the eastern shore of the southwestern arm of Spyder Lake (Figure E). The site consists of a stone circle, a possible hunting blind and a cairn-type rock feature (Figure , Photos 11 and 12) spread over a distance of about 75 m. The stone circle is about three metres in diameter, and is composed of round rocks in an somewhat irregular arrangement, likely due to some displacement, and exhibits an apparent opening facing south. Just north of the circle is a rectangular depression (suggestive of human digging), approximately 2.2 x 1.65 m, containing a partially buried muskox skull. The hunting blind is situated about six metres west of the circle and comprises flat slabs, partially upright and in a slightly curved arrangement. About 50 m west (and approximately 50 m east of the lake edge) is the cairn feature composed of round rocks surrounding several centrally placed flat slabs, one of which has a tobacco tin under it. This feature is approximately two metres north-south by one metre east-west, and there are three partially buried muskox skulls in the vicinity. The function of this feature is presently unknown, but the size and configuration are suggestive of a possible grave, although it could also represent a cache. Stewart (1996) describes a definite grave of apparently similar construction. The presence of the tobacco tin and the squarish shape of the stone circle suggest that this site likely dates to the historic period. No other cultural material was observed but, due to the vegetative cover, there is good potential for buried cultural remains.

MkNh-1 is located on the northern tip of a point of land extending into Spyder Lake (Figure 10.4-1). It consists of one, possibly two, partial stone circle(s) and a possible exterior hearth (Figure F, Photo 13) covering about five metres. The back edge of the circle feature is about three metres from the edge of the landform, which drops about six metres to a rocky beach on the shore of the lake. It is constructed of relatively small rocks on exposed ground with some scattered rocks and sparse vegetation. It is approximately three metres in diameter with the southern side open; a short line of rocks inside the circle may represent a second circle or may simply be displaced rocks. Two metres directly south of the open side is a possible squarish hearth feature composed of four large rocks on an exposed bedrock slab (Photo 13, foreground). Several caribou bones are scattered about, but inspection of the surrounding ground surface revealed no other cultural material, however, there is some potential for buried cultural remains. Period of

use could not be ascertained, although the possibly squarish shape of the stone circle is suggestive of the historic period.

An isolated artifact was found on the eastern edge of the ridge between Stickleback Lake and the southwestern arm of Spyder Lake, about 80 m southeast of MjNh-5 (this location will receive a Borden site designation number). It was found on a path leading from the lower wetlands around Stickleback Lake to the ridge top. It is a caribou antler fragment which has been notched at one end (Photo 14). The function of this item is presently unknown, in spite of some research in published sources (Mathiassen 1927, 1930; McGhee 1972; Rasmussen 1932; Stefansson 1919) and personal communications with other Arctic researchers; the only suggestion offered was a unique, stylized type of marrow extraction tool (Hickey 1996, pers. comm.). It is interesting to note that another such tool was found this season in a cache at site MkNh-3. The area around the isolated find was thoroughly examined and vegetation was scraped away, but no additional cultural material was found. Because it was not thought to be in any immediate danger of impact, the artifact was photographed, recorded and left *in situ*.

10.5.2 Winter Trail Route: Boston to Doris Lake

MkNh-2 consists of two stone circles on a bedrock slab near the eastern edge of a ridge on the east side of the northwestern arm of Spyder Lake (Figure 10.4-1). One ring, approximately three metres east-west by two metres north-south, is about 50 m from the southern end of the landform and is comprised of closely spaced, smaller rocks with some displacement and exhibits a possible opening facing west (Figure G, Photo 15). About six metres north is the second ring which is approximately 4 x 3 m in size. It consists of an outer circle of fairly widely spaced rocks, with an inner circle of more closely spaced, smaller rocks, about 3 x 2 m in size; both circles have the suggestion of an open side to the northeast, and a possible hearth/windbreak, about 0.75 m in diameter, occurs at the northern end of these rings. Examination of surrounding ground exposures revealed no cultural material, therefore, period of use could not be definitively established. There is some potential for buried cultural remains.

MkNh-3 is a large site consisting of three caches and five stone circles on a height of land between the two northern arms of Spyder Lake, covering a distance of about

100 m (Figure 10.4-1, Photo 16). Time was limited here because the helicopter was needed elsewhere and consequently, only a cursory examination and recording was possible. The circles are located on exposed bedrock or gravel patches and two of the caches are downslope from the upper landform (Figure Photo 17 and 18). The stone circles all show some evidence of rock displacement. Beginning at the southern end of the upper portion of the landform, the first circle (about two metres north-south by 2.5 m east-west) is composed of round rocks and has a squarish rock feature (1.2 x 0.80 m) made largely of flat slabs in the northwest quadrant. This seems rather large for a hearth, and thus, it may represent some sort of interior division of space. The second circle is 2.5 x 2.5 m and seems to have an open side toward the southwest. It has a circle of rocks (about one metre in diameter) in the northwest corner; this, again, seems rather large for a hearth. The third circle, approximately two metres in diameter, shows the most disturbance of rocks and is composed of a relatively large number of smaller rocks. The fourth circle is fairly small (1.5 m north-south by one metre east-west), and is oval shaped and has the suggestion of openings at both ends of the oval, hence this could simply be the result of irregular rock arrangement or subsequent displacement (Photo 17). This circle could represent one of the smaller rock arrangements used for skin drying (Jenness 1922). The fifth circle is approximately two metres north-south by 2.5 m east-west and has an apparent opening to the southwest. One of the rocks in this circle has a caribou jaw under it.

The largest cache at this site (1.5 x 1.5 m) is about 30 m north of the smaller circle and is constructed within a frost heaved rock feature (Photo 18). It is shallower than the other two and contains several caribou bones, including a rib fragment with the same type of notching as that found on the antler isolated find, discussed above. The other two caches, both of which were empty, occur downslope, south of the rings. One is near the base of the landform and is approximately 125 x 65 x 60 cm deep. The other cache is 65 x 105 x ~ 60 cm deep. Caribou bone is scattered around the site, but no other cultural materials were observed. Although most of the site features occur on exposed bedrock or in rock outcrops, there is some potential for buried remains in limited vegetated patches. Period of use could not be determined.

MkNh-4 is situated on the southern point of land at the narrows between the main body of Spyder Lake and the northwest arm (Figure 10.4-1). The elevated portion

of the landform containing features is approximately 25 m east-west x 35 m north-south. This site has a historic tent ring component and a probable prehistoric component (Figure I). The prehistoric component is near the southern edge of the elevated landform and is evidenced by a small, pressure flaked chert biface, a bone needle end, and a cut bone blade fragment (Photos 19, 20 and 21). The ground surface was thoroughly examined and two shovel tests were dug about six metres from the artifacts, but no additional cultural remains were uncovered, although soil and vegetative cover are sufficient to permit buried remains. The biface could suggest Arctic Small Tool Tradition (Paleo-Eskimo), since use of small stone tools was common during that period and much less common during subsequent cultural periods. If this does represent Paleo-Eskimo, the site could be as old as 3,500 years B.P. and would represent the oldest site identified in the study area to date.

The stone ring at MkNh-4 (Figure I, Photo 22) is located about eight metres north of the southern landform edge and consists of one large circle (six metres north-south by five metres east-west) of various sized, irregularly spaced rocks with an apparent opening toward the east, and a centrally located, smaller circle, about 2 m north-south x 1.5 m east-west. It is unclear whether these signify one or two occupations. A historic refuse area occurs downslope toward the east and contains glass and tin can remains; other remains scattered about the site include a carved wooden toy outboard motor, a saw blade fragment and a wooden stir stick.

MkNh-5 is located near the northern tip of the elevated portion of the landform on which MkNh-4 is situated, on the same point of land at the narrows of Spyder Lake (Figure 10.4-1). The site consists of two stone circles (Figure J, Photo 23) covering an area of about 15 m^2. The most northerly ring is composed of widely spaced rocks and is approximately five metres in diameter with a possible south facing opening. It has a partially buried half circle inside, the significance of which is unclear. A bone artifact, consisting of a flat round ended bone fragment with a central hole through which a bone dowel is inserted (Photo 24), was found adjacent to this ring. The second stone circle is composed of more closely positioned rocks and is about three metres in diameter. Inspection of the ground surface revealed no additional cultural materials. Site age is undetermined, but the more deeply buried rocks could suggest some antiquity.

The landform on which both sites MkNh-4 and MkNh-5 are located is thinly covered by soil and vegetation, with scattered gravel patches. This, together with the landform's prime location at the narrows (a location presently known as an excellent fishing spot) and the presence of the stone tool, would provide good potential for additional, possibly buried, cultural materials of some significance in defining the older aspects of the culture history of the area.

MkNh-6 is situated on a high ridge on the east side of the Koignuk River (Figure 10.4-2) and covers an area of about 50 x 25 m. It consists of four stone circles, all characterized by solid walls of large rocks; two of these circles have walls at least two courses of rocks high (Figure K, Photos 25 and 26). The most southerly circle is approximately 3.5 m north-south x 2 m east-west and is constructed of a combination of very large rocks, smaller rocks and flat slabs piled on top of each other. This circle it also has two lines of partially buried flat slabs crossing the circle, and cutting it into approximate thirds (Figure K). The second stone circle is about 2.5 m north-south x 2 m east-west and is also characterized by a solid wall of rocks, including some very large, apparently *in situ* rocks. Both these rings show evidence of rocks toppled off the wall. The third feature is a possible stone circle that is composed of a series of large rocks, a single course in height, with a possible attached smaller circle. The former is about two metres in diameter, while the latter is approximately 1.5 m in diameter. The final stone circle is about 1.8 m in diameter and is composed of large, partially buried rocks which form a fairly solid ring. An examination of surficial ground exposures did not reveal any cultural materials; however, there is some soil and vegetation cover, thus, there is good potential for buried remains. The heavily constructed walls and use of huge boulders are reminiscent of classic Thule characteristics and the partitioning is also suggestive of Thule period occupation. Consequently, this site may date to 800 years B.P.

MkNh-7 is a single stone circle on a bedrock slab on the west side of the Koignuk River (Figure 10.4-2). Due to a shortage of helicopter time, the ring was photographed from the air (Photo 27) and its location recorded. Ground examination was not conducted, but no other features were observed from the air. This site should be examined on the ground once the trail route is finalized.

MkNh-8 is a rock trap located on the east side of the confluence of the Koignuk River and the northwest arm of Spyder Lake (Figure 10.4-2). It is situated on a

landform that is about 100 m east of the Koignuk River and is elevated about five metres above the river. The trap consists of a pile of rocks about 1.2 m long x 1.2 m wide and the opening extends the complete length of the trap and is about 20 cm wide and 30 cm high (Figure L). No other cultural remains or features were observed in the immediate vicinity, and age could not be determined.

MkNh-9 occurs on another height of land about 250 m east of the Koignuk River and 150 m northeast of the landform containing MkNh-8 (Figure 10.4-2). This is a stone circle, approximately 3 m north-south x 2.5 m east-west, and composed of evenly spaced, medium sized rocks on a gravelly surface (Figure M, Photo 28). There is a possible opening at the southern end and, just inside this opening, is a small square formation of flat slabs (central space about 30 x 30 cm), probably serving as a hearth/windbreak (see left side of Photo 28). In the northeast quadrant of the ring is an approximately 0.5 m square area of mossy growth indicating some enhanced organic base, probably resulting from some human related deposition. No cultural materials were observed, but vegetal cover is sufficient to permit subsurface remains. Period of use could not be ascertained.

MlNh-1 occurs on an elevated bedrock knoll, about 75 x 60 m in size, on the eastern shore of a lake known locally as Mud Lake (Figure 10.4-3). The site is approximately 40 m from the lakeshore and about 40 m above the water. Features consists of two squarish stone alignments on a smooth bedrock surface and two boat support structures located on a gravel surface (Figure N, Photos 29 and 30). The stone alignments are most likely canvas tent supports (Akana 1996, pers. comm.), consequently, the site probably dates to the historic period. The square stone features have one open side, and both are constructed of flat slabs. The southern one is about two metres square and the open side faces southwest. The other one is about 2.5 m across and the open side faces northeast. The latter has a central rock formation, about one metre in size, possibly signifying a hearth. The different facing directions may indicate different times of use. The boat supports are each constructed of four large boulders positioned in groups of two, about two metres apart (Photo 30). Their functions are interpreted on the basis of comments made by a local Elder (Akana 1996, pers. comm; see NaNh-3 discussion, Section 10.4). There was some caribou bone scattered around the site, and a bird bone was found in the northern stone ring, but no other cultural materials were observed and there is limited potential for buried remains.

NaNh-1 is located on a large, irregular bedrock ridge between two lakes known locally as Wolverine and Patch Lakes (Figure 10.4-3). Site features occur at about 25 m above the lake and cover an area close to 100 m long north-south. The site includes a large stone circle, two stone features suggestive of hunting blinds, a stone semi-circle abutting a rock face, and a rock cache (Figure O, Photos 31 and 32). The stone circle is about four metres east-west by three metres north-south and is constructed of medium sized rocks that are partially buried and re-vegetated (Photo 31). There is a central pile of rocks which may signify a hearth. About 55 m north of the ring is a hunting blind composed of large flat slabs propped up, approximately two metres across and facing west (Photo 32). Another, similar type of feature occurs two metres west, and is constructed of four large rocks encompassing an area about 1.5 m across. There is a muskox skull approximately six metres southwest of the hunting blind. About nine metres north of the hunting blind is a rock cache, approximately 142 x 92 cm in size, and constructed of several large slab rocks with numerous smaller pieces. The cache has caribou bone inside and more is scattered around the vicinity. Approximately 35 m west of the hunting blind is a half circle of rocks with a grassy interior surface, about 1.5 m across, abutting against a rock face which is about 0.75 m high; this could represent a possible shelter or a temporary cache. A thorough surficial inspection did not reveal any artifactual materials, but there are some areas of soil and vegetation which could provide opportunities for buried remains. Occupation period of the site is presently unknown, but the degree of vegetation growth in the stone circle could suggest some antiquity.

10.5.3 Doris Lake Project Area

NaNh-2 is located near the western edge of a high rocky ridge on the east side of the stream at the north end of Doris Lake (Figure 10.4-4). It consists of two rock traps approximately 24 m apart, constructed largely of angular blocks and flat slabs on rocky surfaces (Figure P, Photos 33). The southern trap is about ten metres from the edge of the ridge, is approximately 1.4 x 1 m in exterior dimensions, and has an interior opening that is 70 cm long, 20 cm wide and 14 cm high. The second trap is approximately 22 m from the edge of the ridge, has exterior dimensions of about 1.2 x 2.2 m, and the opening is 160 cm long, 33 cm wide and 33 cm high (Photo 34). Openings in both traps face south. No bone or other cultural evidence was observed in the vicinity of either trap, and due

to the rocky surface, there is little potential for buried cultural materials. Site age could not be ascertained.

NaNh-3 is located near the northwestern edge of the same high landform on which NaNh-2 occurs, approximately 100 m to the northeast (Figure 10.4-4). It consists of a rock trap and a possible double stone circle (Figure P, Photos 35 and 36). The rock trap is constructed of angular blocks on gently sloping, undulating ground, and the west facing opening is approximately 140 cm long, 30 cm wide and 40 cm high. A possible double stone circle is about 60 m south of the trap and is composed of partially buried, medium sized rocks on level ground. It is covered by a thin layer of soil and vegetation. The larger circle is approximately 3 m north-south x 1.8 m east-west and a smaller circle, about 1.5 m north-south by 1 m east-west, abuts the south-east end of the larger circle. Both circles exhibit some rock displacement. A thorough ground inspection revealed no cultural materials, but there is potential for buried remains. Period of use could not be determined, but the degree of soil and vegetative cover around the circle could suggest some age.

NaNh-4 is situated on a small knoll on the west side of the creek draining Doris Lake (Figure 10.4-4). The level upper surface of the knoll is largely exposed bedrock and is about 30 m north-south x 25 m east-west; a lower level on the east side has some vegetative cover. The site consists of a stone circle and a cache or trap on the upper surface, as well as a half circle of stones and a hearth against a rock face on a small, lower ledge on the northeast side of the landform, directly opposite some small rapids on the creek (Figure R, Photos 37 and 38). The stone circle is positioned on a bedrock slab in the northwest quadrant of the upper knoll area, and it is about 4 m north-south x 3.5 m east-west in size. Approximately five metres south of the ring is a rock pile that was a cache or trap, but it has been largely disturbed by survey activities - a survey stake was placed within it and the rocks rearranged to support the stake (Photo 37). At the northeastern edge of the landform is a narrow shelf exhibiting lush vegetation growth, and a semi-circle of stones that abuts the one metre high rock face. There is an apparent opening to the north, and at that point, just inside the semi-circle, a small stick (about 13 cm long) with a groove at one end was found (Photo 39). Less than one metre north of the opening is a small slab lined hearth (approximately 50 x 40 cm) with evidence of burning and some burned bone fragments (Photo 40).

Because of the proximity of this landform to ongoing exploration activities, a detailed scaled map of the features was drawn and two subsurface tests were completed. The upper surface of the landform was thoroughly examined, but no cultural materials were found. One subsurface test was conducted inside the disturbed rock pile. Two central rocks were removed and the five to eight centimetres thick moss accumulation was scraped away to reveal a bed of small shale pieces. Some bits of bone were scattered about, but no cultural materials were found. Our Inuit assistant, John Franklin, mentioned that people might cover cached items with moss, then pile rocks on top; it did appear that the moss within the rock feature was significantly thicker than was apparent on the surrounding surface. Another subsurface, 40 x 40 cm square shovel test was conducted near the centre of the semi-circle stone feature, against the rock face. A ten centimetre thick layer of moss was removed to reveal a shale bed. No cultural remains were found within the test, but due to the vegetation cover, there is a possibility of buried remains. The heavy vegetation growth within and around this feature indicates some enhanced organic base, suggesting a cache, or shelter function (cf. Stewart 1994). Age could not be ascertained, but degree of vegetal cover of the semi-circle feature could suggest some age.

NaNh-5 was found by an exploration survey crew on the last day of archaeological investigation and consequently, the site was recorded that evening, and light conditions were not optimal for photography. It is a large site (covering an area approximately 100 m north-south x 50 m east-west) on a high ridge south of Windy Lake (Figure 10.4-4). The site comprises three stone circles, a possible hunting blind/shelter, possible signal rocks, and a small disturbed stone ring (Figure S). Bone fragments litter the entire site area. The two northerly circles are constructed of angular blocks on exposed bedrock slabs, and both have a small formation of upright slab rocks just inside an apparent entrance, which probably served as hearths/windbreaks. One of these circles, approximately 2.5 m in diameter, has two lines of rocks extending south from the body of the circle, creating the suggestion of an entry tunnel (Photo 41). This could indicate use during Thule times, when entry tunnels were most commonly used. The hearth/windbreak feature in this circle has evidence of burning. The second circle is about 4 m north-south x 3 m east-west and has an apparent opening facing east. Scattered around the vicinity are quantities of bone fragments and bits of cut/notched wood. About one metre north of this circle was a short drop in the

landform that results in a rock face about 0.5 m in height; a possible hunting blind/shelter (1 x 1.3 m) was built against this rock face. It is facing northwest, has a grassy interior and was constructed by propping up several large flat slabs and angular rocks (Photo 42). This is interpreted to be a hunting blind because of the rocks used and the construction method. Jenness (1922) describes "a semi-circular stone shelter on top of a ridge near the camp which would command a wide view over the surrounding country; every day one or other of us would spend several hours there watching for caribou."

The third, southern circle at NaNh-5 is partially buried in a grassy area near the eastern edge of the landform. It is about 3.5 m north-south x 4 m east-west and has an apparent opening facing southeast. About five metres east of this circle, at the edge of the landform, are two upright rocks stuck in a crevasse, suggestive of signal rocks (Photo 43). The rocks are about 34 cm in height and would be very obvious when viewed from the east. Approximately three metres north of the signal rocks is a small, partially disturbed group of rocks which may have been a circle about 1.4 x 0.9 m in size; the small size of this features suggests that it could represent a hide drying structure (cf. Jenness 1922). A thorough examination of the ground surface of the entire site revealed no additional surficial cultural materials, but some areas of soil and vegetative cover provide opportunities for buried remains.

NaNh-6 is located on a grassy flat at the base of a small bedrock knoll, west of the river draining out of the north end of Windy Lake (Figure 10.4-4). It is a squarish rock circle, about three metres north-south by four metres east-west, with an apparent open end to the north (Figure T, Photo 44). Near the back, the southern wall of the structure, is a small squarish formation of slabs which is suggestive of a hearth/windbreak. No surficial cultural remains were observed, but the grassy surface provides potential for buried material. The square shape of the stone ring suggests a historic age for this site.

NaNi-2 is situated on a large, flat topped, grass covered knoll which is about 200 m east of a large lake known locally as Glen Lake (Figure 10.4-4). The site features extend over an area about 80 m north-south and consist of two stone circles, two possible hunting blinds and a possible cache (Figure U, Photo 45). Both stone circles are squarish with three sides of rocks and one open end. One is about 3 m north-south x 2.5 m east-west and has an open side facing northwest.

The other is about 1.5 m^2 with the open side facing east. The hunting blinds are ovals of large rocks, built in small depressions using some *in situ* boulders. One of them has huge flat slabs propped up on smaller rocks; inside dimensions are 2.3 m north-south x 1 m east-west (Photo 46). The other is located downslope; it is backed by large boulders, has flat slabs on the view side, and has inside dimensions of 1.6 m north-south x 1.4 m east-west. The possible cache is situated about half-way down the southern side of the knoll and is a 1.2 x 0.8 m sized hole among huge flat slabs, some of which have obviously been moved. Surficial inspection revealed no cultural materials, but the grass cover provides some potential for buried remains. The square shape of the rings suggests a historic period occupation.

10.5.4 Roberts Bay

NbNh-14 is located on a high bedrock promontory on the west side of Roberts Bay (Figure 10.4-4). It consists of two stone circles placed on shale gravel beds (Figure V, Photo 47). Some of the rocks seem somewhat displaced. One circle is about three metres in diameter, while the other is approximately two metres in diameter. A concentration of shell fragments (whether of natural or cultural origin is unclear) occurs south of the eastern ring, and a carved antler artifact was found southwest of the western ring (Photo 48). Some scattered bone was also noted on the site, but no other cultural remains were observed. Soil deposition is limited, consequently, potential for buried remains is low. Site age could not be determined. Following discussions with BHP camp manager, it was decided to collect the antler artifact, given that use of the general area as a barge landing may increase the chances of someone wandering among the rocks and finding the artifact (Flood 1996, pers. comm.).

NbNh-15 is located in a bedrock outcrop below and just south of NbNh-14 (Figure 10.4-4). It is a rock cache in a crevasse formed of fairly large rocks (Photo 49). The dimensions of the interior area are 1.2 x 1 x .5 m deep. The cache was empty, thus, age could not be ascertained.

NbNh-16 is located on a sheltered gravelly beach at the base of a high bedrock outcrop (Figure 10.4-4) approximately 30 m from the western shore of Roberts Bay. The site consists of what appears to be a double stone circle; one circle is about 3.5 m east-west x 2.5 m north-south, and abutting the south side is another

circle about 2 m east-west x 1.8 m north-south (Figure W, Photo 50). Approximately centrally located in the larger circle is a small square of flat slab rocks which may have functioned as a hearth/windbreak; some apparently burned twigs were noted within the square. Thorough inspection of the surrounding ground revealed no cultural materials, and there is little potential for buried remains. The time period of use could not be determined.

NbNh-17 is located on a large, flat area on the west side of Roberts Bay, some distance south of the high bedrock outcrops on which the above sites occur (Figure 10.4-4). Two stone circles are situated about 75 m from the water's edge, on a pebbly beach with some sparsely vegetated patches. Both rings are constructed from well spaced, small rocks, and both have interior, squarish rock features made of flat slabs, suggestive of hearths/windbreaks (Figure X, Photo 51). The northerly ring is approximately 3 m north-south x 2 m east-west, and the interior rock feature is 60 x 48 cm; the latter is located near the northern wall of the ring. About nine metres southwest is the second circle, which is approximately three metres in diameter; the interior hearth/windbreak feature is about 90 x 30 cm and is placed near the southern wall, just inside a gap in the wall which could represent an opening. Surficial examination of the area revealed a piece of wood about five centimetres long, with a small half circle in one edge, lying within the northern ring could represent a piece of a wooden handle. This may suggest a historic age for this site. There is some potential for additional cultural remains in the vegetated patches.

NbNh-18 is located on the east shoreline of Roberts Bay, immediately north of the mouth of the creek that drains Doris Lake (Figure 10.4-4). The area is generally a flat gravel beach with some sparse vegetative cover back from the shoreline, interspersed by small, low bedrock knolls and rock outcrops. The surface of the bedrock is undulating and there is some vegetation growth in the shallow depressions. The site consists of three stone circles and a cache, on two bedrock outcrops (Figure Y). The remains of a very recent camp (occupied on the day of the overflight with the Elders), signified by a rectangular stone ring and assorted modern garbage, are located adjacent to the creek mouth.

The cache and one stone circle are situated on a bedrock knoll about 50 m from the shore of Robert's Bay and the recent camp is on the flat immediately to the south of this knoll. The cache (1 m north-south x 1.4 m east-west) is a simple pile

of rocks on a fairly flat portion of the knoll. The stone circle (about 2.5 m north-south and 1.5 m east-west) is on a flat slab of bedrock, and the south half is constructed of abutting rocks, while the north half exhibits some spacing between rocks; a considerable amount of lichen growth is evident on the rocks. There is some scattered seal bone in the vicinity. The other two stone circles are situated on a lower rock outcrop about 150 m east. The more easterly ring is approximately 3 m north-south x 1.5 m east-west, is constructed of large abutting rocks with some lichen growth, and there is some evidence of disturbance of the southern rocks. Approximately three metres west, the second ring is about 2.5 m in diameter and is constructed of large rocks with some spacing between. The east side includes a section of protruding bedrock (Photo 52). A nearby rock outcrop has two small depressions containing shell remains, but it could not be determined if these were natural or cultural accumulations. No definite cultural remains were observed, but the vegetal cover presents some potential for buried materials. Site age could not be definitively established, although the degree of lichen growth on the rocks could suggest some antiquity; in addition, the use of large, closely spaced or abutting boulders in oval rings could suggest a Thule time period (up to 800 years B.P.)

NbNh-19 is a large site located on the south side of the creek draining Doris Lake (Figure 10.4-4). Features extend over an estimated area of 150 m^2. The site is situated mostly on a large, low bedrock knoll, the north end of which begins about 40 m from the creek; the landform is about 1.5 m above sea level. There are four stone circles on the bedrock knoll and two, possibly three, on the flat just to the west of the knoll (Figure Z). The circles on the elevated landform are round, while those on the flat are square (with one exception), possibly suggesting different periods of use. The one stone circle on the flat which is oval is partially buried, suggesting some antiquity. The circles range from about 1.5 m in diameter to 6 x 5 m in size (Photo 53). On the flat, a possible small circle could represent a skin drying structure. On the bedrock knoll, there is a small square hearth (about 50 cm across) constructed of flat blocks of stone, a structure of propped and stacked rocks (Photo 54) which may represent a meat or fish drying rack (Franklin 1996, pers. comm.; see also photos in de Coccola and King 1986 and Jenness 1922) and a trap. The interior measurements of the trap are approximately 90 x 30 cm. The site features are generally situated on gravel, but there are some patches of vegetated ground, providing potential for buried remains. Considerable

quantities of bone and historic debris are scattered about, including tin (some modified), canvas, sawed bone and wood. Of particular note were a wooden stick smoothed and thinned at one end for marrow extraction and one leather mitten. These artifacts and the square stone rings indicate historic use of the area, but the presence of circular stone rings may suggest use during earlier times as well.

NbNh-20 is located near a stream outlet on the west side of a large lake known locally as Tail Lake, north of Doris Lake (Figure 10.4-4). It consists of one, and possibly two, stone circles on top of a high bedrock knoll, another ring at the southern base of the knoll and a fourth further south on the flat bordering the lake (Figure 10.4-4). One ring on the upper landform is approximately two metres in diameter and is composed of large, abutting rocks on a shale like surface with some vegetation and the interior is slightly depressed (Photo 55). About one metre east of this circle is a squarish rock arrangement on an exposed bedrock surface with well spaced rocks on three sides and an open side toward the west. This could represent a more recent tent ring. There is some scattered bone in the vicinity of these features.

The stone circle at the base of the knoll is approximately 1 m north-south x 1.5 m east-west and is constructed of abutting large rocks (Photo 56). It is on an undulating, well vegetated bench which is about six metres wide. There is some scattered caribou bone around the ring, and the vegetation cover presents the possibility for buried cultural remains. The small size of this ring could suggest that this may have served as a cache, and the degree of vegetation growth provides some support for such an interpretation.

The final stone circle is about 55 m southeast of the base of the knoll. It is situated on gravelly ground that slopes gently toward the lake. It is about 2.5 m north-south x 3 m east-west; a short distance east is an oil drum rim which may have served as a fireplace, and there is evidence of wooden tent pegs and scattered tin cans. NbNh-20 provides definite evidence of use during historic times, but it may also have seen earlier use, as suggested by the ring with large, abutting rocks.

NbNh-21 is on a rocky outcrop on the east side of Roberts Bay (Figure 10.4-4). The maximum height of the outcrop is about 20 m above sea level at the south end, and it slopes down gently toward the north, forming several slightly different levels of land. The site consists of two stone features on the top of the landform and a

possible cache or trap on the southwest side, near the base of the landform (Figure AB, Photo 57) The two stone features occur in a gravelly area with some surrounding scattered vegetation patches. One is approximately 2 m north-south x 1.5 m east-west; about 3.5 m south is a three-sided stone alignment (~ 1.8 x 1 m) with an open side facing northeast. There is another possible ring about 100 m north of these, and in between is much scattered caribou, seal and bird bone and some historic debris including tin cans, a fragment of a leg hold trap, a wooden handle fragment and rubber boots. In addition, the remains of an abandoned boat are located on the beach. The cache or trap is a pile of rocks, approximately 1.4 x 0.7 m, showing signs of rock displacement to expose the centre. This site was used during historic times, and there is some potential for buried cultural materials.

10.5.5 Site Summary and Preliminary Analysis

Almost all of the 30 archaeological sites for which information was recorded during the 1996 field investigations for the Hope Bay Belt Project have multiple features (Table 10.5-1); consequently, some extend over fairly large areas. Total site size ranges from about three metres for some of the single feature sites up to 300 m for the largest sites.

Stone circles range in shape from round to oval to square; considerable variation in the size of individual rings is evident, from less than one metre in diameter to about six metres. Some of the very small ones may represent skin drying structures, as observed by Jenness (1922). Some double rings were also recorded which may indicate adjoining residences, such as shown by Jenness (1922), or possible storage areas, in the case of the smaller attached circles.

Table 10.5-1
Summary of Site Features

Features	Site
Single stone circle	MjNh-3, MjNh-6, MkNh-4, MkNh-7, MkNh-9, NaNh-1, NaNh-4, NaNh-6
Double stone circle	MjNh-4, NaNh-3, NbNh-16
Multiple stone circles	MjNh-2, MjNh-5, MkNh-1, MkNh-2, MkNh-3, MkNh-5, MkNh-6, MlNh-1, NaNh-5, NaNi-2, NbNh-14, NbNh-17, NbNh-18, NbNh-19, NbNh-20, NbNh-21
Hearth/windbreak	MjNh-3, MjNh-5, MkNh-1, MkNh-2, MkNh-3, MkNh-9, MlNh-1, NaNh-4, NaNh-5, NaNh-6, NbNh-16, NbNh-17, NbNh-19
Shelter/cache	NaNh-1, NaNh-4
Hunting blind	MjNh-5, MjNh-6, NaNh-1, NaNh-5, NaNi-2
Cache	MjNh-2, MkNh-3, NaNh-1, NaNh-4, NaNi-2, NbNh-5, NbNh-18, NbNh-20, NbNh-21
Cairn	MjNh-6
Rock trap	MkNh-8, NaNh-2, NaNh-3, NbNh-19
Signal rocks	MjNh-2, NaNh-5
Kayak supports	MlNh-1
Meat drying support	NbNh-19
Artifacts	MjNh-2, MjNh-3, MjNh-6, MkNh-4, MkNh-5, NaNh-4, NaNh-5, NbNh-14, NbNh-17, NbNh-19, NbNh-20, NbNh-21
Animal bones	MjNh-2, MjNh-6, MkNh-1, MkNh-3, MlNh-1, NaNh-1, NaNh-5, NbNh-14, NbNh-18, NbNh-19, NbNh-20, NbNh-21

Several interesting variations in construction of the stone circles are evident, some of which allow preliminary suggestions concerning possible age. The square configurations are interpreted to represent historic use, on the assumption that the use of square canvas tents beginning in the 1920s resulted in this change in shape (Akana 1996, pers. comm.). Such rings were found at 12 sites which have, therefore, been tentatively assigned to the historic period (Table 10.5-2). Some of these sites also contain round or oval rings, suggesting possible use during other times as well. Five sites contain stone circles with structural evidence suggestive of possible Thule construction, that is, round to oval rings with heavily built walls, partitions, and/or entry tunnels (Table 10.5-2). It must be emphasized that these are preliminary interpretations, based on surficial structural evidence only, which need to be investigated through excavation to recover additional structural details and, possibly, diagnostic artifacts.

Some of the stone circles have apparent openings; although these openings may

Table 10.5-2
Possible Time Periods Represented

Time Period	Site
Paleo-Eskimo	MkNh-4
Thule	MjNh-5, MkNh-6, NaNh-5, NbNh-18, NbNh-20
Historic	MjNh-2, MjNh-3, MjNh-6, MkNh-4, MlNh-1, NaNh-6, NaNi-2, NbNh-17, NbNh-18, NbNh-19, NbNh-20, NbNh-21
Undetermined	NbNh-14, NbNh-15, NbNh-16, NbNh-19, NbNh-20

have been caused by rock displacement, most are assumed to represent doorways in the absence of obvious evidence of disturbance. A tabulation of facing directions of these openings, shown below, indicates that south facing openings are dominant, and when south, southwest and southeast facing directions are grouped, they by far out number those with a northern orientation (that is, 16 to six).

S	SW	SE	W	E	N	NW	NE
7	6	3	4	3	2	2	2

A preliminary explanation for the southerly directional dominance could relate to wind direction. Since prevailing winds are most often northerly or westerly, it seems logical to face a doorway away from the wind, particularly in this area where winds are often very strong. This suggestion is supported by a perusal of the locational situations for the northerly facing rings which indicates that they are generally situated at the base of knolls, in the lee of elevated landforms or are facing lake or river views, probably for game spotting (possibly on days when winds were light or bugs were fierce). Another possible explanation is that southerly facing doorways may permit more warmth within the dwelling from the sun during the period of the day when it is at its warmest.

A number of the stone circles have associated hearth/windbreaks, most characterized by upright, flat slabs. The majority of the slab-type hearths/windbreaks (eight) were located just inside the rings, with only a few situated a short distance outside (two definite, two possible). This type of structure is common in sites found in this region and is illustrated by Jenness (1922), however, other studies have found that these types of hearths/windbreaks more commonly occur outside the rings (cf. Morrison 1978; Damkjar 1994). Jenness (1922) has noted, “In fine weather cooking takes place out of doors, but

whenever it is cold or windy a hearth is made just inside the doorway." Whether the predominance of these features inside the circles apparent in this study represents a regional, functional or temporal difference (or is weather related) is unclear at this time, but it is certainly worthy of further consideration. Two or three exterior hearths/windbreaks have a flat slab placed on top of the central area (NaNh-4, NbNh-19, and possibly MjNh-5) and this was apparently meant to keep the centre dry for future use (Damkjar 1994). Several stone circles contain small circles or semi-circles of round rocks which were placed centrally within the rings. The determination as to whether these features are hearths requires further investigation, but they have been provisionally identified as such.

Three of the multiple feature sites include half circles of rocks placed against a rock face. Two of these (NaNh-1 and NaNh-4) could represent expedient shelters or caches. The third (NaNh-5) is almost certainly a hunting blind/shelter (see site discussion in Section 10.5-3). A hunting blind function is unlikely for the other two similar features because the rocks used are not of sufficient height. At site NaNh-4, the cache suggestion is supported by enhanced vegetation growth, although the shelter possibility is supported by the close proximity of a hearth. The similar feature at NaNh-1 does not contain such obvious enhanced vegetative growth; it simply has an interior of low grass cover, consequently, neither suggested function is supported or eliminated. Some excavation may assist in determining functions of these features.

All the caches found this season were opened and mostly empty (a few bones were found in some). Some exhibited discoloration of the bottom rocks. At least one (NaNh-4) seemed to have an interior mossy layer thicker than surrounding areas. It is possible that this (and perhaps the few bones found in other caches) represents a base layer on which meat was placed, or a moss covering over the meat (Franklin 1996, pers. comm.; Damkjar 1994).

Several interesting stone features were recorded this season. One site (MlNh-1) contains kayak support structures similar to those identified by the Elders at NbNh-3 (see also Stewart 1994). Site NbNh-19 has a boulder alignment identified by Franklin as a possible meat or fish drying rack; similar structures are shown in use in de Coccola and King (1986) and Jenness (1922). Several sites exhibited possible marker stones or signal rocks, generally not large or elaborate enough to be considered true *inukshuit*, with one exception (MjNh-2 contains a possible

partially collapsed one). The hunting blinds recorded this year were generally of a fairly standard construction, that is, a semi-circular arrangement of large boulders or flat slabs propped upright. Similar structures have been recorded by several ethnographers (*e.g.*, Jenness 1922).

Most of the sites have little associated surficial artifact material; only a limited amount of subsurface testing was conducted, and there is some potential for buried cultural material at most sites because of soil and vegetation cover. However, "sterile" sites (sites with no artifacts) are well documented in this area (cf. Morrison 1978) and it is possible that cultural material will not be found in association with some sites. Not many artifacts are expected in most sites because this area it is thought to have been exploited largely during the summer months (see Section 10.3.3), when people were at their most mobile following caribou or travelling in search of other game. Consequently, a particular camp spot may have been occupied only for a night or two, thereby not resulting in much cultural material accumulating. In addition, because of the high degree of mobility, people would probably choose to only carry necessities with them, and may have left many items behind at wintering locations. This practice has been ethnographically documented (*e.g.*, Jenness 1922), and it is possible that prehistoric residents followed a similar practice. However, this is a theory that needs to be tested by excavation, and some of the larger sites with soil and vegetative cover are likely to produce some artifacts.

It is not yet possible to adequately address the issue of site location patterns, since research has been restricted to specific limited development areas. Prior to 1995, no archaeological work had been conducted in the region east of Bathurst Inlet. In 1996, as predicted by Bussey (1995b), the majority of sites were found on elevated, dry landforms near rivers, lakes and the coast. However, a number of sites were found in lower elevation topographic situations, some distance from significant waterbodies. Consequently, such areas cannot be dismissed, particularly since so little archaeological field work has been conducted in the region to date. It should also be noted that the high number of sites found in a relatively restricted area suggests a high degree of use of the region, possibly well into the past, and may refute the opinion that this area has had low populations densities throughout time (Maxwell 1980).

Detailed analysis of the spatial distribution of feature types is not yet possible. Various stone circle types seem to occur throughout the study area, as do the sites which possibly represent different time periods. Consequently, no temporal patterns are yet discernible. However, one apparent pattern seems to be that no rock traps were found in the vicinity of the Boston Project area or Spyder Lake. The Koignuk River/Spyder Lake confluence area seems to be the southern extent of this feature. However, given that little archaeological research has been conducted in the area thus far, this is a very preliminary suggestion.

The results of this study present some tantalizing possibilities for contributions to the culture history of the central Arctic region. For example, thus far, all definite Thule sites seem to occur in close proximity to the coast line. If sites MjNh-5 and MkNh-6, in the vicinity of Spyder Lake, are indeed Thule, then the known range of Thule sites may be expanded some distance from the coast. In addition, the inland sites tentatively identified as Thule may present opportunities to elucidate Thule summer activities, hitherto unknown.

Of equal interest is that this area may provide opportunities to better define the relationships between Thule and modern Copper Inuit. The area east of Bathurst Inlet from the coast to the tree line may hold the key to understanding the development of the Copper Inuit culture (Hickey 1977, pers. comm.). Much can be learned from investigations of sites in this area, in spite of the sparsity of artifacts; for example, if some of these sites could be dated, this would provide a better chronological basis for defining cultural developments in the Copper Inuit region (Hickey 1977, pers. comm.).

10.6 Conclusions And Recommendations

The archaeological investigations conducted in the Hope Bay Belt Project area in 1996 resulted in the recording of information on 30 archaeological sites. Many of these sites have multiple features and include stone rings, rock caches, traps, hearths/windbreaks, boat supports, drying rack supports and possible signal rocks. Some artifacts were also found, consisting of wooden and bone/antler implements, one stone tool, and various historic tin and glass remains. Only two artifacts, endangered by their proximity to proposed development, were collected and will be submitted to the Prince of Wales Northern Heritage Centre.

10.6.1 Project Summary

In the Boston Project area, five new archaeological sites (MjNh-3 to -6 and MkNh-1) and one isolated find were recorded; in addition, one large site (MjNh-2) on a nearby landform was revisited and site information updated. Two sites (MjNh-4 and MkNh-1) occur on the edges of the two possible air strip locations and some mitigative work will likely be necessary once one of the two options is chosen and the exact location is identified. MjNh 6, although not directly within the currently delineated development zone, has a potentially sensitive feature (possible grave) which will require additional investigation if development encroaches on the vicinity of the site. The remaining sites are not in danger of immediate, direct impacts, but will require continual re-assessment as development plans evolve. The archaeological inventory of the Boston Project area, as defined during the summer of 1996, is complete. If new development areas are identified, these will require additional inventory work and possible assessment and/or mitigation if any sites are found.

A preliminary assessment of the currently proposed winter trail route between Boston camp and the south end of Doris Lake resulted in the recording of ten new archaeological sites (MkNh-2 to -9, MlNh-1 and NaNh-1). One disturbed ring was also observed from the air, but was not recorded. These sites represent features reported by trail surveyors last year as well as stone features observed from the air during the helicopter overflight. The preliminary archaeological assessment was designed primarily to identify areas with significant archaeological potential because BHP had indicated that the route had not been finalized and would not be required for at least one year. It must be emphasized that no detailed inventory of the trail route has been completed; a detailed inventory will be necessary once the final route is identified.

The sites recorded in the section of the proposed trail between the Boston and Doris Lake properties occur on elevated landforms (with a few exceptions) adjacent to the trail, which generally passes over low lying waterbodies and wet areas. Consequently, the potential for direct impacts to these recorded sites is minimized, with two exceptions. Sites MkNh-4 and -5 occur on a knoll which the trail is proposed to cross, thus, direct impact is possible. MkNh-4 may be of particular significance, since it is the only site containing a stone tool found thus

far, and the tool is suggestive of a Paleo-Eskimo occupation (that is, might be as old as 3,500 years ago).

With regard to the assessment of archaeological potential along this section of the proposed trail route, all elevated landforms, particularly those adjacent to waterbodies, have been rated as having high potential and would require ground reconnaissance (see Figures 10.4-1 to 10.4-4). Although these landforms may not be directly impacted by trail development and use, indirect impacts are quite possible due to the close proximity. Lower elevation, dry ground immediately adjacent to waterbodies would have sufficient potential to also require examination. In addition, documentation has suggested that portions of the Koignuk River provide resource gathering areas of some importance (cf. Riewe 1992; NPCTT 1996) and since much of the proposed trail route follows the Koignuk River, potential for sites is enhanced.

A detailed inventory and impact assessment was completed for the portion of the trail between Doris Lake and Roberts Bay because it was to be used this winter. Two sites (NaNh-4 and NbNh-19) were recorded, both of which are in danger of direct impacts. In the case of site NbNh-19, consultation with BHP personnel resulted in a revision to the proposed alignment so as to avoid the landform on which the site is located. NaNh-4 is also within the Doris exploration program area and is adjacent to the proposed camp location; therefore, potential for impact is increased. The archeological inventory of the portion of the winter trail between Doris Lake and Roberts Bay, as identified on the plans supplied by BHP in July 1996, is complete.

Three sites (NaNh-2-4) were recorded within the Doris Lake project area. As discussed above, one site (NaNh-4) is in direct conflict with development. NaNh-2 and -3 are adjacent to planned developments and may be subject to indirect impacts. The inventory of the Doris Lake Project area, as defined for 1996, is completed provided there are no changes to its boundaries.

On the west side of Roberts Bay, examination of two possible ports and two proposed barge landings resulted in the recording of four archaeological sites (NbNh-14 to -17). Two of these (NbNh-14 and -15) occur within the proposed northern port location and additional archaeological work will be required if this location is chosen. One site (NbNh-16) occurs adjacent to the northern edge of the

southern proposed barge landingand it is felt to be sufficiently removed that direct impact will not likely occur. Although indirect impact may be possible, it is considered relatively unlikely due to the site's location within a rocky outcrop, as well as the fact that no artifacts were observed, thus reducing the potential for illegal collection. The final site (NbNh-17) is not within any currently planned developments, but is included within a potential development area and may require additional investigation in the future. No archaeological remains were found within the southern port option or the northern barge landing. Consequently, these locations present no further archaeological concerns. The inventory of this development area in Roberts Bay of the trail route has been completed provided no revisions are identified.

Five sites (NaNh-5, -6, NbNh-20, -21 and NaNi-2) that had been reported by survey and geology crews were also recorded. These all occur in the general vicinity of the Doris Lake exploration area, from south of Windy Lake to Roberts Bay. Although they are currently in no danger of direct impacts, continued and/or increased exploration activities could increase the potential for impacts, both direct and indirect. The discovery of these sites was not part of a systematic inventory and there is potential for additional archaeological sites outside of the areas examined in 1996.

The sites recorded in 1996 appear to represent the full time range of occupation known for the central Arctic. One site (MkNh-4) may contain a Paleo-Eskimo component which could date as old as 3,500 years B.P. Five sites (MjNh-5, MkNh-6, NaNh-5, NbNh-18 and -20) contain structural features which could represent Thule occupation, dated from about 1,000 to 400 years ago. Twelve sites contain historic components (see Table 10.5-2), based on the square shape of the stone rings as well as the presence of historic artifacts such as metal and glass. A number of these sites could also contain older occupations, generally suggested by more deeply buried features. Because of the inventory nature of the 1996 field work, the majority of the sites contained features whose ages remain undetermined; additional investigations at those sites may assist in establishing time of use.

In summary, most of the sites recorded in 1996 are not in direct conflict with identified development. Seven sites may be in direct conflict with specific proposed developments (MkNh-4, -5, NaNh-4, NbNh-14, -15, -16 and -19), but

are generally avoidable by development re-design. Another eight sites occur peripherally, that is, just within or immediately adjacent to possible development areas, one on Roberts Bay (NbNh-17), two near the Doris Lake Project (NaNh-2 and -3), and five in the Boston area (MjNh-3, -4, -5,- 6 and MkNh-1). In addition, once a final trail route has been selected, it is possible that additional sites could be in conflict. One of the sites found during the 1995 field reconnaissance is also located near a proposed development, one of the airstrip alternatives. However, MjNh-1 was mitigated in 1995 and no further archaeological investigation is recommended. The other 1995 sites, MjNh-2 and NbNh-1 through -13, are not threatened by direct impact at the present time.

10.6.2 Recommendations

All recorded archaeological sites should be plotted on development and exploration plans and avoidance should be stressed. Any sites that cannot be avoided will require more detailed assessment, possibly including systematic surface collection and/or test excavation, to evaluate significance and to recover data. All revisions to proposed development or exploration areas should be reviewed by an archaeologist to determine the need for additional inventory work.

Boston Project

When an air strip location has been finalized, the sites adjacent to the chosen location (which may be any of sites MjNh-3, -4 or MkNh-1) should be re-examined in order to determine if potential for impact has increased. If so, those sites should be evaluated and mapped in greater detail.

If the Boston project area is revised, additional inventory and impact assessment could be required and the potential for impact on all recorded sites should be re-evaluated. If development plans are extended to the south, the cairn feature at site MjNh-6 should be investigated to attempt to determine its function.

Winter Trail Route

All elevated and dry ground adjacent to or crossed by the current proposed trail route, as indicated on Figures 10.4-1 to 10.4-4, should be examined. The portion of the route along the Koignuk River, especially the vicinity of the confluence of the Koignuk River and Spyder Lake, is of particular significance, as is the Roberts

Bay area. If the trail route is revised, similar areas adjacent to any new route would require ground reconnaissance. It is recommended that selected portions of other, lower potential areas also be examined, to ensure that assumptions of archaeological potential are valid and that no sites are missed. Any of the recorded sites that remain in close proximity to the final trail route selected should be revisited for detailed assessment.

MkNh-4 should be subjected to some test excavation to attempt to determine its temporal significance. In addition, the vicinity of the landform should be thoroughly examined to find a route for the trail which would not impact features at MkNh-4 and MkNh-5 and to ensure that no other unrecorded archaeological resources are impacted.

With regard to the portion of the trail route between Doris Lake and Roberts Bay, NaNh-4 and NbNh-19 should be re-examined to see if construction and use of the nearby ice trail this winter has caused any damage to the site features. It must be emphasized that winter trails are known to have damaged archaeological sites elsewhere in the past, consequently, some monitoring of activity and effects is considered necessary. It is understood that use of the winter trail in 1996 - 1997 will be monitored by an archaeologist. If this re-examination results in an assessment of increased impact potential, these sites should be evaluated and mapped in more detail.

Doris Lake

NaNh-4, discussed above in association with the trail route, is also within the Doris Lake development area and could be in conflict. Any changes to the boundaries of this development area or any increased activity would require a re-assessment of nearby archaeological sites and could require additional inventory.

Roberts Bay

The sites in the vicinity of the barge landing used during the winter of 1996 to 1997 should be revisited to monitor impacts on the archaeological sites. If the potential for disturbance of NbNh-14, -15, and -16 appears to be enhanced, more detailed mapping and site evaluation is recommended.

General

It has been suggested that a number of the sites threatened by impact may require evaluation. This is partially intended to assist in the identification of site significance, but also to help in the determine of the level of mitigation required if the site can not be avoided. More intensive examination would likely involve a combination of exploratory subsurface testing and/or intensive surficial examination and collection. However, because little is known of this region it is suggested that a number of sites that are in close proximity to development areas, or could fill information gaps, should also be tested. Of particular significance are sites suspected to represent Thule occupation, the testing of which may reveal structures such as sleeping platforms as well as diagnostic artifacts. In addition, sites with animal bone could provide valuable dates for developing a chronological framework. This strategy is recommended for several reasons that are listed below:

- Development plans can be revised on very short notice, and sites which may not have appeared to be in direct conflict with development may suddenly be within impact zones.
- The archaeological field season is so short in this region that field work must be planned well in advance.
- The results of such work would be of great interest to local Inuit residents by helping to elucidate their history and would demonstrate BHP's commitment to sharing the benefits of their projects.
- It could be of considerable significance from a scientific perspective to examine sites which could hold the key to defining the culture history of the Copper Inuit traditional territory and provide a cultural historical framework within which archaeological sites recorded in the future can be evaluated.

Sites for which some subsurface testing and intensive surficial inspection/collection is recommended are: MjNh-5 (possible inland Thule), MjNh-6 (possible grave), MkNh-4 (possible Paleo-Eskimo), MkNh-6 (possible Thule), NaNh-4 (possible development impacts), NbNh-19 (multiple occupation, possible development impacts). These sites represent a selection of the known sites in the project area which are in close proximity to possible development

and/or could provide opportunities for examination of various feature types and the recovery of cultural materials and/or dateable materials which could assist in establishing a temporal framework for the prehistory of the study area. It is suggested that this degree of additional work may assist in mitigating conflicts between development and archaeological sites in the future as well as provide a better basis for evaluating sites and the overall potential for impacts.

Every effort should be made to have potential exploration areas examined for archaeological resources. Exploration activities, in particular but not restricted to, drilling activities and associated camps, can cause considerable damage to archaeological sites. All such areas should be investigated as much in advance of exploration as possible. It is acknowledged that it is impractical to cover the entire region potentially to be explored, but it is recommended that some level of archaeological survey be conducted prior to intensive exploration activities which involve ground disturbance.

Some form of crew education is recommended, to stress the importance of leaving in place all rocks, bones and artifacts within and around archaeological sites, as well as not building new rock features such as inukshuit. This should apply to BHP personnel as well as any subcontractors working for them and may require an orientation lecture.

It must be acknowledged that the possibility exists that some archaeological remains may have been missed. It is impossible to cover every inch of ground within possible development or exploration areas and there could be some small or buried sites which escaped detection using methods designed to cover large areas, but this is an unlikely possibility, given the generally good visibility in this region. Further, it is very unlikely that any large or intensively utilized sites exist within the portions of the development areas that have been subjected to ground reconnaissance. However, if any cultural or human remains are encountered during development, all activities in the vicinity should cease and the Prince of Wales Northern Heritage Centre should be contacted.

Further inventory in this area will likely yield similar types of archaeological sites to those already discovered. However, it is also possible that different site types, possibly including those without surface features, could be located. Because

traditional knowledge has already contributed to the archaeological study, it is suggested that further consultation would be of value.

This inventory phase is only the first step in dealing with the archaeological resources of this region. As development plans are revised, the possible effects on recorded sites will require ongoing evaluation. Consultation with the Prince of Wales Northern Heritage Centre and the Inuit Heritage Trust with regard to further investigations, site assessments and mitigation measures will be necessary. Avoidance is the preferred mitigative strategy; however, threatened sites must be assessed and tested or excavated if avoidance is not feasible. Further, some evaluative testing of sites is desirable to assist in assessing the archaeological resources of this little known region. Where avoidance is possible, site protection measures will need to be considered and periodic monitoring may be necessary.

11. Traditional Knowledge, Community Consultations and Socioeconomics

11. TRADITIONAL KNOWLEDGE, COMMUNITY CONSULTATIONS AND SOCIOECONOMICS.

BHP Minerals became a partner in the Naonayaotit Traditional Knowledge Study being conducted by the Kugluktuk Angoniatit Association on behalf of the Kitikmeot Hunters and Trappers Association (KHTA), in May of 1996, to provide an overview of local indigenous knowledge for the Hope Bay Belt projects. This study provides a step toward working more closely with the hunters of Cambridge Bay, Omingmaktok, and Bathurst Inlet through their local Hunters and Trappers Organizations (HTO's) by accepting that their experience on the land has an important role in planning development.

The geographic scope of the Naonayaotit study is very large. It will provide an overview of traditional and modern Inuit land use of the west Kitikmeot mainland by people from Kugluktuk, Bathurst Inlet, Omingmaktok, and Cambridge Bay. It extends from the west Nunavut boundary east to the Perry River and south from the Arctic coast to the southern boundary of Nunavut.

Within this large study area, particular attention will be given to the Hope Bay Belt south of the Kent Peninsula, Lac de Gras, the area between Tahikyak and Imaokatalok, and the Hood River region. These areas contain mineral deposits under exploration by BHP, Lytton, Echo Bay, and Diavik Diamond Mines. Traditional knowledge of these areas will assist in planning, monitoring and mitigating the impact of exploration and perhaps in some instances mining. The study also provides traditional knowledge to the Department of Resources, Wildlife and Economic Development's (DRWED) grizzly bear study, and Parks Canada's History of Nunavut Project.

The Kugluktuk Angoniatit Association is conducting the study. BHP Diamonds, BHP Minerals, Lytton, Diavik Diamond Mines, Echo Bay Mines Ltd., DRWED and Parks Canada are partners in the Project. The partners acknowledge that the KAA owns the interview data. This database will provide the people of the Kitikmeot with a valuable planning tool to help manage their lands.

Interviews and transcription/translation for the Naonayaotit Traditional Knowledge project is nearly complete. Proofed and corrected transcripts are

expected in April of 1997. BHP and the other industrial partners are currently working on a pilot with the KAA to digitize the map overlays from the interviews into the GIS program *Arch View*. The final report for the Naonayaotit project is due in the summer of 1997. To accommodate BHP Minerals' Hope Bay Belt projects, the Kugluktuk Angoniatit Association's principal investigator has indicated that he will work with BHP Minerals on integrating traditional knowledge with biophysical data sets as material becomes available in the late winter of 1997. At the request of elders who visited the region during the summer of 1996, emphasis will be given to wintering by Victoria Island caribou, the calving grounds of the Bathurst and Queen Maud Caribou herds, water quality and fish in the Koignuk River, and marine mammals around Roberts Bay.

The KHTA project will provide a useful data set for comparison with the older Inuit Land Use and Occupancy Studies and more recent work done by the Nunavut Planning Commission. Analysis of regional level patterns will provide BHP Minerals with the background to work with local Inuit on more specific problems associated with the Hope Bay Belt project. Topics currently under discussion include management of heritage sites and caribou. Subsequent studies will be designed in consultation with the Inuit to examine specific questions.

11.1 Community Consultation

From the onset of exploration in 1991 until 1995, at least one community meeting per year has been held in Cambridge Bay and Omingmaktok. Beginning in 1996, two community meetings were held in each of these communities and annual elders' visits to the Hope Bay Belt were instituted. These gatherings dealt with a range of issues including, but not limited to, jobs, training, business opportunities and environmental protection.

Starting in April 1996, the BHP Minerals Hope Bay Belt projects have been active participants in the community mobilization component of the NWT Job Development Strategy. BHP Minerals is currently participating in job shadowing programs for people from the surrounding Arctic communities, associated with the strategy's pre-mine employment training.

Consultation has occurred with the Hamlet of Cambridge Bay on a yearly basis. BHP Minerals has been closely working with Kitikmeot Inuit Association since

the proclamation of the Nunavut Land Claim, on a variety of land use issues. The Kitikmeot Hunters and Trappers Association, and community hunters' and trappers' organizations have been consulted on traditional knowledge, use of BHP facilities by Inuit corporations for communal caribou hunting, and potential land use conflicts between Inuit land users and mineral exploration. BHP Minerals has worked with the Nunavut Tunngavik Inc. on the lease of mineral concessions. Since early 1996 BHP Minerals has been cooperating with the New Nunavut land and water organizations - Nunavut Planning Commission, Nunavut Impact Review Board, and the Nunavut Water Board. Discussions with these councils, boards and agencies will in turn create the need for further rounds of community consultations.

As BHP Minerals undertakes mine feasibility studies for the Boston Project, the frequency of community visits will increase as new issues arise that require local updates and discussion. To accommodate the increased need for community consultation, BHP Minerals is assigning specific staff to handle community consultation and traditional knowledge. This staff is shared with BHP Diamonds in order to provide a more uniform approach to BHP operations in the Northwest Territories.

11.2 Socioeconomics

A limited evaluation of socioeconomic conditions was conducted in 1996. It is customary to reserve detailed socioeconomic assessment until such time as a decision is made to proceed to apply for development approvals. This is to ensure that the data collected for socioeconomic input assessment and management purposes is sufficiently current to reflect, as best as possible, conditions that are likely to be experienced at the time of project development. The ultimate objective of the study will be to generate sufficient socioeconomic data to allow for project planning to maximize the benefits and minimize any disruption that may result to local Inuit people and northerners more generally.

In addition to socioeconomic studies that will be instituted, important and relevant data will also be garnered from the traditional knowledge and community consultation programs. BHP's involvement in the community mobilization and NWT Job Strategy will also provide useful information for a socioeconomic

analysis. As mentioned above, broader and longer term socioeconomic studies (*e.g.*, employment levels, demographics, infrastructure and services availability, *etc.*) will follow the successful completion of exploration activities and the decision to proceed to full feasibility studies.

Socioeconomic impact assessment involves identifying population and income effects on the region and any communities where mine employees or suppliers/contractors may settle. Company policies on workforce shift schedules, recruitment, transportation, accommodation, and native involvement will be reviewed to delineate specific impact issues.

Not only benefits but also potential negative impacts of project development would be critically reviewed when a more extensive socioeconomic review is called upon, within the categories of social tensions, racial interactions and demographic considerations. The aim would be to organize and operate the project so as to maximize socioeconomic benefits to the region and minimize any social disruption.

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