

**Distribution of Large Mammals
in the Badami Development Area, Alaska
Summer 1994**

Final Report

September 1994

Prepared by
LGL Alaska Research Associates, Inc.
4175 Tudor Centre Drive, Suite 101
Anchorage, Alaska 99508-5917

Prepared for
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Environmental and Regulatory Affairs Department
P.O. Box 196612
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INTRODUCTION

In spring 1994, BP Exploration (Alaska) Inc. (BPX) initiated development plans for the Badami prospect which includes placement of a gravel drilling pad and an associated pipeline that will connect the site with existing oil transport systems to the west. Although there has been extensive research on wildlife in relation to both the Prudhoe Bay oil fields and the Arctic National Wildlife Refuge (ANWR), relatively few studies have concentrated on the area between the Sagavanirktok and Staines rivers, an area encompassing the proposed project. During 1993 and again in 1994, LGL Alaska Research Associates, Inc., (LGL) conducted aerial reconnaissance surveys in the Badami development area. These efforts focused on caribou (*Rangifer tarandus granti*), muskoxen (*Ovibos moschatus*), brown bear (*Ursus arctos*), and arctic fox (*Alopex lagopus*). This report provide a synopsis on the occurrence of large mammals near the proposed gravel pad and along the associated pipeline route and a description of the results obtained from the 1994 surveys.

Caribou

One caribou herd occurs near the Badami development area: the Central Arctic Herd (CAH). This herd has grown from 5,000 animals in 1979 (Cameron and Whitten 1980) to approximately 23,000 animals in 1992 (Cameron 1993), concurrent with expanding oil field development. The eastern segment of the CAH uses a broad area along the Arctic Coastal Plain between the Sagavanirktok and Hulahula rivers as summer range (Clough et al. 1987). During spring migration, CAH caribou move from the northern foothills of the Brooks Range to the coastal plain. In general, cows arrive on the coastal plain between late April and early June, while bulls do not arrive at the coast until post-calving in early July (Whitten and Cameron 1980, Jakimchuk et al. 1987).

There are several routes traveled by migrating CAH caribou in the spring. Gavin (1983) reported heavy use of the Itkillik, Ivishak, Kuparuk, and Sagavanirktok rivers as spring travel routes from 1969-1979. The Canning, Kadleroshilik, and Kavik rivers were used to a lesser degree, although level

of use of each river system varied from year to year. Carruthers et al. (1984:106) characterized spring migration in 1982 and 1983 as occurring, "...along a broad east-west front rather than along restricted routes of movement." Despite the fact that they found no indication of large numbers of caribou traveling along specific routes in spring, researchers did observe some northward migration along the Anaktuvuk, Itkillik, and Atigun rivers during the same study (Carruthers et al. 1984). Carruthers et al. (1984) suggested that Gavin's reports of major migratory movements along rivers may have been due to the concentration of his survey efforts along river channels. More recently, Elison et al. (1986) noted that CAH females wintering in the mountains and foothills of ANWR's 1002 area (i.e., members of the eastern segment of the CAH) use the Canning River as a migratory route to calving grounds on or near the Canning and Staines river deltas; some females also migrate north-northwest across the uplands south of Camden Bay.

Since studies of caribou in the central Arctic region began in 1969, considerable effort has been expended to document calving distributions on the coastal plain. Several general areas of "concentrated calving" have been reported over the years, but the distribution of calving caribou is annually variable. Two areas—between Oliktok Point and the Kuparuk River (Milne Point) and between Bullen Point and the Canning River (immediately west of the Badami development area)—have been used consistently by calving caribou in most years since at least 1969 (Cameron and Whitten 1978, Gavin 1983, Lawhead and Curatolo 1984, Whitten and Cameron 1985, Cameron et al. 1989). Calving caribou of the CAH have been found west of the Colville River and east of the Canning River (Carruthers and Jakimchuk 1986). Curatolo and Reges (1984) described the 1984 CAH calving distribution as low-density and relatively dispersed, especially in comparison with other herds.

In all years 1970-1977, Gavin (1978) reported observing more calves in the Bullen Point area than in the Milne Point area. In 1984, however, a larger proportion of CAH cows were observed calving in the Milne Point area than in the Bullen Point area, and nearly 50 percent of the cows calved outside the two concentration areas (Curatolo and Reges 1984). Sopuck and Jakimchuk

(1986) reported that an average of 64 percent of cows and calves observed on transects during mid-June post-calving surveys in 1981-1985 were west of the Sagavanirktok River. In contrast, most cows apparently calved east of the Sagavanirktok River in 1986 in response to extensive snow cover on calving grounds west of the river. Calving caribou generally scatter throughout the calving grounds in groups of less than 10 animals (Bergerud 1978). In 1993, little calving occurred in the Badami development area; however, greater concentrations of calving caribou were seen to the south of the current study area (BPX 1993).

The area between the Sagavanirktok River and the Hulahula River (which encompasses the Badami development area) is also used by the CAH during the post-calving period. Because of their value as insect-relief habitats, certain areas (e.g., the Beaufort Sea coast, river deltas, river channels, wind-swept uplands and ridges) are used regularly by mosquito-harassed caribou during the post-calving period. During Gavin's surveys, for example, large groups were often observed near the Franklin Bluffs, on the deltas of the Kadleroshilik, Sagavanirktok, and Shaviovik rivers, as well as along the Staines River (Gavin 1983). During post-calving surveys in 1981-1983, aggregations were observed on the Sagavanirktok River delta and north of the Franklin Bluffs (Carruthers et al. 1984). Lawhead and Curatolo (1984) reported that large aggregations sought relief on or near deltas of the Kuparuk, Shaviovik, and Canning rivers during intense insect harassment, although caribou groups were observed along the coast within the entire Oliktok-Canning zone.

Muskoxen

By the late 1800's, muskoxen were exterminated from the North Slope of Alaska and little is known about historic levels (Clough et al. 1987). Muskoxen were reintroduced into ANWR in 1969 and 1970, and the population has grown exponentially since 1974. The year-round range of muskoxen is primarily within ANWR, and the major calving areas occur within the 1002 area. However, mixed-sex herds are dispersing into new areas east of the Aichilik River (i.e., the eastern border of ANWR) (Clough et al. 1987) and west of the Canning River (i.e., the western border of ANWR) in the area encompassing the Badami development area (P. Reynolds, pers.

comm.). Mixed-sex herds of muskoxen have been observed at least as far west as the Kuparuk River (pers. observ.).

Muskoxen are non-migratory but move in response to seasonal changes in snow cover and vegetation. During summer and fall, they are found primarily in riparian habitats but move to adjacent uplands in winter and spring (Clough et al. 1987). Riparian habitats are also important travel routes and muskoxen feed there year-round. Distributions from aerial surveys in 1993 were concentrated along rivers in the study area (BPX 1993).

Brown Bear

Little information exists on the distribution and abundance of brown bears in the project study area. Research on brown bears in northeastern Alaska has been concentrated primarily in ANWR (Clough et al. 1987) and, more recently, in the Prudhoe Bay oil field (Shideler, ADF&G, pers. comm.). Coastal areas in ANWR are used seasonally by brown bears. They move north from denning areas in the foothills in late May and are most abundant during June and July when caribou are on the coastal plain. In late July, they gradually move south to the foothills after caribou have migrated south (Clough et al. 1987). Riparian areas are used as travel routes and contain abundant prey and preferred vegetation. During aerial surveys conducted in June through early September 1993, no bears were sighted in the Badami development area (BPX 1993).

Arctic Fox

Arctic foxes occur across the Arctic Coastal Plain, but relatively little information exists regarding their distribution and abundance within the project area. However, studies conducted in 1992 showed there to be four active dens and no inactive dens in the Badami development area (Burgess et al. 1993). This limited site-specific information and fox studies conducted within the Yukon Delta and Prudhoe Bay areas will serve as background data for the project area.

STUDY AREA AND METHODS

The study area extends from Drill Site 3 on the west to Bullen Point on the east, and from the Beaufort Sea inland to approximately 70° 05' N latitude (Fig. 1). Much of this area falls within the Arctic Coastal Plain physiographic province (Wahrhaftig 1965), characterized by flat, poorly drained plains with many thaw lakes. Several river drainages exist in the study area, including the Sagavanirktok, Kadleroshilik and Shaviovik rivers.

During summer 1994, we conducted ten, strip-transect aerial surveys (Caughley 1977) from fixed-wing aircraft (Cessna 207). Three surveys were conducted during the caribou calving period in early to mid-June, and seven surveys were conducted during the post-calving period between 5 July and 8 August. Transect centerlines were spaced at 1.6 km intervals, oriented north-south, and centered on township and section lines mapped on 1:63,360-scale U.S. Geological Survey (USGS) topographic maps. Surveys were conducted at a flying height of 90 m above ground level and at 115 km/hr airspeed. Two observers were used during surveys; each observer was responsible for searching an 800 m wide swath on one side of the transect centerline.

During each survey, we recorded species, number, sex/age composition (i.e., for caribou: bulls, cows, calves, yearlings, and unclassified adults; for muskoxen: adults and calves; for brown bears: adults, yearlings, females with cubs; for Arctic foxes: adults and pups), and location of observation. Incidental observations of other large mammals were also made and recorded.

As with previous aerial surveys conducted by LGL in the Prudhoe Bay oil field (Pollard et al. 1992a,b; Pollard and Ballard 1993; Pollard and Noel 1994), a Trimble *Pathfinder*TM Global Positioning System (GPS) was used to navigate the aircraft during surveys and to facilitate accurate locations of animals sighted.

After the field season, animal observation data was combined with base-map data in MapInfo. Spatial data was used to produce maps of caribou, muskoxen, grizzly bear, and arctic fox distributions observed during each survey.

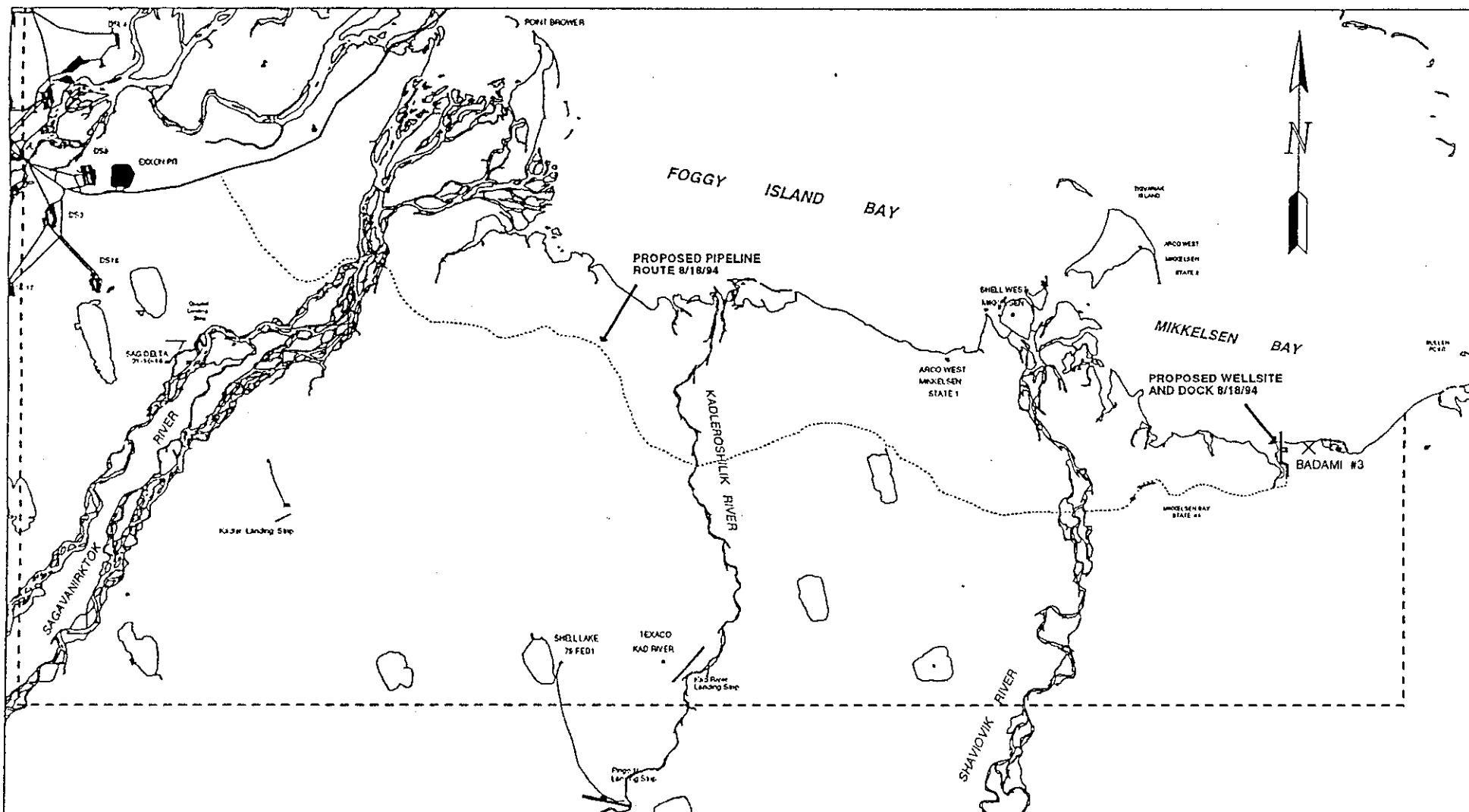


Figure 1. Map showing the proposed Badami development and study area boundary (dashed lines) for aerial surveys of large mammals.

RESULTS

On the 1 June survey, a total of 92 caribou (68 cows, 6 calves, 9 yearlings, 9 unclassified adults) were observed in the study area most of which were located between the Kadleroshilik River and Bullen Point (Table 1, Fig. A-1, Appendix 1). All cow/calf pairs observed were located south of the proposed pipeline route. Snow cover was extensive (90-95%) across the entire study area but patches of snow-free ground occurred on high-centered polygons and elevated ridges along stream banks. A total of 45 muskoxen (Table 2) were observed in three groups; two of these groups (14 animals) were located along the coast between the Kadleroshilik River and Mikkelsen Bay and one group consisting of 31 individuals was located on the Shavirovik River, approximately 4.2 km south of the proposed pipeline route (Fig. A-1, Appendix 1).

A total of 27 caribou (2 bulls, 13 cows, 1 calf, 3 yearlings, 8 unclassified adults) were observed on 6 June, widely scattered across the study area between 4-8 km from the coast (Table 1, Fig. A-2, Appendix 1). Mottled snow cover (60-75%) existed over most of the study area. Three muskoxen groups, totaling 45 animals (Table 2), were observed in roughly the same location as those seen on 1 June (Fig. A-2, Appendix 1). It is highly probable that the same muskoxen were observed on both dates, indicating that little movement had occurred.

On the 16 June survey, the study area was virtually snow-free but very wet from recent snow melt. Thirty-four caribou were observed (8 bulls, 18 cows, 6 calves, 2 unclassified adults), the majority of which were located between the Sagavanirktok and Kadleroshilik rivers, between 2-10 km from the coast and south of the proposed pipeline route (Table 1, Fig. A-3, Appendix 1). All six cow/calf pairs observed were located south of the proposed pipeline route. One group of 11 muskoxen (Table 2) was observed adjacent to the Kadleroshilik River about 6.5 km inland (Fig. A-3, Appendix 1).

Approximately 3,316 caribou were observed in the study area on 5-6 July (Table 1). Bulls comprised about 43% of the total and cows and calves comprised 24% and 22%, respectively, of the total. Caribou were widely

Table 1. Numbers and sex/age composition of caribou observed during areial surveys conducted from June through early August 1994 in the Badami study area, Alaska.

Survey	Date	Number of Caribou					Total
		Bulls	Cows	Calves	Yearlings	Unclass.	
1	1-Jun	0	68	6	9	9	92
2	6-Jun	2	13	1	3	8	27
3	16-Jun	8	18	6	0	2	34
4	5,6-Jul	1418	807	746	28	317	3316
5	11,12-Jul	11	3	0	0	1	15
6	19,20-Jul	138	153	85	6	94	476
7	25,26-Jul	18	13	3	1	20	55
8	28-Jul	16	6	2	0	0	24
9	1-Aug	15	10	4	1	0	30
10	8-Aug	19	32	5	1	1	58

Table 2. Number of muskoxen adults and calves observed during aerial surveys conducted from June through early August 1994 in the Badami study area, Alaska.

Survey	Date	Number of Muskoxen		
		Adults	Calves	Total
1	1-Jun	45	0	45
2	6-Jun	44	1	45
3	16-Jun	10	1	11
4	5,6-Jul	7	3	10
5	11,12-Jul	17	4	21
6	19,20-Jul	27	6	33
7	25,26-Jul	31	8	39
8	28-Jul	29	10	39
9	1-Aug	31	10	41
10	8-Aug	0	0	0

scattered across the study area from the Sagavanirktok River delta to Mikkelsen Bay (Fig. A-4, Appendix 1). The majority of animals were located east of the Shaviovik River. Among these animals, two groups of 330 and 2,500 individuals comprised 85% of the total observed on the survey. Other smaller (35-85 animals) cow/calf-dominated groups were located in the same general area. As with the previous three surveys, most caribou on 5-6 July were located south of the proposed pipeline route. Ten muskoxen (including 3 calves) were observed on the Kadleroshilik River approximately 10 km from the coast on 6 July (Table 2, Fig. A-4, Appendix 1). Two adult arctic foxes were observed east of the Kadleroshilik River on 6 July (Fig. A-4, Appendix 1).

On the 11-12 July surveys, 15 caribou (11 bulls, 3 cows, 1 unclassified adults) were observed in the study area (Table 1). Virtually all of these animals were using coastal insect-relief habitat in the Sagavanirktok and Kadleroshilik river deltas (Fig. A-5, Appendix 1). Two muskoxen groups, totaling 21 individuals (including 4 calves), were observed along the Kadleroshilik River on 12 July (Table 2, Fig. A-5, Appendix 1). An adult brown bear was observed near where the proposed pipeline route crosses the Shaviovik River, approximately 4 km from the coast on 12 July (Fig. A-5, Appendix 1). An adult arctic fox was sighted near the coast, just east of the Kadleroshilik River delta (Fig. A-5, Appendix 1).

On 19-20 July, 476 caribou were observed in the study area (Table 1), most of which were located on the Sagavanirktok River delta and in areas immediately to the west (Fig. A-6, Appendix 1). Bulls comprised 29% of the total, cows 32%, and calves 18%. Thirty-three muskoxen (including 6 calves) were observed on 29 July in two groups adjacent to the Shaviovik River, south of the proposed pipeline route (Table 2, Fig. A-6, Appendix 1). An adult arctic fox was observed west of the Kadleroshilik River and south of the proposed pipeline route on 29 July (Fig. A-6, Appendix 1).

A total of 55 caribou (18 bulls, 13 cows, 3 calves, 1 yearling, 20 unclassified adults) was observed in the study area on 25-26 July (Table 1). The majority of these animals were using insect-relief habitat in the Sagavanirktok River delta and along the coast south of Foggy Island Bay. (Fig. A-7, Appendix 1). Two groups of muskoxen, totaling 39 animals (including 8 calves), were observed on the Kadleroshilik River south of the proposed

pipeline route (Table 2, Fig. A-7, Appendix 1). A bull moose was observed midway between the Kadleroshilik and Shaviovik rivers approximately 6.4 km from the coast on 26 July (Fig. A-7, Appendix 1).

On 28 July, 24 caribou (16 bulls, 6 cows, 2 calves) were observed widely scattered across the study area from the Sagavanirktok River to the Shaviovik River (Table 1, Fig. A-8, Appendix 1). Most of these animals were located north of the proposed pipeline route. Three groups of muskoxen, totaling 39 individuals (including 10 calves), were located on the Kadleroshilik River approximately 6.7 km from the coast (Table 2, Fig. A-8, Appendix 1). It is likely that these muskoxen were the same as those observed in this area on 26 July. A brown bear sow and three yearling cubs were observed near the Shaviovik river just north of the proposed pipeline route (Fig. A-8, Appendix 1). Two bull moose were observed in the eastern portion of the study area on 28 July. One of these animals was located midway between the Kadleroshilik and Shaviovik rivers approximately 6.4 km from the coast (Fig. A-8, Appendix 1); the other was located just east of the Shaviovik river approximately 3.5 km from the coast (Fig. A-8, Appendix 1).

A total of 30 caribou (15 bulls, 10 cows, 4 calves, 1 yearling) was observed in the study area on 1 August (Table 1). Most of these animals were using coastal and river delta insect-relief habitat (Fig. A-9, Appendix 1). Forty-one muskoxen (including 10 calves) were observed in the study area on 1 August (Table 2). One group of 33 muskoxen was located on the Kadleroshilik River delta; one group of 7 muskoxen was seen just east of the Kadleroshilik River approximately 5 km from the coast; and one lone muskoxen was observed on the tundra about 5 km due south of the proposed well site (Fig. A-9, Appendix 1). A bull moose was observed in the same area where previous sightings of moose were made on 26 and 28 July (Fig. A-9, Appendix 1).

On 8 August, a total of 58 caribou (19 bulls, 32 cows, 5 calves, 1 yearling, 1 unclassified adult) was observed in the study area (Table 1). Most of these animals were located in the Sagavanirktok River delta (Fig. A-10, Appendix 1). Several individual caribou were seen on the coast between the Sagavanirktok River and Bullen Point. No muskoxen were observed in the study area on 8 August.

Of the 153 caribou that were observed during the three calving-period surveys in June, 7% were bulls, 65% were cows, 8% were calves, 8% were yearlings, and 12% were unclassified adults. The low percentage of bulls among all sex/age classes is typical for this time of the year, as cows generally arrive on the coastal plain between early May and early June, while bulls do not arrive at the coast until post-calving in early July (Whitten and Cameron 1980, Jakimchuck et al. 1987). Of the 3,974 caribou that were observed during the seven post-calving surveys, bulls comprised 41% of the total, cows 26%, calves 21%, yearlings 1%, and unclassified adults 11%.

SUMMARY

Much of the variability in caribou distributions during calving has been attributed to variations in snow cover and flooding during that season (Whitten and Cameron 1985). In seasons of deep snow and/or flooding on the coastal plain, concentrations of CAH caribou have tended to calve inland near drier upland sites. Deep snow in the foothills of the Brooks Range also may delay migration and cause cows to have their calves further inland (Gavin 1983). Thus, the relative lack of calving caribou in our study area during 1994 may be due, in part, to snow and flood conditions that existed during calving period surveys. However, the low number of calving caribou in the study area is probably more related to the fact that historically, large numbers of CAH caribou have not consistently used this area for calving.

During most of our post-calving surveys, relatively few caribou were found in the study area. The exceptions were on the 5-6 July and 19-20 July surveys, when 3,316 and 476 caribou, respectively, were observed. Caribou distribution during post-calving in 1994 was strongly influenced by weather-moderated insect activity, as is generally the case on the coastal plain during this phase of the caribou's life cycle (White et al. 1975, Roby 1978, Dau 1986). On survey days characterized by warm temperatures and low wind velocities, mosquito harassment was severe and caribou were found primarily in coastal and river delta insect-relief habitat, north of the proposed pipeline route. A reduction in air temperature or increase in wind velocity may result in a decrease in mosquito activity and cause caribou to drift inland to feed (White et al. 1975, Dau 1986). These conditions existed during surveys on 5, 6, and 20

July and caribou were found further inland, south of the proposed pipeline route. These observations indicate that caribou crossed the proposed pipeline route in traveling to and from insect-relief habitat on the coast.

Muskoxen were observed in the study area on all surveys except on the 8 August survey. During early surveys on 1 and 6 June, presumably the same three muskoxen groups, totaling 45 individuals, were found in roughly the same locations on both dates. By the 16 June survey, one of the above groups (11 animals) that was originally observed on the coast a few kilometers west of the Shaviovik River delta, had apparently moved inland and was located adjacent to the Kadleroshilik River. This particular group was again observed on 6 July, a few kilometers to the south. The two other muskoxen groups observed on the first two surveys had evidently moved out of the study area, as they were not found on the 16 June or 6 July surveys. During all subsequent surveys, muskoxen consistently used riparian habitat associated with the Kadleroshilik and Shaviovik rivers and occasionally were found on the coast. Similar patterns of use were documented during 1993 surveys of the study area. Only one muskoxen calf was observed during June 1994 surveys indicating that, as in 1993, the study area was little used by muskoxen for calving.

Surveys conducted during mid-to-late July, showed an increase in the number of muskoxen using the study area, probably due to northward movements by muskoxen groups along the Kadleroshilik and Shaviovik rivers. During the above time period, several groups of between 2-30 individuals were observed near where the proposed pipeline route crosses the Kadleroshilik River. By the 1 August survey, these groups had coalesced, forming two groups of 7 and 33 individuals, and had moved north of the proposed pipeline route. The larger of these groups was located on the coast during this survey. It is evident from our 1994 observations, that muskoxen crossed the proposed pipeline route, probably at several locations, during their north-south movements across the study area.

Brown bears were observed on two occasions during our 1994 surveys. An adult brown bear was observed near where the proposed pipeline route crosses the Shaviovik River, approximately 4 km from the coast on 12 July and a brown bear sow and three yearling cubs were observed near the

Shaviovik river just north of the proposed pipeline route on 28 July. In contrast, no brown bears were observed in the study area in 1993.

Arctic foxes were observed in the study area on three surveys. Two adult arctic foxes were observed east of the Kadleroshilik River on 6 July; an adult arctic fox was sighted near the coast, just east of the Kadleroshilik River delta on 12 July; and an adult arctic fox was observed west of the Kadleroshilik River and south of the proposed pipeline route on 29 July.

No moose were observed in the study area during our 1993 surveys, however in 1994, bull moose were seen on several occasions. A bull moose was observed midway between the Kadleroshilik and Shaviovik rivers on 26 July; two bull moose were observed in the eastern portion of the study area on 28 July; and on 1 August, a bull moose was observed in the same area where previous sightings of moose were made on 26 and 28 July.

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APPENDIX A

Maps of Large Mammal Observations

in the Badami Study Area, 1994

Figure A-1. Locations of large mammals observed during aerial surveys conducted on 1 June 1994 in the Badami study area.

Figure A-2. Locations of large mammals observed during aerial surveys conducted on 6 June 1994 in the Badami study area.

Figure A-3. Locations of large mammals observed during aerial surveys conducted on 16 June 1994 in the Badami study area.

Figure A-4. Locations of large mammals observed during aerial surveys conducted on 5-6 July 1994 in the Badami study area.

Figure A-5. Locations of large mammals observed during aerial surveys conducted on 11-12 July 1994 in the Badami study area.

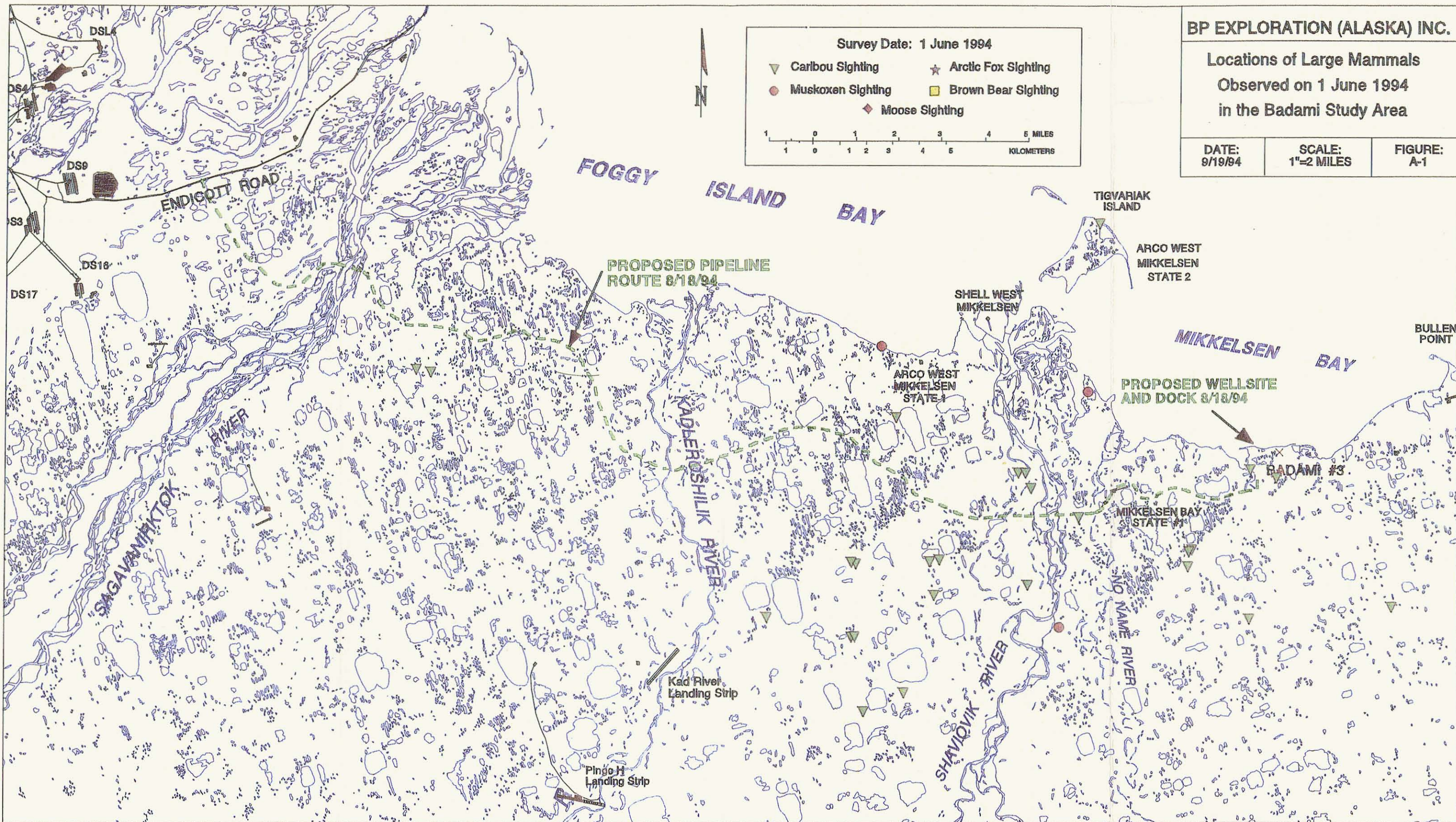
Figure A-6. Locations of large mammals observed during aerial surveys conducted on 19-20 July 1994 in the Badami study area.

Figure A-7. Locations of large mammals observed during aerial surveys conducted on 25-26 July 1994 in the Badami study area.

Figure A-8. Locations of large mammals observed during aerial surveys conducted on 28 July 1994 in the Badami study area.

Figure A-9. Locations of large mammals observed during aerial surveys conducted on 1 August 1994 in the Badami study area.

Figure A-10. Locations of large mammals observed during aerial surveys conducted on 8 August 1994 in the Badami study area.



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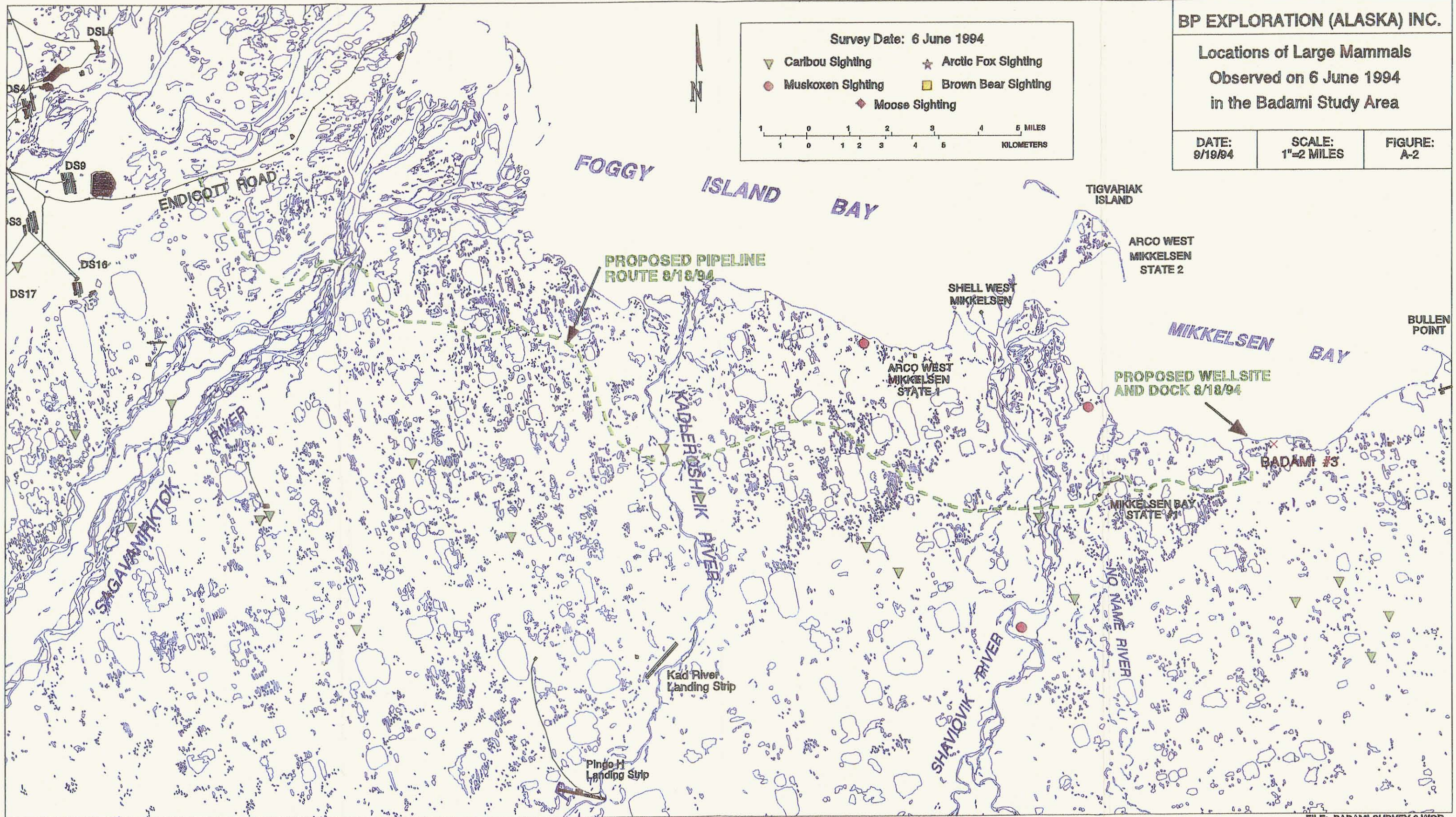
Locations of Large Mammals
Observed on 6 June 1994
in the Badami Study Area

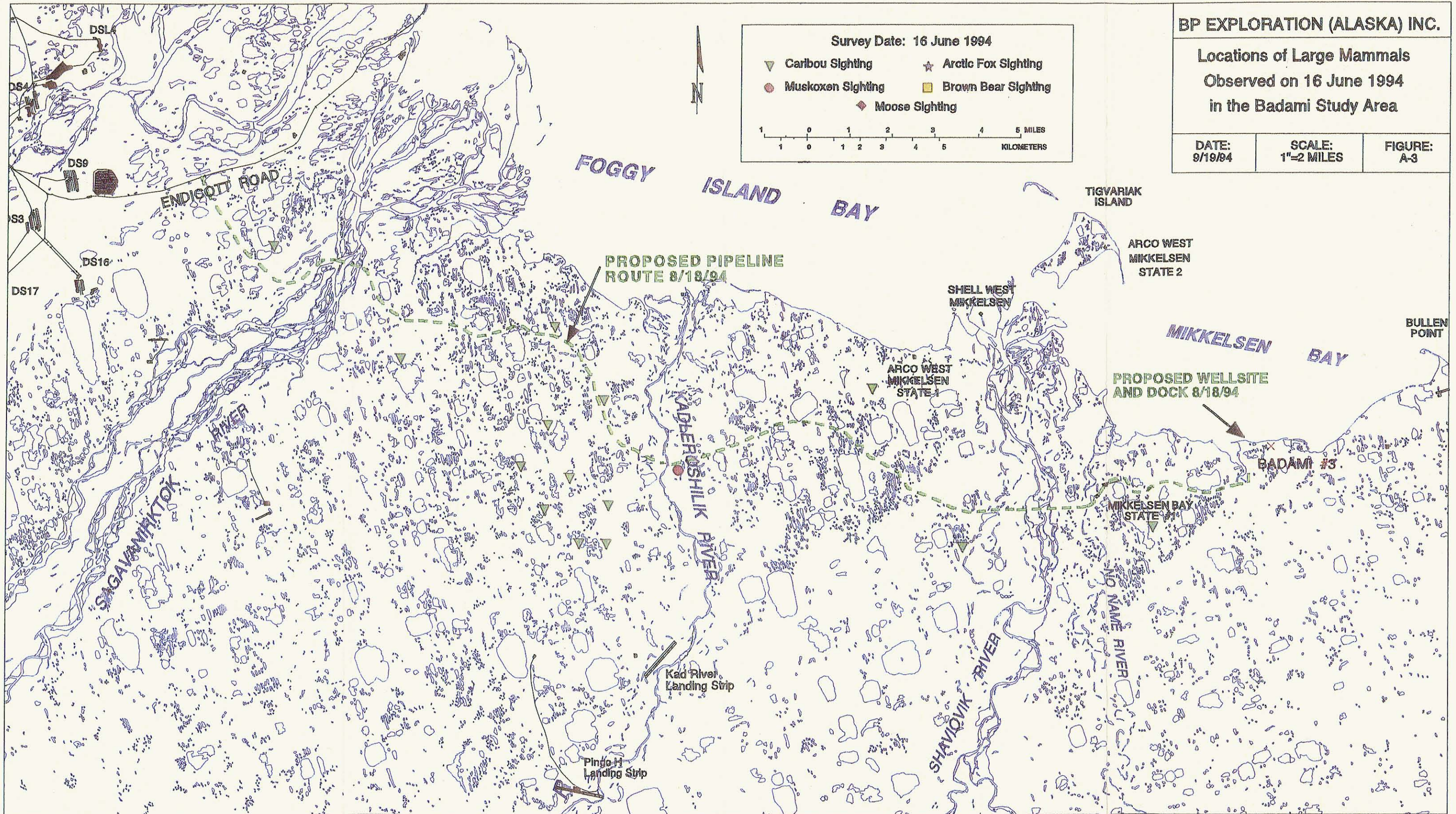
DATE: 9/19/94	SCALE: 1"=2 MILES	FIGURE: A-2
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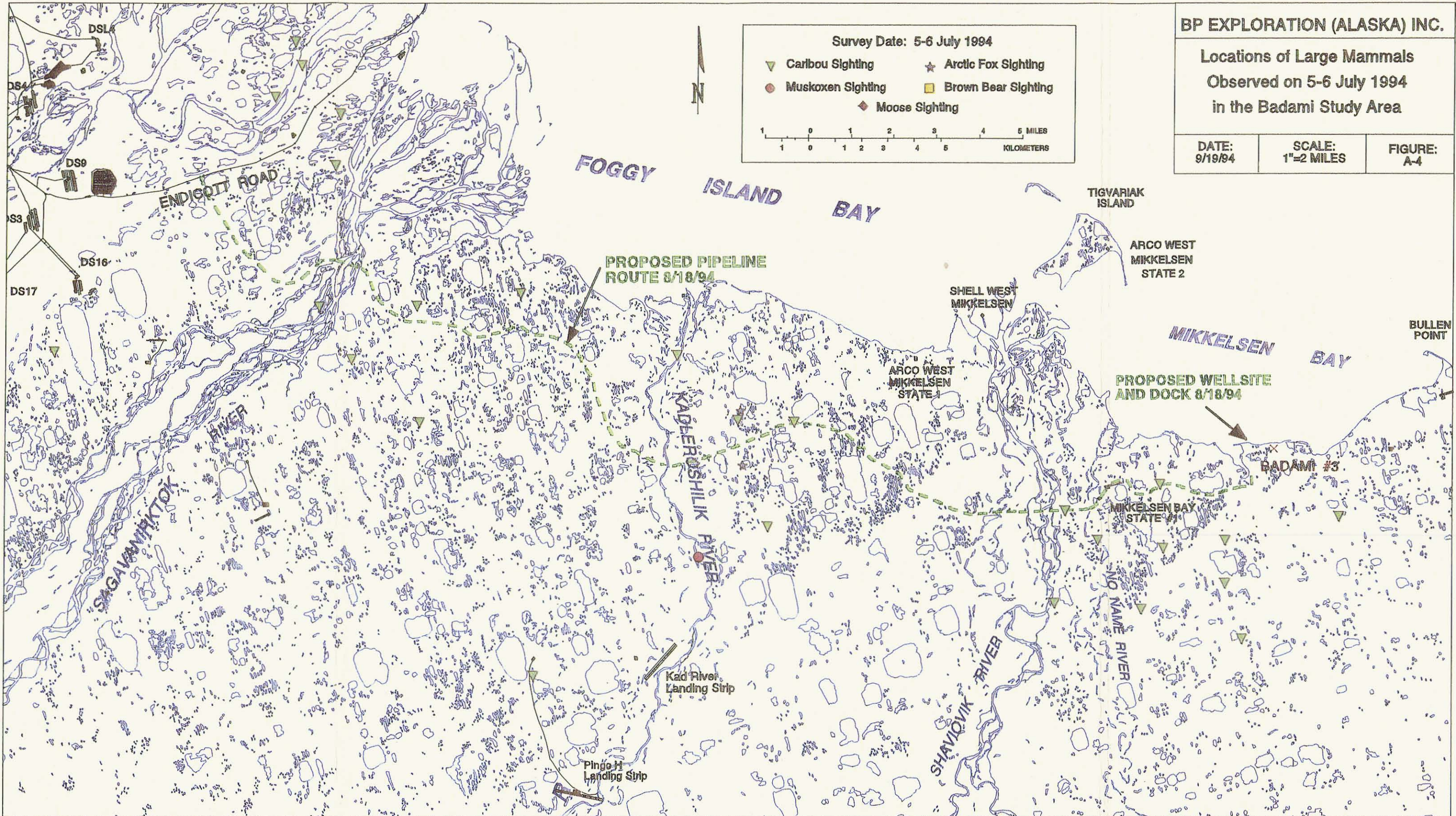
Survey Date: 6 June 1994

- Caribou Sighting (green triangle)
- Muskoxen Sighting (red circle)
- Arctic Fox Sighting (star)
- Brown Bear Sighting (yellow square)
- Moose Sighting (red diamond)

1 0 1 2 3 4 5 MILES
1 0 1 2 3 4 5 KILOMETERS







Survey Date: 5-6 July 1994

- ▼ Caribou Sighting
- ★ Arctic Fox Sighting
- Muskoxen Sighting
- Brown Bear Sighting
- ◆ Moose Sighting

1 0 1 2 3 4 5 MILES
1 0 1 2 3 4 5 KILOMETERS

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**Locations of Large Mammals
Observed on 5-6 July 1994
in the Badami Study Area**

DATE: 9/19/94	SCALE: 1"=2 MILES	FIGURE: A-4
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BP EXPLORATION (ALASKA) INC.

Locations of Large Mammals
Observed on 11-12 July 1994
in the Badami Study Area

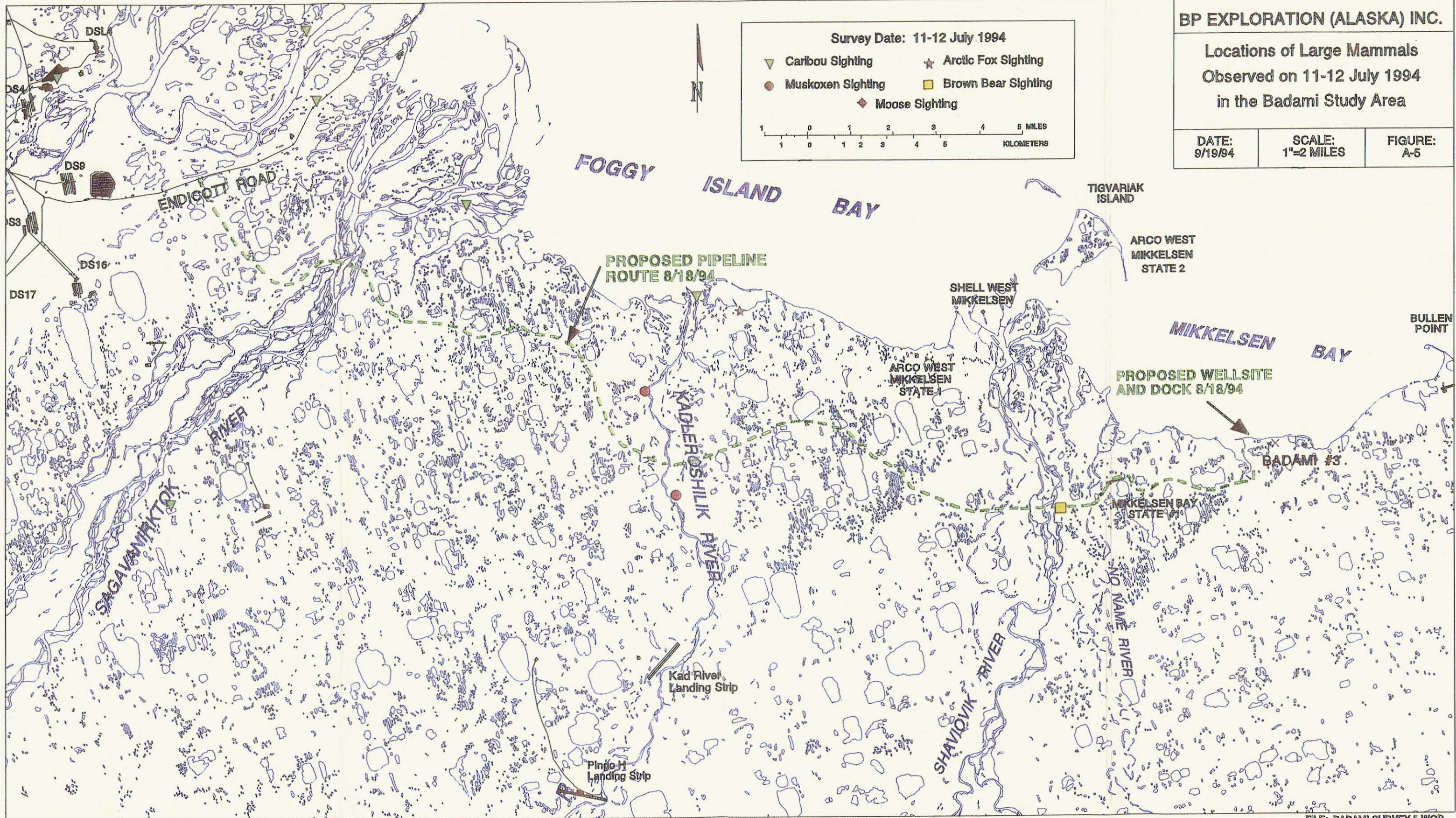
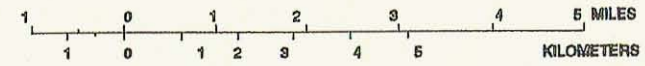
DATE:
9/19/94

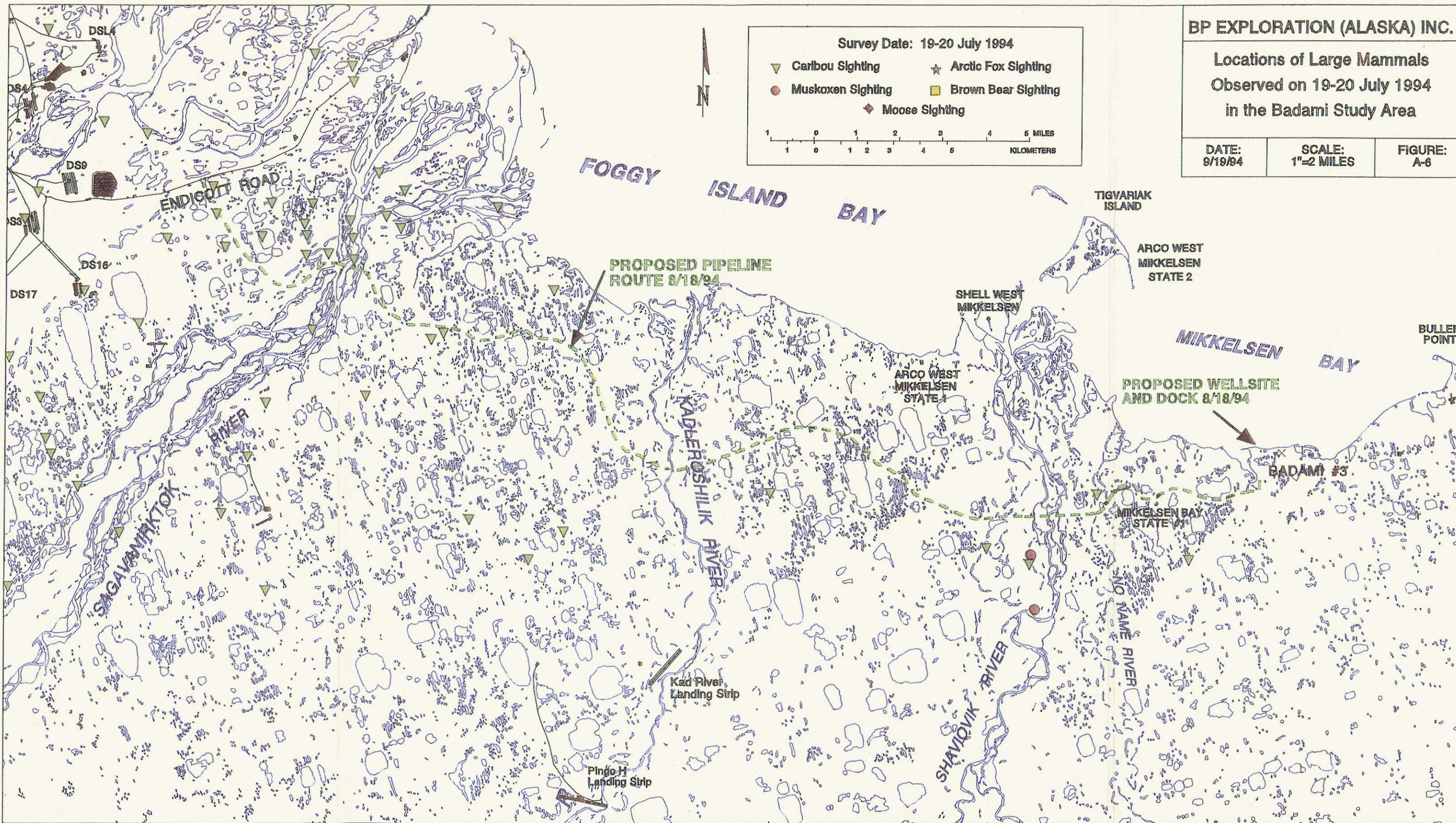
SCALE:
1"=2 MILES

FIGURE:
A-5

Survey Date: 11-12 July 1994

- ▼ Caribou Sighting
- ★ Arctic Fox Sighting
- Muskoxen Sighting
- Brown Bear Sighting
- ◆ Moose Sighting





BP EXPLORATION (ALASKA) INC.

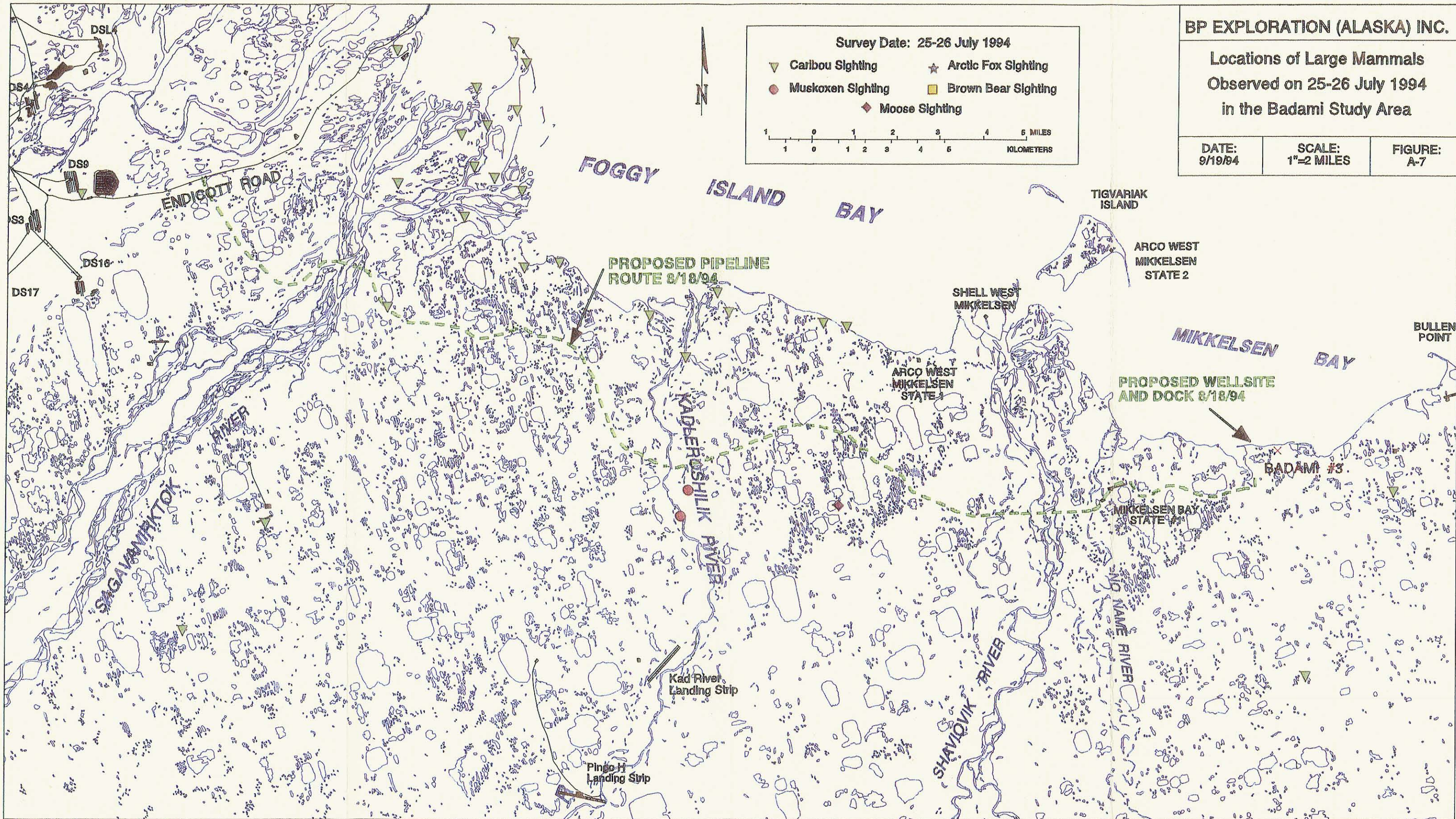
Locations of Large Mammals
Observed on 19-20 July 1994
in the Badami Study Area

Survey Date: 19-20 July 1994

- ▼ Caribou Sighting
- ★ Arctic Fox Sighting
- Muskoxen Sighting
- Brown Bear Sighting
- ◆ Moose Sighting

1 0 1 2 3 4 5 MILES
1 0 1 2 3 4 5 KILOMETERS

DATE: 9/19/94	SCALE: 1"=2 MILES	FIGURE: A-6
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BP EXPLORATION (ALASKA) INC.

Locations of Large Mammals
Observed on 28 July 1994
in the Badami Study Area

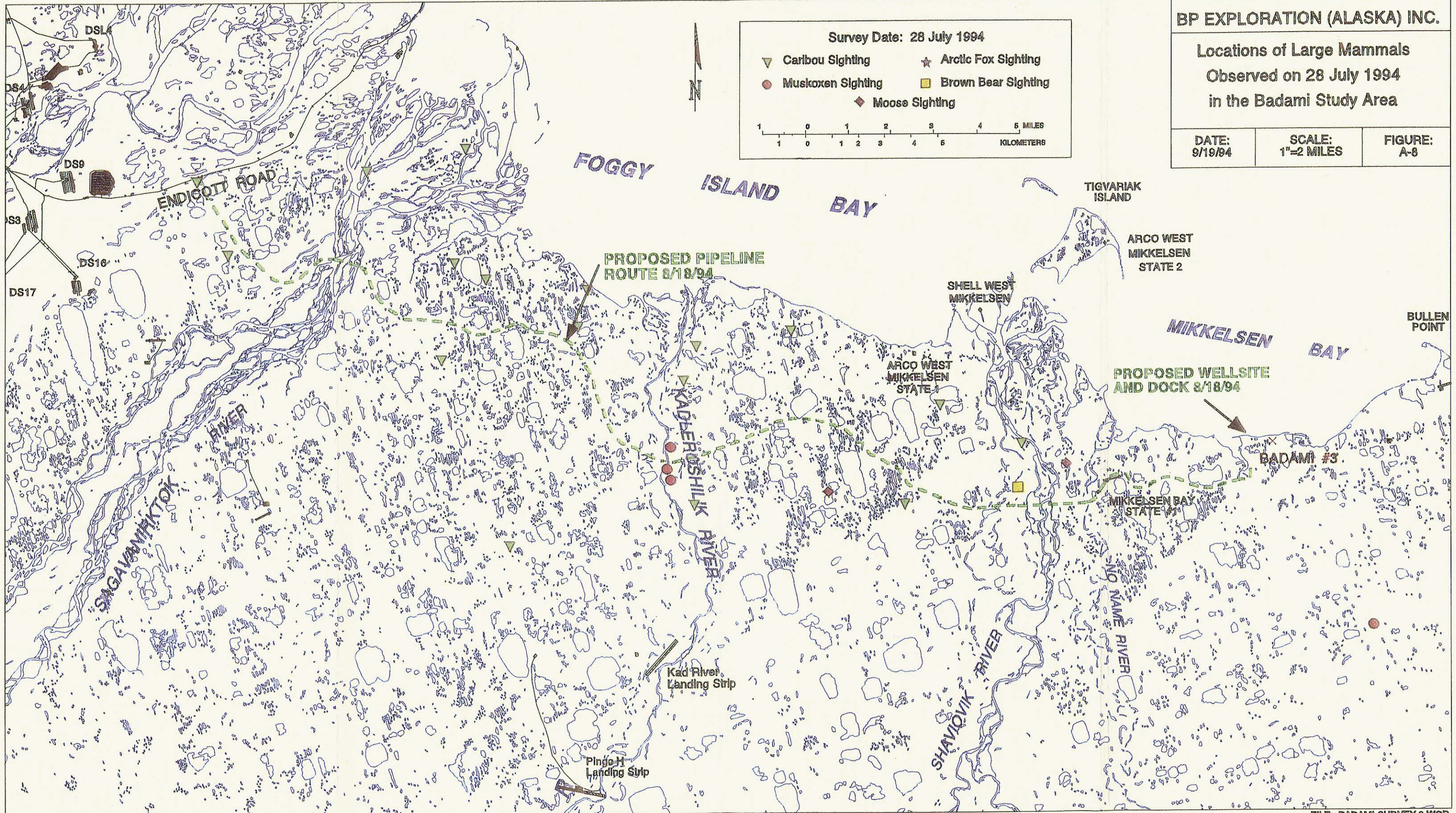
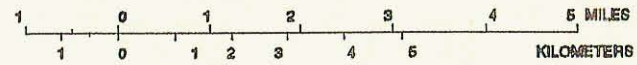
DATE:
9/19/94

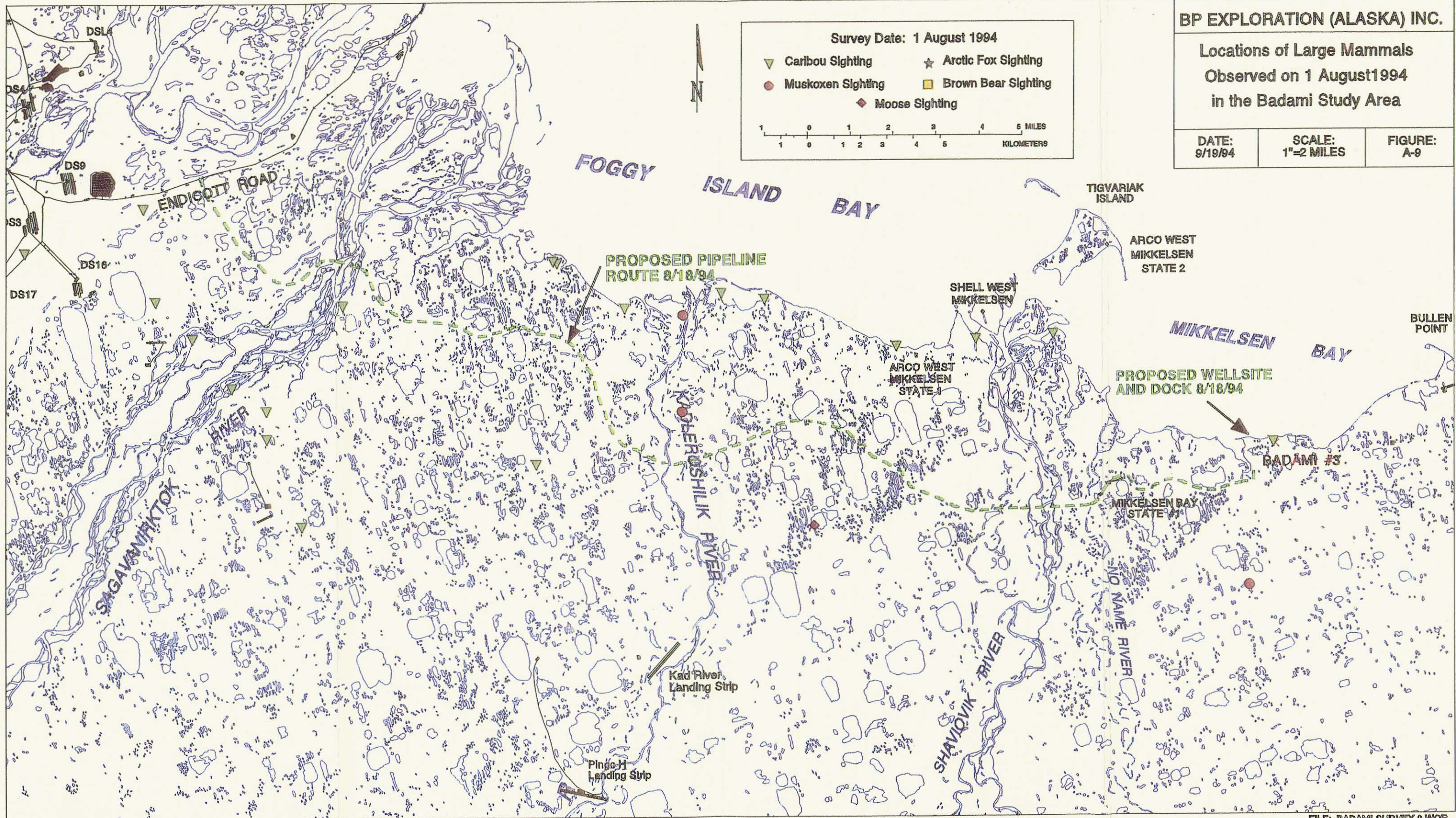
SCALE:
1"=2 MILES

FIGURE:
A-8

Survey Date: 28 July 1994

- ▼ Caribou Sighting
- ★ Arctic Fox Sighting
- Muskoxen Sighting
- Brown Bear Sighting
- ◆ Moose Sighting





BP EXPLORATION (ALASKA) INC.

Locations of Large Mammals
Observed on 8 August 1994
in the Badami Study Area

DATE:
9/19/94

SCALE:
1"=2 MILES

FIGURE:
A-10

Survey Date: 8 August 1994

- ▼ Caribou Sighting
- ★ Arctic Fox Sighting
- Muskoxen Sighting
- Brown Bear Sighting
- ◆ Moose Sighting

