NORTHERN ALASKA RESEARCH STUDIES

Arctic Fox Investigations in the North Slope Oil Fields in 1991:

Status Report

by
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Alice A. Stickney
Alaska Biological Research, Inc.

Prepared for
BP Exploration (Alaska) Inc.

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This report was prepared under contract to BP Exploration (Alaska) Inc. Inquiries about this report may be addressed to:

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Executive Summary

In 1991, a program was initiated to develop a GIS database of arctic fox denning locations. The program synthesized historical information on den locations and use and successfully established a database for long-term investigations of the density and productivity of arctic foxes between the Kuparuk and Sagavanirktok rivers. Prior to conducting aerial and ground surveys of den sites, we obtained maps of den locations identified during 1975–1979 by Wayne Hanson's group from Battelle Pacific Northwest Laboratories (under contract to the DOE). We added to this database by conducting a systematic survey of the 842 km² region between the Kuparuk and Sagavanirktok rivers, inland to the southern boundary of USGS Township 10N (approximately 16 km inland in the Sagavanirktok River delta and 24 km from the mouth of the Kuparuk River). Sites identified in the Sagavanirktok River delta then were visited, to obtain information on the number of sites in that area that were used as natal dens in 1991. Ground reconnaissance was restricted to the delta because of limited availability of helicopter time and because waterfowl densities are highest there, making it the highest priority for accurate estimates of fox abundance.

Recognizing that our survey technique was capable of recognizing only "typical" fox dens and that more of these typical and some atypical dens may be added to our database with additional years of searching, our preliminary minimal estimate of the density of available dens is 0.04 dens/km², or 1 den/25 km². Comparison with published densities from other studies suggests that densities in our study area are about average.

The GIS database currently includes 33 sites that have been positively identified as present or former arctic fox den locations. In 1991, 8 of these sites were identified as active natal dens, 1 site was identified as a secondary or accessory den location, 5 were identified as inactive, and no determination (because no ground visit was possible) was made for 19 dens. Historical information on the use of specific sites has been located for many dens; activity at one den is known for 7 of the past 17 years, 2 dens have 6 years of records, one has 4 years, one has 3 years, 6 have data for 2 years, and 22 have data on fox use (or lack of use) for only a single year.

Because previous records were mainly opportunistic, it is not possible to accurately estimate the proportion of dens in the region active in past years. In 1991, only the 13 dens located on the Sagavanirktok River delta were visited for an accurate determination of activity. Of these, 3 were used as natal dens in 1991, yielding an occupancy rate of 23%. There are no data to indicate whether den occupancy in the Sagavanirktok River delta differed in 1991 from other parts of the Prudhoe Bay oil field.

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Arctic Fox Investigations in the North Slope Oil Fields in 1991: Status Report

INTRODUCTION

Three factors prompted the initiation of arctic fox studies in 1991: documented high levels of egg and nest loss in various avian study plots in the North Slope oil fields (particularly the failure of the Snow Goose and Brant colonies on Howe Island), continued health concerns relating to human exposure to rabies, and identification by management and regulatory agencies of a perceived increase in fox populations in the oil field as a problem that may require mitigation or control.

The well-documented ability of one or two foxes to destroy bird colonies was demonstrated on the Sagavanirktok River delta in 1991. During annual monitoring of the Snow Geese during late May and early June, a pair of arctic foxes was observed removing eggs from nests as fast as they were laid. These foxes first gained access to the island by walking across bottomfast ice. When the ice began to disintegrate, the foxes remained on the island, destroying all existing nests and preventing establishment of other nests. Breakup in 1991 did not appear to be unusual, except that the timing provided foxes access to Howe Island during nest initiation. Events during breakup followed the typical pattern, with river water flooding the ice at channel mouths in the delta in the latter half of May and later draining through offshore cracks in the ice and reexposing the ice. This reexposure was followed by a more or less rapid floating of the nearshore bottomfast ice and appearance of open water in the channel between Howe Island and the mainland.

The failure of the Snow Goose and Brant colonies on Howe Island in the spring of 1991, and the concurrent observation of what were termed "abnormally" high levels of egg or nest loss to foxes in various other avian study plots in the oil field, focused attention on foxes as predators of birds and nests in the region. Many questions were asked by interested parties, including:

- Will the same foxes return to Howe Island in subsequent years?
- Might foxes begin denning on the island?
- Is the density of foxes in the delta higher than usual?
- Is the density of foxes higher in the oil field than in surrounding areas?
- If densities are higher in the oil field, is this due to development activities?
- Would it be useful to implement a "predator control" plan to reduce fox numbers or to protect sensitive nesting areas?

Casual observations of foxes do not provide adequate information to address these questions. Consequently, at the request of BP Exploration (Alaska) Inc., Alaska Biological Research initiated a research program that established a database which, if maintained on a long-term basis, will address questions regarding actual densities and productivity of foxes in the oil field. In 1991, our objectives were twofold:

- To capture and mark the foxes on Howe Island to allow future identification of those individuals, and
- To establish a GIS database of fox den locations in the oil field for long-term monitoring of den use.

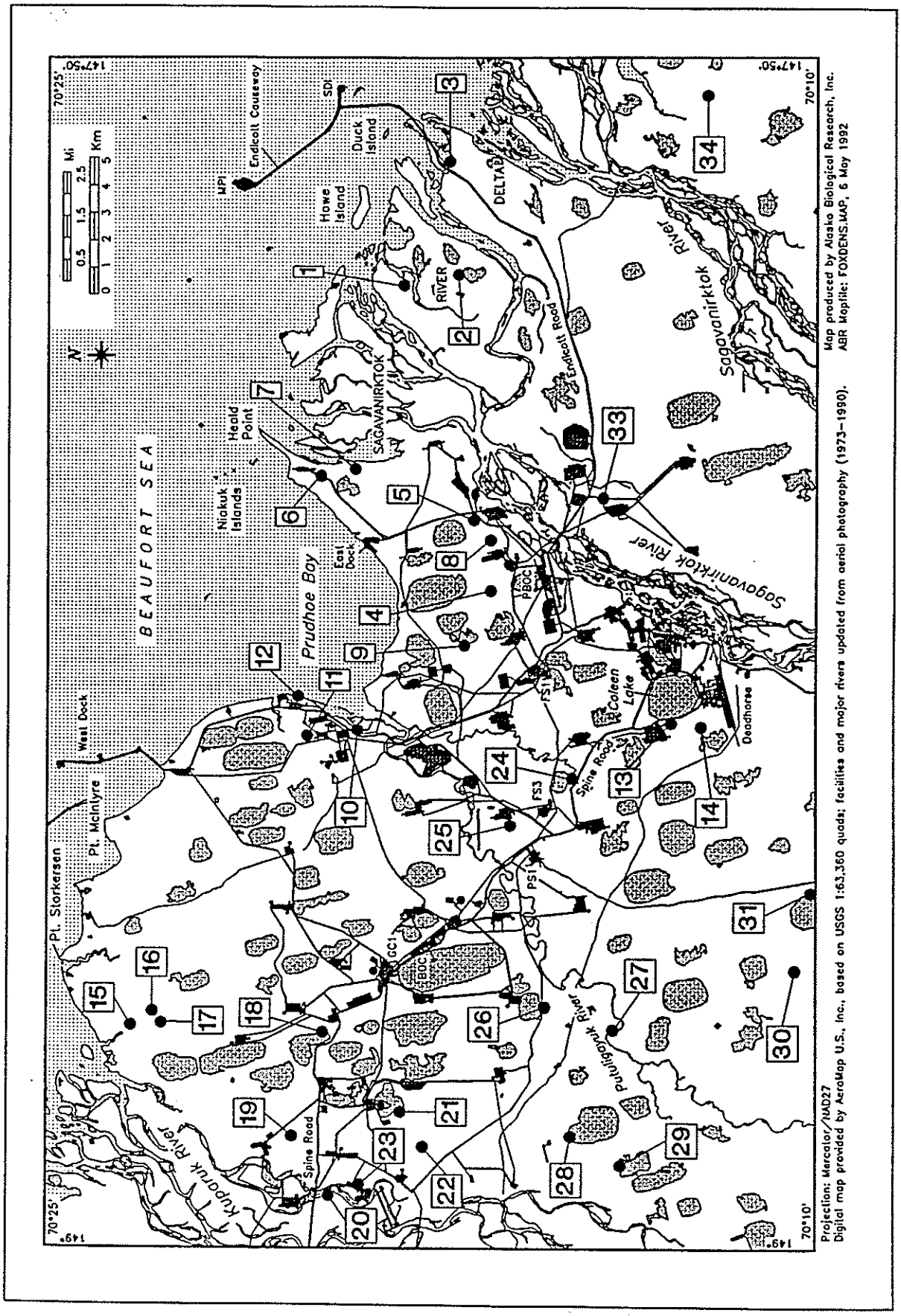

Figure 1. Locations of fox dens between the Sagavanirktok and Kuparuk rivers, coastal Alaska. (Discontinuities in identification numbers of dens result from the inclusion in the database of dens outside of the formally defined 1991 study area. Precise locations are presented in the Appendix, excepting Dens 30, 31, and 32, which are at sites not mapped at 1:6000.)

the Sagavanirktok River delta were visited for determination of use. Of these, 3 were used as natal dens in 1991, yielding an occupancy rate of 23%.

Recognizing that our survey technique was capable of recognizing only "typical" fox dens, our minimal estimate of the density of available dens is 0.04 dens/km^2, or 1 den/25 km^2. Comparison with published densities from other studies suggests that densities in our study area are average (Table 1). Interestingly, Eberhardt's survey area (Eberhardt et al. 1983b) extended farther inland than ours, and his overall densities (including the inland dens) were about twice that of ours (about 1 den/12 km^2 vs. 1/25 km^2, in this study). The highest densities on record were observed in the Taimyr Peninsula of Siberia, reportedly up to 2 dens/km^2 (Sdobnikov 1958, cited in Macpherson 1969).

SUMMARY

The failure of the Snow Goose and Brant colonies on Howe Island in 1991 demonstrated the ability of a pair of arctic foxes to eliminate avian productivity at a nesting colony for one season. Our attempt to capture and mark the responsible animals was motivated by speculation that those individual foxes might represent a long-term threat to productivity of Snow Geese and Brant on Howe Island. Unfortunately, the foxes left the island before the capture effort could be mobilized. In the event that foxes are present during nesting in 1992, we will be unable to determine whether the same individuals are involved. It is difficult to speculate on the likelihood that foxes will eliminate or otherwise reduce productivity in 1992 or future years. Although we consider it unlikely that foxes would whelp or successfully rear pups on Howe Island, waterfowl activity there will continue to be attractive to foxes. At present, there is no evidence that access to Howe Island has changed, either by natural processes or by causeway-induced effects. Therefore, fox predation observed during 1991 must be considered a natural phenomenon. We believe that any future fox control to protect geese should be justified by an explicit management plan for the geese.

The pilot study program in 1991 established the first long-term geographic database of fox den locations in the region. To date, the GIS database includes 33 fox dens between the Sagavanirktok and Kuparuk rivers. The density of available den sites is about 1/25 km^2, which appears similar to that reported from other arctic regions. Limited ground visits in 1991 prevented a regional determination of occupancy of dens, but, on the Sagavanirktok River delta, 3 of 13 dens (23%) were active in 1991.

Table 1. Reported densities of fox dens in different parts of the range of arctic foxes.

Den Density	Location	Source
1/0.5 km^2	Taimyr Peninsula, Siberia, Russia	Sdobnikov 1958 *in* Macpherson 1969
1/1 km^2	Yukon-Kuskokwim delta, AK	Anthony et al. 1985
1/10 km^2	Siberia, Russia	Danilov 1968
1/12 km^2	Prudhoe Bay, AK	Eberhardt et al. 1983
1/13 km^2	Okpilak River, AK	Spindler 1978
1/16 km^2	Siberia, Russia	Dementyeff 1958
1/25 km^2	Sagavanirktok River delta, AK	This study
1/32 km^2	Entire tundra zone, Siberia, Russia	Boitzov 1937 *in* Speller 1972
1/34 km^2	Colville River delta, AK	Eberhardt et al. 1983
1/36 km^2	NWT, Canada	Macpherson 1969
1/37 km^2 (1/22 - 1/141 km^2)	Banks Island (high - low density areas)	Urquhart 1973
1/46 km^2	North Slope	Garrott 1980

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A13 Location of fox dens in Beechey Point Quadrangle, Township 10N, Range 14E, Sections 3, 4, 9, and 10 22

A14 Location of fox dens in Beechey Point Quadrangle, Township 12N, Range 13E, Sections 13, 14, 23, and 24 23

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A16 Location of fox dens in Beechey Point Quadrangle, Township 11N, Range 13E, Sections 3, 4, 9, and 10 25

A17 Location of fox dens in Beechey Point Quadrangle, Township 11N, Range 13E, Sections 15, 16, 21, and 22 26

A18 Location of fox dens in Beechey Point Quadrangle, Township 11N, Range 13E, Sections 5, 6, 7, and 8 27

A19 Location of fox dens in Beechey Point Quadrangle, Township 11N, Range 13E, Sections 17, 18, 19, and 20 28

A20 Location of fox dens in Beechey Point Quadrangle, Township 10N, Range 13E, Sections 5, 6, 7, and 8 29

Table A1. Location and status of known arctic fox dens in the Prudhoe Bay region in 1975, 1979, and 1985–1991. U = status unknown; A = active whelping den; N = inactive; 2 = site used as secondary den (not a whelping den).

Den No.	Latitude (°N)	Longitude (°E)	Year								
			1975	1979	1985	1986	1987	1988	1989	1990	1991
1	70.301187	148.055227	U	U	U	U	U	U	A	U	A
2	70.283336	148.044839	U	U	U	U	U	U	U	U	A
3	70.286338	147.934871	U	U	U	U	U	U	U	U	A
4	70.272407	148.355329	A	A	U	A	N	A	A	U	A
5	70.278068	148.285452	A	N	A	N	A	U	A	U	N
6	70.328151	148.242679	U	U	U	U	A	U	U	U	N
7	70.316867	148.235652	U	U	U	U	A	2	A	U	N
8	70.272481	148.305167	U	U	U	U	U	U	2	U	U
9	70.281141	148.409014	U	U	U	U	U	U	A	U	U
10	70.316065	148.492388	U	U	U	U	U	U	U	U	A
11	70.332483	148.498248	U	U	U	U	U	U	A	U	N
12	70.335530	148.459570	U	U	A	A	A	N	N	N	N
13	70.213309	148.484997	A	U	U	U	U	U	U	U	A
14	70.203533	148.488848	N	A	U	U	U	U	U	U	U
15	70.389647	148.781091	A	U	U	U	U	U	U	U	U
16	70.382624	148.767270	A	U	U	U	U	U	U	U	A
17	70.379759	148.778670	A	U	U	U	U	U	U	U	U
18	70.327020	148.787513	N	A	U	U	U	U	U	U	U
19	70.336982	148.890495	N	A	U	U	U	U	U	U	U
20	70.324844	148.948524	A	U	U	U	U	U	U	U	U
21	70.301677	148.866121	N	U	U	U	U	U	U	U	U
22	70.294265	148.900400	N	U	U	U	U	U	U	U	U
23	70.315035	148.937841	N	U	U	U	U	U	U	U	U
24	70.245595	148.539531	A	U	U	U	U	U	U	U	A
25	70.265781	148.585782	N	A	U	U	U	U	U	U	A
26	70.254320	148.762231	N	U	U	U	U	U	U	U	U
27	70.232106	148.784711	N	U	U	U	U	U	U	U	U
28	70.245819	148.890112	A	N	U	U	U	U	U	U	U
29	70.229596	148.918423	A	N	U	U	U	U	U	U	U
30	70.170000	148.730000	N	U	U	U	U	U	U	U	U
31	70.170000	148.620000	A	U	U	U	U	U	U	U	U
32	70.130000	148.750000	A	U	U	U	U	U	U	U	U
33	70.235707	148.263855	U	U	U	U	U	R	R	U	2
34	70.201892	147.869662	U	A	U	U	U	U	U	U	A

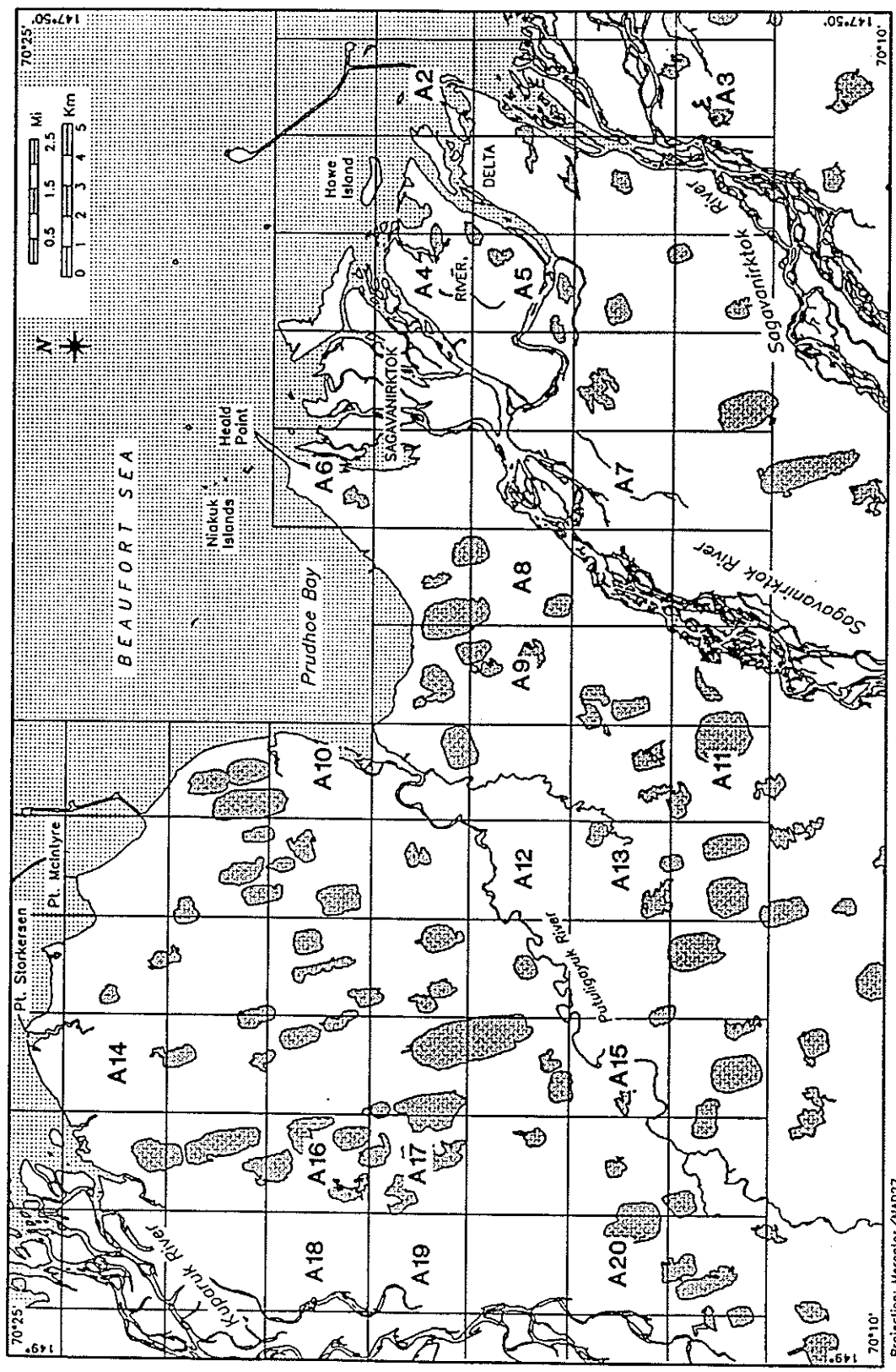

Figure A1. Location map for appendix figures. Figure numbers for each map in this appendix are listed by a letter-number code beginning with "A". Each map comprises four sections (original base map scale 1:6000) and is designated here by a six-letter code representing Township (N), Range (E), and Section (the upper right-hand section on each map).

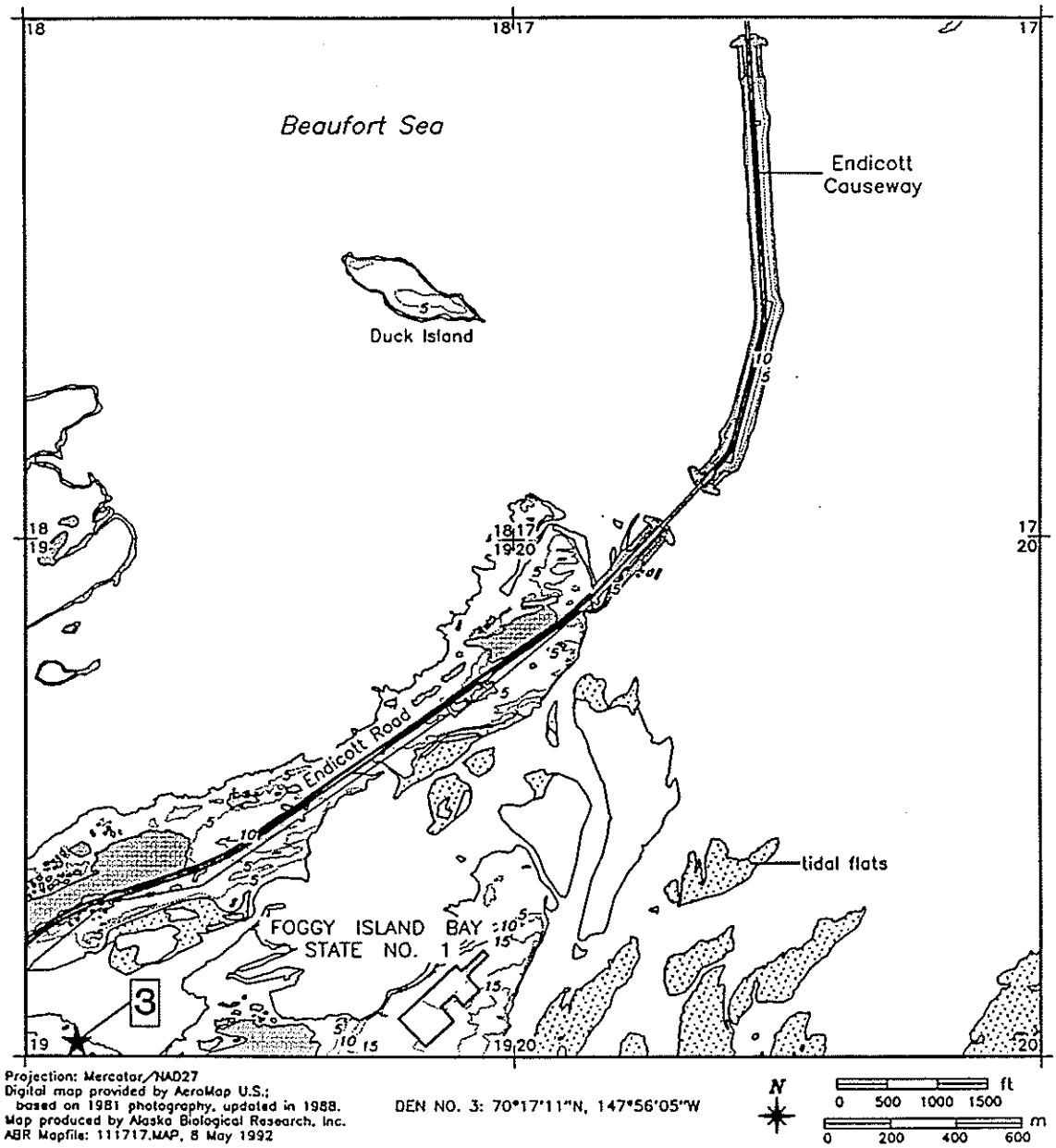

Figure A2. Location of fox dens in Beechey Point Quadrangle, Township 11N, Range 17E, Sections 17, 18, 19, and 20.

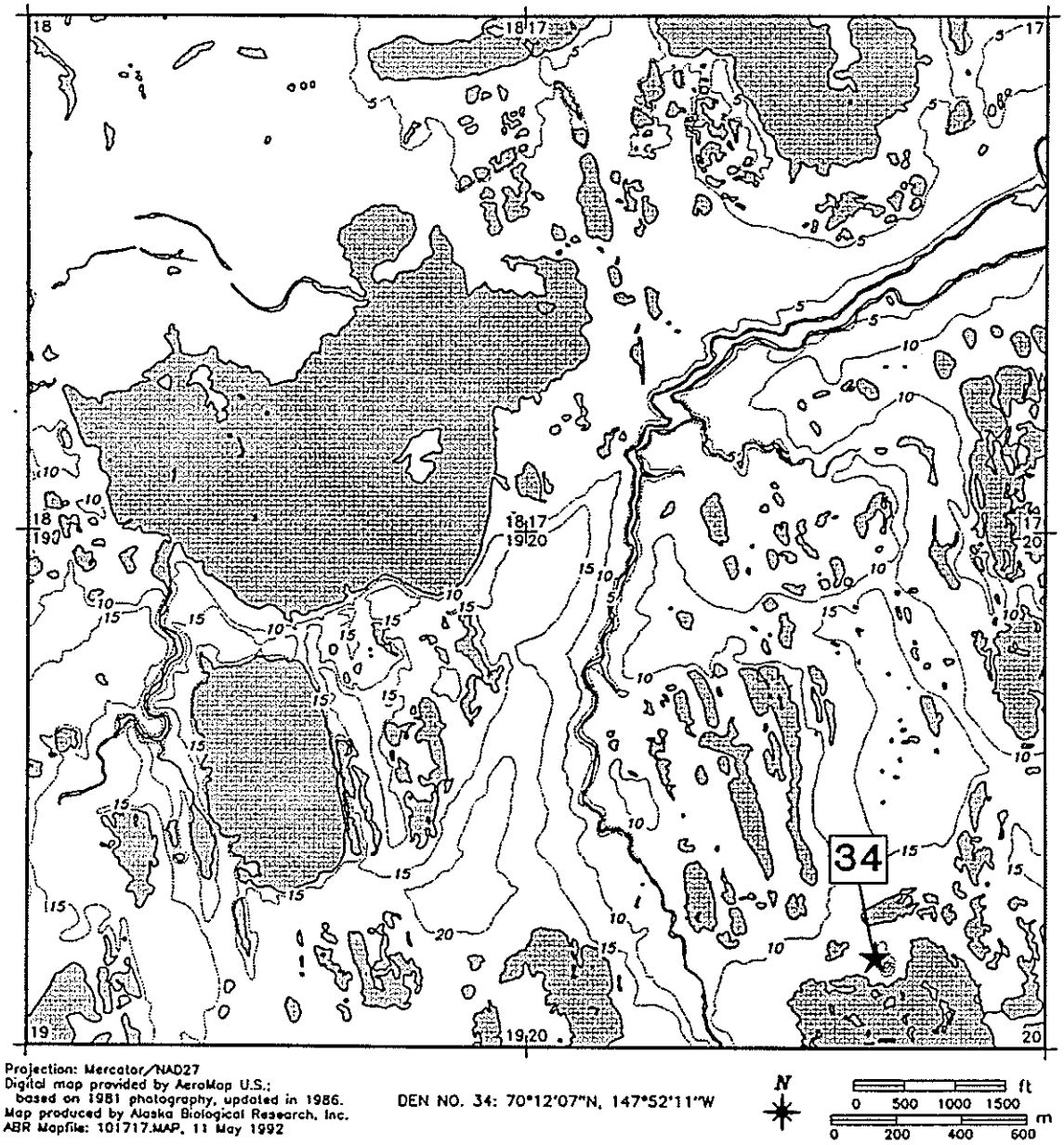

Figure A3. Location of fox dens in Beechey Point Quadrangle, Township 10N, Range 17E, Sections 17, 18, 19, and 20.

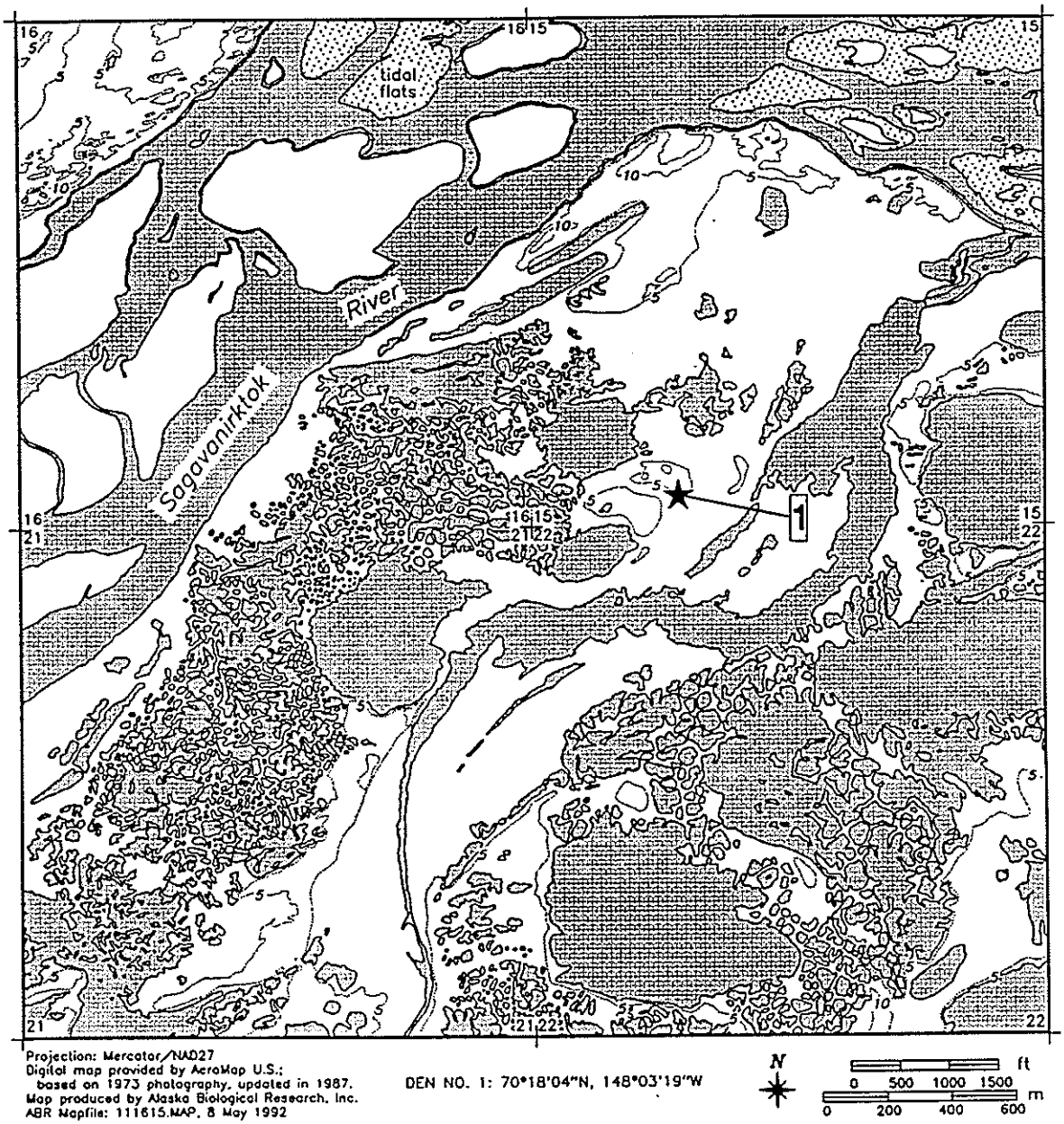

Figure A4. Location of fox dens in Beechey Point Quadrangle, Township 11N, Range 16E, Sections 15, 16, 21, and 22.

Figure A5. Location of fox dens in Beechey Point Quadrangle, Township 11N, Range 16E, Sections 27, 28, 33, and 34.

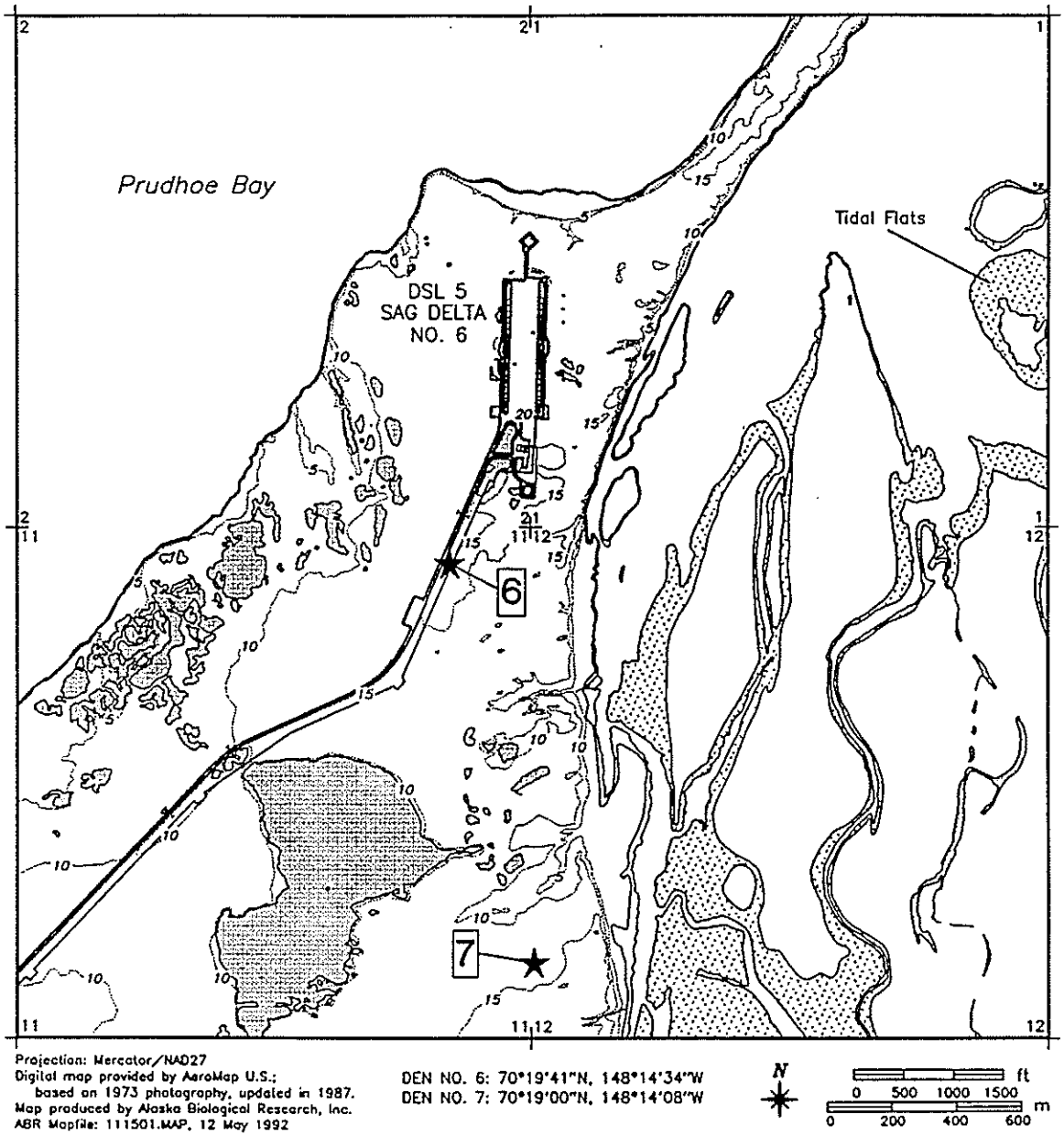

Figure A-6. Location of fox dens in Beechey Point Quadrangle, Township 11N, Range 15E, Sections 1, 2, 11, and 12.

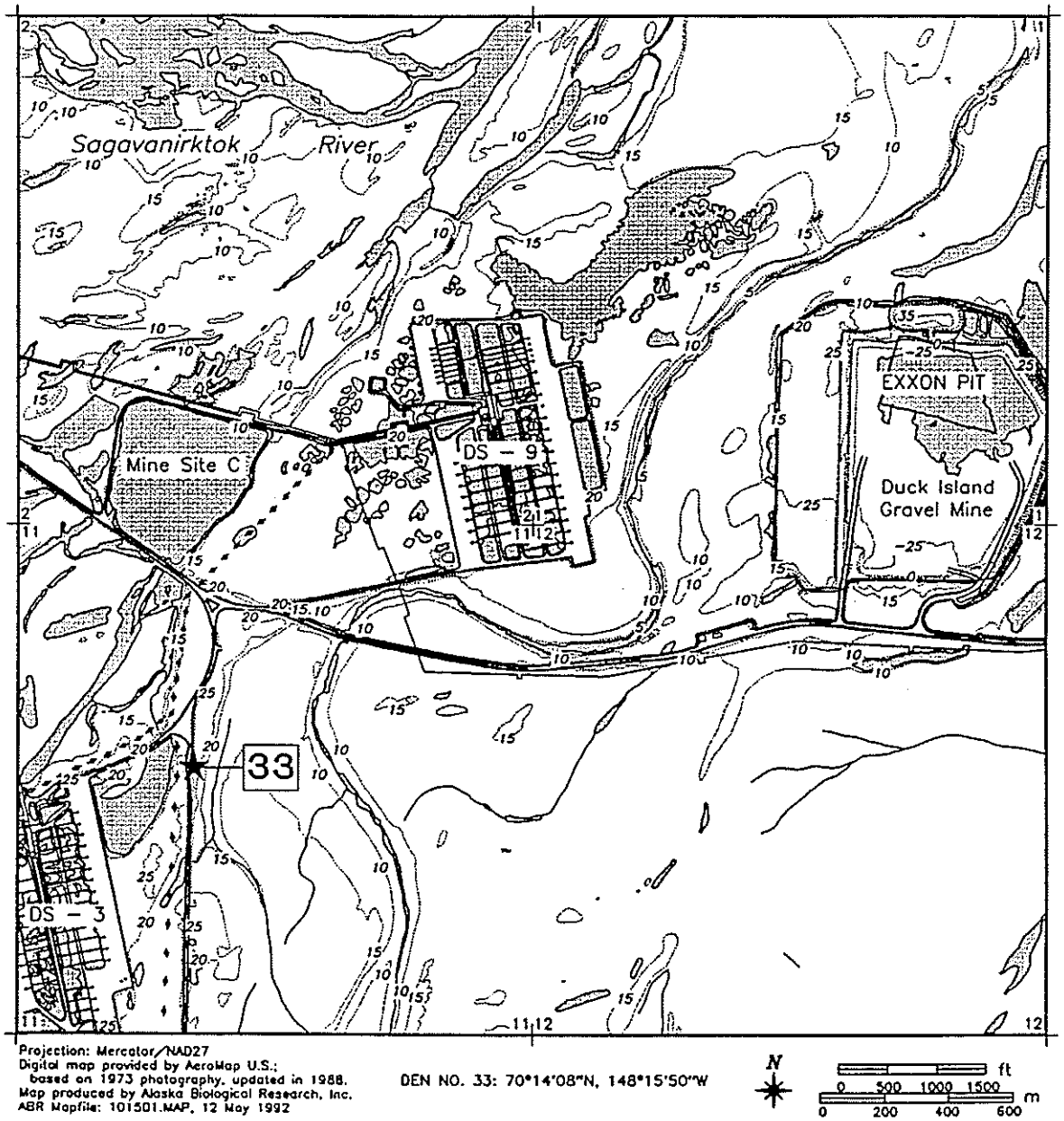

Figure A7. Location of fox dens in Beechey Point Quadrangle, Township 10N, Range 15E, Sections 1, 2, 11, and 12.

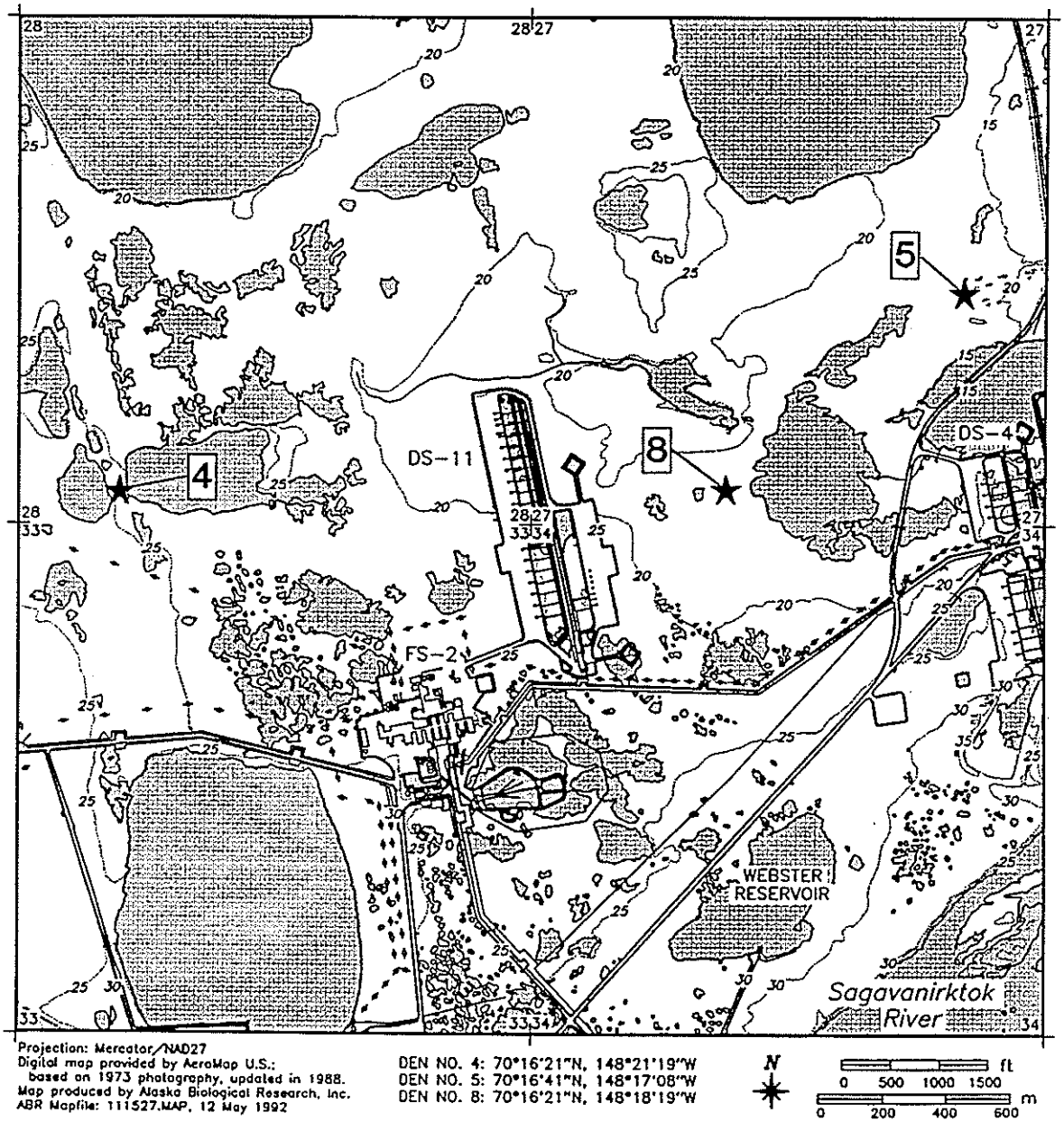

Figure A8. Location of fox dens in Beechey Point Quadrangle, Township 11N, Range 15E, Sections 27, 28, 33, and 34.

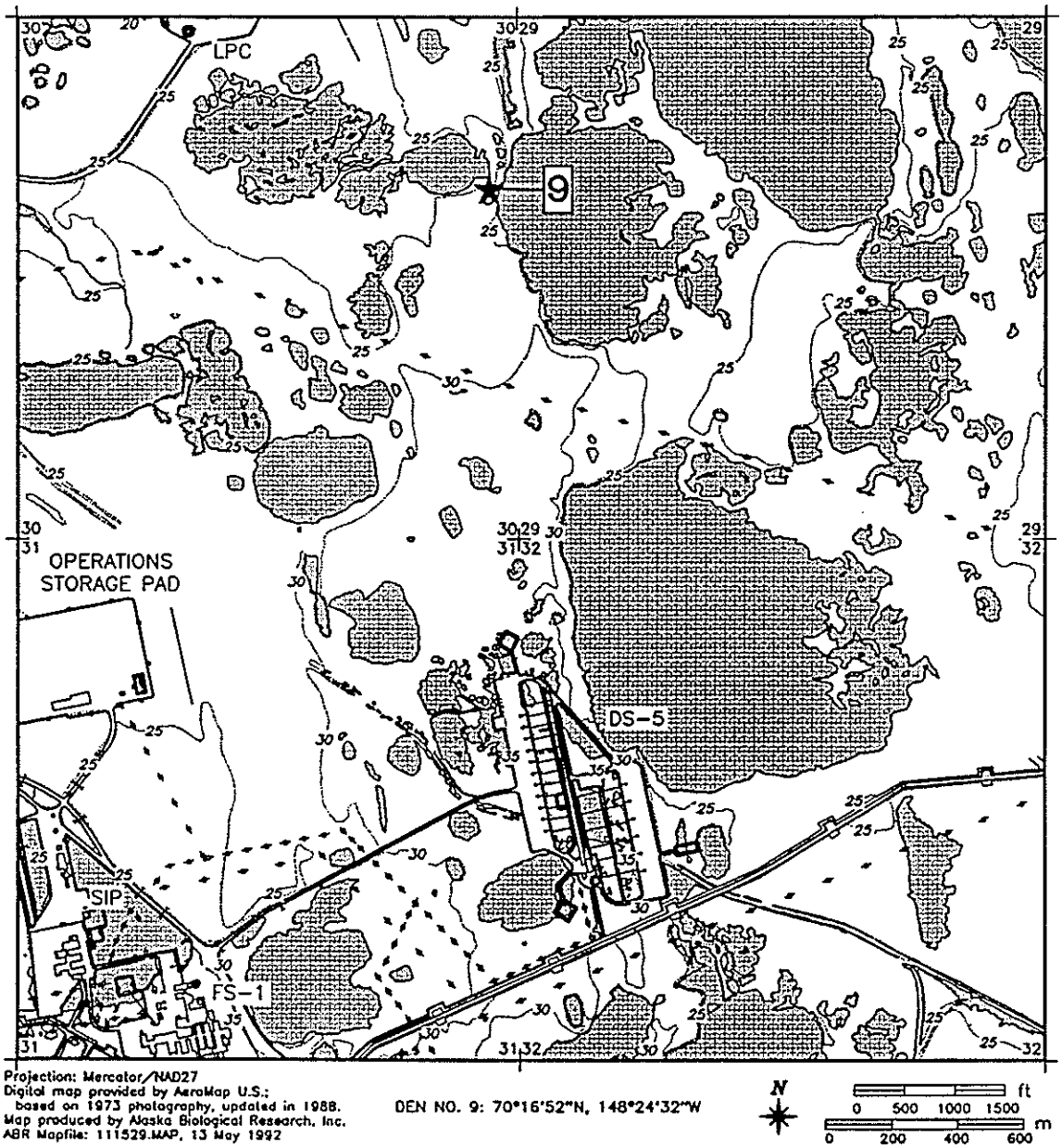

Figure A9.. Location of fox dens in Beechey Point Quadrangle, Township 11N, Range 15E, Sections 29, 30, 31, and 32.

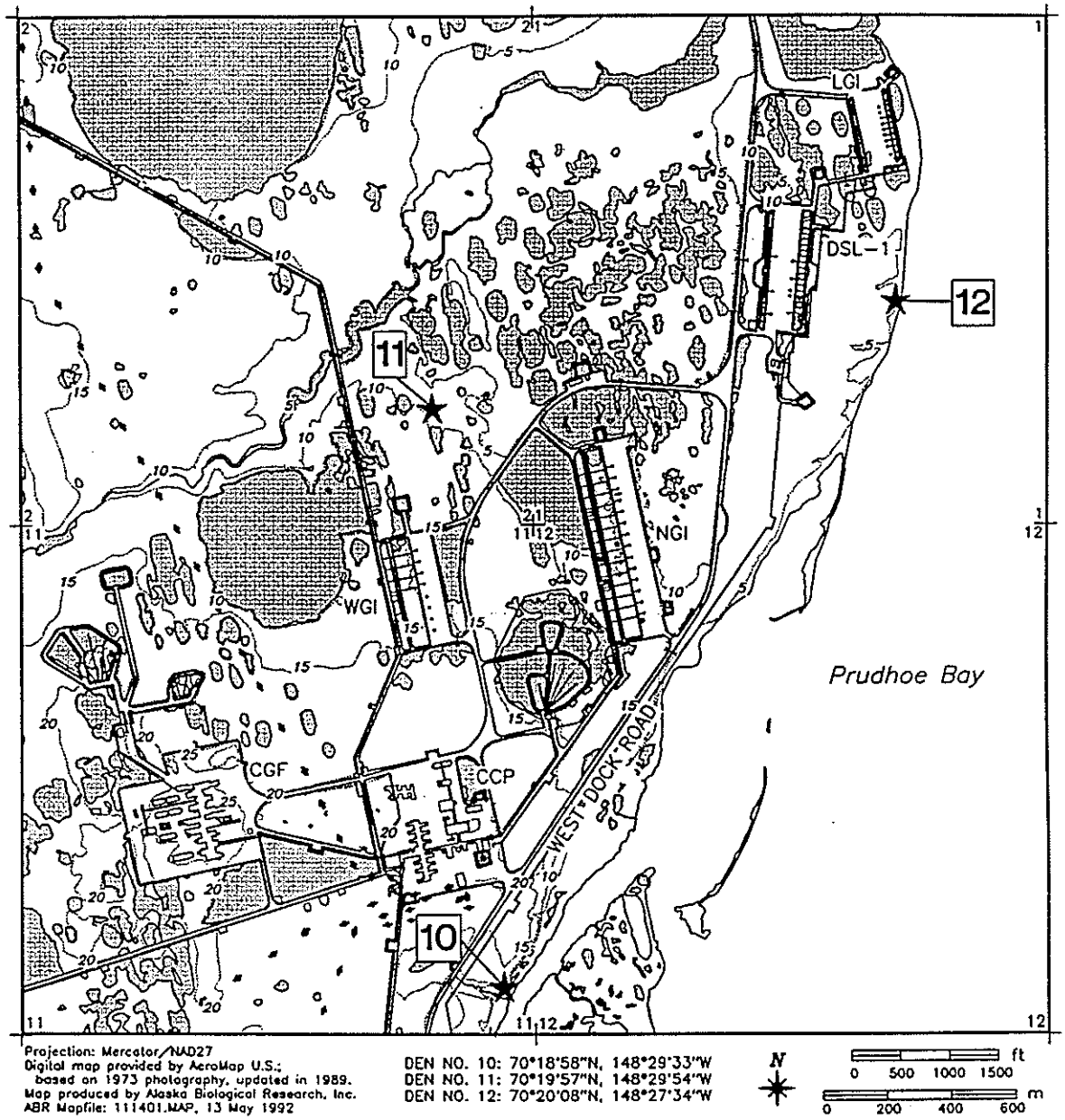

Figure A10. Location of fox dens in Beechey Point Quadrangle, Township 11N, Range 14E, Sections 1, 2, 11, and 12.

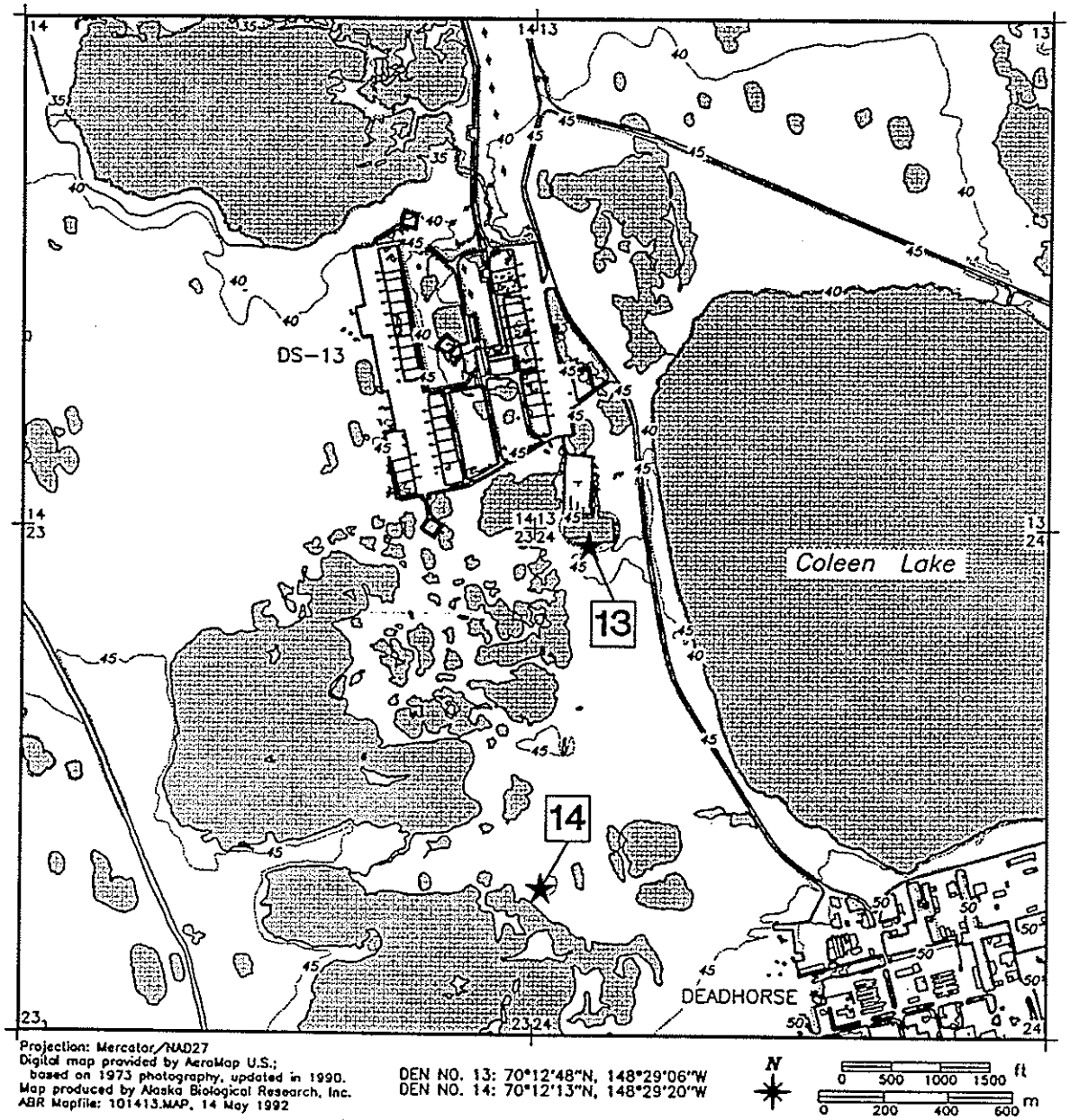

Figure A11. Location of fox dens in Beechey Point Quadrangle, Township 10N, Range 14E, Sections 13, 14, 23, and 24.

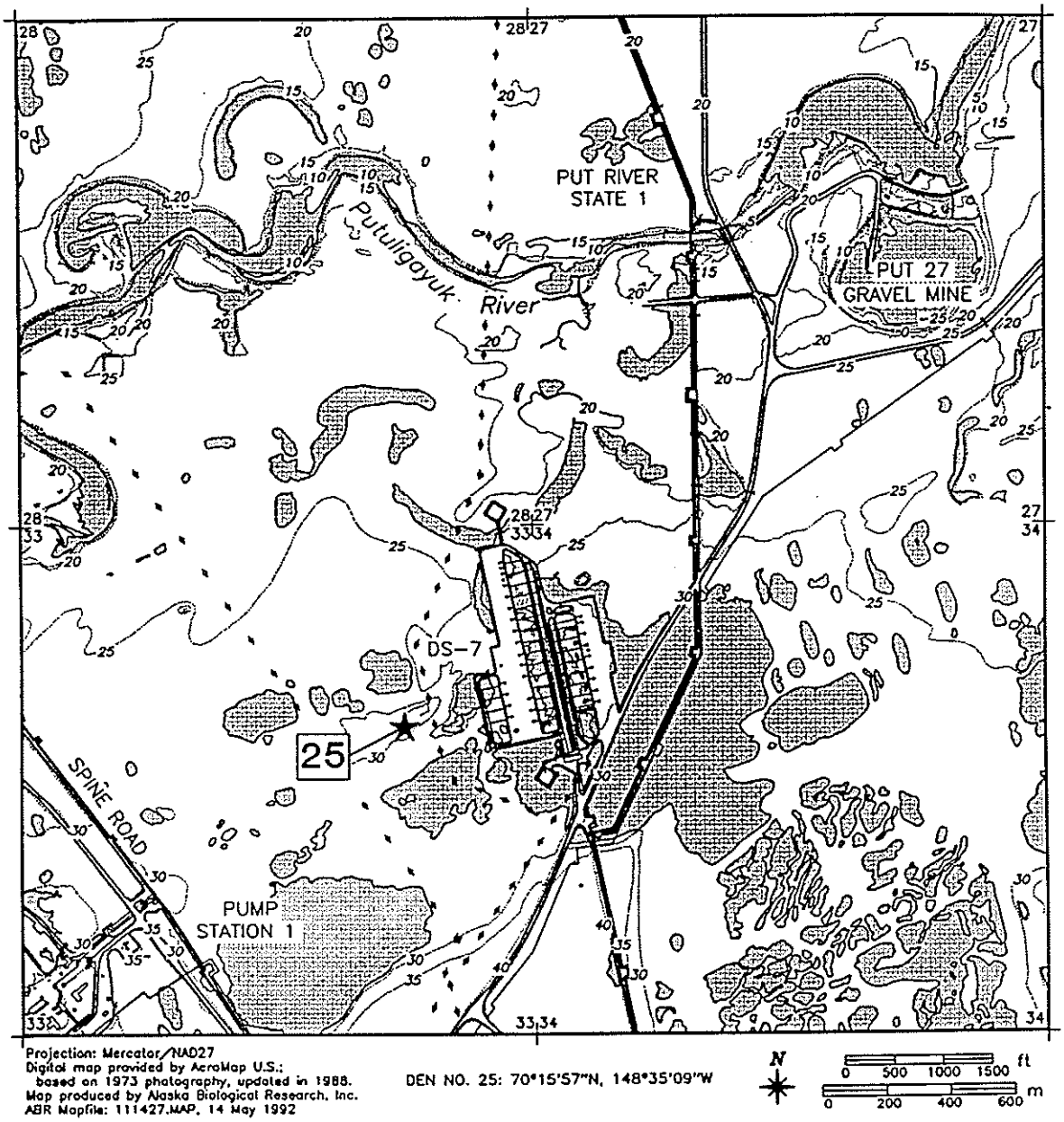

Figure A12. Location of fox dens in Beechey Point Quadrangle, Township 11N, Range 14E, Sections 27, 28, 33, and 34.

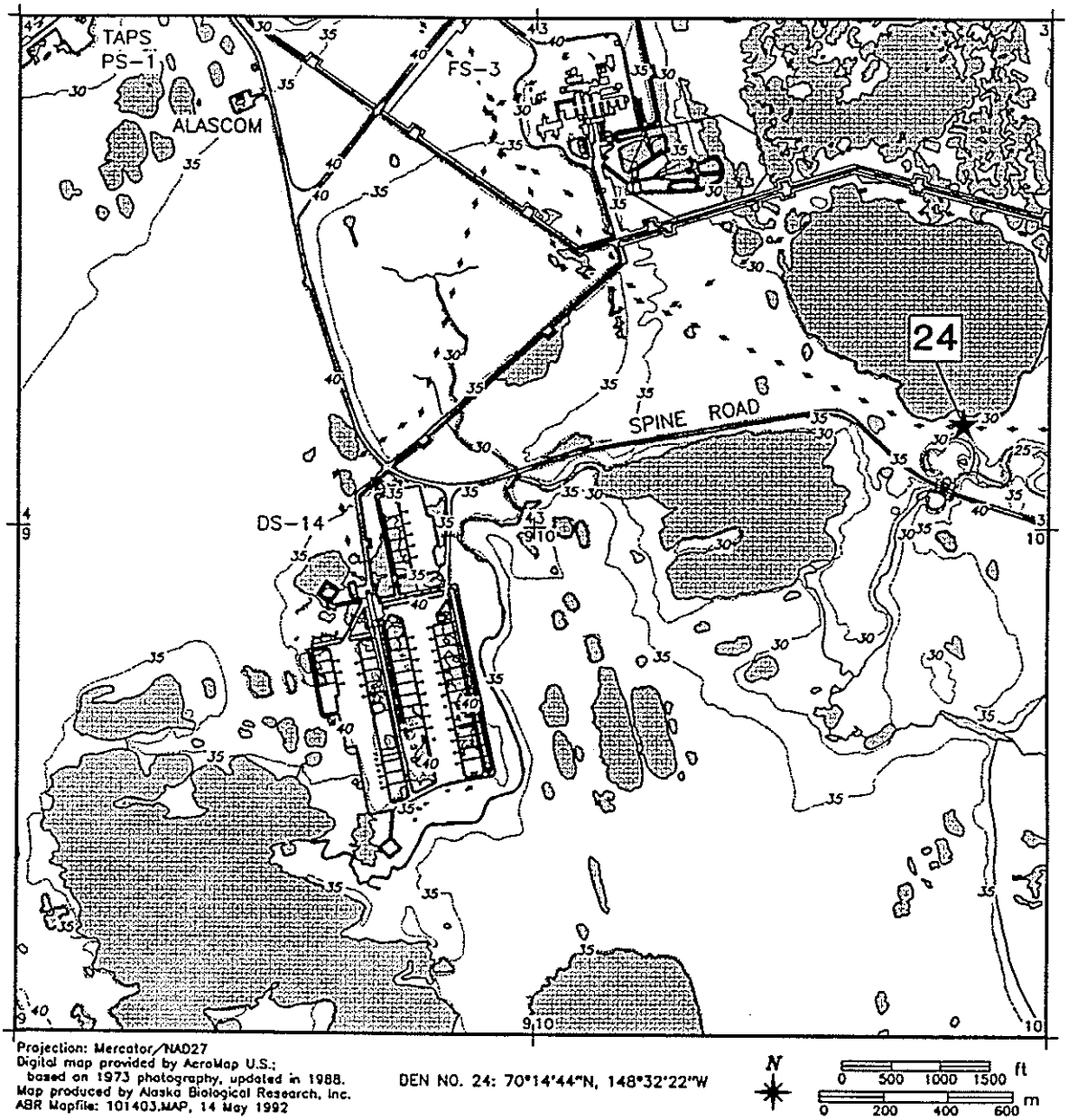

Figure A13. Location of fox dens in Beechey Point Quadrangle, Township 10N, Range 14E, Sections 3, 4, 9, and 10.

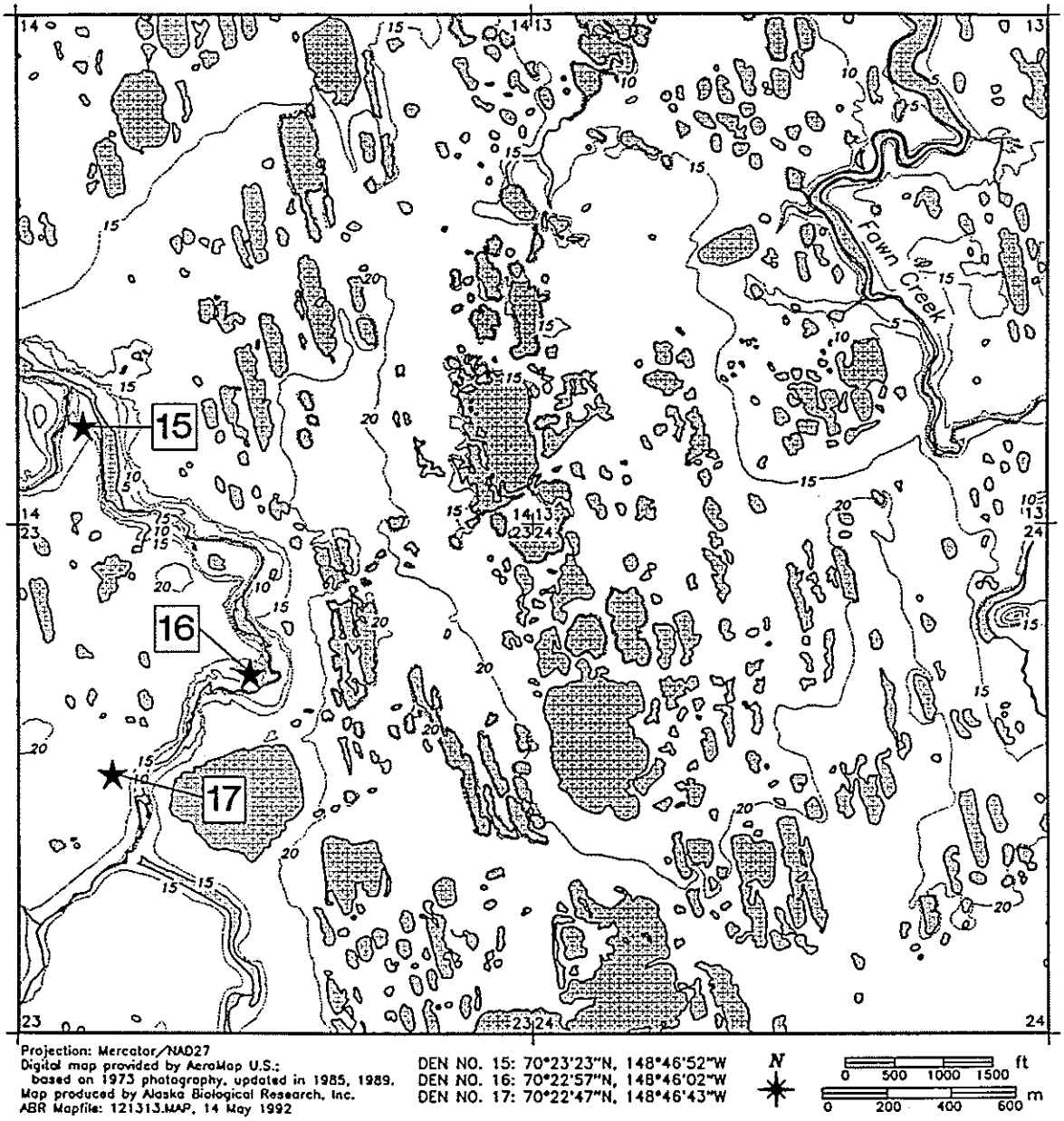

Figure A14. Location of fox dens in Beechey Point Quadrangle, Township 12N, Range 13E, Sections 13, 14, 23, and 24.

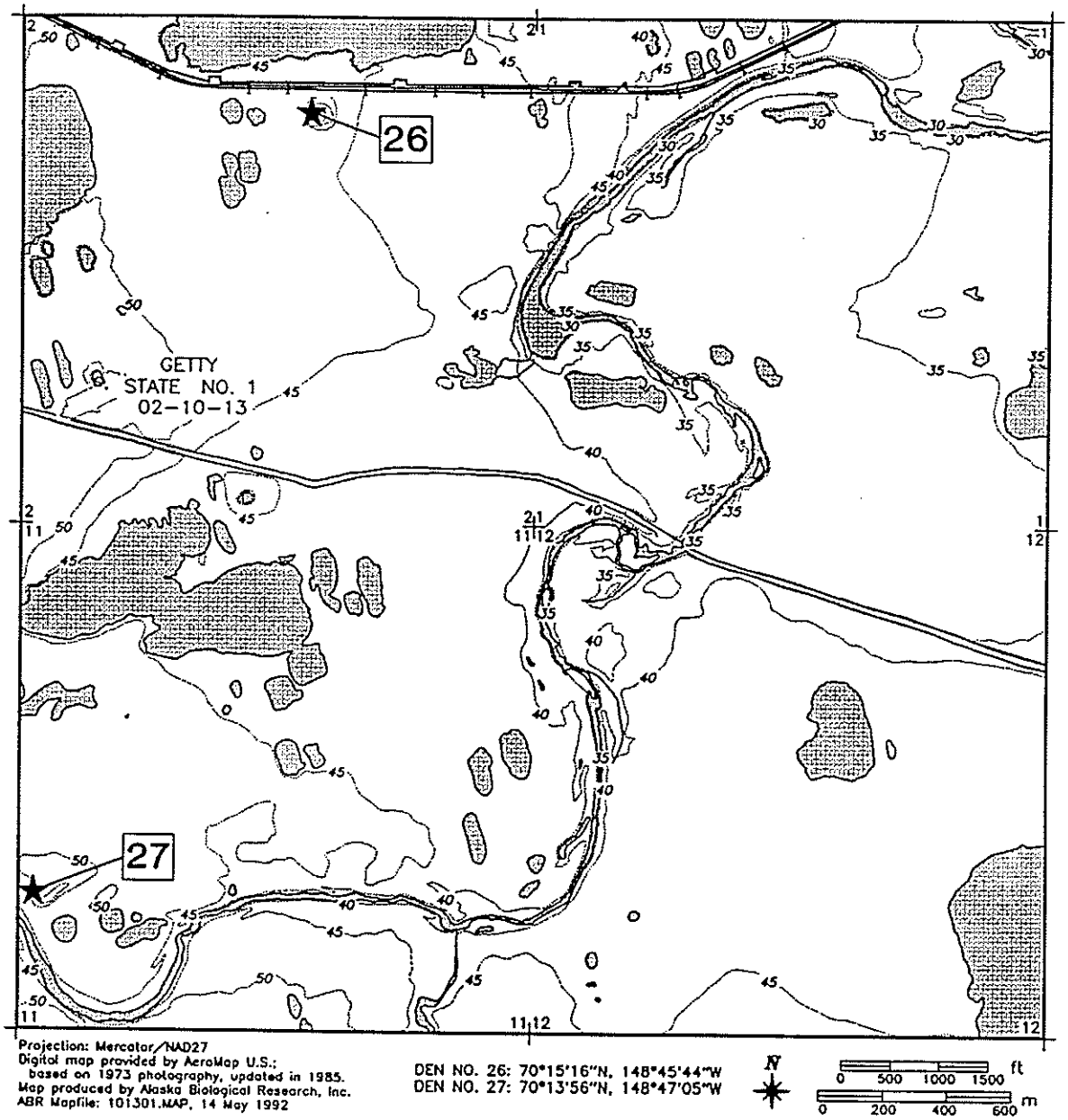

Figure A15. Location of fox dens in Beechey Point Quadrangle, Township 10N, Range 13E, Sections 1, 2, 11, and 12.

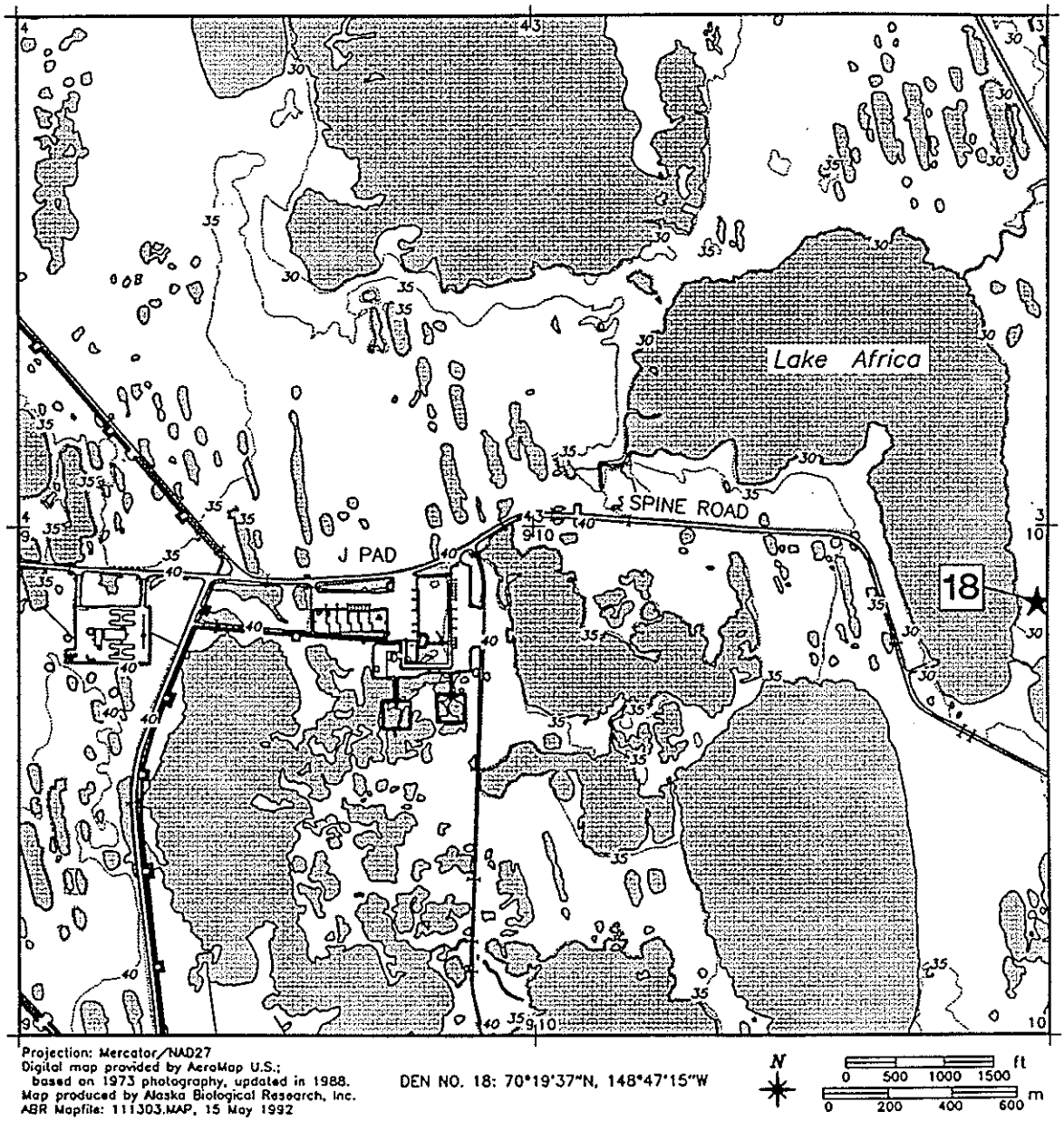

Figure A16. Location of fox dens in Beechey Point Quadrangle, Township 11N, Range 13E, Sections 3, 4, 9, and 10.

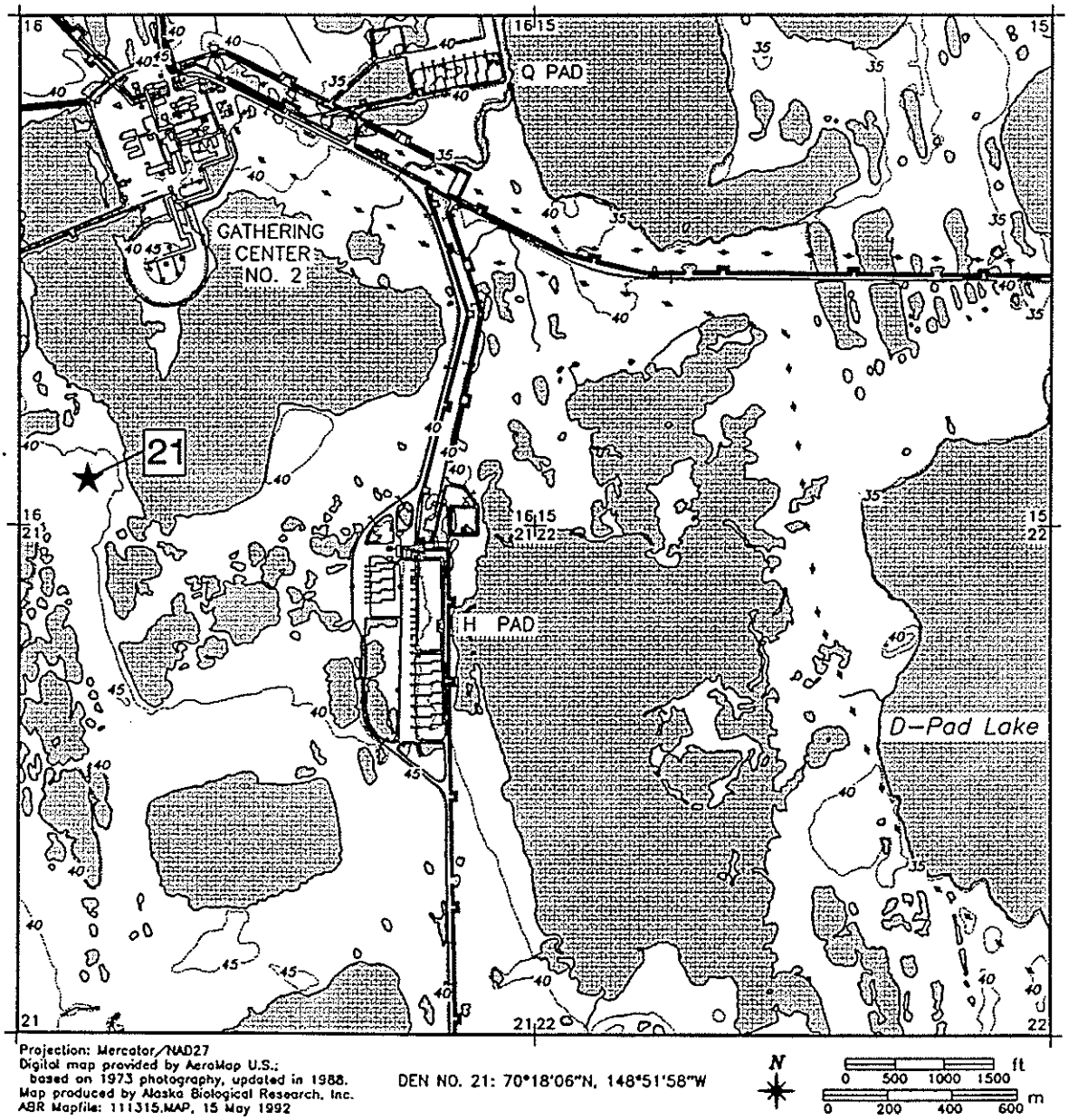

Figure A17. Location of fox dens in Beechey Point Quadrangle, Township 11N, Range 13E, Sections 15, 16, 21, and 22.

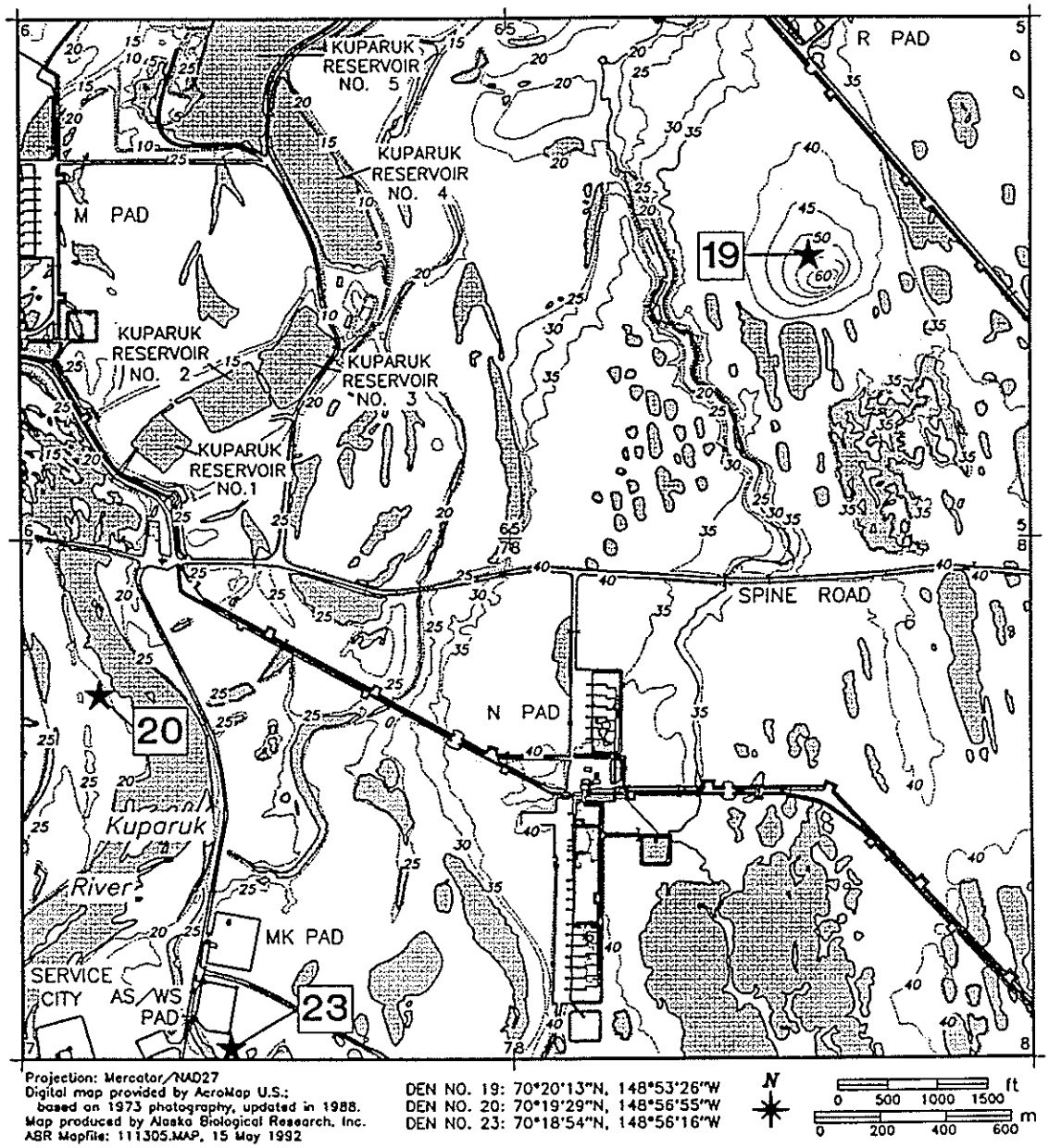

Figure A18. Location of fox dens in Beechey Point Quadrangle, Township 11N, Range 13E, Sections 5, 6, 7, and 8.

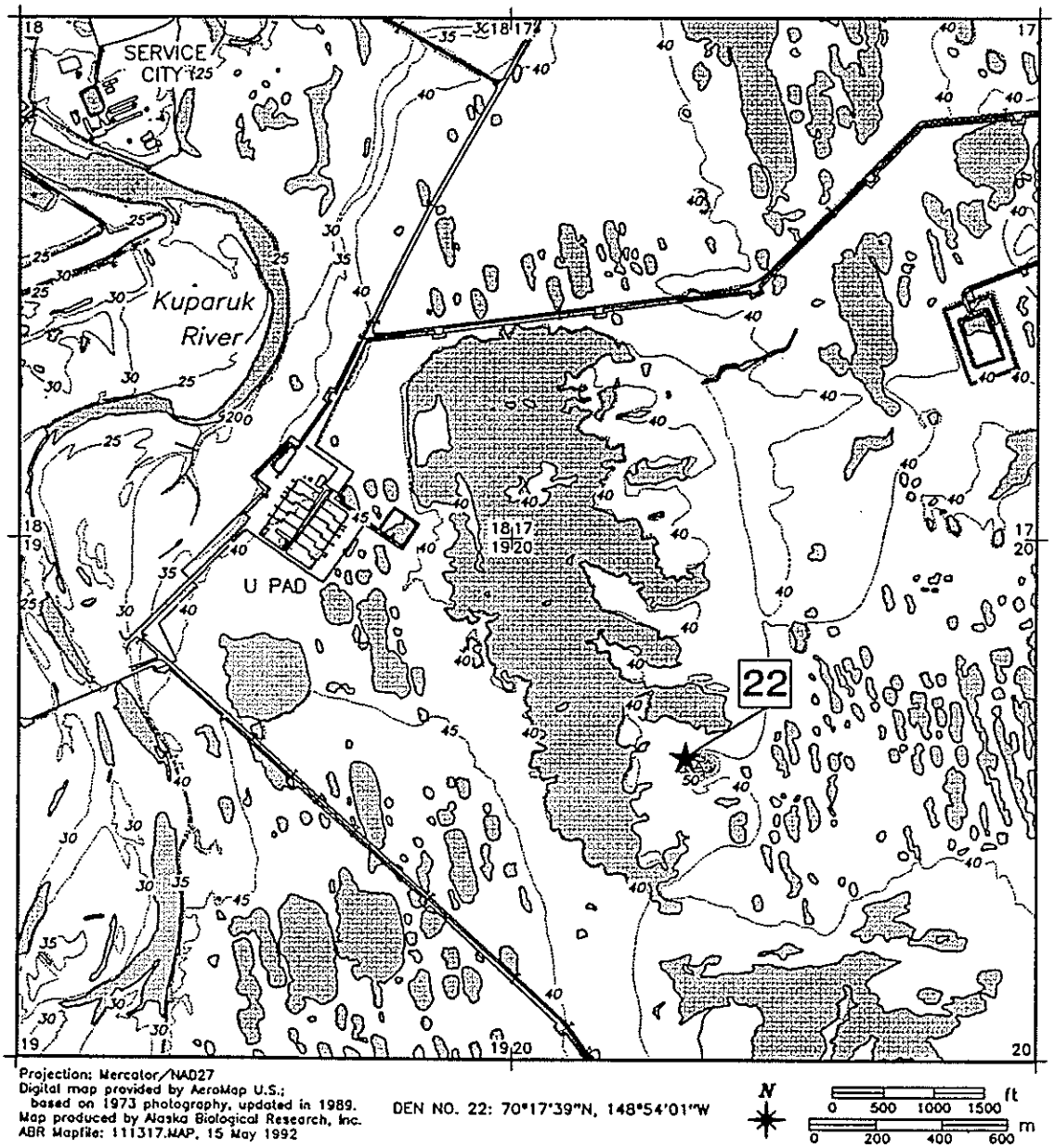

Figure A19. Location of fox dens in Beechey Point Quadrangle, Township 11N, Range 13E, Sections 17, 18, 19, and 20.

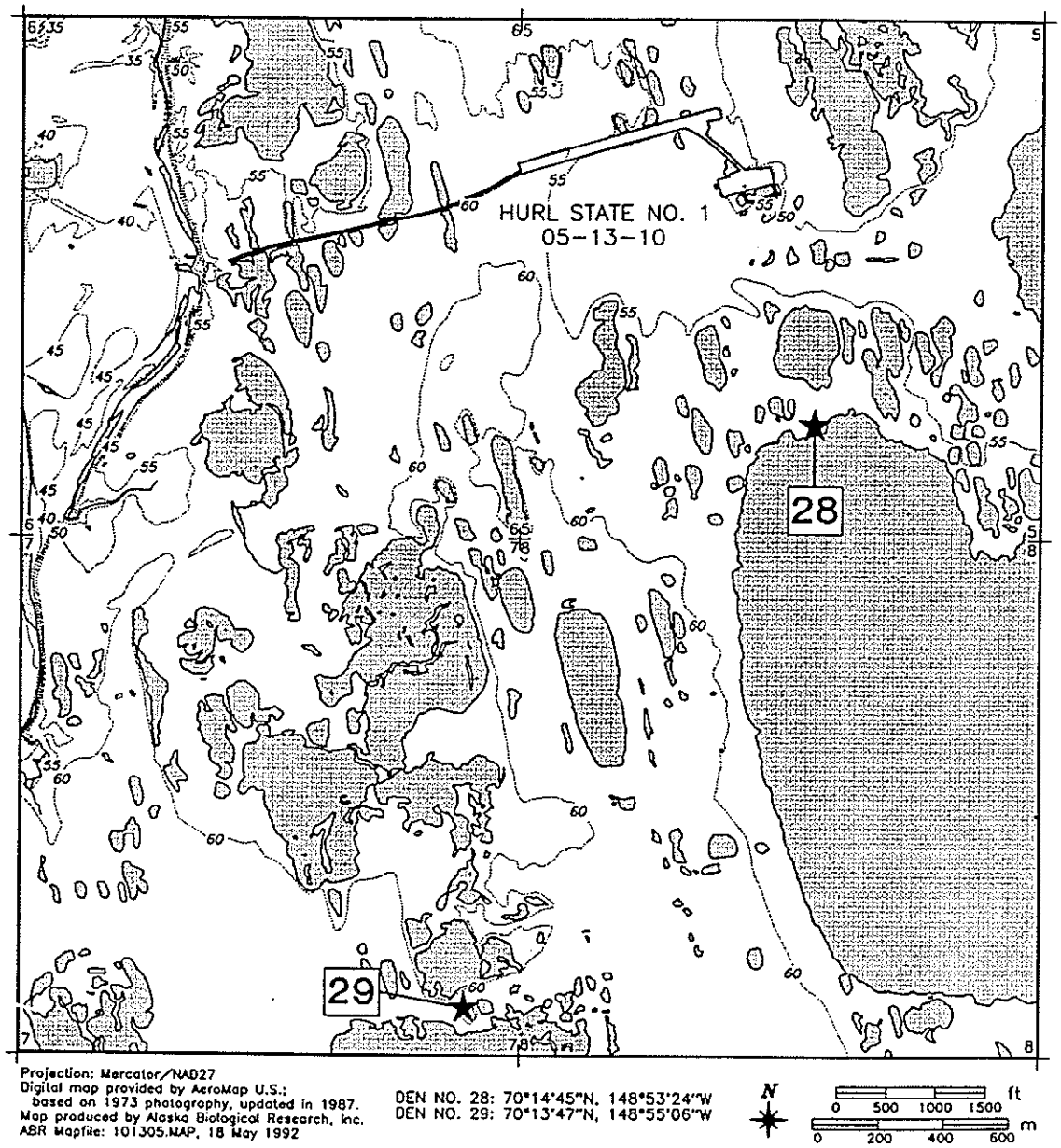

Figure A20. Location of fox dens in Beechey Point Quadrangle, Township 10N, Range 13E, Sections 5, 6, 7, and 8.