TERRITORY PARAMETERS IN SNOWY OWLS WINTERING IN THE DULUTH - SUPERIOR HARBOR

A FINAL REPORT SUBMITTED TO:

NONGAME WILDLIFE PROGRAM

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INTRODUCTION

The Duluth - Superior harbor is a traditional wintering area for Snowy Owls (Nyctea scandiaca). High prey densities, resulting from grain spillage from trains, trucks, and around grain elevators, have supported the highest reported densities of wintering Snowy Owls in North America (Evans 1980, Boxall and Lein 1982). Winter counts, conducted since 1973, have varied from lows of 10-15 owls to as high as 60 or more (Evans 1980), presumably in response to arctic and subarctic microtine cycles.

The Nongame Program of the Minnesota Department of Natural Resources contracted with D. Evans to further investigate, via radiotelemetry, territory parameters of Snowy Owls wintering in the urban - industrial environment of the Duluth - Superior harbor.

STUDY AREA AND METHODS

The Duluth - Superior study area (Fig. 1) was surveyed for the presence of Snowy Owls from 24 November, 1985 through 3 April, 1986. Location, activity, habitat, and perch substrate were recorded for all owls sighted. We attempted to capture all owls seen, using a quonset shaped bal chatri baited with pigeon (Columba livia) and starling (Sturnis vulgaris) or a portable bownet baited with pigeon and/or starling. Captured owls were banded with U. S. Fish and Wildlife Service aluminum rivet bands, weighed, measured, fitted with a patagial wing marker, and colormarked with black dye. Five owls were fitted with a 20 g radio transmitter (164 MHz) attached to a central rectrix with 2 plastic cable-ties (J. Kenty, pers. comm.) or, in one case, a 35 g radio was attached to the two central rectrices with waxed dental floss as described by Kenward (1978). All five of the 20 g radios attached with cable ties came off; two a

result of broken feathers, two directly molted out, and one unknown. In 1984-85 the only bird to lose a 20 g radio was a male; this year, 2 males and 3 females were involved. Apparently, the 20 g radio is too heavy to be supported by a single feather. Two of the females were recaptured; one 20 g radio was replaced using 2 supporting loops of dental floss drawn moderately tight around an adjacent rectrix (which allows the radio to slip off in the event of the main feather being molted), similar to the method described by Kenward (1978). The remaining owl was fitted with a 35 g radio. Territories of marked owls were checked at least once every week for the presence of owls. Radioed owls were monitored at least 5 times per week during the afternoon. We were unable to make visual confirmation of 7% of the locations of radioed owls. We also monitored radio locations on one randomly selected morning during successive 5 day periods. For reference purposes, the study area was gridded into 160 A (1/4 square mile) squares (Fig. 1) and further designated to 40 A parcels with the location of the appropriate quarter (e.g. J10.SW). Home range size was calculated using the minimum area method (Mohr 1947), where the outermost locations are connected to form a polygon. In general, 'territory' is used in the abstract sense when referring to owls residing in particular areas. In reference to specific owls, 'territory' is applied only to those areas known to have been defended, especially in the mid-winter period. 'Home range' is applied to movements beyond defended areas. With the approach of spring, territories dissolve into home ranges, with little or no response to the presence of other owls. A qualitative assessment of food habits was undertaken by analysis of pellets collected from beneath favored perches of some owls and visual observations of feeding owls.

RESULTS

Overview

Ten different owls were positively identified in the study area and captured, processed, and released (Table 1.). They included 2 juvenile males, 5 juvenile females, 2 adult males, and 1 adult female. A number of additional sightings early in the season were likely those of owls subsequently captured and marked. Radios were placed on 2 adult males (one a return bird also radioed last year), 1 juvenile male, and 3 juvenile females. Length of residence, number of sightings, and home range size are presented in Table 2.

Home Range Size and Habitat Use: Case Histories.

T26, a Return yearling male, was first sighted on 21 November 1985 in sector C9 (Fig. 2; cf. Fig. 1 for grid reference) by Kim Eckert. We originally captured him last season on 15 January 1985 at Cargill elevator 'D' (D10) and placed a radio on him at that time, which was molted out on 2 February 1985. We recaptured him on 29 November, again at Cargill 'D', and attached a 20 g radio. There was no sign of abnormality in the replacement feather from last year's molted radio. This year he again lost the radio, this time as a result of the feather breaking off, on 26 December. His home range (Fig. 2A) was 208 ha smaller than last year's (Fig. 2B), at 327 ha, and fell almost entirely within it. In contrast to last year when he virtually never came inland until after dark, he appeared less shy this year and was usually seen inland during daylight hours. We had two observations of him feeding on pigeons (Columba livia) and once observed several flights at a pheasant (Phasianus colchicus) hiding in a small patch of weeds along a Century fence. Perches included ice (14), telephone poles (13), boxcar (4), rock (4), freeway light (3), snow pile (3), post (2), railroad swing bridge (2), billboard (2), pile of

railroad ties (2), a 20 m bank of lights in a railroad yard, a small shed, a dirt pile, Century fence, a light post, a pile of scrap iron, and once in channel ice (broken up, with chunks and slabs up to 1 m high jumbled about).

T29, a juvenile female, was first observed and captured on 8 December 1985 just east of the Superior Hospital (Sector M11.NW). In contrast to last year, there was little or no sign of vole (Microtus pennsylvanicus) activity in this area which likely prompted her move to St. Louis Bay (E8) where we next sighted her on 13 December. After another sighting on 22 December at the Ortran coal dock (G9), she moved to Continental elevator (H13) on 27 December. Since she was now adjacent to the territory of radioed T31, we recaptured her and attached a 20 g radio. She remained there until 3 January 1986, covering 26 ha (Fig. 3A). On 4 January she returned to St. Louis Bay and the Ortran coal dock, where she remained until our last sighting on 27 March, with a home range size of 444 ha (Fig. 3B). She lost her radio on 10 January, as a result of the feather molting out. On 27 December, T29 and T31 were sitting on the ice about 250 m apart. Even though T29 flew twice, there was no response from T31 which was a bit unusual considering their proximity (cf. Evans 1980). While T29 was there, we observed no sign of interaction during the 9 concurrent sightings, in which they averaged a distance of 700 m. After T29 returned to St. Louis Bay, we twice observed her feeding on pigeons. Her total home range size for the entire season was 2424 ha (Fig. 3C). Perches included ice (22), a 15 m pile of rocks (15), channel ice (14), telephone pole (4), a 9 m boat mast (2), and on a Century fence, in a boat slip, a chunk of cement, a 3 m pier landing, boxcar, coal pile, dirt pile, old wooden pier, 20 m ore boat mast, ore boat railing, a post, and a pile of railroad ties.

T30, a juvenile female, was first observed and captured on

09 December 1985 at Superior Fibre Products (G13) and fitted with a 20 g radio. The next day, 10 December, she ranged rather widely, moving in about 2 h from the Port Terminal (E11) to Fraser Shipyards (G11) and to the Bell microwave tower (I10.SW), which extended her eventual total home range to 1214 ha (Fig. 4A). She remained within Fig. 4B thereafter, 887 ha, with her initial activity center on Connor's Point (G11, H12, G12) and offlying ice. Rabbits (Sylvilagus floridanus) were relatively abundant in this area and were likely her chief prey although we did see her feeding on a pigeon on 19 December. About mid-January her activity center gradually shifted to the Port Terminal (D10, E10, E11) and offlying ice. From then until her departure on 16 March we observed her feeding on pigeons 4 times. On a number of occasions we observed her arrive from the ice at the Soo line rail yard (E10.NW) about noon where a yearling male Peregrine (Falco peregrinus) usually hunted around 1300 h. Although never observed directly we feel it likely she was retrieving Peregrine kills when he was finished eating. On 1 February I flushed the Peregrine from a freshly killed pigeon and placed a noose carpet over it at 1330 h. At 1353 h the Peregrine flew about 40 m and stooped 3 times on T30 who was sitting on the roof of the American Hoist building (D10.NW). At 1354 h T30 beat a hasty retreat to the nearest ice. T30 lost her radio on 11 or 12 January; although we had a signal on 11 January we did not have a visual sighting. On 13 January the Coast Guard Cutter Sundew apparently plowed it to the bottom of the bay as it made its weekly run to the Superior Entry since there was no signal after that date. We were able to visually confirm the absence of the radio on 14 January. At that time we frequently found her sitting in the shipping channel. We recaptured her on 2 February and attached another 20 g radio with supporting loops. Perches included telephone pole (35), ice (21), channel ice (17), a 15 m ship loading superstructure at the cement plant (8), snow pile (7),

building roof (3), light pole (3), a 33 m material handling superstructure (2), dirt pile (2), a pile of scrap iron (2), a crane at Fraser Shipyards, on a supporting pillar of the Blatnik Bridge, a concrete pier, freeway light, on a metal bar in Fraser Shipyards, the Bell microwave tower (30 m), an old wooden trestle, and on an ore boat mast. Our last sighting of T30 was on 16 March. On 5 May she was seen in Baraga, MI, some 280 km east of Duluth. She appeared weak and was found dead on 7 May with the radio still attached and functional. She was subsequently necropsied by the Michigan Wildlife Disease Laboratory and found to have a Sileo Index of 1.33 (S. M. Schmitt, pers. comm.) which strongly suggests that the combination of levels of DDE, Dieldrin, and PCB's were instrumental in her death. We feel it unlikely that the prey available in Duluth would provide such high levels of the chemicals involved. A more likely explanation involves her probable route to Baraga, where she could have encountered and fed upon spring migrant gulls along the south shore of Lake Superior. Gull prey has been implicated in pesticide associated mortality of nestling Bald Eagles in the Apostle Islands, Wisconsin (C. R. Sindelar, pers. comm.).

T31, a juvenile female, was first observed and captured on 16 December 1985 on St. Louis Bay off the Ortran coal dock (F9) and fitted with a 20 g radio. We found her on 17 and 19 December sitting in channel ice in St. Louis Bay (G7.SW) but could not get a signal on 18 December anywhere in the study area. Since weather conditions that afternoon were 2° F temperature and northwest winds at 15 knots she likely was tucked in a protected spot out in the channel ice. We have observed owls sitting in channel ice as close as 100 m without being able to get a radio signal. On 20 December she moved to sector I13 (radio only) and on 21 December we observed her on the ice off the Superior Sewage Treatment Plant (I13.NE). With the exception of one sighting in

sector K16 on 24 December (Fig. 5A), she remained in this area until her departure on 26 March , encompassing 232 ha (Fig. 5B), with most observations off Continental elevator in sectors G13 and H13 and extending to G12 in March. All sightings but 9 were on the ice. She did not appear shy, as she often sat quite close to land and ignored cars and people; when and where she hunted is unknown. There were rabbits directly inland and a sizeable flock of pigeons at Continental elevator. We observed her eating pigeons 3 times and found a rabbit leg hidden under an overhanging ice chunk in her territory. She lost her radio on 9 January which I was unable to locate and recover, due to severe signal bounce off the head house on Continental elevator. On 13 January the Coast Guard Cutter Sundew apparently plowed it under on its weekly run to the Superior Entry as there was no signal after that date. On 3 February we recaptured her and attached the 35 g radio left over from last year, which finally went dead on 11 March. She weighed 151 g more when we recaptured her so she apparently was getting enough to eat. Although T31's territory was bounded on the northwest by T30 and on the southeast by T29 briefly and later by T34, we never observed any territorial interactions among them. Her perches included channel ice (45), ice (33), a building roof, a concrete pier on the edge of Superior Bay, a 33 m material handling superstructure, light pole, 20 m ore boat mast, a dike at Superior Sewage Treatment Plant, telephone pole, 9 m boat mast, and a pile of gravel. Her entire home range encompassed 1288 ha (Fig. 5C).

T32, a yearling male, was first observed and captured on 31 December west of the Ortran coal dock (G8.NE) and fitted with a 20 g radio. We had a total of 4 sightings, encompassing 10 ha (Fig. 6), before it left the study area. On 4 January, T29 moved back to the Ortran coal dock and presumably evicted T32; we had radio signals from T32 on the

ice off the Port Terminal (F12) in the morning and the afternoon but could not see him. Our last location, on 6 January, was in sector G7, about 1 km west of T29. Perches included a 15 m salt pile, channel ice, ice, and a 4 m tree. T32 was later found dead on 7 April 1986, near New London, Kandiyohi County, Minnesota. The cause of death was presumed to be collision with a powerline. At that time his radio was missing; whether it was molted out or broken off is unknown.

T33, a juvenile male, was first observed and captured on 3 January 1986 on the ice off North Star Steel (E9.NW). He ranged rather widely, the entire home range encompassing 864 ha (Fig. 7), and there were often extended periods of time when we did not see him. We rarely observed him on consecutive days and successive observations were usually in different areas. He did seem to concentrate in the southern portion of his observed home range in the latter half of February and in March. On 20 January at 1145 h I observed T33 flying west from the Port Terminal. He looked back several times as he flew and again when he landed on the Minnesota Draw swing bridge (E9.SW); I presumed at the time that T30 had evicted him from her territory. On 5 March at 1748 h we observed him sitting on a 3 m concrete platform within T29's territory. He flew to the south when T29 flew in from the ice at 1750 h to the rock pile 350 m north of his perch. We subsequently located him at 1802 h on a 18 m telephone pole about 0.8 km southeast of his original perch. Our last sighting of him was on 25 March. Perches included telephone pole (6), ice (5), channel ice (5), a 9 m snow pile (3), 30 m light pole (3), a 50 m silo at the cement plant, a crane at the Port Terminal, a 15 m ship loading superstructure at the cement plant, coal pile, the railroad swing bridge on the Minnesota Draw, and on the radar of an ore boat.

T34, a juvenile female, was first observed and caught on 27 January just south of Huron Cement (H13.SE). She had a healing wound on the underside of the right patagium but did not appear to have any difficulty flying. She maintained a rather small territory, at 78 ha (Fig. 8), in the area that T29 had spent a short time in early January. The only apparent prey available were rabbits, pheasants, and a small area with voles. Our last sighting was on 17 March. Perches included the radar on an ore boat (8), a 9 m mast on a fueling boat (6), telephone pole (6), a billboard (5), channel ice (4), a 13 m cement storage cone (3), ore boat antenna (2), and the ore boat mast.

T35, a juvenile male, was first observed and caught on 9 February near the freeway exit to the Port Terminal at North Star Steel (E10.NW). The only prey available on his small territory (58 ha, Fig. 9) appeared to be a small area containing voles in the median strip of the freeway interchange, where we frequently observed him hunting. His territory fell within T30's home range and we had a number of observations of them in proximity. On 5 occasions she was perched about 30 m east of the freeway interchange while he was perched in plain view just west of the interchange. While we observed no interactions between them, he never occupied his primary hunting perch, which was about 30 m from her perch, while she was there. On 19 February she was beyond him, eating a pigeon on the ice off North Star Steel, while he sat on a telephone pole along the freeway in North Star Steel. Again, there appeared to be no interaction. Our last sighting of him was on 23 March. Perches included telephone pole (19), freeway light (14), on the roof of a small 6 m building (4), ice (3), a pile of railroad ties, and a pile of snow plowed along a road.

T36, an old adult female, was first observed on 23 January as she flew from a telephone pole and captured prey near a

dumpster at the Soo Line roundhouse (J12.SW). I had the distinct feeling that she recognized us, as she stared intently at us for almost 5 minutes, ignoring other cars and people passing by 30 m away. After numerous capture attempts, we finally caught her on 14 March at the roundhouse. She did not have a band or wing tag but did have a hole in her right patagium the same size and in precisely the same location as would have been made by the wing tag. Thus, we feel it is highly probable that she was in reality a Return bird that had had its band and wing tag removed by persons unknown. She maintained a small territory of 52 ha (Fig. 10A), with one sighting outside of this territory resulting in a total home range size of 87 ha (Fig. 10B). The only prey available appeared to be voles, pigeons, and possibly rats and rabbits. Our last sighting of her was on 20 March. Perches included a 20 m antenna on the WITI building at U. W. - Superior (17), 9 m light standards in a dorm parking lot and at the UWS maintenance building (7 and 4, respectively), telephone pole (6), a 6 m tree (4), on Wessman Arena (3), a 25 m antenna on Wessman Arena (3), a dorm antenna (3), a baseball backstop (2), UWS dorm (2), ground (2), a post, the UWS gym, and a dirt pile.

T37, a juvenile female, was observed and caught on 21 March at the Incan loading dock (H8.NE). She appeared to be a transient spring migrant as we saw her for the second and last time on 25 March on an ore boat antenna at Huron Cement (H13.SW), which was about a week after our last sighting of T34 there.

Food Habits

Favored perches of some owls were searched intermittently throughout the winter for pellets. Visual observations of feeding owls, numbers of pellets, and prey contained therein are reported in Table 3. The shipping channel along

Connor's Point (F12) was searched once in conjunction with a search for a lost radio, before learning that the Coast Guard Cutter was making weekly trips there and we deemed it unsafe to walk in the channel. I found a rabbit leg cached under an ice chunk and a recent pigeon kill, but no pellets. However, searches for pellets likely would not have been very productive, as a small flock of Ravens (Corvus corax) hunted the ship channel every day and we had a number of observations of them landing and feeding, presumably on Snowy Owl kill remains or pellets.

Morning Tracking Periods

We conducted 23 morning tracking sessions throughout the season. Since no owl was radioed continuously, there were some instances when we failed to find owls in one or both sessions of the day. In several instances, we were unable to make a visual confirmation of a radio signal, especially for T26 in the first week after capture when we received a weak signal over 2 km away up on the hill but which disappeared when we got closer to the location where we eventually found him. Results of visual sightings on double tracking days are presented in Table 4. Since T30 and T31 were radioed the longest and also were typically easy to find during their non-radioed periods, they are represented more often on the double tracking days. T35 and T36 also were usually easy to find. In contrast, T29, who often sat hidden in channel ice a long way from shore, and T33, who wandered widely, were not often found on both tracking sessions of a day. We found individuals in at least one session of a double tracking day on 71% of the individual-days possible. Of those found at least once, 65% were present on both the morning and afternoon sessions. Thus, we were able to find owls on both sessions 46% of the individual-days possible. Of those found on both sessions, 78% had moved from their morning location when sighted in

the afternoon. There was a strong tendency for those owls with ice available in their territory (all except T36) to utilize it during daytime roosting. Ice roosts comprised 73% of morning observations, while only 40% of the afternoon sightings were on the ice, when owls were more apt to be hunting inland.

DISCUSSION

The distribution of territories returned to a more typical pattern this year, in contrast to last year, when many owls resided away from the harbor. The absence of high vole populations in the southern portions of the study area appears wholly responsible for the lack of owls there. For example, T29 was first seen in an area with high vole numbers last year but she moved north to the harbor area within 5 days. All of the owls except T36 wintered in proximity to the harbor. T36 hunted a field in sector K11 where voles were available, and more frequently in the Soo Line rail yard (J12.SW) where voles, rabbits, pigeons, and possibly rats may have been available. Rat populations continued to be low or nonexistent in the harbor area. Rabbit and vole populations were substantial in some localized areas in the harbor and appeared to be the focus of some owl territories, notably T31, T34, T35, and T36. We observed owls feeding on pigeons on 10 different occasions, a surprisingly high number. It is unlikely that owls were catching free flying pigeons, as this is often difficult even for Peregrines or Gyrfalcons (Falco rusticolus). We suspected T30, who represented 5 of the observations, of scavenging Peregrine kills. However, moribund pigeons, occasionally observed in the rail yards, also would have been easily obtainable.

In 1984/85 we found a considerable difference in territory size between owls in the harbor area and in the southern

study area where high vole populations were present. Harbor territories averaged 523 ha while vole territories averaged 57 ha. This year, the three owl territories in which we observed voles (T35, T34, and T36) averaged 63 ha in size, while the remaining territories in the harbor averaged 550 ha. The larger size of the non-vole territories reflect the general dearth of prey available in the harbor when compared to the high rat populations present prior to 1980 (cf. Evans and Evans 1985).

Of the 20 owls banded in the past 2 seasons, we are aware of 4 that have died. One (T22) was presumably killed by a vehicle while on the study area. Another (T32) died in southern Minnesota as a result of collision with a powerline; it was recovered on 7 April 1986 but the actual date of death is uncertain. The remaining two, T21 and T30, died while on spring migration from the study area, both apparently from starvation. In one, T30, high pesticide levels, which may have been exacerbated by weight loss, were implicated as the cause of death.

The 1985-86 Snowy Owl season was again characterized by relatively low numbers of owls, with juveniles predominating and proportionally few adult females. Thus, it appears that prey populations in the arctic remained at high levels in 1985, resulting in high production of young and allowing most owls to overwinter in the far north (cf. Evans and Evans 1985).

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History, for the loan of a telemetry receiver and yagi antenna. Ed Lindquist, U. S. Forest Service, provided access to a digital planimeter for calculating home range areas.

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Table 1. Measurements of Snowy Owls captured in the Duluth - Superior harbor, 1985-86.

Owl	Date	Age[a]	Sex	Tail	Wing Chord	Weight
T26	11-29-85	SY	Male	206mm	388mm	1539.0g
T29	12-08-85	HY	Female	213	417	2274.0
T30	12-09-85	HY	Female	213	422	2122.0
T31	12-16-85	HY	Female	227	437	2426.0
T32	12-31-85	SY	Male	210	394	2060.0
T33	01-03-86	SY	Male	209	385	1950.0
T34	01-27-86	SY	Female	210	428	2025.0
T35	02-09-86	SY	Male	204	388	1424.0
T36	03-14-86	ASY	Female	213	424	2161.0
T37	03-21-86	SY	Female	219	421	1871.0
Recaptures						
T26	01-15-85	SY	Male	213	393	1672.0
T29	12-28-85					-58.0
T30	02-02-86					+54.0
T31	02-03-86					+151.0

[a] HY - Hatching Year, or a juvenile bird.
SY - Second Year, or a bird at least 1 year old.
ASY - After Second Year, or a bird at least 2 years old.
Age designations advance on 1 January; an SY bird in the spring is still in its first year.

Table 2. Territory parameters of Snowy Owls in the Duluth - Superior harbor, 1985-86.

Owl / Period	No. days on Home Range	No. of Sightings	Figure	Territory Size (ha)
T26				
21 Nov. - 27 Mar.	125	56	2A	327
15 Jan. - 06 Mar. 1985	51	32	2B	535
T29				
27 Dec. - 03 Jan.	8	8	3A	26
04 Jan. - 27 Mar.	83	54	3B	444
08 Dec. - 27 Mar.	110	66	3C	2424
T30				
09 Dec. - 16 Mar.	98	99	4A	1214
11 Dec. - 16 Mar.	96	97	4B	887
T31				
20 Dec. - 26 Mar.	97	81	5A	340
20 Dec. - 26 Mar.[a]	96	80	5B	232
16 Dec. - 26 Mar.	101	85	5C	1288
T32				
31 Dec. - 06 Jan.	7	8	6	10
T33				
03 Jan. - 25 Mar.	82	25	7	864
T34				
27 Jan. - 17 Mar.	50	34	8	78
T35				
09 Feb. - 25 Mar.	43	38	9	58
T36				
23 Jan. - 20 Mar.[b]	56	47	10A	52
23 Jan. - 20 Mar.	57	48	10B	87
T37				
21 Mar. - 25 Mar.	5	2	-	-

[a] Excludes the 24 Dec. sighting
[b] Excludes the 30 Jan. sighting

Table 3. Prey sightings and contents of Snowy Owl pellets collected in the Duluth - Superior harbor, 1985-86[a].

Owl	No. of Pellets	Meadow Vole	Pigeon	Rabbit	Pheasant
T26			(2)		
T29			(2)		
T30	4	1	3 (5)		
T31			(3)	(1)	
T34	3	1	1		2
T35	2	9			
T36	4	4 (1)	1		

[a] Sightings of owls feeding on prey are included in parentheses.

Table 4. Numbers of visual sightings on double tracking days

Owl	Double Tracking Days	At Least One Sighting	Morning and Afternoon Sightings	Moved from Morning Sighting
T26	22	9	6	4
T29	20	10	5	4
T30	19	18	15	14
T31	20	16	13	7
T32	2	2	0	0
T33	16	8	4	4
T34	10	10	5	3
T35	9	8	4	4
T36	11	10	8	7
T37	1	1	0	0
Total	130	92	60	47

Figure 1. Duluth - Superior Study Area: ¼ square mile grid.

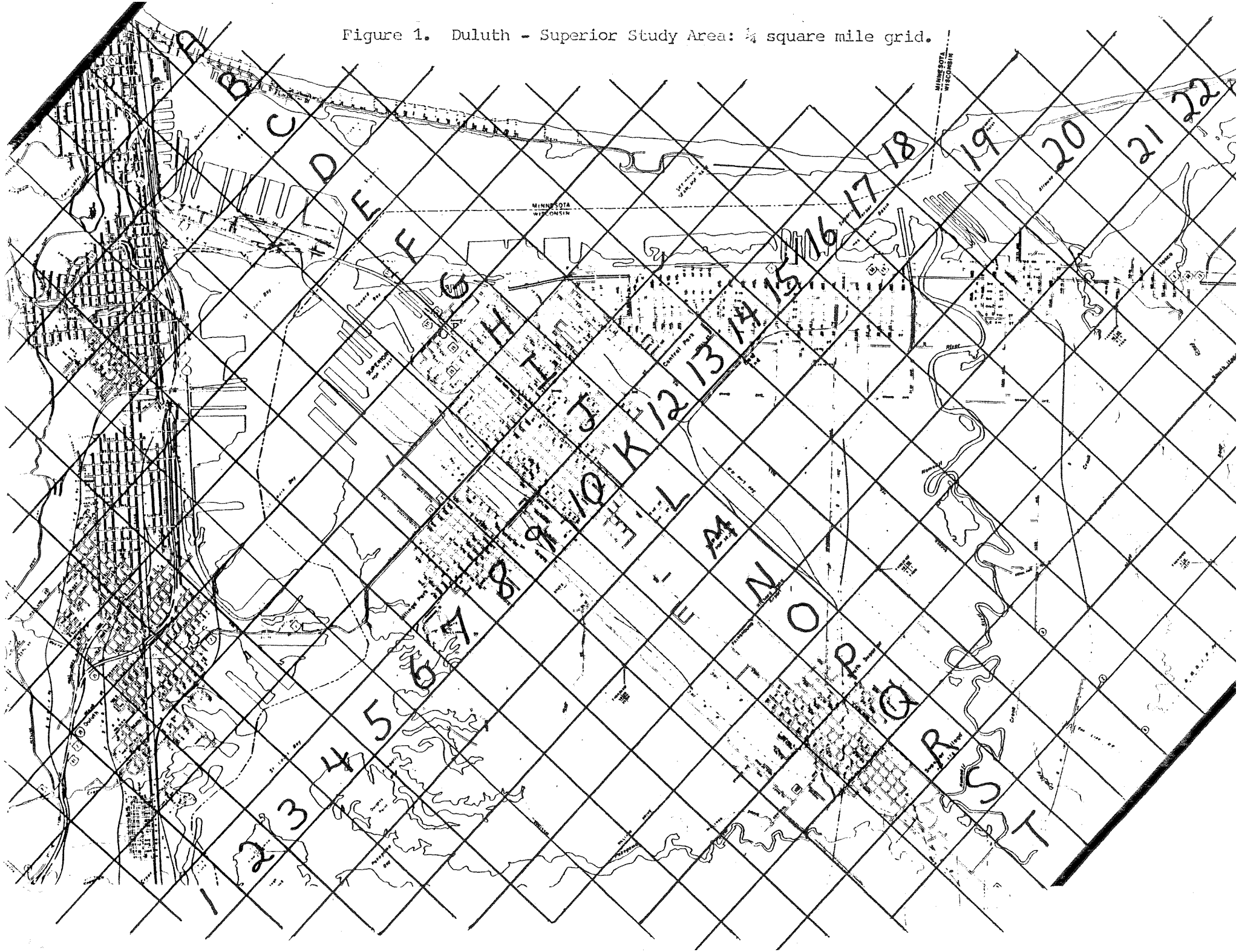

Figure 2. Home Range of T26
A. 21 Nov. - 27 Mar.
B. 15 Jan. to 06 Mar. 1985

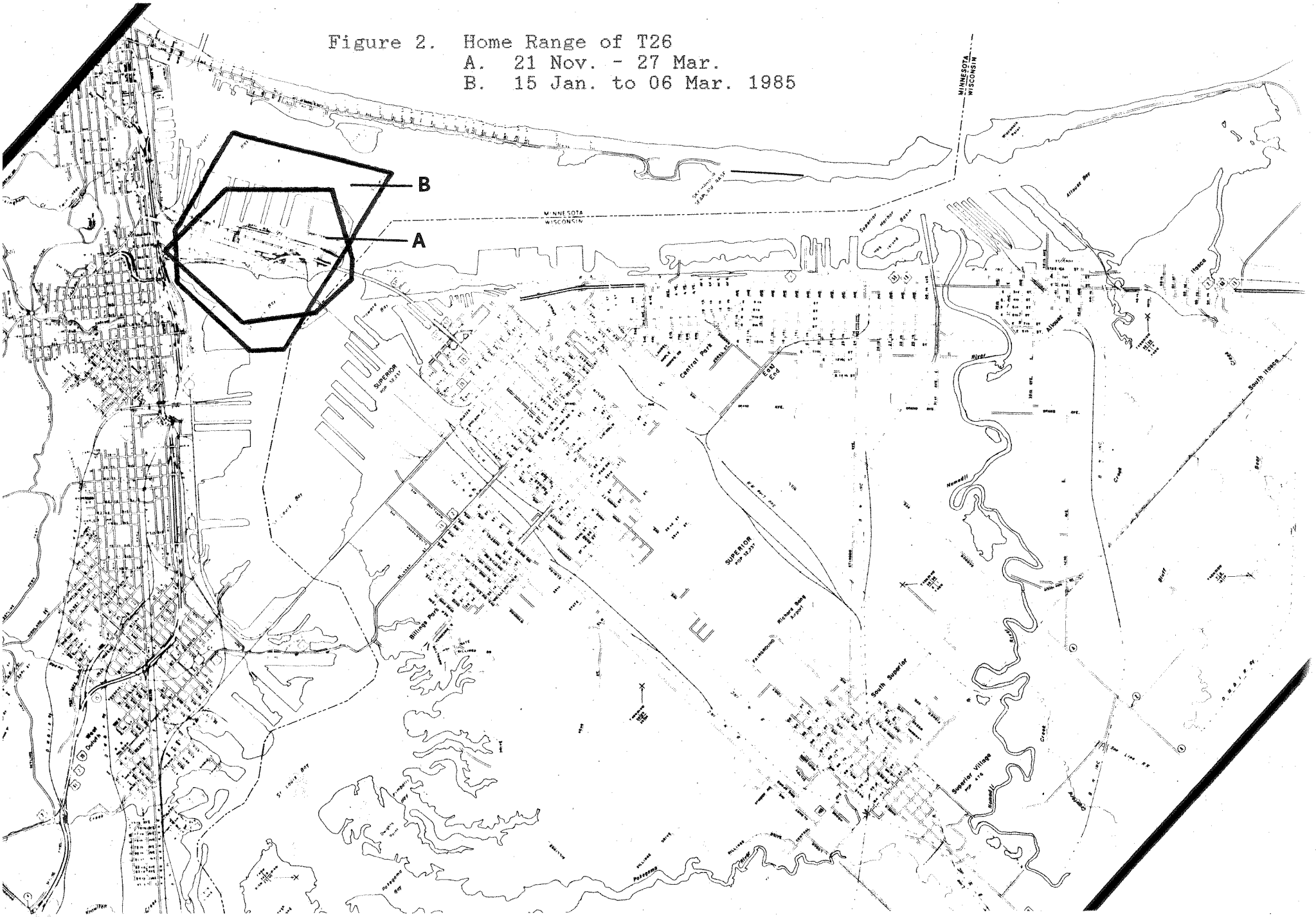

Figure 3. Home Range of T29
A. 27 Dec. - 03 Jan.
B. 04 Jan. - 27 Mar.
C. 08 Dec. - 27 Mar.

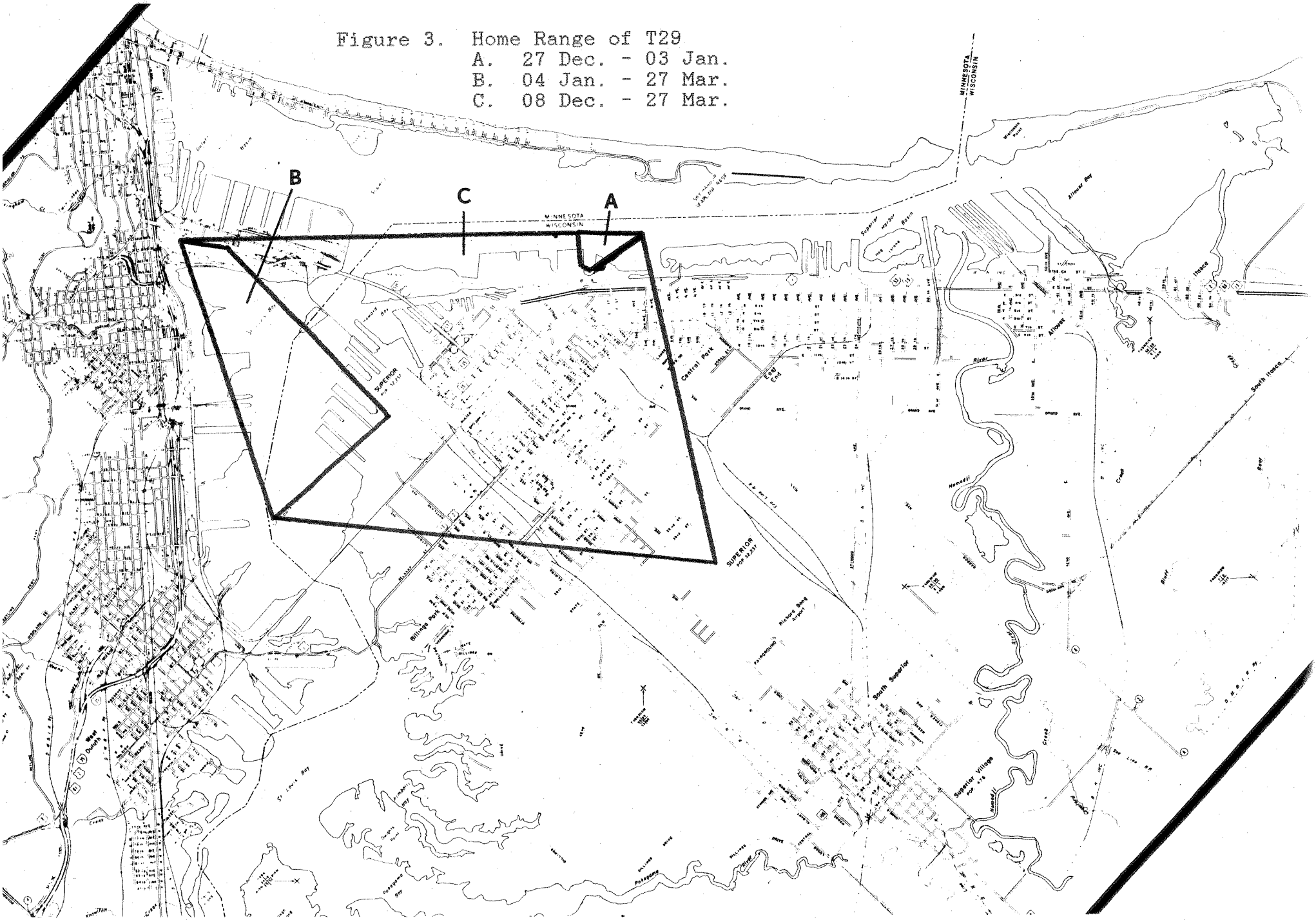

Figure 4. Home Range of T30
A. 09 Dec. - 16 Mar.
B. 11 Dec. - 16 Mar.

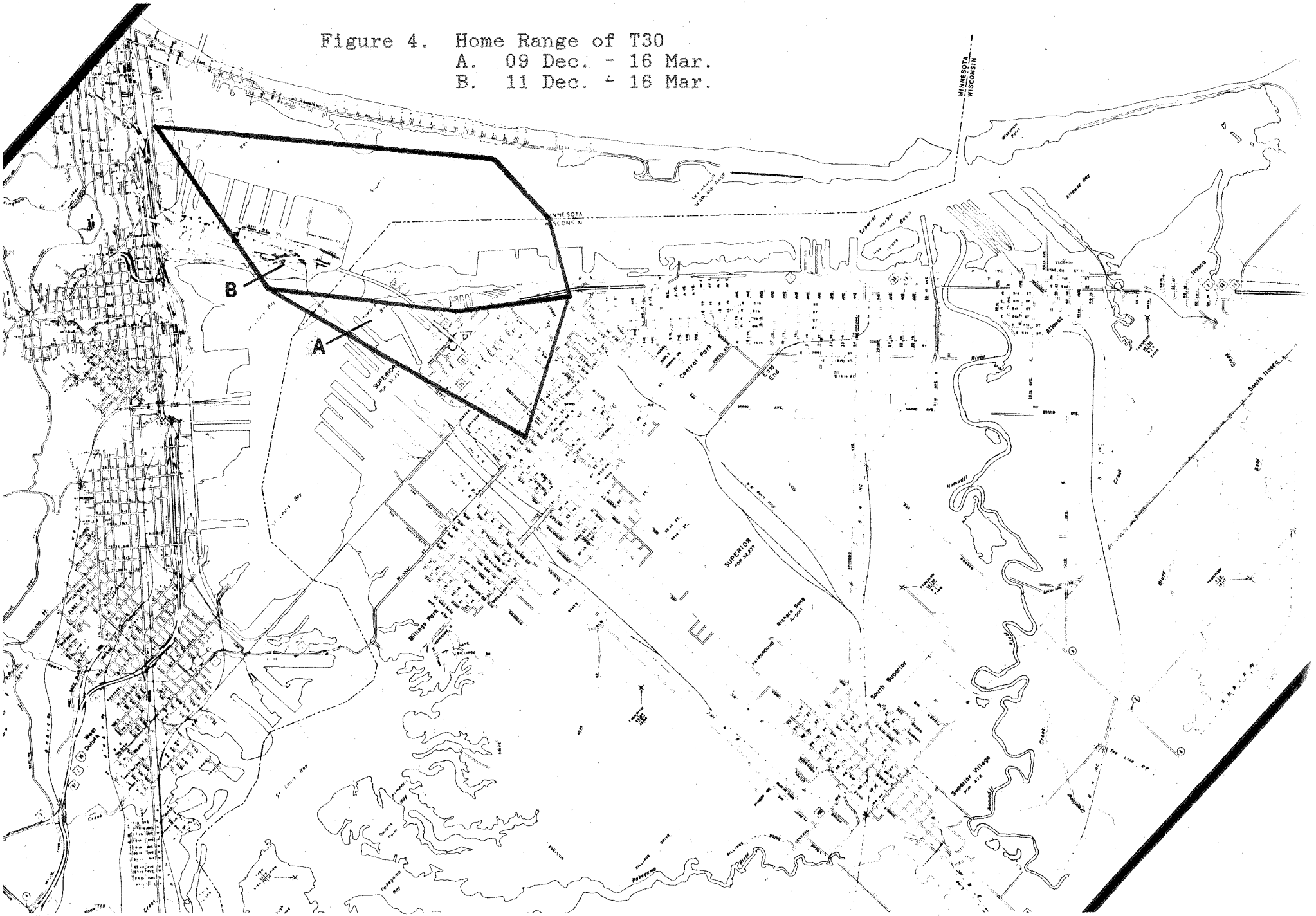

Figure 5. Home Range of T31
A. 20 Dec. - 26 Mar.
B. 20 Dec. - 26 Mar.
C. 16 Dec. - 26 Mar.

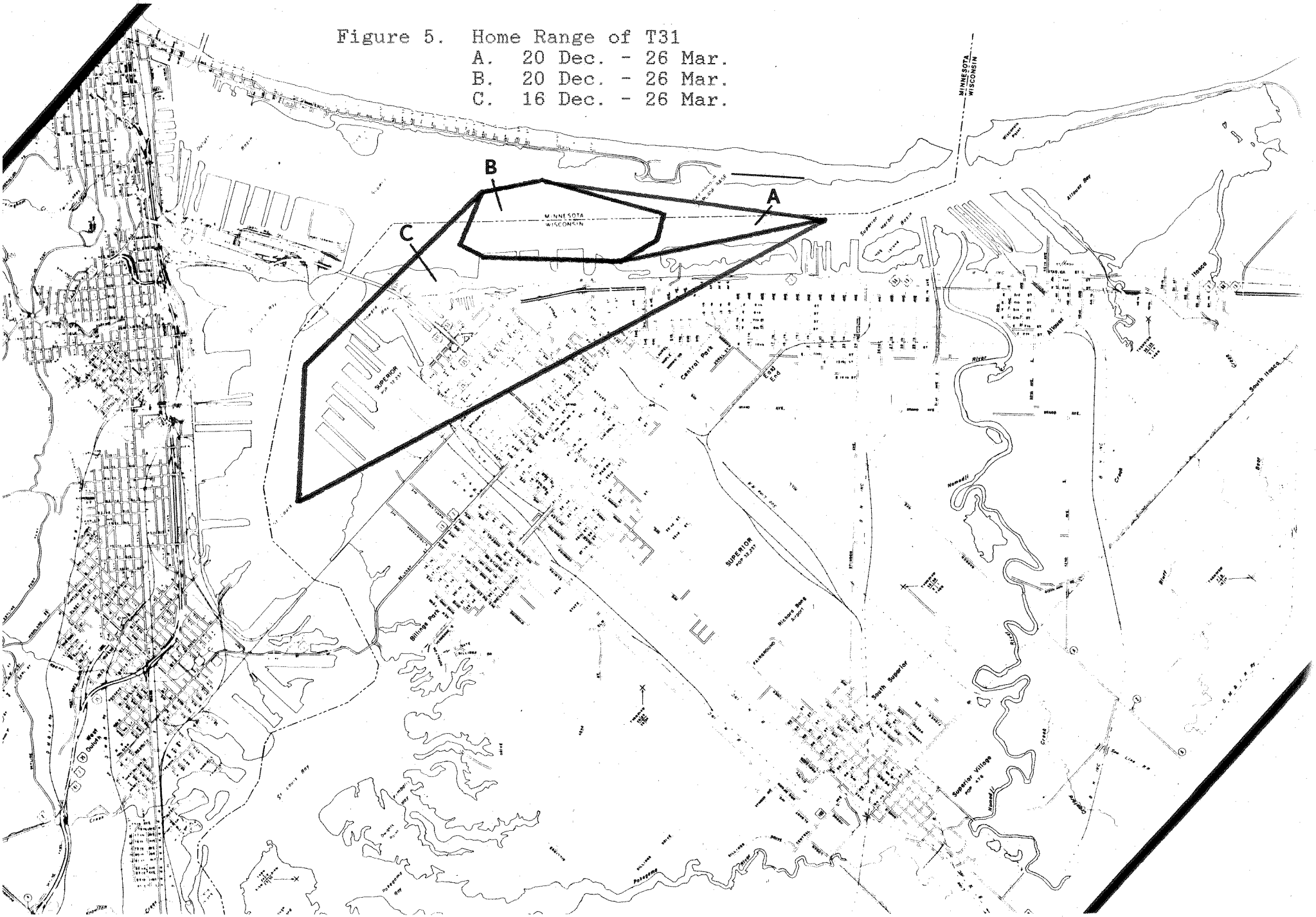

Figure 6. Home Range of T32: 31 Dec. - 06 Jan.

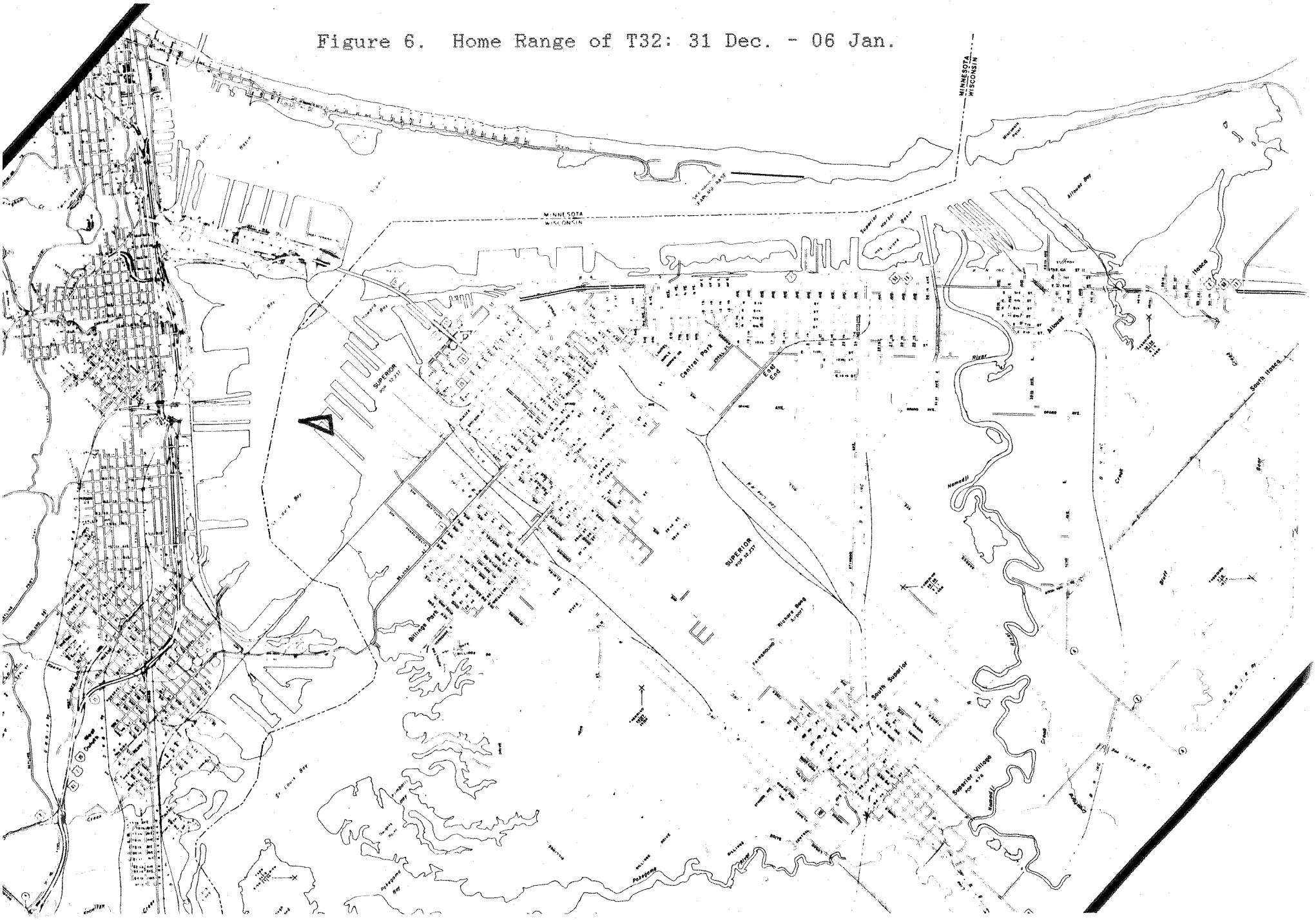

Figure 7. Home Range of T33: 03 Jan. - 25 Mar.

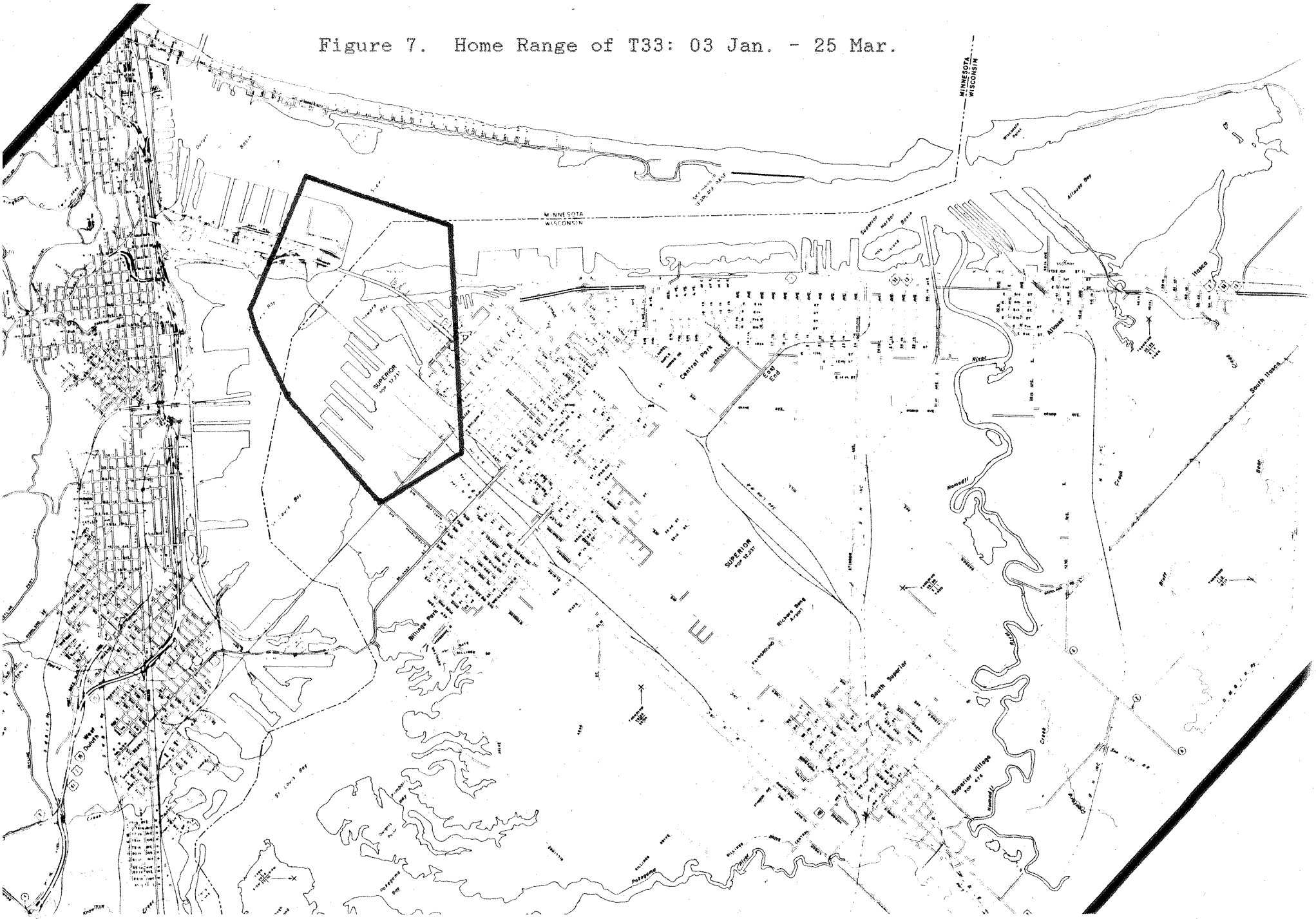

Figure 8. Home Range of T34: 27 Jan. - 17 Mar.

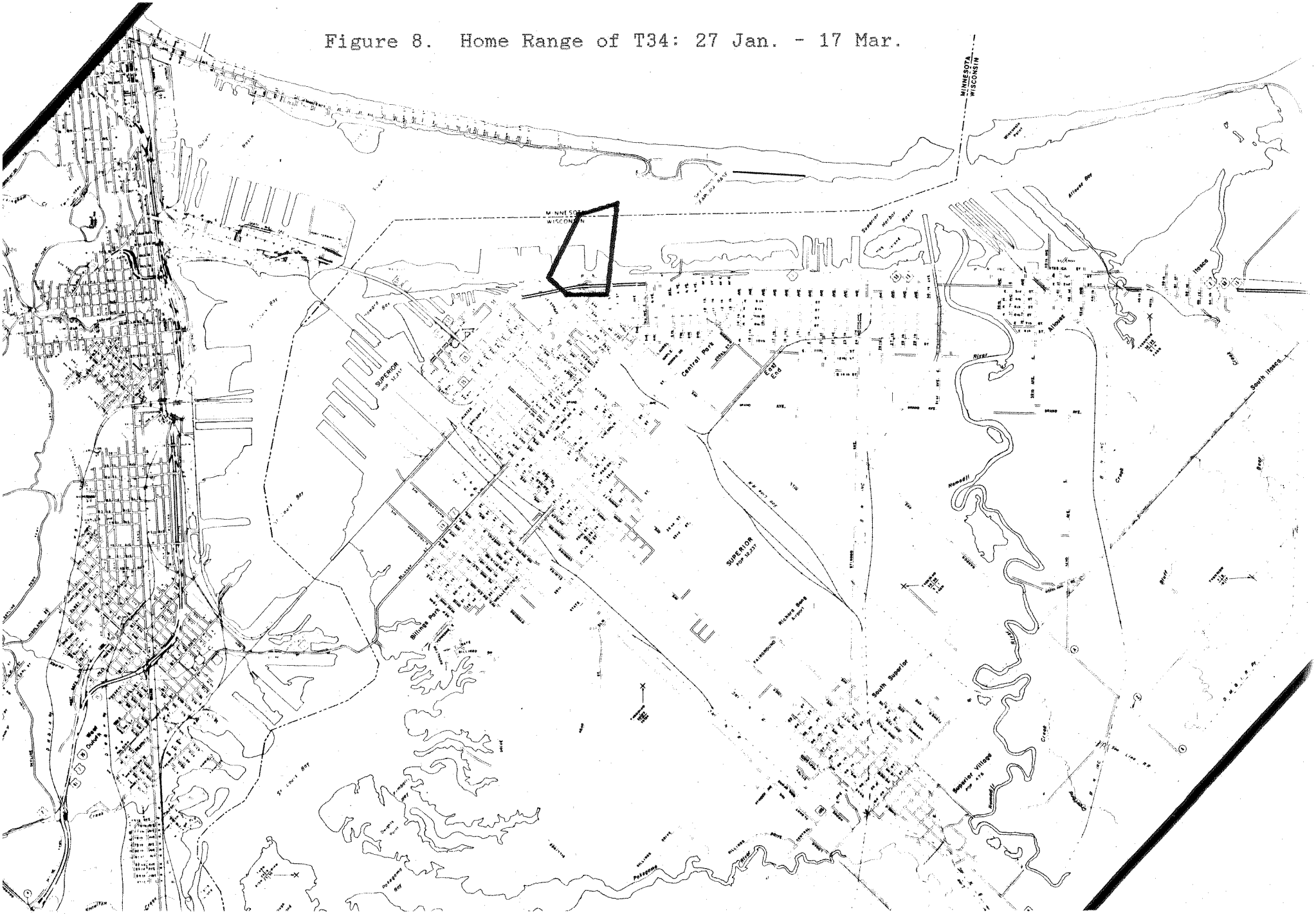

Figure 9. Home Range of T35: 09 Feb. - 25 Mar.

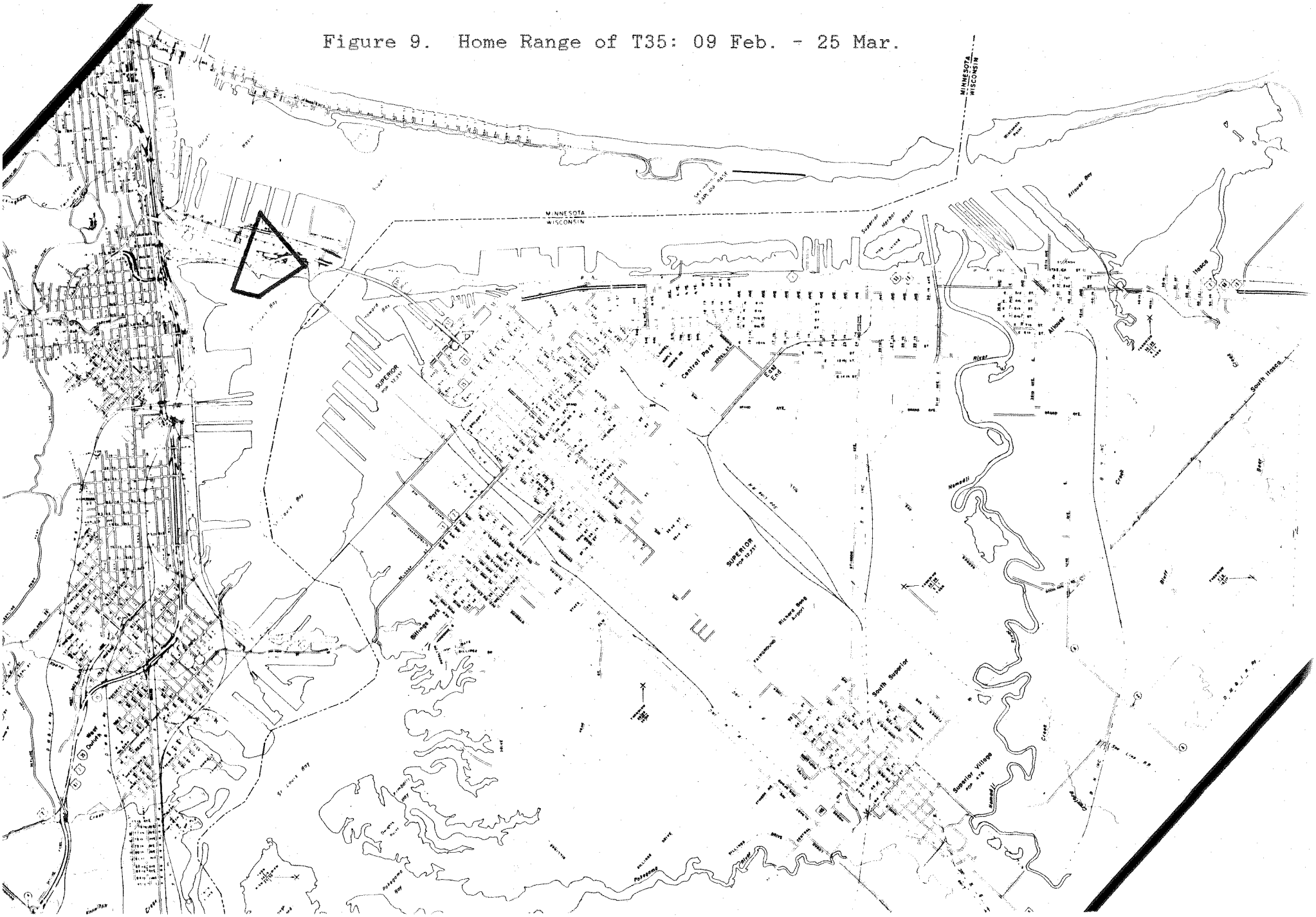

Figure 10. Home Range of T36
A. 23 Jan. - 20 Mar.
B. 23 Jan. - 20 Mar.