Projection: NAD 1983 UTM Zone 15N
Creator: SS
Date: 12/01/2009 Scale: 1:1,250,000
File: 1038926.04-020
Data Sources: *Natural Resources Canada, Geobase®, Natai Topographic Database, Areva Resources Canada Inc.*

FIGURE 8.2-2
SURVEY EFFORT SEPTEMBER 11 2008
MARINE MAMMAL SURVEYS

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Photo 8.2-2 Beluga Whales Sighted Offshore between Rankin Inlet and Chesterfield Inlet on September 11, 2008

September 12, 2008

As with prior surveys, the coastal region between Rankin Inlet and Chesterfield Inlet was surveyed first. Due to high offshore winds and in response to input from the local wildlife observers, the survey design was altered to focus on Chesterfield Inlet itself. Following the survey of Chesterfield Inlet (south and north shore), attempts were made to survey Transects 1 and 2 (Figure 8.2-3). The remaining Transects (3 to 14) could not be surveyed due to the reduced visibility associated with wave states of greater than or equal to a Beaufort State 4. The coastal region between Chesterfield Inlet and Rankin Inlet was surveyed again (during the return to base). Total survey effort was 842 km.

Weather conditions during the day's survey varied from clear to overcast skies with a sea state of up to 3 along the shoreline and of greater than 4 offshore. Only two belugas were observed (in two separate sightings). One sighting occurred along the shoreline between Chesterfield Inlet and Rankin Inlet in an area known as the 'Baker forelands'. The other beluga was observed along the north shore of Chesterfield Inlet (Figure 8.2-3). A group of 24 unidentified seals was sighted approximately 3 km from the north shore of Chesterfield Inlet (Figure 8.2-3). Seals were observed quickly swimming towards land. Attempts to obtain further information (e.g., through photo-identification) were unsuccessful.

September 13, 2008

As with prior surveys, the coastal region between Rankin and Chesterfield Inlet was surveyed first. The southern and northern coasts of Chesterfield Inlet were then surveyed (using the same flight path as the previous day). Upon completion of the survey of Chesterfield Inlet, offshore Transect 1 was completed; however, further survey of offshore transects was abandoned due to increasing winds and sea states. The remainder of the survey captured coastal regions between Rankin Inlet and Chesterfield Inlet, with a focus on Sakpik and Fairway islands, the Baker forelands and the outlet of the Josephine River (total effort of 768 km; Figure 8.2-4). A local wildlife advisor (Andre Tautu) reported the harvest of a single beluga on the shoreline near Finger Point (Baker forelands) during the week of September 1, 2008.

Conditions were overcast without precipitation throughout the day and with winds increasing in the afternoon. Two beluga sightings of one individual each were made, both along shore between Rankin Inlet and Chesterfield Inlet adjacent to the Baker forelands (Figure 8.2-4). No other marine mammals were observed.

Projection: NAD 1983 UTM Zone 15N
Creator: SS
Date: 12/01/2009 Scale: 1:1,250,000
File: 1038926.04-021
Data Sources: *Natural Resources Canada, Geobase®, Nation Topographic Database, Areva Resources Canada Inc.*

FIGURE 8.2-3
SURVEY EFFORT SEPTEMBER 12 2008
MARINE MAMMAL SURVEYS

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Projection: NAD 1983 UTM Zone 15N
Creator: SS
Date: 12/01/2009 Scale: 1:1,250,000
File: 1038926.04-022
Data Sources: *Natural Resources Canada, Geobase®, Nata[illegible] Topographic Database, Areva Resources Canada Inc.*

FIGURE 8.2-4
SURVEY EFFORT SEPTEMBER 13 2008
MARINE MAMMAL SURVEYS

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September 15, 2008

Initial coastal surveys and offshore surveys were not possible due to limited visibility and/or weather. The survey was, therefore, restricted to coastal regions near Sakpik, Fairway and Marble Islands and the north coast of Chesterfield Inlet (total of 477 km).

Weather conditions varied, but were generally overcast with high winds. Beaufort Sea state ranged from 2 to 5.

Two single belugas were observed during two independent sightings, both near the coast between Rankin and Chesterfield Inlet. One beluga was observed near the Baker forelands and the other approximately 15 km north (Figure 8.2-5). No other marine mammals were observed.

Projection: NAD 1983 UTM Zone 15N
Creator: SS
Date: 12/01/2009 Scale: 1:1,250,000
File: 1038926.04-023
Data Sources: *Natural Resources Canada, Geobase®, Natural Topographic Database, Areva Resources Canada Inc.*

FIGURE 8.2-5
SURVEY EFFORT SEPTEMBER 15 2008
MARINE MAMMAL SURVEYS

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8.2.3 Summary of Marine Mammal Sightings

Marine mammals were sighted every day and included only beluga whales and seals (likely harp or ringed seals; Table 8.2-1). All pinnipeds have been grouped because of the difficulty in identifying species from the air.

Over five survey days, a total of 62 beluga whales were observed (during 30 separate sightings) and 81 seals were observed (during six separate sightings; Table 8.2-1).

The majority of sightings (80%) and number of beluga whales observed (93%) occurred during the first two days of the survey (Table 8.2-1). Seals were not sighted during the last two days of the survey (Table 8.2-1).

Table 8.2-1 Marine Mammals Sightings and Number of Individuals Observed by Transect and Region on Each Day, September 10 – 15, 2008

Date	Flight, Transect Number or Area Name	Region	Time on Transect (min)	Beluga (sighting)	Beluga (# of animals)	Seal (# of sightings)	Seal (# of animals)
Sept 10, 2008	Coastline RI to CI	shoreline	43	3	3	1	1
	1	offshore	20	0	0	0	0
	2	offshore	21	0	0	0	0
	3	offshore	19	0	0	0	0
	4	offshore	19	0	0	0	0
	5	offshore	18	1	1	0	0
	6	offshore	14	3	6	0	0
	7	offshore	11	0	0	0	0
	b/w 7 and 8	shoreline	-	1	15	0	0
	8	offshore	11	1	1	0	0
	b/w 8 and 9	offshore	3	1	12	0	0
	9	offshore	13	2*	3	0	0
	10	offshore	16	1	3	0	0
	11	offshore	15	0	0	0	0
	12	offshore	19	0	0	0	0
	Marble Island	shoreline	13	0	0	1	1
Total for Sept 10, 2008			**255**	**13**	**44**	**2**	**2**

Table 8.2-1 Marine Mammals Sightings and Number of Individuals Observed by Transect and Region on Each Day, September 10 – 15, 2008

Date	Flight, Transect Number or Area Name	Region	Time on Transect (min)	Beluga (sighting)	Beluga (# of animals)	Seal (# of sightings)	Seal (# of animals)
Sept 11, 2008	RI to CI	shoreline	32	2	2	0	0
	RI – CI / Chesterfield Inlet	shoreline	61	6	6	1	30
	Off transect: circling group of animals	shoreline	21	0	0	1	24
	1 (shoreline from CI)	shoreline	20	1	2	0	0
	2	offshore	22	1	1	1	1
	3	offshore	19	0	0	0	0
	4	offshore	18	0	0	0	0
	6	offshore	13	1	1	0	0
	7	offshore	10	0	0	0	0
	8	offshore	10	0	0	0	0
Total for Sept 11, 2008			**226**	**11**	**12**	**3**	**55**
Sept 12, 2008	Coastline RI – CI	shoreline	46	0	0	0	0
	CI	Chesterfield Inlet	120	1	1	0	0
	Off CI transect: circling for group of animals	shoreline	10	0	0	1	24
	1	offshore	16	0	0	0	0
	2	offshore	19	0	0	0	0
	Shoreline CI – RI	shoreline	24	1	1	0	0
Total for Sept 12, 2008			**235**	**2**	**2**	**1**	**24**
Sept 13, 2008	Coastline: RI – CI	shoreline	36	0	0	0	0
	CI – length of the Inlet	chesterfield inlet	127	0	0	0	0
	1	offshore	13	0	0	0	0
	Coastline: CI – RI	shoreline	41	1	1	0	0
	Off transect: Circling Sakpik	shoreline	33	1	1	0	0

Table 8.2-1 Marine Mammals Sightings and Number of Individuals Observed by Transect and Region on Each Day, September 10 – 15, 2008

Date	Flight, Transect Number or Area Name	Region	Time on Transect (min)	Beluga (sighting)	Beluga (# of animals)	Seal (# of sightings)	Seal (# of animals)
	and Fairway Islands						
Total for Sept 13, 2008			**250**	**2**	**2**	**0**	**0**
Sept 15	Coastline: RI – CI	Chesterfield Inlet	85	2	2	0	0
Total for Sept 15			**85**	**2**	**2**	**0**	**0**
TOTAL			**1,051**	**30**	**62**	**6**	**81**

NOTE:

* Includes one sighting of a cow/calf pair

Survey effort of the coastal region resulted in 34 belugas being observed during 17 individual sighting events over 1,083 km of track-line surveyed (Table 8.2-2). These data translate to 1.57 sightings per 100 km and 3.14 whales per 100 km. Within the coastal survey region (i.e., 5 km or closer to shore), 32 seals were observed during three sighting events, corresponding to 0.28 sightings per 100 km and 2.95 seals per 100 km (Table 8.2-3). Of the 32 seals observed in the coastal region, 30 were counted during one of the three sightings.

A total of 25 belugas were observed offshore (i.e., greater than 5 km from shore) during 10 separate sighting events over 1,225 km of track-line surveyed (Table 8.2-2). This corresponded to 0.82 beluga sightings per 100 km and 2.04 whales per 100 km (Table 8.2-2). Within the offshore survey region, one seal was observed during one sighting event, representing 0.08 sightings and seals per 100 km (Table 8.2.3). The individual seal was observed approximately eight kilometres offshore, north of Chesterfield Inlet. No other pinnipeds were observed in the offshore region.

Within Chesterfield Inlet, three belugas were observed during three individual sighting events over 1,560 km of track-line surveyed. This corresponded to 0.19 beluga sightings and individuals per 100 km (Table 8.2-2). Two groups containing 24 seals each were observed on consecutive days in separate locations within Chesterfield Inlet (Tables 8.2-1 and 8.3-3). The first sighting occurred on September 11 adjacent to the south shore of the inlet and the second sighting occurred on September 12 on the north side of Chesterfield Inlet. These sightings were made approximately 20 km apart and could be of the same group. When combined, this corresponded to 0.13 seal sightings per 100 km and 3.08 individuals per 100 km surveyed (Table 8.2-3); however, actual densities are likely lower if possible resightings are considered.

In total, 62 belugas were sighted during 30 sightings over 3,868 km of survey track-line survey. This corresponded to 0.78 sightings per 100 km and 1.60 whales per 100 km (Table 8.2-2).

Amongst the three general regions surveyed (coastal, offshore and Chesterfield Inlet) within the study area, encounter rates of beluga whales were greatest coastally (1.57 sightings per 100 km and 3.14 belugas per 100 km), compared to offshore areas (0.82 sightings per 100 km and 2.04 belugas per 100 km) or Chesterfield Inlet (0.19 sightings and individuals per 100 km) (Table 8.2-2).

Table 8.2-2 Beluga Whale Encounter Rates per 100 km by Survey Regions, September 10 – 15, 2008

Survey Region	Number of Sightings	Number of Belugas	Survey Distance km	Sightings per 100 km	Belugas per 100 km
Coastal	17	34	1083	1.57	3.14
Offshore	10	25	1225	0.82	2.04
Chesterfield Inlet	3	3	1560	0.19	0.19
TOTAL	**30**	**62**	**3,868**	**0.78**	**1.60**

In total, 81 seals were sighted during six sightings over 3,868 km of survey track-line resulting in 0.16 sightings per 100 km and 2.09 seals per 100 km.

Amongst the three general regions surveyed (coastal, offshore and Chesterfield Inlet) within the study area, the number of pinnipeds sighted per 100 km was greatest coastally (0.28 sightings per 100 km), followed by Chesterfield Inlet (0.13 sightings per 100 km) and the offshore area (0.08 per 100 km) (Table 8.2-3). However, the number of seals per 100 km was greatest within Chesterfield Inlet (3.08 seals per 100 km), followed by coastal (2.95 seals per 100 km) and offshore areas (0.08 seals per 100 km) (Table 8.2-3).

Table 8.2-3 Pinniped (Seal) Encounter Rates per 100 km by Survey Regions, September 10 – 15, 2008

Survey Region	Number of Sightings	Number of Seals	Survey Distance km	Sightings per 100 km	Seals per 100 km
Coastal	3	32	1083	0.28	2.95
Offshore	1	1	1225	0.08	0.08
Chesterfield Inlet	2	48	1560	0.13	3.08
TOTAL	**6**	**81**	**3,868**	**0.16**	**2.09**

8.3 Aerial Survey Results – 2009

8.3.1 Overview

Aerial surveys were conducted in early summer (July 29 – 30, 2009) and early fall (August 31 – September 3, 2009) in an attempt to capture seasonal changes in marine mammal distribution and abundance within the study area. The summer (July) surveys were timed to assess the study area immediately after ice breakup, as relatively little is known about beluga presence, abundance or distribution at the start of the open-water period. The fall (late August/early September) surveys were timed to gain a better understanding of beluga abundance and distribution during their northward migration to over-wintering habitat.

In total, 7,035 km of track-line was flown across four survey days, including 2,922 km of coastline and 4,113 km of offshore transects (Tables 8.3-1 and 8.3-2). Transects reached up to 100 km offshore in order to capture the extent of potential tug/barge routing. All sighting details can be found in Appendix C.

Table 8.3-1 Summary of Coastal Survey Details for July 29 – 31, 2009 and August 31 – September 3, 2009

	Date	# km Flown	Total Flight Time	Conditions	Overall Sightability
Coastal Transects	July 29, 2009	651	2.8 hours	Mixed sun and cloud; brief periods of rain; ice along Transects 7/8	Good to excellent
	July 30, 2009	529	1.8 hours	Mixed cloud; periods of light rain; ice along Transects 7/8	Good
	July 31, 2009	–	Grounded	Fog; low ceiling	Impossible
	August 31, 2009	828	3.6 hours	Clear and calm south of Rankin; severe sun glare along Transects 7/8; low ceiling and fog north of Rankin	Good
	September 1, 2009	–	Grounded	Wind warning	–
	September 2, 2009	–	Grounded	Wind warning	–
	September 3, 2009	914	4.6 hours	Severe sun glare south of Rankin; low-lying fog north of Rankin and offshore	Moderately impaired

Table 8.3-2 Summary of Offshore Survey Details for July 29 – 31, 2009 and August 31 – September 3, 2009

	Date	# km Flown	Time of flights	Conditions	Overall Sightability

Table 8.3-2 Summary of Offshore Survey Details for July 29 – 31, 2009 and August 31 – September 3, 2009

	Date	# km Flown	Time of flights	Conditions	Overall Sightability
Offshore Transects	July 29, 2009	1409	7.8 hours	Mixed sun and cloud; brief periods of rain; ice along Transects 7/8	Good to excellent
	July 30, 2009	1326	6.9 hours	Mixed cloud; periods of light rain; ice along Transects 7/8	Good
	July 31, 2009	–	Grounded	Fog; low ceiling	Impossible
	August 31, 2009	1069	4.5 hours	Clear and calm south of Rankin; severe sun glare along Transects 7/8; low ceiling and fog north of Rankin	Good
	September 1, 2009	–	Grounded	Wind warning	–
	September 2, 2009	–	Grounded	Wind warning	–
	September 3, 2009	309	2.4 hours	Severe sun glare south of Rankin; low-lying fog north of Rankin and offshore	Moderately impaired

8.3.2 Daily Reports

July 29, 2009

A total of 2,060 km were flown over 10.6 hours on July 29, 2009 (Tables 8.3-1 and 8.3-2). The ability to detect marine mammals was ranked as good to excellent throughout the day. Short periods of reduced sightability, resulting from sun glare (<1 hour along Transects 3, 5 and the coast) and light rain (<0.5 hours along Transect 7), were also recorded. Weather varied between overcast with mixed cloud and sun throughout the day. Some sea ice was encountered in the south-eastern region of the study area, just north of Churchill, along Transects 7 and 8; observations continued over the ice. The ice type was mostly brash, with some larger pans and small-medium floes, and ranged from 1/10 to 9/10 in cover.

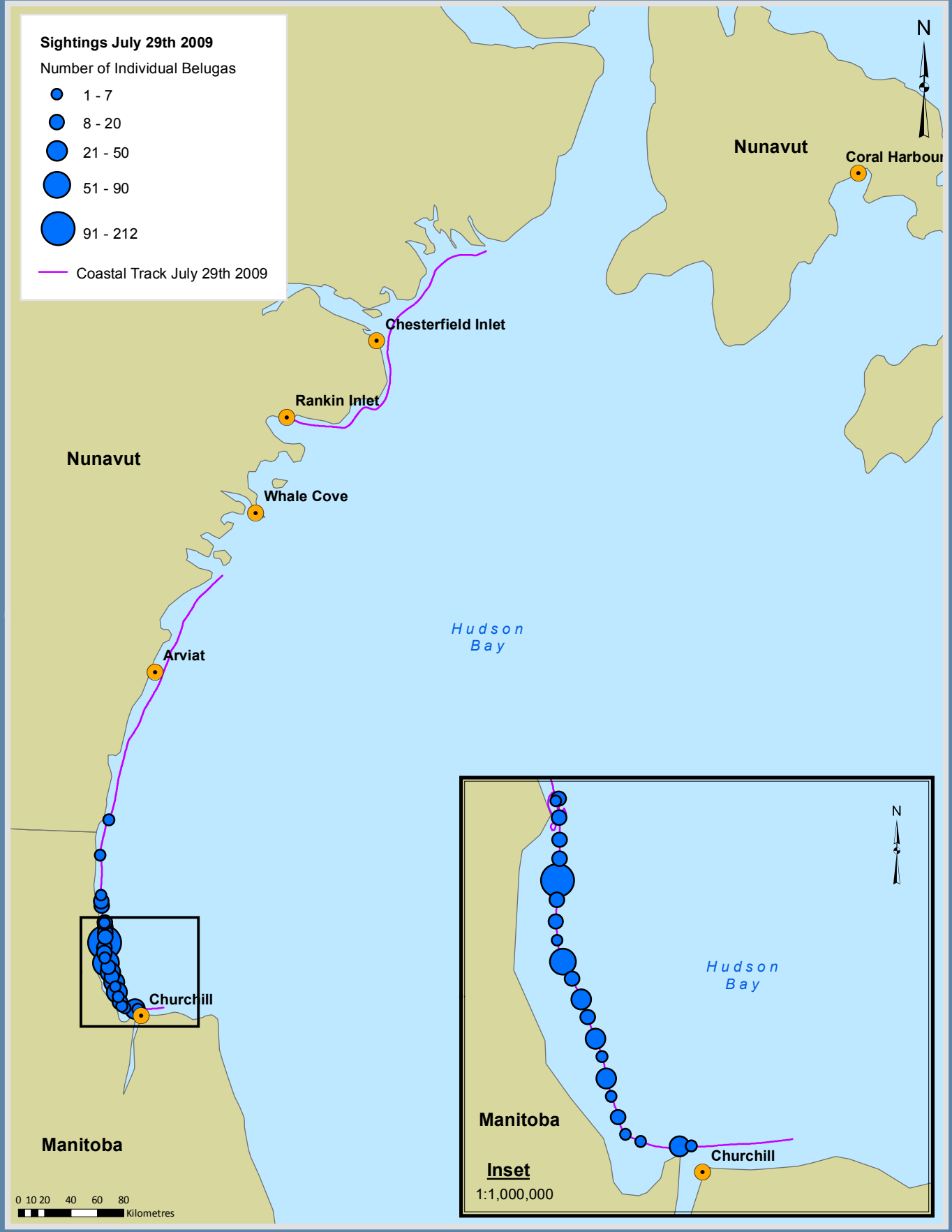
A total of 952 beluga whales were observed amongst 123 sightings from all transects flown (Figure 8.3-1). Sightings of beluga whales were most frequent in and around the Churchill River estuary, where the whales were densely congregated. Eighteen cow/calf pair sightings were observed. The northern-most beluga whale sighting occurred between Arviat and Churchill near the Manitoba/Nunavut border. Observed activities included feeding, travelling and socializing, and behaviours included swimming, diving and milling.

A total of 554 beluga whales were observed on the coastal survey, across 84 sightings (Figure 8.3-1). In contrast, 398 beluga whales amongst 39 sightings were observed along the coastal portion of the offshore transects (on section of track-line from Churchill which overlaps with the coastal area) (Figure 8.3-2). However, all of these sightings were documented along Transects 8 and 9, which spanned the Churchill River estuary. No whales were observed offshore, nor were any viewed on Transects 1 through 7.

Eleven seals were observed from six sightings (Figures 8.3-3 and 8.3-4), including one sighting of six individuals hauled out on a rocky island just off the coast between Arviat and Churchill (Appendix C). Three sightings were recorded north of Chesterfield Inlet, including an offshore sighting of a single seal. Seal species were not identified.

A group of approximately 20 walrus was observed hauled out on one of the larger ice floes (Figure 8.3-4).

A total of 16 polar bears were observed over two separate sightings (Figures 8.3-3 and 8.3-4). One sighting of 15 individuals, including cubs, was made on a rocky coastal headland just north of Churchill. Bears were observed feeding on a beluga carcass. Two passes over the spit were flown to maximize observations and to take photographs (Photo 8.3-1). A single polar bear was also seen swimming north of Churchill (Figure 8.3-4).



Projection: NAD 1983 UTM Zone 15N
Creator: SS
Date: 12/04/2009 Scale: 1:4,000,000
File: 1038926.04-001
Data Sources: *Natural Resources Canada, Geobase®, Nation Topographic Database, Areva Resources Canada Inc.*

FIGURE 8.3-1
COASTAL SURVEY EFFORT AND BELUGA SIGHTINGS FOR JULY 29, 2009
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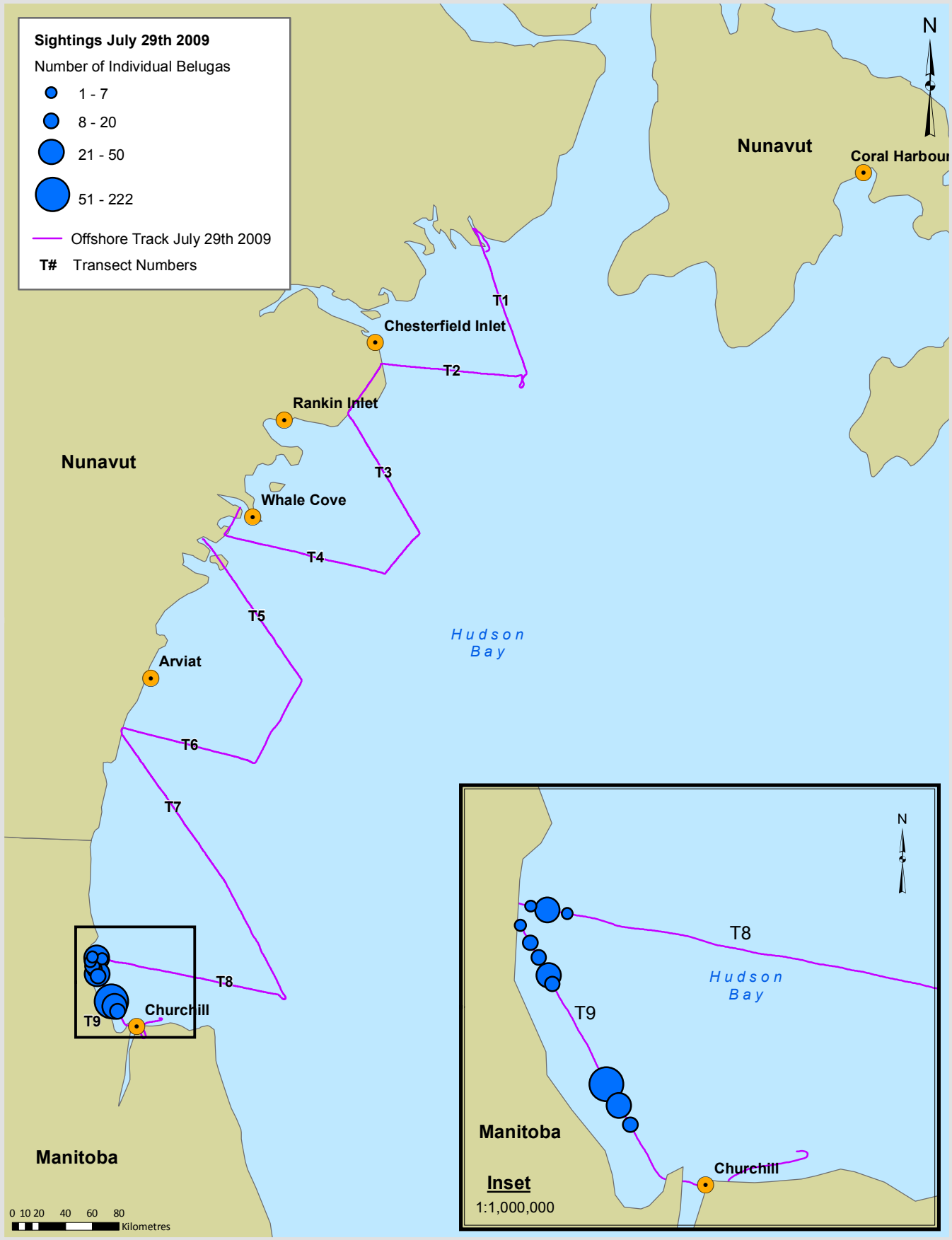

Projection: NAD 1983 UTM Zone 15N
Creator: SS
Date: 12/04/2009 Scale: 1:4,000,000
File: 1038926.04-002
Data Sources: *Natural Resources Canada, Geobase®, Nation Topographic Database, Areva Resources Canada Inc.*

FIGURE 8.3-2
OFFSHORE SURVEY EFFORT AND BELUGA SIGHTINGS FOR JULY 29, 2009
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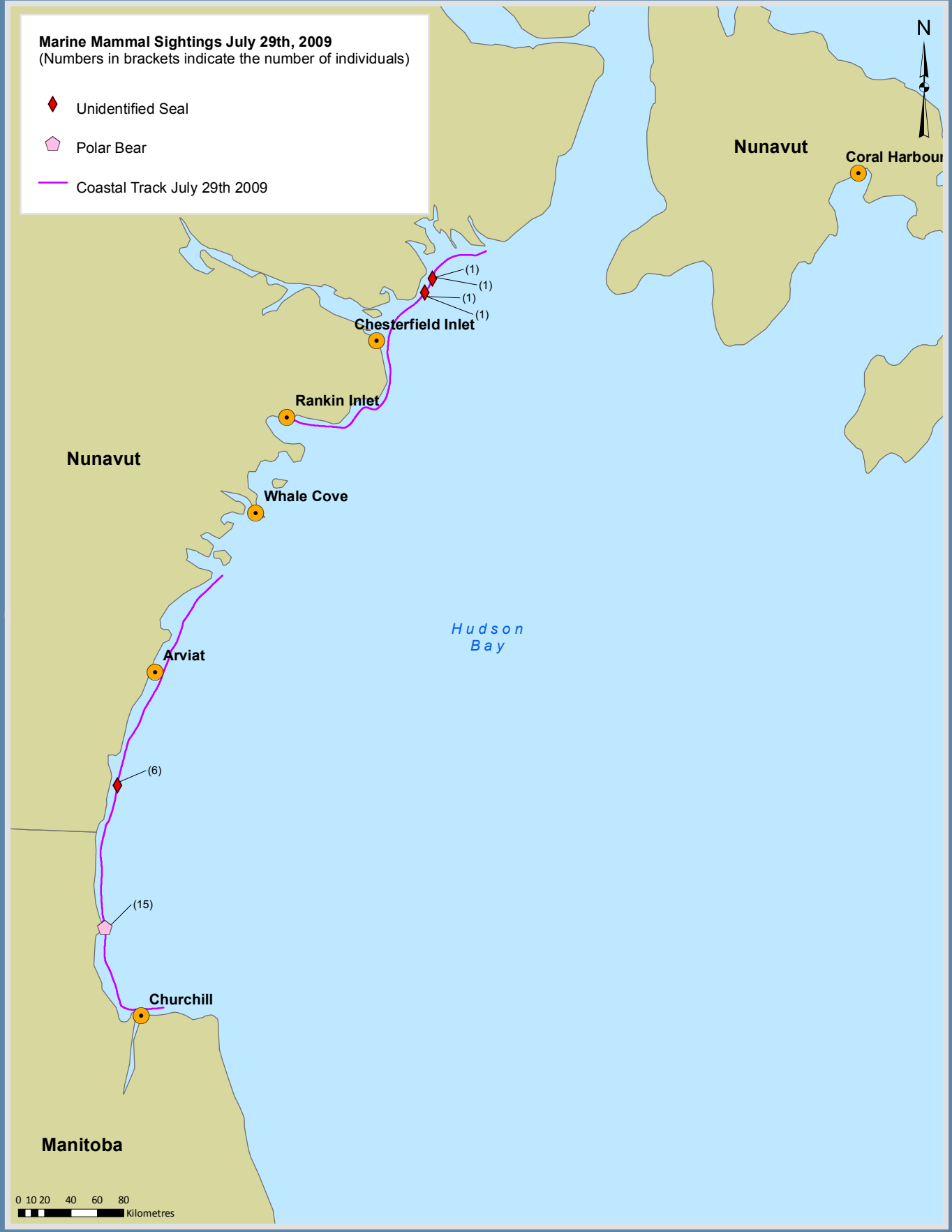

Projection: NAD 1983 UTM Zone 15N
Creator: SS
Date: 12/04/2009 Scale: 1:4,000,000
File: 1038926.04-003
Data Sources: *Natural Resources Canada, Geobase®, Nation Topographic Database, Areva Resources Canada Inc.*

FIGURE 8.3-3
COASTAL SURVEY EFFORT AND
OTHER MARINE MAMMAL SIGHTINGS
FOR JULY 29, 2009
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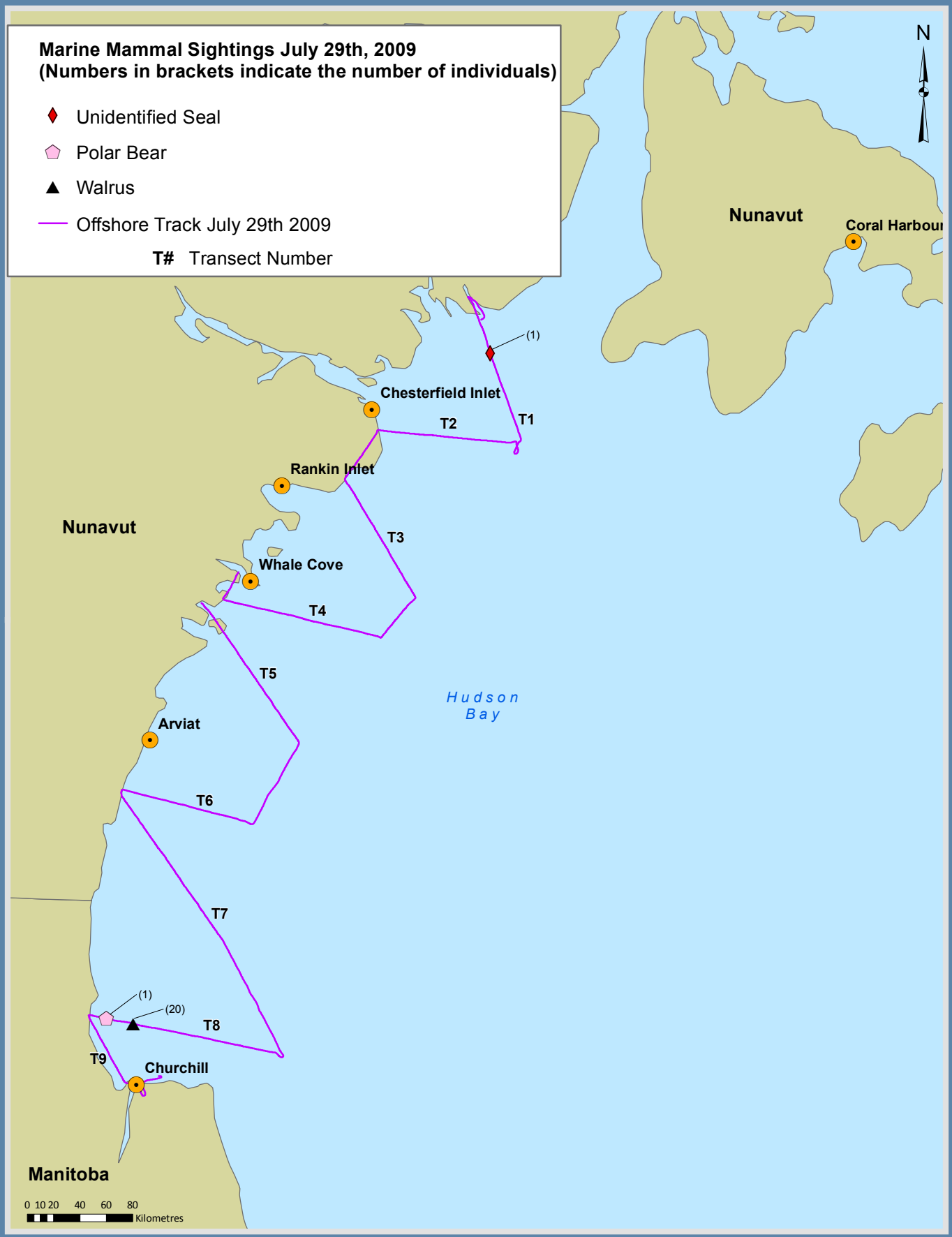

Projection: NAD 1983 UTM Zone 15N
Creator: SS
Date: 12/04/2009 Scale: 1:4,000,000
File: 1038926.04-004
Data Sources: *Natural Resources Canada, Geobase®, Nation Topographic Database, Areva Resources Canada Inc.*

FIGURE 8.3-4
OFFSHORE SURVEY EFFORT AND
OTHER MARINE MAMMAL SIGHTINGS
FOR JULY 29, 2009
KIGGAVIK PROJECT - EIS

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Photo 8.3-1 Group of Polar Bears Sighted on a Rocky Headland in between Churchill and Arviat on July 29, 2009

July 30, 2009

Favourable conditions offshore allowed the completion of all offshore transects and the coastal survey on July 30, 2009. A total of 1,855 km were flown over 8.7 hours. The ability to detect marine mammals was ranked as good throughout the day. Short periods of reduced sightability, resulting from fog and light rain (less than two hours along Transects 3 to 5 and the coast), were also recorded. Weather was predominantly overcast throughout the day. Some sea ice was encountered in the south-eastern region of the study area, just north of Churchill, along Transects 7 and 8; observations continued over the ice. The ice type was mostly brash and ranged from 1/10 to 4/10 in cover.

A total of 1,177 beluga whales were observed amongst 139 separate sightings. Again, sightings were most frequent in and around the Churchill River estuary where the whales were densely congregated. At least twenty cow/calf pair sightings were observed. The northern-most sighting was observed offshore between Rankin Inlet and Arviat along Transect 4. Observed activities included feeding, travelling and resting, and behaviours included swimming, diving and milling.

A total of 715 whales were observed on the coastal survey, across 58 sightings (Figure 8.3-5). In contrast, 462 whales were observed amongst 81 sightings along the coastal portion of the offshore transects (i.e., Transects 8 and 9, which span the Churchill River estuary) (Figure 8.3-6). Photo 8.3-2 shows three adult and one sub-adult belugas sighted along the coast between Arviat and Churchill.

Twenty seals were observed over seven independent sightings (Figures 8.3-7 and 8.3-8), including one sighting of seven individuals hauled out onshore north of Chesterfield Inlet. Three sightings were made offshore, including two along Transect 6 and one while transiting between Transects 7 and 8. Again, no species were identified.

One polar bear was observed swimming just off the coast between Arviat and Churchill, with no ice present in the field of view (Figure 8.3-7).