Aerial Infrared Survey
of
Maternal Polar Bear (*Ursus maritimus*)
Denning Habitat

Winter 2018/2019

FINAL

Prepared for:

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Survey conducted by Fairweather Science, LLC for ConocoPhillips Alaska, Inc.

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Introduction

Infrared (IR) surveys were conducted in the winter of 2018/2019 to locate potential maternal polar bear dens in the vicinity of ongoing and planned industrial operations occurring on the North Slope of Alaska. During a pre-flight meeting on November 6, 2018, the USFWS identified the specific survey areas to be flown based on the levels and types of activities to occur, as well as their location in proximity to known denning habitat. This report summarizes the results of the survey effort conducted on behalf of ConocoPhillips Alaska, Inc. (CPAI) under the Letters of Authorization (LOA) 16-13, 18-12, 18-13, and 18-14 (amended).

The areas encompassing CPAI planned activities for the winter of 2018/2019 were surveyed on December 11-14, 2018 and January 10-12, 2019, and the areas and activities included:

- Routine operations and ice road construction within the Kuparuk River Unit;
- Routine operations and ice road construction within and near the Alpine oil field in the Colville River Unit and Greater Mooses Tooth Unit;
- GMT2 Development construction activities; and,
- An exploration program in the National Petroleum Reserve – Alaska (NPRA), including geotechnical surveys, and weather station and survey monument installation.

Methods

The surveys were conducted using the Shared Services Twin Otter (DHC-6) equipped with the Star SAFIRE® 380-HD FLIR or the Star SAFIRE® III FLIR imaging system. The SAFIRE® III was installed for the last two January surveys to improve image quality, as the Star SAFIRE® 380-HD FLIR was due for maintenance. Surveys were flown between 700 and 1,500 feet above ground level, depending on weather conditions.

Prime terrestrial maternal polar bear denning habitat in northern Alaska has been identified as snow drifts that form on banks or bluffs measuring ≥16° in slope and ≥1.3 m in height (Durner et al., 2001). These features have been mapped as denning habitat (Durner et al., 2001; Durner et al., 2006; Blank, 2012; Durner et al., 2013), and were overlaid with the current proposed industrial activities. The crew utilized Global Positioning System coordinates, computer mapping software, and visual ground references to target these areas of overlap in-flight. The survey coordinator directed the pilots and IR operator to ensure adequate coverage of target areas and acquisition of high-quality imagery. When

necessary, due to survey limiting factors such as environmental conditions, effort was duplicated to provide sufficient coverage.

High probability denning habitat, e.g. along the barrier islands, outside of the planned areas of activity were surveyed in order to calibrate the IR equipment. The locations of potential polar bear dens (Hotspots) observed outside of CPAI's operations were transferred directly to the USFWS and are not addressed in this report.

Survey times, locations, and flight crew are shown in Tables 1 and 2. Reported weather conditions at nearby airports are shown in Tables 3-9.

Survey Activities

On December 11-14, 2018 and January 10-12, 2019, potential denning habitat, including drainages, bluffs, and channels conducive to adequate snow drifting, was surveyed near the CPAI project areas. Survey area and aircraft flight tracks are shown in Figures 1-2. The January surveys focused on the northernmost, and coastal areas as a follow up to the December 2018 surveys.

Results

Heat signatures indicative of potential dens were not observed within the CPAI area of operations surveyed. Video imagery was reviewed by the Fairweather Science project data manager post-flight to identify potential locations to re-survey, and video files were made available to USFWS via Egnyte (a document storage and sharing website). CPAI will also receive the survey data to accompany this report.

Summary

Aerial IR survey equipment and techniques, while the recognized standard methodology for locating and evaluating potential polar bear dens, may not detect 100% of the dens inhabited in the survey area. Operations should be completed with caution in all areas. USFWS will advise CPAI on any supplemental findings (e.g. locations of collared bear den locations) once available.

Table 1. December Survey Summary

Aircraft	Shared Services Twin Otter (DHC-6) [N842AR]			
Sensor	Star SAFIRE® 380-HD FLIR			
Pilot	John Gregorio (Dec 11), Mike Watson (Dec 12-14)			
Co-Pilot	Steve Jones (Dec 11), Marcus Durrett (Dec 12-14)			
FLIR Operator	Bryan Nelson (Dec 11), Ross Bennett (Dec 12-14)			
Survey Coordinator	Justin Blank			
Observer	Kathleen Leonard			
Area Surveyed	NPR-A, CRD, Areas in Kuparuk			
Survey Date	Dec 11	Dec 12	Dec 13	Dec 14
Departed	16:14	17:55	17:37	17:50
Landed	20:05	20:23	20:28	20:55
Notes	• Departed and landed at Alpine airstrip. • Barrier islands were surveyed for calibration before or after effort in the CPAI survey area. • No potential dens were detected in the survey area.			

Table 2. January Survey Summary

Aircraft	Shared Services Twin Otter (DHC-6) [N842AR]		
Sensor	Star SAFIRE® 380-HD FLIR (Jan 10) Star SAFIRE® III FLIR (Jan 11-12)		
Pilot	Larry Shue		
Co-Pilot	Marcus Durrett		
FLIR Operator	Ross Bennett		
Survey Coordinator	Justin Blank		
Observer	Kathleen Leonard		
Area Surveyed	NPR-A, CRD, Areas in Kuparuk		
Survey Date	Jan 10	Jan 11	Jan 12
Departed	17:06	18:08	16:51
Landed	18:47	20:55	18:48
Notes	• Departed and landed at Kuparuk airstrip. • Barrier islands were surveyed for calibration before effort in the CPAI survey area. • Due to the forecast for deteriorating weather trends the January surveys did not cover all project areas, and were focused on the coastal and northern habitat where dens most often occur. • No potential dens were detected in the survey area.		

Table 3. Weather Conditions on December 11, 2018

	Alpine (PALP)	**Deadhorse (PASC)**	**Kuparuk (PAKU)**	**Nuiqsut (PAQT)**	**Point Thomson (PAAD)**
Time (AKST)	15:45	15:53	15:45	15:53	16:15
Temperature (Celsius)	-24.0	-21.7	-24.0	-23.9	-21.0
Dew Point (Celsius)	-27.0	-24.4	-26.0	-26.1	-23.2
Altimeter (cmHg)	29.46	29.41	29.43	29.45	29.4
Wind Direction (magnetic)	50	60	50	50	80
Wind Speed (knots)	13	20	18	17	19
Visibility (miles)	3	3	1.5	2.5	1.5
Ceiling (feet)	4,500	4,700	4,600	4,700	1,800
Cloud Cover (feet)	OVC @ 4,500	OVC @ 4,700	OVC @ 4,600	OVC @ 4,700	OVC @ 1,800
Notes	Light snow Blowing snow	Mist	Light snow Low drifting snow Mist	Mist Unknown precip	Light snow

Table 4. Weather Conditions on December 12, 2018

	Alpine (PALP)	**Deadhorse (PASC)**	**Kuparuk (PAKU)**	**Nuiqsut (PAQT)**	**Point Thomson (PAAD)**
Time (AKST)	17:58	17:53	17:47	17:53	17:55
Temperature (Celsius)	-33.0	-32.2	-31.0	-35.0	-30.8
Dew Point (Celsius)	-37.0	-35.6	-34.0	-	-34.0
Altimeter (cmHg)	29.56	29.54	29.54	29.57	29.55
Wind Direction (magnetic)	220	240	270	230	250
Wind Speed (knots)	4	10	3	5	10
Visibility (miles)	15	7	10+	9	10+
Ceiling (feet)	1,700	1,700	1,500	2,200	6,000
Cloud Cover (feet)	BKN @ 1,700 BKN @ 3,800	FEW @ 600 OVC @ 1,700	BKN @ 1,500	BKN @ 2,200 OVC @ 2,800	SCT @ 3,700 OVC @ 6,000
Notes	-	-	-	-	-

Table 5. Weather Conditions on December 13, 2018

	Alpine (PALP)	**Deadhorse (PASC)**	**Kuparuk (PAKU)**	**Nuiqsut (PAQT)**	**Point Thomson (PAAD)**
Time (AKST)	17:45	17:53	17:53	17:53	17:35
Temperature (Celsius)	-25.0	-27.8	-29.0	-24.4	-28.5
Dew Point (Celsius)	-28.0	-30.6	-32.0	-27.2	-32.0
Altimeter (cmHg)	29.63	29.60	29.61	29.62	29.60
Wind Direction (magnetic)	70	-	-	80	260
Wind Speed (knots)	6	Calm	Calm	4	4
Visibility (miles)	15	10	10+	9	10+
Ceiling (feet)	2,800	1,200	800	3,000	at least 12,000
Cloud Cover (feet)	OVC @ 2,800	OVC @ 1,200	BKN @ 800 BKN @ 1,500	OVC @ 3,000	SKC below 12,000
Notes	Light snow	-	-	-	-

Table 6. Weather Conditions on December 14, 2018

	Alpine (PALP)	**Deadhorse (PASC)**	**Kuparuk (PAKU)**	**Nuiqsut (PAQT)**	**Point Thomson (PAAD)**
Time (AKST)	17:45	17:53	18:45	17:53	17:55
Temperature (Celsius)	-23.0	-27.8	-25.0	-23.9	-30.0
Dew Point (Celsius)	-26.0	-30.6	-27.0	-26.1	-33.1
Altimeter (cmHg)	29.55	29.54	29.53	29.56	29.55
Wind Direction (magnetic)	20	220	240	220	220
Wind Speed (knots)	10	11	10	8	10
Visibility (miles)	10+	10+	10+	2.5	10+
Ceiling (feet)	-	at least 12,000	at least 12,000	4,200	at least 12,000
Cloud Cover (feet)	-	FEW @ 7,000 FEW @ 9,500	FEW @ 6,500	OVC @ 4,200	SKC below 12,000
Notes	Light snow	-	-	Light snow Mist	-

Table 7. Weather Conditions on January 10, 2019

	Alpine (PALP)	**Deadhorse (PASC)**	**Kuparuk (PAKU)**	**Nuiqsut (PAQT)**	**Point Thomson (PAAD)**
Time (AKST)	16:45	16:53	16:45	16:53	16:55
Temperature (Celsius)	-38.0	-34.4	-37.0	-38.9	-34.5
Dew Point (Celsius)	-42.0	-	-40.0	-	-37.5
Altimeter (cmHg)	30.41	30.38	30.39	30.40	30.38
Wind Direction (magnetic)	Variable	240	280	170	250
Wind Speed (knots)	2	8	4	4	8
Visibility (miles)	15	3	3	10+	7
Ceiling (feet)	12,000	3,500	4,400	At least 12,000	7,000
Cloud Cover (feet)	SCT @ 3,500 BKN @12,000	SCT @ 2,000 OVC @ 3,500	FEW @ 3,000 BKN @4,400 BKN @ 14,000	FEW @ 4,500 FEW @ 10,000 SCT @ 12,000	SCT @ 2,900 BKN @ 7,000 OVC @ 10,000
Notes	-	Light snow Mist	Mist	-	-

Table 8. Weather Conditions on January 11, 2019

	Alpine (PALP)	**Deadhorse (PASC)**	**Kuparuk (PAKU)**	**Nuiqsut (PAQT)**	**Point Thomson (PAAD)**
Time (AKST)	18:07	17:53	17:45	17:53	17:55
Temperature (Celsius)	-32.0	-33.3	-31.0	-32.2	-34.0
Dew Point (Celsius)	-36.0	-36.7	-34.0	-34.4	-37.5
Altimeter (cmHg)	30.26	30.23	30.24	30.26	30.23
Wind Direction (magnetic)	30	240	50	30	240
Wind Speed (knots)	10	6	7	6	12
Visibility (miles)	15	10+	10+	9	10+
Ceiling (feet)	2,100	2,300	2,200	2,400	2,200
Cloud Cover (feet)	BKN @ 2,100 BKN @ 9,000	OVC @ 2,300	BKN @ 2,200	OVC @ 2,400	OVC @ 2,200
Notes	-	-	-	-	-

Table 9. Weather Conditions on January 12, 2019

	Alpine (PALP)	**Deadhorse (PASC)**	**Kuparuk (PAKU)**	**Nuiqsut (PAQT)**	**Point Thomson (PAAD)**
Time (AKST)	16:50	16:53	16:45	16:44	16:55
Temperature (Celsius)	-40.0	-40.6	-40.0	-41.4	-
Dew Point (Celsius)	-44.0	-	-43.0	-	-
Altimeter (cmHg)	30.38	30.35	30.36	30.37	30.36
Wind Direction (magnetic)	-	-	Variable	-	-
Wind Speed (knots)	Calm	Calm	2	Calm	Calm
Visibility (miles)	10+	3	5	4	10+
Ceiling (feet)	At least 12,000	At least 12,000	At least 12,000	200	At least 12,000
Cloud Cover (feet)	FEW @ 200	SCT @ 200	Clear skies	OVC @ 200	SKC below 12,000
Notes	-	Mist	Mist	Haze	-

MAP

Figure 1. December 2018 Survey Flight Tracks

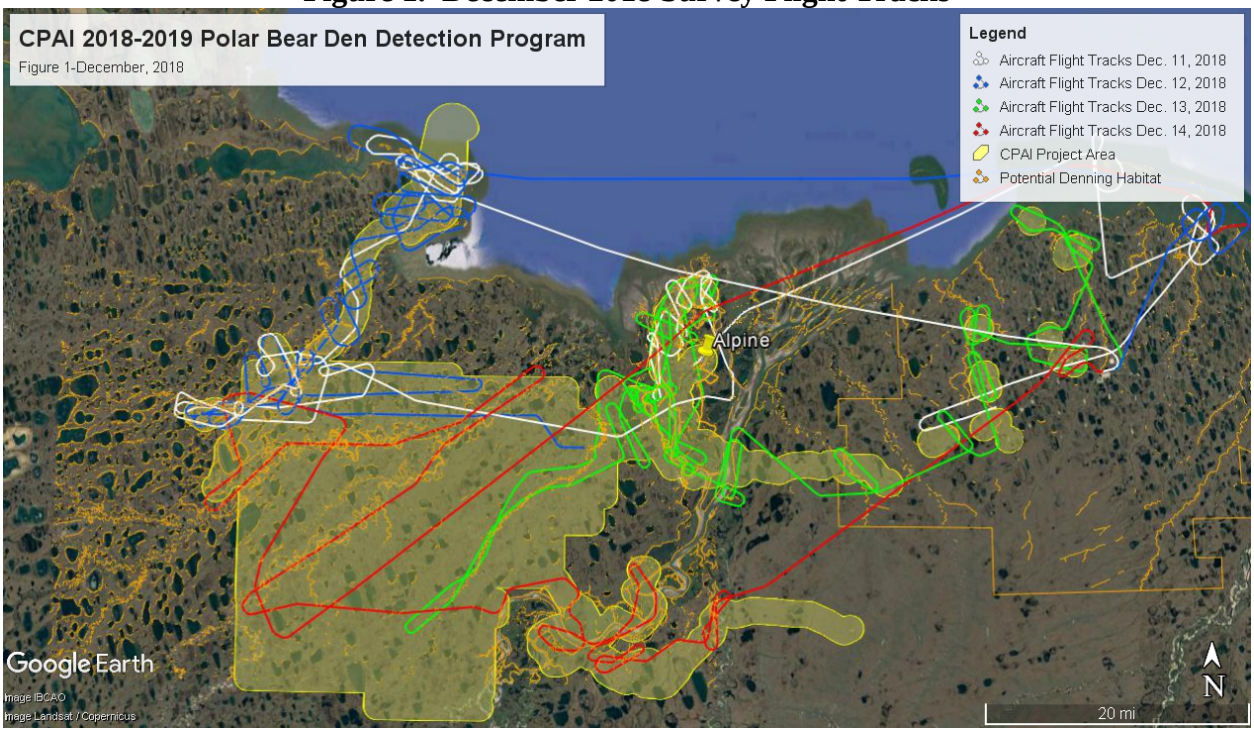
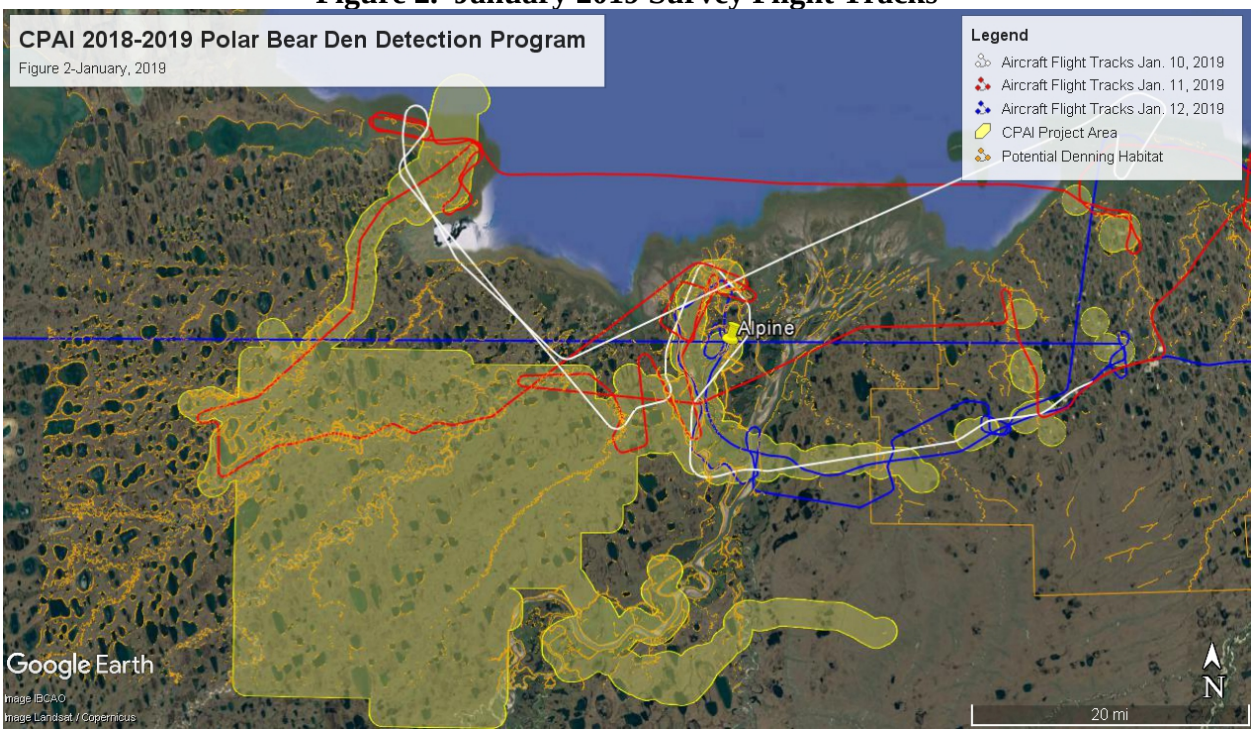


Figure 2. January 2019 Survey Flight Tracks



References

Blank, J. J. (2012, December). Remote Identification of Polar Bear (Ursus maritimus) Denning Habitat on the Colville River Delta.

Durner, G. M., Amstrup, S. C., & Ambrosious, K. J. (2001, June). Remote Identification of Polar Bear Maternal Den habitat in Northern Alaska. *Arctic, 54*(2), 115-121.

Durner, G. M., Amstrup, S. C., & Ambrosius, K. J. (2006, March). Polar Bear Maternal Den Habitat in the Arctic National Wildlife Refuge, Alaska. *Arctic, 59*(1), 31-36.

Durner, G. M., Simac, K., & Amstrup, S. C. (2013, June). Mapping Polar Bear Maternal Denning Habitat in the National Petroleum Reserve-Alaska with an IfSAR Digital Terrain Model. *Arctic, 66*(2), 197-206.