

Appendix B

Impacts of aircraft on subsistence: excerpts from BLM NPRA NEPA analyses 2012-2020

2012 IAP

Vol 1 468	Beginning in the summer of 2008, the BLM has implemented a flight following process with all authorized helicopter landings and takeoffs north of latitude 70° North in the NPR-A. This process is a result of the programmatic consultation the BLM conducts each spring with the U.S. Fish and Wildlife Service per the Endangered Species Act. The data has shown a concentration of flight paths around winter and summer oil and gas project areas. There are a large number of landings and takeoffs associated with a typical flight, i.e., most helicopter flights in the summer are not long distance, but rather short hops highly concentrated in exploration projects in the Fish Creek, Judy Creek, and Tingmiagsivik (Ublutuoch) River drainages and the Simpson Peninsula area. For aircraft operating south of latitude 70° North, the BLM monitors its own contracted helicopters and any other aircraft that uses the Automated Flight Following system. Aircraft are reaching all parts of the NPR-A for a variety of purposes: recreation, research, land management, and industry-related activities. Several commercial air taxis and transporters fly guides and visitors into remote areas to backpack, hunt, and float rivers primarily on the Colville, Etivluk, Nigu and the Utukok rivers.
Vol 2 7	Access to NPR-A is typically by aircraft, and approximately 1,000 helicopter take offs and landings were expected for the 2012 environmental studies. Field crews (currently 20 to 50 personnel) and helicopters are based at previously established commercial camps at Wainwright, Atqasuk, or Umiat.
11-12	Aircraft, both fixed-wing and helicopter, would provide access for many oil and gas field activities. This could include air support for seismic surveys and exploratory drilling; aerial surveys and support for ground surveys of wildlife, archaeological, and other resources; road and pipeline route surveys; pipeline inspections; and support for other development, operations, and abandonment activities. The location, timing, and frequency of such flights and the type of aircraft used will be influenced by the phase of oil exploration, development, and operations; the location of any oil discovered; the type of development that might occur; as well as restrictions that the BLM and other regulators might place on the lessee or permittee. While a very accurate projection of the number of flights is not possible, the following examples give some indication of the number of flights at different stages of oil and gas exploration and development: <ul style="list-style-type: none"> <li>• Commonly at least three summer helicopter surveys for resources (archaeological, lakes, and fish) are required for each exploratory well prior to drilling, and additional trips would be necessary to identify the best access routes and stream crossings.</li> </ul>

	<ul style="list-style-type: none"> <li>• Construction-related flights during the development of the Alpine Central Processing Facility and its CD-2 satellite pad ranged from approximately 6 one-way flights a day during winter (nearly all by single or twin engine planes) to approximately 20 round-trip flights daily during the summer (nearly all helicopter or single or twin engine planes).</li> <li>• In analyzing the impacts of development of five satellite production pads for Alpine, one of which would not be connected by a road, the BLM in 2004 (USDO I BLM 2004b) projected that: <ul style="list-style-type: none"> <li>○ "non-operational" helicopter flights for such activities as environmental studies and monitoring and travel for important people and government agency personnel may result in 2,500 summer helicopter flights annually (this would be in addition to an equal number of such non-operational helicopter flights associated with the existing Alpine Central Processing Facility and its existing CD-2);</li> <li>○ during an approximately six-year construction phase, there would be an average of 45 to 70 round-trip operational aircraft flights per month during winter (some months as high as 245 such flights) and 0 to 340 one-way operational flights per month during the summer (some months as high as 615 such flights);</li> <li>○ during the drilling phase that would occur over the same number of years, there would be approximately 70 to 90 one-way operational flights per month during both summer and winter;</li> <li>○ once operations began flights would average 8 to as many as 32 flights in winter per month and 8 to as many as 80 flights per month in summer.</li> </ul> </li> </ul>
95	<p>In addition, helicopter and fixed-wing aircraft activities are likely to occur each summer. Additional flights would originate out of Deadhorse, Prudhoe Bay, Barrow, and other airfields on the North Slope. . . . Regardless of development phase, it is anticipated that helicopter use would occur throughout the planning area under all alternatives.</p>
167	<p>Cleanup activities at sites in the NPR-A that are not associated with oil and gas activities but require cleanup (e.g., military sites) may involve the use of fixed-wing aircraft or helicopters to access the sites. . . . Support of seismic surveys and other exploration activities would include the use of both fixed-wing aircraft and helicopter.</p>
175, 242	<p>Aircraft, both fixed-wing and helicopter, would provide access for oil and gas-related activities throughout the development, operation, and abandonment of any oil or gas field developed in the NPR-A. This could include air support for ground surveys of wildlife, archaeological, hydrological, aerial surveys for other resources; road and pipeline route surveys; pipeline inspections; and support for many other development, operation, and abandonment activities. The location, timing, and frequency of such flights and the type of aircraft used will be influenced by the phase of oil and gas development and operation, the location of any oil or gas discovered, the type of development that might occur, as well as restrictions that the BLM and</p>

	<p>other regulators might place on the lessee or permittee (see the section “Description of Typical North Slope Oil and Gas Activities” on page 7 for a discussion of potential number of flights associated with various activities). . . . Gollop et al. (1974b) and Ward et al. (1999) suggested that helicopters may be more disturbing to wildlife than low-flying fixed-wing aircraft, although Balogh (1997) indicated that fixed-wing aircraft flown at 150 feet above ground level often caused spectacled eiders to flush, while helicopters flown at similar altitudes in the vicinity of Prudhoe Bay did not.</p>
188	<p>Potential causes of disturbance to terrestrial mammals from inventory or research activities and overland moves would be helicopter traffic, fixed-wing aircraft traffic (see “Logistics” in section 4.2.1.2), vehicular traffic on ice or snow roads, and humans on foot. Caribou have been shown to exhibit panic or violent, running reactions to aircraft flying at elevations of approximately 160 feet and to exhibit strong escape responses (animals trotting or running) to aircraft flying at 150 to 1,000 feet (Calef et al. 1976). These documented reactions were responses to aircraft that circled and repeatedly flew over caribou groups.</p>
206	<p>Caribou could be temporarily exposed to helicopter traffic and other human activities associated with resource inventories, seismic operations, exploratory drilling, and pipeline construction, but such exposure would not be expected to have any effects at the population level.</p>
234	<p>Aerial surveys for wildlife in the planning area could include fixed-wing aircraft and helicopter surveys. . . . Cleanup activities at abandoned sites in the planning area could involve the use of fixed-wing aircraft or helicopters to access the sites. The effects of this traffic would be similar to those described above for mobilizing and re-supplying summer camps. . . .</p>
251	<p>Summer fixed-wing or helicopter aircraft activity in support of oil and gas exploration, including related research, could result in disturbance to special status species, causing temporary or permanent displacement from preferred feeding, nesting, staging, or brood-rearing habitats in localized areas near areas of activity. Most aircraft disturbance during exploration would be confined to the area within approximately 2,300 feet of the site, and little disturbance would be likely beyond 6,500 feet.</p>
287	<p>Under Alternative A, it is anticipated that there will be a certain level of aircraft activity associated with the management of the NPR-A, including aircraft activity in support of research, surveying crews, or other projects. This aircraft activity includes fixed-wing surveys, such as those conducted to determine wildlife populations; point-to-point flights by both fixed-wing aircraft and helicopters; and helicopter-supported surveys. Aircraft operating under a BLM permit for non-oil and gas projects would be required to follow the stipulated altitude and activity rules; however, the BLM would have no authority over private aircraft not associated with</p>

	<p>permitted activities. It is anticipated that most non-oil and gas aircraft activity would occur during the summer months in support of research or other projects; however, aircraft use could also occur during the winter in support of remediation or clean-up work, as well as some climate research activities.</p> <p>Of all non-oil and gas activities, aircraft use, especially the use of helicopters, has the most potential to disrupt subsistence use in the planning area.</p>
288	<p>Helicopters are commonly used in support of most field activities in the NPR-A as a result of the limited amount of adequate landing areas for fixed-wing aircraft and the lack of road or trail systems. Statements from local hunters, including direct complaints to the BLM and the North Slope Borough Department of Wildlife Management, indicate that helicopters frequently disrupt hunting parties by scattering and displacing caribou or other game. This can also result in a missed harvest because hunters are reluctant to take a “spooked” animal because the meat has a bad flavor (USDOI BLM Subsistence Advisory Panel 2002, 2004, 2005, 2006a, 2006b). This type of disrupted harvest directly impacts the hunter in terms of lost time, effort, and resources (primarily fuel). Subsistence harvesters also describe the stress that occurs when they are out hunting, hear a helicopter operating nearby, and worry that the helicopter will approach and disrupt the hunt.</p>
293	<p>Summer activities associated with exploratory drilling would result in impacts to subsistence resources and users similar to those discussed above under non-oil and gas activities—namely, displacement of resources due to aircraft or watercraft use; impacts to hunters from disrupted hunts; and possible increase in the amount of time, effort, and fuel needed to harvest displaced animals. Commonly at least three summer helicopter resource surveys are required for each exploratory well prior to drilling and additional trips are needed to identify access routes and stream crossings.</p>
294	<p>After construction is completed, the production phase would begin. Because the development would be roadless (i.e., not connected to outside oil and gas infrastructure by gravel road, although gravel roads would be constructed between the productions and the central processing facility), primary access to the area would be by aircraft. Although a reliable projection of the number of flights is not possible, development of five satellite production pads for Alpine was estimated to result in 2,500 “non-operational” helicopter flights per summer in addition to the equal number associated with the existing central processing facility and satellite. An average of 45 to 70 one-way flights per month was estimated to occur in the winter during an approximately six-year construction phase, with as many as 245 such flights during certain months, and 0 to 340 such flights in the summer with as many as 615 per month. Approximately 70 to 90 operational flights per month could occur per month during winter and summer, and once operations began flights could average 8 to as many as 32 flights in winter per month and 8 to as many as 80 flights per month in summer.</p>

441	Subsistence users have repeatedly stated during scoping meetings that aircraft traffic reduces harvest access and success (Nukapigak 1998; Ahtuanguruak 2003; Kaigelak 2003; Olemaun 2003). Disrupted harvests directly impact hunters in terms of lost time, effort, and resources (primarily fuel). Subsistence harvesters also describe the stress that occurs when they are out hunting, hear a helicopter operating nearby, and worry that the helicopter will approach and disrupt the hunt.
443	Summer activities associated with exploratory drilling involving the use of helicopters for access would result in displacement of resources due to aircraft or watercraft use; impacts to hunters from disrupted hunts; and possible increase in the amount of time, effort, and fuel needed to harvest displaced animals.
477	Environmental noise may cause annoyance or sleep disturbance for those who experience it; this is most likely to be people on the land or in cabins who are affected by helicopter traffic or overflights.
Vol 3 78, 192, 303	Subsistence harvesters also describe the stress that occurs when they are out hunting, hear a helicopter operating nearby, and worry that the helicopter will approach and disrupt the hunt.
80	Summer activities associated with exploratory drilling involving the use of helicopters for access would result in displacement of resources due to aircraft or watercraft use; impacts to hunters from disrupted hunts; and possible increase in the amount of time, effort, and fuel needed to harvest displaced animals.
116, 229, 339	Environmental noise may cause annoyance or sleep disturbance for those who experience it; this is most likely to be people on the land or in cabins who are affected by helicopter traffic or overflights.
194	Summer activities associated with exploratory drilling involving the use of helicopters for access would result in displacement of resources due to aircraft or watercraft use; impacts to hunters from disrupted hunts; and possible increase in the amount of time, effort, and fuel needed to harvest displaced animals. Given the increase in proposed activity under Alternative C, the effects on subsistence use could be increased in extent and duration.
305	Summer activities associated with exploratory drilling involving the use helicopters for access would result in displacement of resources due to aircraft or watercraft use; impacts to hunters from disrupted hunts; and possible increase in the amount of time, effort, and fuel needed to harvest displaced animals. Given the increase in proposed activity under Alternative D, the effects on subsistence use could be increased in extent and duration.

Vol 4 35	<i>Beaufort Sea Development</i> In deeper water, bottom-founded structures and drillships would require supply vessels and helicopter support because they would not be accessible for vehicles. . . . The offshore production platform would be accessed by helicopter, barge, and in nearshore areas, by a winter ice road. . . . The Bureau of Ocean Energy Management assumed that to transport the oil and gas would require 423 miles of offshore pipelines and 290 miles of onshore pipelines. The wells would require 30 service vessel and 30 helicopter trips/week.
129	Helicopter activity, barge and crew vessel traffic, and spill response training activities do occur during the summer. During the summer open-water seasons of 2001 and 2002 at the Northstar development off Prudhoe Bay, helicopter activity ranged from 477 to 989 round trips, crew vessel activity ranged from 469 to 824 round trips, and barge traffic ranged from 63 to 64 round trips (Williams 2002, Williams and Rodrigues 2003). . . .
131	During exploration drilling, operations would be supported by both helicopters and supply vessels. Helicopters would probably fly from Barrow or Wainwright at a frequency of 1-3 flights per day. Support vessel traffic would be 1-3 trips per week, also out of Barrow or Wainwright. . . . In deeper water, bottom-founded structures and drillships would require supply vessels and helicopter support.
144	Aircraft disturbance of terrestrial mammals associated with resource inventory and survey activities (particularly by helicopter traffic) would be expected to have short-term effects on some caribou, moose, muskoxen (particularly cow/calf groups) and bears, with animals being briefly displaced from preferred feeding and resting areas when aircraft disturbances occur nearby. Unless they were to occur multiple times per day and over many days, it is not expected that these types of disturbances would have effects that persist and accumulate.
174	Gollop et al. (1974b) and Ward et al. (1999) suggested that helicopters may be more disturbing to wildlife than low-flying fixed-wing aircraft, although Balogh (1997) indicated that fixed-wing aircraft flown at 150 feet above ground level often caused spectacled eiders to flush, while helicopters flown at similar altitudes in the vicinity of Prudhoe Bay did not.
241	Aircraft have interfered with hunts by scaring game away from hunters, and an increase in air traffic by fixed-wing aircraft and helicopters would make this worse and over a much greater area if development goes forward. Oil and gas development is impacting traditional use areas and the ability of the Iñupiaq to pass on knowledge of subsistence resources in these area, and use of these resources, to their children.

183	While it is not possible to project an exact number of flights required for prospective oil and gas developments, information in the IAP/DEIS provides some insight into the potential scale of development-related air traffic. Based on analysis of activity associated with projected development of Alpine satellite fields, the BLM estimated: up to 2,500 “non-operational” summer helicopter flights annually; during a six-year construction phase, up to 340 one-way “operational” flights per month in the summer (some months as high as 615 flights); during the drilling phase, approximately 70-90 one-way operational flights per month summer and winter; and during satellite field operations, up to 80 flights per month in the summer. [55]
269	Northern Center: [26.030] p. 11. The BLM must provide actual numbers of aircraft flights, including fixed wing and helicopter, or describe the basis used to calculate these estimates. Aircraft disturbance is a significant source of effects on wildlife and people ranging from subsistence to recreational users of the area.
431	Shell comments: IAP/EIS lacks sufficient analysis of potential environmental studies: Various types of environmental studies are required to support oil and gas exploration and development in remote areas such as the NPR-A. Such studies include cultural resource surveys, fish and wildlife surveys, habitat surveys, physiographic studies, and hydrological studies. There is insufficient assessment of these studies in the Draft IAP/EIS and no specific impact analyses. Shell is presently conducting some such studies and plans to conduct additional studies in future years, and requests that BLM provide additional descriptions of these types of studies and corresponding environmental impact analyses of typical or hypothetical studies in the IAP/EIS. BLM's analyses should include projects with helicopter support with 1,000 or more landings and take-offs, field crews totaling 50 persons or more, and housing of these crews in either existing camps in villages or remote/temporary camps in the NPR-A. These types of studies are critical for pipeline siting and design, and it is important that they are considered in the subject NEPA analysis from which project specific analyses can be tiered in the future.
467	R. Ahtuanguaruk: I wish we had the depth of people here that could say how many times they came across a helicopter already this nigliq season, how many times they had overflight activity from planes this nigliq season, how many times they had impacts out on the ice or even here in Barrow
Vol. 6, 4	Numerous studies are conducted on a year-round basis on the North Slope, including aerial surveys by fixed-wing aircraft or helicopter, or ground surveys on foot or by off-highway vehicle, all of which have the potential to disturb animals. The most frequent complaint voiced by local subsistence users is that a large amount of aerial disturbance to animals occurs each field season in conjunction with scientific studies (Subsistence Advisory Panel Minutes, November 16, 2011 meeting and August 22, 2002 meeting). Many of the scientific studies that currently occur are a result of stipulations imposed on oil and gas activities in the planning area; however, these

	<p>same mandatory stipulations serve to minimize the potential effects of conducting research. Based on the analysis presented in Chapter 4 (Environmental Consequences), the effects of non-oil and gas activities on the species utilized by subsistence users are expected to be localized and short-term, and to have no regional population effects.</p>
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2020 IAP

<p>Vol. 1, 3- 157</p>	<p>Additional helicopter, boat, and human activity likely would occur throughout the life of any project, associated with pipeline inspection and maintenance, surveying, tundra cleanup (i.e., stick-picking), and spill prevention and response activities on waterways.</p>
<p>2-30</p>	<p><i>ROP F-3: Minimum Flight Altitudes</i> Objective: Minimize the effects of low-flying aircraft on wildlife, subsistence activities, and local communities.</p> <p>Requirement/Standard: Aircraft flights for permitted activities (fixed-wing and helicopters, unless specified), except for takeoffs and landings, shall maintain the following minimum altitudes agl during the dates and in the areas defined, unless doing so would endanger human health and safety or violate safe flying practices, or if the purpose of the flight requires constant sight of the ground, such as sighting of permitted wildlife or for archaeological or engineering survey flights or ice road planning and cleanup: a. April 15–August 15—1,500 feet agl within 0.5 miles of cliffs identified as raptor nesting sites b. March 15–August 15—1,500 feet agl within 0.5 miles of known gyrfalcon nest sites c. May 20–August 20—All aircraft use in the Goose Molting Area should be minimized. d. December 1–May 1—1,500 feet agl over caribou winter ranges e. May 20–August 20—1,500 feet agl over the TCH Habitat Area and over the Utukok River Uplands Special Area f. Fixed-wing—2,000 feet agl when within 0.5 miles of walrus haul-outs g. Helicopters—3,000 feet agl and a 1-mile buffer from walrus haul-outs h. Aircraft—3,000 feet agl when within 1-mile of aggregations of seals.</p> <p><i>ROP F-3: Minimum Flight Altitudes</i> Objective: Minimize the effects of low-flying aircraft on wildlife, subsistence activities, and local communities.</p> <p>Requirement/Standard: Except for takeoffs and landings, manned aircraft flights for permitted activities (fixed-wing and helicopters, unless specified) shall maintain a 1,500-foot minimum altitude agl unless doing so would endanger human health and safety or violate safe flying practices, or if the purpose of the flight requires constant sight of the ground, such as sighting of wildlife or for archaeological or engineering survey flights or ice road planning and cleanup. Exceptions to the 1,500-foot agl minimum altitude are listed below: a. Single-engine manned aircraft and unmanned</p>



	<p>aircraft systems devices should not knowingly fly within 0.5 miles of walrus haul-outs; or, if required, then maintain 2,000 feet agl when within 0.5 miles of walrus haul-outs. b. Helicopters and multi-engine aircraft should not knowingly fly within 1 mile of walrus haul-outs; or, if required, then maintain 3,000 feet agl and a 1-mile buffer from walrus haul-outs. c. Aircraft—3,000 feet agl when within 1 mile of aggregation of seals.</p> <p><i>ROP F-4: Reduce Impacts of Air Traffic on Subsistence Resources</i> Objective: To reduce the impacts of aircraft traffic on North Slope subsistence hunters. Requirement/Standard: a. Hazing of wildlife by aircraft is prohibited. Pursuit of running wildlife is hazing. If wildlife begins to run as an aircraft approaches, the aircraft is too close and must break away. b. Nonessential helicopter flights would be suspended during peak caribou hunting within 2 miles of heavily used subsistence rivers,* or helicopter traffic during this time would be limited to flight corridors that minimize impact (e.g., perpendicular crossings upstream of cabins). The current suspension dates are July 15 through August 15. Suspension dates may be revised every 3 years upon review of peak caribou season, in consultation with affected communities and the NSB Department of Planning and Department of Wildlife Management. Ongoing (multiyear, already planned) scientific and environmental studies that depend on access to study sites that are already planned could continue if there is no alternative access to sites.</p> <p><i>ROP F-4: Reduce Impacts of Air Traffic on Subsistence Resources</i> Objective: To reduce the impacts of aircraft traffic on North Slope subsistence hunters. Requirement/Standard: a. Hazing of wildlife by aircraft is prohibited. Pursuit of running wildlife is hazing. If wildlife begins to run as an aircraft approaches, the aircraft is too close and must break away. b. Minimize (consistent with operational efficiency and safety) helicopter flights during peak caribou hunting within 2 miles of important subsistence rivers.* Pay particular attention to limiting helicopter traffic during this time to flight corridors that minimize impact (e.g., perpendicular crossings upstream of cabins). The current peak dates are July 15 through August 15, but these dates may be revised from time to time in consultation with affected communities and the NSB Department of Planning and Department of Wildlife Management.</p>
3-24	<p>Disturbance of subsistence resources (particularly caribou) and subsistence activities by low-flying aircraft, including helicopters, has been an issue of concern to North Slope residents. The level of concern has increased over time as use of aircraft to support research and monitoring, recreation, oil and gas development, and other activities on the North Slope has increased during the past few decades (USFWS and BLM 2018). As reported in Stinchcomb 2017, sound levels perceived as unwanted or annoying by humans correspond with the range of sound levels emitted by low-flying aircraft, and aircraft sound is concentrated at low frequencies, which lose little</p>

	energy over long distances and produce vibrations that elicit feelings of discomfort and annoyance.
3-28	Over the shorter term and based on current permitting practices, future developments would require three years of biological surveys prior to development and then surveys in June to look for caribou and birds before ice road construction can begin. These surveys are typically performed using helicopters, which produce noise levels of 70–80 dBA at 1,000 feet, attenuating to 50 dBA between 1.9 and 6 miles and to 35 dBA between 10.6 and 33.6 miles. Over the longer term and on a more regular basis, aircraft activity would increase as oil and gas facilities with airstrips are developed, typically located at central processing facilities. Current practice on the North Slope generally includes daily flights on larger aircraft from Anchorage and Fairbanks to the Ugnu-Kuparuk airport (a privately owned airport between Nuiqsut and Prudhoe Bay, east of the NPR-A), flights on smaller aircraft from Kuparuk to the main development facility, and helicopter flights from the main development facility to the satellite pads, which do not have airstrips (Rice and Nigro 20194). Noise produced by helicopters is described above; noise levels produced by aircraft range from 69–81 dBA at 1,000 feet, attenuating to 50 dBA between 1.3 and 6.7 miles and to 35 dBA between 9.5 and 37.8 miles.
3-31	Under Alternative B, ROP F-4 would reduce the impacts of aircraft traffic noise on North Slope subsistence hunters by suspending nonessential helicopter flights during peak caribou hunting within 2 miles of heavily used subsistence rivers or limit helicopter traffic during this time to flight corridors that minimize. Similarly, ROP I-1 potentially would result in some reduction in aircraft traffic noise on North Slope subsistence hunters by including information for aircraft personnel concerning subsistence activities and areas/seasons that are particularly sensitive to disturbance by low-flying aircraft.
3-34	Under Alternative E, ROP F-4 would minimize helicopter flights but would allow for revision of aircraft overflight dates during peak caribou hunting, in consultation with affected communities and the NSB. This would result in slightly less protection for subsistence communities, compared with that described under Alternative B. ROP I-1 would reduce noise impacts in the same way as described under Alternative B.
3-190	Activities not associated with oil and gas activities will continue. This includes scientific activities including ground surveys and low-level helicopter and fixed-wing aircraft flights resulting in localized disturbance.
3-192	Construction and drilling activities would continue to result in increases in light and noise from blasting, drilling, vehicle traffic and fixed wing aircraft and helicopter traffic. These would likely lead to local disturbance and avoidance of the areas of activity.

3-194	Aircraft noise during take-offs and landings could continue to result in disturbance and increased stress of nearby terrestrial mammals as well as an inability to hear biologically important sounds, such as predators, prey, or interspecific communication (Barber et al. 2010). Low-level aircraft may cause some short-term flight responses or temporary changes in caribou behavior (Maier et al. 1998; Reimers and Colman 2006). Helicopters would continue to be used to support construction, research and monitoring, survey, and summer cleanup activity and possibly for spill-response equipment deployment and maintenance. The level of aircraft activity would increase if road-less developments are implemented.
3-195	Miller and Gunn (1979) found that 53.6 percent of caribou exhibited an extreme response to helicopters flying by at low levels (<656 feet) but only 16.1 percent exhibited an extreme response at higher altitudes. A total of 28.6 percent of muskoxen exhibited extreme responses to helicopters, and the percentage declined for altitudes > 656 feet (Miller and Gunn 1979). The level of reaction increased with circling behavior, but the effect declined with repeated passes during a day. Valkenburg and Davis (1985) also found that habituation appears to lower the response of caribou to aircraft activity. Teshekpuk Caribou Herd caribou are currently exposed to significant levels of aircraft noise on the eastern portion of their range (Stinchcomb 2017; Stinchcomb et al. 2019). There are minimum flight altitudes stipulated in different areas during biologically important areas and seasons which would reduce disturbance of wildlife and subsistence hunters (BMP F-1). The largest disturbance levels are likely to occur for large cargo and passenger aircraft during takeoff and landing as well as for helicopters circling at low-levels (Miller and Gunn 1979).
3-246-47	Infrastructure construction and operation of facilities during the production phase may reduce the desirability of land use near leased areas, primarily from exposure to dust, air pollution, noise, helicopters, or road traffic generated from oil and gas activities. . . . Construction near Native allotments may reduce the desirability of using a specific area or allotment, primarily from exposure to dust, air pollution, noise, helicopters, or road traffic from activities; however, K-15 would minimize disturbance to Native subsistence hunters resulting from development and ensure access to Native allotments.
3-265, 266	Local observations regarding these types of impacts include personal experiences of helicopter and airplane overflights disrupting hunting and decreased hunting success due to the diversion and displacement of resources.
3-270	Air traffic, particularly helicopter traffic, has been the most commonly reported impact on caribou hunting by Nuiqsut harvesters since the Nuiqsut Caribou Subsistence Monitoring Project began in 2009. Residents note that air traffic can

	<p>cause skittish behavior in caribou, either causing them to stay inland from riversides or diverting them from their usual migration and crossing routes. Such potential impacts could occur for NPR-A harvesters as they travel along the coast or rivers by boat or inland by snowmachine looking for caribou. While oil and gas development is a primary source of air traffic on the North Slope, other sources of air traffic include scientific and agency research, recreational uses, and commercial flights.</p>
3-271	<p>ROP F-4 (BMP F-1 under Alternative A) places restrictions on the timing, location, and altitude of aircraft, in addition to requiring consultation with subsistence users. This would help reduce the intensity and frequency of air traffic-related impacts. While Alternatives B through D would suspend nonessential helicopter flights during peak caribou hunting within 2 miles of key subsistence rivers, Alternative E would minimize, rather than suspend, helicopter flights in these areas.</p>
3-273	<p>Summer activities that could affect caribou distribution or migration are helicopter, plane, and ground traffic along gravel roads; combined with impacts of infrastructure (see below) this could affect the timing or location of WAH or TCH caribou arrival into subsistence harvesting areas to the south of the NPR-A during fall and winter. In addition, reduced harvests of caribou by NPR-A communities could disrupt sharing networks with other communities and regions if residents are unable to share as widely or frequently as they are accustomed to.</p>
3-371	<p>Residents on the North Slope have observed changes to caribou herd movements due to noise from helicopters, small aircraft, and seismic testing (SRB&amp;A 2009a). Until site-specific development is proposed, the extent of this effect is not possible to determine.</p> <p>ROPs F-2 to F-4 would minimize effects of low-flying aircraft on subsistence activities and local communities by implementing minimum flight altitudes, requiring aircraft use plans 60 days prior to flying, minimizing aircraft use near subsistence camps and cabins, and suspending nonessential helicopter flights during peak caribou hunting. These ROPs would reduce potential noise impacts from air traffic on subsistence users and local communities (Chapter 2, Table 2-2).</p>
Vol. 2, App. B-Y, E-19	<p>Until recently, air traffic, particularly helicopter traffic, has been the most commonly reported impact on caribou hunting to the Nuiqsut Caribou Subsistence Monitoring Project (SRB&amp;A 2018a, CPAI 2018, SRB&amp;A 2019a). Residents from Nuiqsut and other North Slope communities (SRB&amp;A 2018a, 2009) note that air traffic can cause skittish behavior in caribou, either causing them to stay inland from riversides or diverting them from their usual migration and crossing routes; such impacts could occur for NPR-A harvesters as they travel along the coast or rivers by boat or inland by snowmachine looking for caribou.</p>

E-22	<p>Heavy construction noise and helicopter, plane, and ground traffic (along gravel roads) combined with impacts of infrastructure (see below) could affect the timing or location of WAH or TCH caribou arrival into subsistence harvesting areas south of the NPR-A during the fall and winter (e.g., to the 42 WAH/TCH study communities or the peripheral study communities) or into NPR-A community hunting areas during the summer. Reduced harvests of caribou by NPR-A communities could disrupt existing sharing networks to other communities and regions if residents are unable to share as widely or frequently as they are accustomed to doing.</p>
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GMT-1 FSEIS

<p>Vol. 1, 452-53</p>	<p><i>Potential New Mitigation Measure 5: Reduce Non-essential Aircraft Traffic</i>  Objective: To reduce the impacts of helicopter traffic on Nuiqsut subsistence activities. . . .</p> <p>Negative impacts of ice roads are increased by the traditional method of stick picking, which can add hundreds of flights to the permittee’s overall flight numbers. In the past, the system had two workers walk along the ice road route gathering debris in bags while the helicopter leapfrogs over them every 0.25 to 1 mile to pick up the bags. This practice takes more time than is necessary and occupies the helicopter for long periods of time during a subsistence period when flying is of lower impact. It is anticipated that greater availability of the helicopter during this early-spring period would allow the permittee to conduct other required actions instead of delaying those until peak hunting season.</p>
47	<p>Alt. A: Once construction of the GMT1 road and pad are complete, 115 additional flights would consist of six additional fixed-wing flights and 109 helicopter flights to support special studies. . . . CPAI also expects that helicopter operations would be based at APF – flights would originate from and return to APF as a home base for operations and maintenance (DeGeorge 2014b). . . . In 2016, between 5 and 15 Otter/CASA flights would be required each month to support construction. Helicopter flights would occur May through September to support special studies. Most helicopter flights would occur in June (145 flights). In 2017, aircraft traffic is expected to be similar to that estimated for 2016. In 2018, six DC-6 flights are anticipated (one each alternate month, starting in January). Helicopter flights supporting special studies would be significantly reduced compared to previous years because some of the special studies would be conducted from access provided by the CD5-GMT1 road. Helicopter flights would occur May through September, with a maximum of 44 flights in June. For 2019 and beyond, Alternative A (B and C comparable) would have a 4 percent increase in total flights above baseline, including an approximate 7 percent increase</p>

	in helicopter flights for special studies in the NPR-A which would occur from June through September.
48, 55, 61, 71- 75, 82- 85, 92-93	Tables detailing number of flights for “special studies” per alternative
79	Alt. D-2: From mid May to October 2016, two helicopter flights per day would support a small gravel-working crew at GMT1 (no GMT1 camp or airstrip available). During the second summer (2017), GMT1. . . . In 2016 . . . Helicopters would transport crews (15 flights per month) for ice road cleanup inspection and gravel working from June through September. Once per month (July through October), a DC-6 would provide transport of equipment, materials, and supplies. Helicopter flights supporting special studies would be most frequent in May (68 trips) and June (86 trips) and decrease to 8 trips in September. . . . In 2017 . . . Helicopters would transport crews (15 trips per month, June through September for ice road inspection and cleanup). A C-130 large cargo transport would transport equipment, materials, and supplies twice per month in September and December. Helicopter flights supporting special studies would be most frequent in May (68 trips) and June (86 trips) and decrease to 8 trips in September (the same as for 2016). Beginning in 2018 . . . Helicopter flights would support for special studies in May through September, with most helicopter flights occurring in June (104).
81	In 2016 . . . Helicopters would transport crews (between 10 and 75 trips per month) to support ice road cleanup inspection and gravel working from May through October. DC-6 flights would support transport of equipment, materials, and supplies with flights once per month in July through October. Helicopter flights would support special studies from May through September with the most flights in June (86) and least flights in September (8). In 2017 . . . Helicopters would transport crews for ice road cleanup inspection in June through September (15 trips per month). Helicopters would support special studies in May through September with the most flights in June (86) and least flights in September (8). . . . From January 2018 through April 2039 (end of drilling), . . . Helicopter flights would support ice road cleanup and inspection with 15 flights per month June through September.
118	Noise levels from helicopters.

187	<p>Helicopter use in the area is an area of concern for the people of Nuiqsut. BLM permittees are required to report to BLM the number and location of take offs and landings made in the NPR-A at the end of the summer. The date, time and location of the take offs and landings are collected; however, BLM does not collect data on take offs or landings outside of the NPR-A, or for flight-tracking. Types of permitted activities in NPR-A include studies for wildlife, fisheries, vegetation, water quality, climate and weather, as well as oil and gas compliance work and cleanup and inspection of winter exploration sites and access routes. The number of permitted flights varies, but has generally risen over the past six years. Generally, the locations of aircraft landings were clustered around scientific and oil and gas development study areas and those areas are likely to change each year as projects are completed and new projects are started. See Map 2.5-5.</p>
304	<p>Suggested Mitigation Measure which BLM will not Implement for GMT1 . . .</p> <p>Monitoring decibels of helicopter noise near Nuiqsut.</p> <p>There would be difficulty in distinguishing between noise generated by helicopters and other sources. Also, any buffer zone that might be established by BLM would only apply to helicopter flights associated with activities permitted by BLM, limiting its effectiveness. Additionally, based on the analysis in this section, noise impacts under the proposed action are expected to be minor. For these reasons the measure is impracticable to implement and would provide only marginal benefits.</p>
341-42	<p>Under Alternatives A, B, and C, new flights are the greatest during the construction period, then once construction is complete, there is no need for routine additional fixed wing flights. Post construction, aircraft traffic primarily consists of helicopter flights for special studies from May through September when migratory birds are present in the area. For Alternative D1, flights are the most intensive during construction and drilling. Once drilling is complete, flights decrease to support essential transportation operations and helicopter special studies. For Alternative D2, when construction is complete and seasonal drilling begins, flight frequency decreases to only support seasonal drilling. In 2023, when year-round operations begin under Alternative D2, flights increase to support year-round operations. . . .</p> <p>Under roaded Alternatives, A, B, and C, the need for access by aircraft is negated, along with the accompanying aircraft disturbance. However, summer studies (via helicopter) would remain as a source of aircraft disturbance under the roaded alternatives. Aircraft would be required to access GMT1 pad during the non-ice road season for Alternatives D1 and D2. During ice road season for Alternatives D1 and D2, aircraft is still utilized for support of equipment and personnel. Potential impacts to birds from aircraft under Alternatives D1 and D2 is greater than other action alternatives due to the requirement to use aircraft to access the GMT1 pad when ice roads are not present (roughly nine months of the year).</p>

347	In addition to impacts from gravel fill and road usage, disturbance from aircraft (fixed-wing and helicopter) is expected to occur within the project study area.
437	Harvesters have noted that helicopter and plane traffic tends to divert caribou or cause skittish behavior, resulting in reduced harvest opportunities . . . During interviews with Nuiqsut caribou hunters for the 2008-2011 study years, helicopter traffic was the most commonly cited impact on caribou hunting related to CD4 and other Alpine Satellite Developments, followed by plane traffic, and human-made structures (i.e., pipelines blocking caribou movement) (SRB&A 2010b, 2011a, 2012, 2013b). The issue has been the subject of several NPR-A Subsistence Advisory Meetings and land use plan hearings. Comments on the Draft GMT1 SEIS in spring 2014 continued to note aircraft as a main source of disturbance
438	<p>During operations, helicopter traffic will largely be limited to summer months in support of scientific studies. BLM and CPAI have been improving systems to estimate and keep track of all take offs and landings of both helicopter and fixed-wing flights. Flight totals (baseline and estimated new flights) required for each alternative during construction and operation are described by alternative in Chapter 2. The baseline number of flights (Otter/CASA, DC-6, and helicopter) in the area is 2,997 per year, of which 1,457 occur during the peak hunting months of June, July, August, and September.</p> <p>In year one of the construction phase, Alternative A would require a total of 539 new flights, including 330 new flights during the June–September season. In year two of construction, Alternative A would require a total of 504 new flights, including 320 new flights June–September. The number of new flights required would decline after construction: it is estimated that during operation Alternative A would require 115 new flights each year, of which 107 would occur during the June-September hunting season. According to these estimates, the total number of flights during routine operation (for approximately 30 years) would be 3,112 per year of which 1,564 would occur during the June-September season.</p>
440	Alt. D-1: From CD5 to GMT1, annual construction of an ice road would have associated impacts including ice road crews lodged in camps in town, heavy industrial traffic during construction period, significant use of lake water, and numerous helicopter flights in early spring to clean up ice road debris.
441	Alternative D1 would likely require additional helicopter flights to survey the larger pad and the airstrip before construction could begin. In Year 1 of the construction phase, there would be no runway or camp at GMT1 and construction crews would stage out of Nuiqsut and Alpine. Fixed wing flights associated with Year 1 of construction would land at Alpine and during the summer, helicopters would ferry crews back and forth daily to GMT1 from Alpine. During Year 2 of construction, crews would work from the new camp at GMT1 and ferrying would be limited to crew changes.



442	<p>Alt. D2: From CD5 to GMT1, annual construction of an ice road would have associated impacts including ice road crews lodged in camps in town, heavy industrial traffic during the construction period, significant use of lake water, and numerous helicopter flights in early spring to clean up ice road debris. Most significantly, all impacts associated with Alternative D2 would occur over a longer period of time (35 years total) rather than the 30 years projected for other alternatives. This includes 24 years of infill drilling which would require a 75-person crew to be moved in and out each season and a 25-person crew that would support year-round operations and maintenance. . . From CD5 to GMT1, annual construction of an ice road would occur over a longer period of time (35 years instead of 30) and would have associated impacts including ice road crews lodged in camps in town, heavy industrial traffic during construction period, significant use of lake water, and numerous helicopter flights in early spring to clean up ice road debris.</p>
443	<p>Alternative D2 would require additional helicopter flights to survey the larger pad and the airstrip before construction could begin. In Year 1 of the construction phase, there would be no runway or camp at GMT1 and construction crews would stage out of Nuiqsut and Alpine. Fixed wing flights associated with Year 1 of construction would land at Alpine and during the summer, helicopters would ferry crews back and forth daily to GMT1 from Alpine. During the second year of construction, crews would work from the camp at GMT1 and ferrying would be limited to crew changes.</p>
445	<p>As the GMT1 Applicant and primary oil development company in the Nuiqsut area, CPAI management has recently attempted to mitigate these impacts by coordinating helicopter-based hydrology studies with other regional oil development companies (Great Bear and Repsol), by establishing dedicated ice road cleanup crews and modifying the ice road cleanup program to reduce helicopter flights, by implementing a daily call in service that allows people to listen to updates on aircraft activity and by providing a weekly summary of helicopter activity that they share with stakeholders. CPAI managers are currently making efforts to schedule helicopter activity during early or late summer, thus avoiding peak caribou hunting season during July. For necessary flights during July, CPAI managers are attempting to schedule helicopter flights during the week so that impacts are reduced during the weekends.</p>
448	<p>Suggested Mitigation Measures which BLM will not Implement for GMT1</p> <p>The government and industry should restrict flying until they learn how to adequately inform hunters of locations of helicopter flights and landing sites.</p> <ul style="list-style-type: none"> <li>– As noted above, BLM-chartered aircraft and aircraft use by BLM permittees accounts for a small percentage of the aircraft use within the NPR-A; therefore, this mitigation is not relevant to the GMT1 SEIS. Several other mitigation measures are being considered that address impacts from aircraft traffic.</li> </ul>

	<ul style="list-style-type: none"> <li>• Scientific studies that require helicopters should only be allowed every three years. <ul style="list-style-type: none"> <li>– This requirement would not be reasonable, as industry and other groups would not be able to comply with other BLM-required studies for permits.</li> </ul> </li> </ul>
450	<p><i>Potential New Mitigation Measure 1: Tinmiaqsigvik (Ublutuoch) River Boat Launch</i></p> <p>Objectives: Alleviate helicopter flights and reduce the impacts of helicopter traffic on Nuiqsut subsistence activities, alleviate disturbing oil spill prevention/response training activities and facilitate oil spill cleanup activities, and facilitate subsistence boat access to Fish Creek. . . . The boat launch could potentially alleviate the high number of helicopter flights in the area, which would address a primary disturbance to subsistence activities. A portion of research, monitoring, oil spill preparation and response and other activities associated with development would be able to forego helicopter trips by using either Alpine or Nuiqsut as a hub, transporting boats to the Tinmiaqsigvik (Ublutuoch) River by road, and accessing the GMT1 project study area (and possibly GMT2 and other future project study areas) by river.</p>
451	<p><i>Potential New Mitigation Measure 3: Consultation Regarding Aircraft Communication Protocols</i></p> <p>Objective: Ensure that current communication protocols related to helicopter and fixed wing air traffic by the permittee are adequate in addressing Nuiqsut concerns about the impacts of air traffic on their hunting activities.</p>
453	<p><i>Potential New Mitigation Measure 7: Reduce Flights by Utilizing Unmanned Aerial Vehicles (UAVs)</i></p> <p>Objective: To reduce the impacts of aircraft traffic on Nuiqsut subsistence activities.</p> <p>Requirement/Standard: The permittee will begin to employ UAVs to conduct monitoring activities that otherwise require helicopters (i.e., pipeline inspections, studies, and other appropriate activities).</p>
477	<p>Surveillance for this portion of the pipeline could be done with snowmachine or ATV, if mobilization of a helicopter was not feasible.</p>
493	<p>Table 4.6-3 summarizing annual select non-oil and gas-related management activities including aircraft use for point-to-point and wildlife and other aerial surveys, mostly occurring in summer.</p>
Vol. 3, 48	<p>NVN comments: [02-003] The number of flights used for studies and activities like stick-picking can be reduced by using other methods of transportation. [02-004] Researchers may be able to collaborate with subsistence hunters who have boats and can assist with studies. Likewise, industry can hire local people to pick up trash and debris rather than making multiple helicopter flights. Some "stickpicking" can be accomplished by boat or 4-wheeler, or simply by making fewer helicopter landings</p>

	<p>and walking more. Bear safety training could be required to minimize bear-human conflicts. [02-005] As much as possible, workers should pick up trash as they go rather than leaving it for later. Trash should be stockpiled in fewer areas so fewer stops are required to pick it up. As much as possible, trash should be picked up in May before the ice road closes. To avoid interfering with subsistence, the remaining trash could be picked up in August (not in July during the height of subsistence season). The route for stick-picking should be minimized and streamlined, and it should be given to the Native Village of Nuiqsut ahead of time for review.</p>
50	<p>D. Noise [02-023] As a mitigation, the Native Village of Nuiqsut would like to be provided with a tool capable of monitoring the decibels of helicopter noise. This could help assess the impact on hunting and establish an appropriate buffer/distance between helicopters and hunting activity.</p>
54	<p>Response to comments: [02-004] Potential new mitigation measure 9 in the Subsistence section called “Reduce Helicopter Flights Associated with Ice Road Cleanup” is included in the Final SEIS. In addition, BMP A-8 from the NPR-A IAP ROD requires oil and gas lessees and their contractors and subcontractors, as a part of preparation of lease operation planning, prepare and implement bear-interaction plans to minimize conflicts between bears and humans, and thus this comment is not substantive.</p> <p>[02-005] This potential new mitigation measure will be considered in the Final SEIS.</p>
225	<p>Northern Center comments: [14-010] The analysis for Alt. D which does not have a connecting road to CD-5, unlike the others, seems biased. Why would there be twice as many helicopter flights needed for special studies (hydrology and biological studies) for Alt. D than the other alternatives – with all of these being in the summer months (May – Aug)? [14-011] Why weren’t any flights show to be necessary for 2019 and beyond for the proposed project (Alt. A)? If this involves stick pickers, water quality or other monitoring or surveillance, could this be done via walking with backpack kits as is done in many places? How many of these flights are for spill monitoring? Could Alpine “baseline” flights be reduced?</p> <p>[14-014] ConocoPhillips’ draft GMT1 Aircraft Transportation Plan in Appendix J, a short 3-pages, does not have specific numbers of ground vehicle trips, aircraft and helicopter trips by month, and for the duration of the project, and a more complete plan should be provided. [14-015] It also only addresses this first development, GMT1, not the construction and operation of additional fields in the future and how operations may overlap. We are concerned because an analysis of cumulative effects from all sources of flights in the affected region (with clear GMT-1 necessary flights clearly shown) was not done in the draft SEIS. [14-016] We note that recent studies on aircraft flights in the NPR-A, presented at the Subsistence Advisory Committee</p>

	<p>meeting, showed major impacts in the number of flights across the Reserve, from 410 in 2008 to 3069 in 2013, with an average of 1800 per year (both industry and research flights were recorded). While there may now be predictive improvements for estimation of flight numbers, the fact is an upward trend for flights as an increasing stressor. [14-017] The DSEIS does not analyze information on geographic area affected (i.e. lots of flights in one place or broad geographic coverage), nor the combination of flights for exploratory drilling operations underway in the Reserve, further studies for offshore pipeline baseline studies, and other scientific research which is extensively being done across the Reserve. [14-018] How does aircraft, road vehicle traffic, blasting noise for gravel extraction, and pile-driving noises for bridges, VSM, etc. combine during various time periods, for geographic areas, as well as cumulatively within key fish, wildlife, subsistence, and other areas?</p>
385	<p>Conoco comments: [18-077] Helicopter disturbance is clearly the issue of most concern to local residence because of the disruption it can cause to hunting.</p>
419	<p>Commenter: Alternative A will also minimize the amount of noise and required overflights by helicopters and fixed wing aircraft, which has been repeatedly expressed to the BLM and stated in the SEIS document as being more disruptive to subsistence hunting than any other activity and because GMT1 project (sic) is located in an area that is not heavily utilized by Teshekpuk or Central Arctic Caribou Herds, a road connection is unlikely to have any substantial impact to this important subsistence resource.</p>
574	<p>Nuiqsut commenter: [20-005] Summer studies and stickpicking can be postponed until fall when caribou go inland.</p>
576	<p>Response to comments: [20-005] BLM is analyzing the impacts of road development cumulatively mitigation measures in the Final SEIS which would decrease the impacts of stick picking and associated helicopter flights.</p>
Vol. 4, B-5	<p>Helicopter traffic is the most commonly cited impact on caribou hunting, but ground traffic on the road could also affect caribou distribution. Caribou, especially females with calves, tend to avoid areas of human activity. Because the Colville Delta is in the peripheral range of both the Teshekpuk and Central Arctic caribou herds, impacts to caribou populations are expected to be minor across alternatives. However, Nuiqsut harvesters are particularly vulnerable to changes in the distribution and/or behavior of caribou in these herds.</p>
B-6, B-26	<p>The Applicant (CPAI) has numerous voluntary policies and measures in place that also</p>

	<p>minimize impacts to subsistence. CPAI has attempted to coordinate helicopter-based hydrology studies with other regional oil development companies, has improved its ice road cleanup program to reduce helicopter flights, has established a daily call-in service to share updates on aircraft activity, and is attempting to schedule flights to avoid the peak hunting season. Any new mitigation measures would be established with the ROD for the GMT1 SEIS. Potential new mitigation measures that have been put forward for consideration and that might be established in the ROD include a legally binding Right of Access Agreement for the GMT1 road, the extension of subsistence monitoring studies on caribou and the initiation of similar studies on fish and fowl, a subsistence foods safety testing service, an aircraft monitoring plan, a measure to further reduce flights associated with ice road cleanup, and a measure that would require industry to use non-disruptive technology for monitoring whenever possible.</p>
<p>B-16</p>	<p>According to BLM ANILCA policy, <i>“significant restrictions are differentiated from insignificant restrictions by a process assessing whether the action undertaken shall have no or a slight effect as opposed to large or substantial effects”</i> (BLM Instructional Memorandum No. AK86-350, Policy for Section 810 Compliance with the Alaska National Interest Lands Conservation Act). Further direction states <i>“no significant restriction results when there would be ‘no or a slight’ reduction in the abundance of harvestable resources and no or only ‘occasional’ redistribution of these resources; there would be no effect (or slight inconvenience) on the ability of harvesters to reach and use active subsistence harvesting sites; and there would be no substantial increase in competition for harvestable resources”</i> (ibid.).</p> <p>The positive finding for Alternative D2 of a significant restriction to subsistence for the village of Nuiqsut is based on the following criteria: . . .</p> <p>Annual ice road construction would result in heavy industrial traffic during the construction period and numerous helicopter flights in early spring to clean up debris.</p> <p>The significant increase in air traffic is likely to displace animals (particularly caribou) from the area and will almost certainly lead to greater hunter avoidance of the area.</p>
<p>B-17</p>	<p>Numerous studies are conducted on a year-round basis on the North Slope, and aerial survey by fixed-wing aircraft or helicopter, or ground surveys on foot or by ORV, all have the potential to disturb animals. However, the effects of these activities on species utilized by subsistence users are expected to be local and short-term, and to have no regional population effects.</p>
<p>C-2</p>	<p>Reduce aircraft traffic through the following measures: (1) Suspend non-essential helicopter traffic during peak caribou hunting season to reduce the impacts of helicopter traffic on Nuiqsut caribou hunters; (2) Reduce helicopter flights associated with ice road cleanup by requiring cleanup on foot when feasible; (3) The number of</p>

	takeoffs and landings to support oil and gas operations with necessary materials and supplies shall be limited to the maximum extent possible. Trips shall be combined when possible, and studies shall be conducted by boat and foot when possible; (4) Reduce helicopter flights by utilizing unmanned aerial vehicles.
H, 1	The GMT1 development will require some additional environmental study and monitoring flights, the majority of which will be in support of hydrological assessments associated with the gravel roads and water use in the area. During the summer months an estimated 1-5 Helicopter flights will occur daily, likely originating and terminating at the Alpine facility, utilizing multiple landings and takeoffs.
H, 2	<p>Use of aircraft, especially rotary wing aircraft, near known subsistence camps and cabins or during sensitive subsistence hunting periods (spring goose hunting and fall caribou/moose hunting) should be kept to a minimum.</p> <ul style="list-style-type: none"> <li>o CPAI has developed robust helicopter protocols and communication with the village of Nuiqsut to minimize conflict with subsistence activities.</li> </ul> <p>Aircraft use (including fixed wing and helicopter) by oil and gas lessees in the Goose Molting Area should be minimized from May 20 through August 20, unless doing so would endanger human life or violate safe flying practices.</p> <p>Helicopters used as part of a BLM authorized activity along the coast shall maintain minimum altitude of 3,000 feet and a 1-mile buffer from walrus haulouts, unless doing so would endanger human life or violate safe flying practices.</p>

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45, 51	<p>All fixed-wing flights listed will land in CD1/Alpine Central Processing Facility and helicopters will base out of CD1/Alpine Central Processing Facility. Aircraft would maintain altitude of 1,000 feet or more except during takeoff and landing (within 3.6 miles of the airstrip).</p> <p>During construction, fixed-wing aircraft trips are limited to between 5 and 15 flights per month for crew changes. Helicopter landings to support environmental studies and ice road cleanup will occur from May through September.</p> <p>Once construction of the GMT2 pad and GMT1–GMT2 Access Road are complete there will be no need for routine additional fixed-wing flights as post-construction drilling needs will be handled by flights into CD1/Alpine Central Processing Facility that are already part of the ongoing operations. Operation and maintenance will be handled by staff at the CD1/Alpine Central Processing Facility who will travel by the GMT1–GMT2 Access Road. Helicopter landings to support environmental studies will occur from May through September until the end of operations.</p>
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57-58	<p>Helicopters will also be used to support Alternative C.</p> <p>From May to October of Year 2 there will be two helicopter flights per day to support gravel-working crews at GMT2. From May to September approximately 400 helicopter flights will support special studies and ice road cleanup activities.</p> <p>GMT2 air access facilities will become available in April/May of Year 3 and flights supporting drilling and operations will begin using the GMT2 airstrip. From May to September, approximately 400 helicopter flights will support special studies and ice road cleanup activities.</p> <p>Beginning in Year 4 and continuing through Year 9, . . . In addition, approximately 36 helicopter landings will occur to support ice road cleanup activities and 107 helicopter landings will occur to support special studies. Helicopter flights will generally occur between May and September. Helicopter visits to spill response equipment related to the GMT2 Project are included in the estimated helicopter landings.</p> <p>Upon completion of drilling activities in Year 10 . . . Helicopter landings for ice road cleanup activities and special studies would remain the same.</p>																				
60	<table border="1" data-bbox="321 1052 1409 1367"> <thead> <tr> <th data-bbox="321 1052 764 1163">Table 13. Summary of ConocoPhillips current aircraft flights a, b Flight Purpose</th> <th data-bbox="764 1052 938 1125">Aircraft Type</th> <th data-bbox="938 1052 1138 1163">Flights Projected for 2018</th> <th data-bbox="1138 1052 1409 1163">Flights Projected for 2019 and Beyond</th> </tr> </thead> <tbody> <tr> <td data-bbox="321 1163 764 1205">Construction Crew Support c</td> <td data-bbox="764 1163 938 1205">Otter/CASA</td> <td data-bbox="938 1163 1138 1205">2,071</td> <td data-bbox="1138 1163 1409 1205">1,981</td> </tr> <tr> <td data-bbox="321 1205 764 1247">Construction Cargo d</td> <td data-bbox="764 1205 938 1247">DC-6</td> <td data-bbox="938 1205 1138 1247">360</td> <td data-bbox="1138 1205 1409 1247">366</td> </tr> <tr> <td data-bbox="321 1247 764 1320">Special Studies/Ice Road Cleanup e</td> <td data-bbox="764 1247 938 1320">Helicopter</td> <td data-bbox="938 1247 1138 1320">1,070</td> <td data-bbox="1138 1247 1409 1320">765</td> </tr> <tr> <td data-bbox="321 1320 764 1367">Annual Total</td> <td data-bbox="764 1320 938 1367">N/A</td> <td data-bbox="938 1320 1138 1367">3,501</td> <td data-bbox="1138 1320 1409 1367">3,112</td> </tr> </tbody> </table> <p>Special studies and ice road cleanup flights will originate at the CD1/Alpine Central Processing Facility airstrip. Landing/overflight area will be determined by the ice road location or study being conducted.</p>	Table 13. Summary of ConocoPhillips current aircraft flights a, b Flight Purpose	Aircraft Type	Flights Projected for 2018	Flights Projected for 2019 and Beyond	Construction Crew Support c	Otter/CASA	2,071	1,981	Construction Cargo d	DC-6	360	366	Special Studies/Ice Road Cleanup e	Helicopter	1,070	765	Annual Total	N/A	3,501	3,112
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64	<p>The number of aircraft flights required differs dramatically between alternatives. Alternative C requires 14 times the number of flights required by Alternative A. These include all types of flights, such as crew changes using both Otter/CASA aircraft and helicopter, cargo flights, pipeline inspection flights, and helicopter-based special studies and cleanup activities. Table 16 provides a summary of aircraft flights required for each alternative.</p>																				
65	<p>Table 16. Summary of total aircraft flights for project alternatives</p>																				

	Aircraft Type	Alternative A Preferred Alternative	Alternative B	Alternative C
	Otter/CASA	270	270	12,542
	DC 6/C-130	None	None	2,570
	Helicopter a, b	3,642	3,642	5,207
	Total c, d	3,912	3,912	20,319
	<p>Helicopter numbers refer to landings within the NPR-A. Helicopter visits to spill response equipment pre-staged as part of the GMT2 Project are included in helicopter landing numbers.</p> <p>b Helicopter landings for ice road cleanup are estimated at five landings per mile of ice road. Ice road cleanup will only occur from May–September of Year 2 and Year 3.</p> <p>c Total flights are divided across the GMT2 Project’s estimated 30-year lifespan.</p> <p>d A single “flight” is defined as a landing and subsequent takeoff.</p>			
101	Table 28, measured and estimated noise sources, including helicopters.			
105	<p>At all sites, fewer aircraft events were attributable to helicopters (11.4 percent of total events, on average) than to propeller aircraft (62.5 percent of total events, on average) over the course of the study. Across the 20 study sites, the median duration of discrete aircraft noise events ranged from 1.9 minutes to 5.5 minutes, and the maximum duration ranged from 5.8 minutes to 30.3 minutes (Table 30). . . . On the basis of this metric, noise levels measured during helicopter events in 2016 tended to be greater than levels measured during propeller aircraft events and jet aircraft events. Across study sites, the median Lmax ranged from 44.6 dBA to 72.9 dBA for helicopter events, from 40.9 dBA to 58.8 dBA for propeller aircraft events, and from 38.0 dBA to 52.6 dBA for jet aircraft events (Table 31). The maximum Lmax measured at study sites ranged from 66.8 dBA to 94.0 dBA for helicopter events, from 59.4 dBA to 88.9 dBA for propeller aircraft events, and from 40.3 dBA to 77.3 dBA for jet aircraft events. Although maximum noise levels attributable to helicopters tended to be greater than those attributable to propeller aircraft, it is nevertheless reasonable to conclude from data currently available that propeller aircraft generated more noise and thus greater impacts on the acoustical environment in the project area during summer 2016 because of the greater frequency of propeller aircraft noise events relative to helicopter noise events.</p>			
178	<p>Air travel is supported by an airport at the Native Village of Nuiqsut and airstrip at Alpine. Helicopter use in the area is a concern for the people of the Native Village of Nuiqsut due to the potential impacts to subsistence resources and activities. BLM permittees are required to report to the BLM the number and location of take-offs and landings made in the NPR-A at the end of the summer. The date, time, and location of the take-offs and landings are collected; however, the BLM does not collect data on take-offs or landings outside of the NPR-A, or for flight-tracking. The</p>			



	location of permits change from year to year; the locations of aircraft landings are generally clustered around research areas and oil and gas development study areas.
226	While helicopter traffic had been the most commonly reported impact across all study years, recent years have shown a decrease in helicopter traffic impact reports and an increase in impacts related to manmade structures (e.g., roads and pipelines).
298	Proposed aircraft operations during the construction phase of the project include transport of cargo into the Alpine airstrip by Twin Otter (DHC6) and CASA twin-engine (2E) turboprop aircraft (Alternatives A and B), transport of cargo by DC-6 (primarily) and C-130 four-engine (4E) aircraft into the GMT2 airstrip (Alternative C), transport of personnel into GMT2 by Twin Otter/CASA aircraft and helicopters (Alternative C), and helicopter flights into the project area in support of required special studies, monitoring, and ice-road clean-up (all alternatives). Potential impacts of aircraft noise vary according to the type of aircraft, the phase of aircraft operations (i.e., take-off and landing versus level flight), the location (Alpine and GMT2 airstrips, versus pipeline and ice-road corridors, versus in-transit flight paths and dispersed locations of special studies), and timing of aircraft operations in relation to locations and activities of noise-sensitive receptors, and flight altitude above ground level. (More detailed discussion of noise and disturbance to wildlife follows on 299)
437-38	<p>Under Alternatives A and B, fixed-wing aircraft would typically utilize the existing CD1/Alpine Processing Facility airstrip and helicopters would base out of CD1/Alpine Processing Facility. Flights would support personnel and equipment transport required for construction and the start of drilling. Under Alternatives A and B, personnel, equipment, and materials would be transported overland on snow trails, ice roads, and on the gravel GMT2 road, once it is constructed. Helicopter landings, to support environmental studies and ice road cleanup, would occur from May through September.</p> <p>Aircraft traffic results in unique and substantial impacts for Nuiqsut hunters. Impacts from infrastructure, road traffic, and drill pad noise, odors, and activity are impacts that hunters expect to occur near the actual site of development. These known impacts can be avoided if hunters choose to hunt elsewhere. In contrast, impacts from aircraft traffic are more difficult to forecast or avoid and can cause more acute stress and disruption to both animals and harvesters.</p> <p>...</p> <p>Aspects of air traffic disturbance considered in this analysis include:</p> <ul style="list-style-type: none"> <li>• The frequency with which aircraft traffic is cited as a negative impact on subsistence uses on the North Slope.</li> <li>• The unique nature of helicopter noise associated with human disturbance, and The increasing amount of helicopter traffic in key Nuiqsut subsistence use areas and the amounts estimated to result under GMT2 Alternative A.</li> </ul>

449	As the GMT2 applicant and primary oil development company in the Nuiqsut area, ConocoPhillips management has made substantial efforts to mitigate these impacts by coordinating some helicopter-based studies with other regional oil development companies, by establishing dedicated ice road cleanup crews and modifying the ice road cleanup program to reduce helicopter flights, by implementing a daily call in service that allows people to listen to updates on aircraft activity, and by providing a weekly summary of helicopter activity that they share with stakeholders. The effectiveness of these measures and other new aviation mitigation measures will continue to be evaluated throughout the life of the project.
Vol. 3, PDF 41-46	TbIs of estimated aircraft flights construction schedule: “Helicopter landings for ice road cleanup are estimated at five landings per mile of ice road. Ice road cleanup will only occur from May–September of Year 2 and Year 3. Helicopters will take off from Alpine CD1/Alpine Central Processing Facility and land along the ice road route. Helicopter flights during drilling and annual operations years will take off from CD1/Alpine Central Processing Facility and will support required monitoring and studies, survey work, and staging of spill response equipment. Landing/overflight areas within the NPR-A for monitoring helicopter flights will differ based on the study.”
PDF 254	NSB Oil & Gas Forum on aviation disturbance: Specific recommendation to “Reduce “stick picking” to reduce impacts of aircraft.”
PDF 257-59	Community members recommendations to address helicopter disturbance to subsistence activities.
PDF 260-61	ICAS resolution addressing high levels of air traffic, including helicopters.
PDF 276	Discussion about displacement of caribou: “Fixed-wing and helicopter aircraft would be based at the Alpine CPF during construction for all alternatives. Fixed-wing air traffic would consist of 270 flights over the 2-3 year period. Helicopter traffic (1032 flights over 2-3 years) would be present within the GMT2 project area from May to September and would include flights required for monitoring studies, ice road clean-up, and emergency response. A total of 1302 fixed-wing and helicopter flights would occur during the 2-3 year construction phase.”
PDF 280	GMT2 SEIS Table 2.9-3 summarizes the total number of projected aircraft flights over the course of construction, drilling, and operations under Alternatives A, B, and C. Alternative C would consist of 81% more flights over the course of the project. Helicopter traffic would be 30% higher.

	<p>The GMT2 SEIS describes impacts of aircraft on caribou. Numerous studies have documented general behavioral responses ranging from escapist behavior to no observable effect. Caribou ultimately appear to habituate to aircraft when aircraft consistently maintain altitudes greater than 500 feet above ground level and do not engage in hazing or harassing behavior (Webster 1997). Despite this, Nuiqsut caribou hunters cite aircraft traffic as the most common impact on caribou. They believe that increased air traffic diverts caribou away from hunting areas, and make caribou more wary and difficult to approach, resulting in reduced harvest opportunities. Given these consistent concerns and observations, it is likely that availability of caribou would be impacted under Alternative C.</p>
<p>PDF 284</p>	<p>The ice roads, where and when access is permitted and feasible, facilitate access to remote areas that some subsistence hunters appreciate and can be considered a countervailing effect. Adverse impacts include traffic, large man camps, and subsequent helicopter traffic, resulting in overall adverse and additive impacts of winter oil and gas activities.</p>
<p>PDF 809- 10</p>	<p>Potential Mitigation Measure 2: Suspend Non-essential Helicopter Traffic during Peak Caribou Hunting Season</p> <p>Objective: To reduce the impacts of helicopter traffic on Nuiqsut caribou hunters.</p> <p>Requirement/Standard: Via ongoing consultation with the City of Nuiqsut, the North Slope Borough Department of Planning, Native Village of Nuiqsut, Kuukpik Corporation, and the Kuukpik Subsistence Oversight Panel, Inc., the BLM will establish an approximately 1-month-long period during peak caribou hunting when non-essential helicopter flights will be suspended within a predetermined distance of rivers that have been documented as caribou subsistence use areas, or limit helicopter traffic during this time to established flyways. The consultation results should be documented, distributed to BLM and other stakeholders, and clearly identify actions to be implemented based on the consultation.</p> <ul style="list-style-type: none"> <li>• Ongoing (multi-year, already planned) scientific/environmental studies that depend on access to study sites that are already planned could continue if there is no alternative access to sites.</li> <li>• Suspension dates can be revised every 3 years upon review of peak caribou season.</li> </ul> <p>Potential Benefits and Residual/Unavoidable Impacts: Reducing helicopter traffic or limiting the geographic area affected by helicopter traffic would reduce the incidence of conflicts between GMT2-related helicopter traffic and Nuiqsut subsistence activities. However, other operators on the North Slope may continue to fly during the suspension period.</p>
<p>810</p>	<p>Potential Mitigation Measure 3: Consultation Regarding Aircraft Communication Protocols</p>

	<p>Objective: Ensure that current communication protocols related to helicopter and fixed-wing air traffic by the permittee are adequate in addressing Nuiqsut concerns about the impacts of air traffic on their hunting activities.</p> <p>Requirement/Standard: In consultation with local hunters and local organizations, the permittee will continue to facilitate, improve, and expand communication protocols to inform subsistence users of daily flight patterns and identify potential conflict areas during peak hunting times. This consultation should include efforts to advertise these communication protocols within the community so that Nuiqsut subsistence harvesters are aware of them and confirmation that existing minimum altitude requirements are adequate. The consultation results should be documented, distributed to BLM and other stakeholders, and clearly identify actions to be implemented based on the consultation.</p> <p>Potential Benefits and Residual/Unavoidable Impacts: Strong communication protocols with the community of Nuiqsut regarding the timing, altitude, and location of air traffic should reduce the frequency of these impacts on subsistence users. However, such protocols will not remove impacts of air traffic altogether.</p>
816	<p>Potential Mitigation Measure 1 —Trash Removal and Anti-Littering Campaign</p> <p>Objective: Prevent unnecessary or undue degradation of the land.</p> <p>Requirement/Standard: All solid waste and industry-derived trash originating from permitted activities is required to be properly containerized while on site, or removed from the area of operation/activity. Objects that have the potential to be left or forgotten (such as duck ponds, containments, or sorbent material caches) shall be clearly marked with the name of the company using the object.</p> <p>The permittee will solicit ideas from the community of Nuiqsut to assist with addressing regular trash removal and inadvertent littering (including such things as ice-roads delineation markers, construction detritus, etc.) in order to ensure or adopt cost-effective methods that also minimize other identified impacts, such as those associated with helicopter use.</p> <p>Potential Benefits and Residual/Unavoidable Impacts: Clearly marking movable objects associated with industrial development with the name of the company who utilized them will instill a greater sense of responsibility in employees in being good neighbors and ensuring the objects are not left or forgotten. In addition, it will also allow the permittee, the BLM, and local residents to track and assess the effectiveness of workers or contractors in following authorization requirements. By working with the community to identify new ideas or suggestions for the removal and handling of trash, the permittee may be able to save money while building effective partnerships.</p>

Willow 2020 SEIS

Vol. 1,	Tbl ES.1 Summary of key impacts by alternative:
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ES-10, 25	<b>Project Component</b>	<b>Resources Affected</b>	<b>Alternative B: Proponent's Project</b>	<b>Alternative C: Disconnected Infield Roads</b>	<b>Alternative D: Disconnected Access</b>
	Helicopter air traffic <sup>c</sup>	Changes to undisturbed characteristics visual landscape including night skies Disturbance and displacement of birds, caribou, and marine mammals Injury or mortality of birds	2,421 total flights Willow: 2,321 Alpine: 100	2,910 total flights South Willow: 2,421 North Willow: 357 Alpine: 132	2,503 total flights Willow: 2,403 Alpine: 100
<p>Typical helicopters include A-Star and 206 Long Ranger models, although other similar types of helicopters may be used. Includes support for ice road construction, pre-staged boom deployment, hydrology and other environmental studies, and agency inspection during all phases of the Project</p>					
ES-13, 27	Tbl. ES.2 Summary of key impacts by sealift module delivery				
	<b>Component</b>	<b>Option 1: Atigaru Point Module Transfer Island</b>	<b>Option 2: Point Lonely Module Transfer Island</b>	<b>Option 3: Colville River Crossing</b>	
Helicopter traffic (number of trips) <sup>e</sup>	450 total flights Willow: 435	450 total flights Willow: 435	16 total flights to/from Alpine		

		Alpine: 15	Alpine: 15	
70-71	Alt. B “Aircraft activity could potentially be audible in Nuiqsut if planes traveled within 20.3 miles of the community or helicopters traveled within 33.2 miles, but the sound levels of most aircraft activity would be less than 39 dBA, which is typically considered protective of residential uses.”			
258	Noise and traffic associated with ice roads, and the physical presence of the ice roads themselves, could affect the availability of caribou, wolf, and wolverine for Nuiqsut and Utqiagvik harvesters. The ice road may still be present in late April, when goose hunting along Fish (Uvlutuuq) Creek intensifies (Figure E.16.10 in Appendix E.16); thus, goose hunters could experience direct impacts on their hunting, although impacts related to ice road traffic would likely not extend into the peak hunting month of May. Helicopter traffic may also extend into early summer along ice road routes for cleanup and “stick picking” purposes.			
260	Construction of the ice road under Option 3 would result in the community of Nuiqsut being completely encircled to the north, west, south, and east by gravel or ice roads. . . . Option 3 would require one less winter ice road season (two winters) compared to Options 1 and 2 (three winters); in addition, substantially less ground traffic would be required under Option 3 (approximately one-quarter of that anticipated under Option 1, Table D.5.5 in Appendix D.1) and therefore the ice road and associated traffic are less likely to deflect or disturb subsistence resources and less likely to deter subsistence harvesters from crossing. Option 3 would also require substantially less fixed-wing and helicopter traffic than Option 1, reducing disturbances to wildlife resources and hunters.			
275	Tbl. 3.18.1 describing changes to best management practices from 2013 to 2020 IAP, including minimizing effects of low-flying aircraft/helicopters on wildlife, subsistence activities, and local communities.			
294	While impacts related to helicopter traffic have decreased in recent years, impacts related to human-made structures have increased slightly, likely related to increased road infrastructure in the area (SRB&A 2018a). In addition, between 33% and 46% of harvesters reported they avoid developed areas during individual study years (CPAI 2018b).			
PDF 77	In response to comment about tools and other debris left behind during construction, “BMP A-1 (Waste and Litter) stipulates that “areas of operation shall be left clean of all debris.” The proposed changes to this BMP expand the requirement language: “All solid waste and industry-derived trash originating from permitted activities is required to be properly containerized while on-site or removed from the area of operation and			

	<p>activity.” Applicable BMPs/ROPs considered in the revised IAP are included in the Final EIS as <i>Applicable Existing and Proposed Lease Stipulations and Best Management Practices</i> sections (typically, Section 3.X.2.1.1). The BLM Arctic Office conducts inspections at the start of winter operations or activity, typically the first winter inspection is in January and occurs monthly through the winter. After stick-picking is complete in the summer, the BLM inspects across the permitted area once via helicopter. Anything that is left, the BLM would attempt to pick up. Any notable observations are documented in the inspection reports, which are also shared with the operators.”</p>
PDF 77	<p>In response to comment requesting public availability of monitoring and mitigation reports, proposed BMP H-5 requires data and summary reports derived from North Slope studies be made easily accessible. This was added to the <i>Applicable Existing and Proposed Lease Stipulations and Best Management Practices</i> section throughout the resource sections in Chapter 3.0 (<i>Affected Environment and Environmental Consequences</i>) (typically, Section 3.X.2.1.1) and to Appendix I.1 (<i>Avoidance, Minimization, and Mitigation</i>). The BLM requires weekly reports from operators on NPR-A activities during construction of surface development. The BLM Arctic Office conducts inspections at the start of winter operations or activity, typically the first winter inspection is in January and occurs monthly through the winter. After stick-picking is complete in the summer, the BLM inspects across the permitted area once via helicopter. Any notable observations are documented in the inspection reports, which are also shared with the operators.</p> <p>The public may request inspection and monitoring reports from the Arctic District Office through FOIA.</p>
PDF 109	<p>In response to comment about cumulative impacts of water usage and aircraft flights, “Quantitative descriptions of the gallons of water use and traffic trips for other projects (past, present, or reasonably foreseeable future actions) are not available to quantitatively describe cumulative values of the Project combined with other actions.”</p>
PDF 160	<p>In response to comment that BLM should consider impacts from “helicopter landings to support stick picking. These would occur at a crucial time for caribou, right in a narrow movement corridor. BLM must consider these potential impacts and whether they would cause significant restriction, beyond just the recognition that “air traffic for Option 2 would cause markedly more disturbance of caribou than Option 1” ... “Reviewed analysis of Option 2 and revised discussion in Section 3.16.2.7, <i>Module Delivery Option 2: Point Lonely Module Transfer Island</i>, to clarify the greater potential for displacement and indirect impacts to caribou subsistence harvesting activities.”</p>
PDF 164	<p>In response to comment about noise impacts from helicopters on caribou, Additional text on aircraft and noise was added to Section 3.12.2.3.2, <i>Disturbance or</i></p>

	<i>Displacement</i> , although there are limited data available on aircraft effects on caribou behavior under similar circumstances and with similar aircraft.
PDF 165	In response to similar comment as directly above, “Additional text on aircraft and ice road impacts, as well as energetic impacts of winter disturbance for Option 2, was added to Section 3.12.2, <i>Environmental Consequences</i> . The analysis of Option 2 was also revised in Section 3.16.2.7, <i>Module Delivery Option 2: Point Lonely Module Transfer Island</i> , to clarify the greater potential for displacement and indirect impacts to caribou subsistence harvesting activities. The discussion of impacts under Option 1 acknowledges the peak traffic levels and the high potential for impacts to both caribou and caribou harvesters.”
PDF 339	Following the end of the ice road season, all ice road stream crossings would be breached or slotted, and the ice built up artificially at crossings (e.g., ice or snow ramps) would be removed to match the static water elevation. Following spring breakup, work crews would conduct “stick picking” to remove any anthropogenic materials. BMPs typically used in conjunction with ice roads include: <ul style="list-style-type: none"> <li>☐ Placement of delineators to mark ice road edges</li> <li>☐ Frequent maintenance of routes</li> <li>☐ Use of portable spill containment (i.e., duck ponds) under vehicles and equipment</li> <li>☐ Coordination with the Kuukpik Subsistence Oversight Panel and the ice road monitors to patrol routes for spill cleanup needs</li> <li>☐ Summer cleanup activities (i.e., stick picking) . . .</li> </ul> CPAI would remove any anthropogenic debris (i.e., stick pick) from the route annually and perform annual inspections, as required by respective landowners and land managers.
PDF 341	Helicopters would be used to support Project construction, ongoing environmental studies, ice road permit compliance, and to a lesser extent, drilling and operations. Helicopter support for future exploration, including exploration wellhead inspections and debris cleanup (i.e., stick picking) from winter exploration activities, is not part of the Project.
PDF 361 366 367	Table D.4. 7, summarizing Alt. B components & identifying total number of helicopter flights
PDF 368 379 395	Helicopters would be used to support ice road construction, environmental monitoring, and surveying. Following construction of gravel roads, and during the drilling and operations phases, Project helicopter use would primarily be limited to ongoing environmental monitoring and spill response support.



PDF 374	Expected helicopter traffic for Alt. C: 2,910 total flights South Willow: 2,421 North Willow: 357 Alpine: 132
PDF 380 -3	Table D.4.17 summarizing Alt. C, identifying total number of helicopter flights
PDF 388	Expected helicopter traffic for Alt. D: 2,503 total flights Willow: 2,403 Alpine: 100
PDF 390	Unlike Alternatives B and C, the Project area would not be connected to the GMT Unit by an all-season gravel road. Rather, air access (fixed-wing aircraft and helicopter) and tundra travel would provide the only year-round access to the Project area. Alternative D would include annual construction of a seasonal ice road connection from GMT-2 to the Project area to transport materials and supplies to the Project area and waste and other materials out of the Project area.
PDF 393 -94	Table D.4.25 and D.4.26 summarizing Alt. D, identifying total number of helicopter flights
PDF 400 -04	Tbl. D.4.31 comparing helicopter flights across alternatives
PDF 410 416 420 426 443	Tbl. D-4.35 - traffic volume, including helicopter flights, around Atigaru Point module transfer island.  Tbl. D.4.41 – same for Point Lonely  Tbl. D.4.422 – same for Colville River
PDF 444 -49	Tbl. D.5.15 – alternatives comparison for total and daily helicopter traffic by season and year. Same for module delivery options, same from Alpine development.
Vol. PDF 728 778 -90	Access to the Plan Area from Alpine, Kuparuk, and/or Deadhorse would occur via ground transportation on ice roads, fixed-wing aircraft, and helicopter. Access from Alpine would also occur by gravel road. Anticipated ground, air, and marine traffic is detailed in the Willow MDP EED.

	<p>Helicopters would be used to support project construction, ongoing environmental studies, ice road permit compliance, and, to a lesser extent, drilling and operations. Helicopter support of future exploration, including exploration wellhead inspections and “stick picking” from winter exploration activities, is not part of the Willow MDP but is described within the context of cumulative effects within the Willow MDP EED.</p>
PDF 58	<p><b>Displacement of Caribou Due to Air Traffic Disturbance</b></p> <p>During construction, fixed-wing airplanes would be the primary source of air traffic, with helicopters used to support ice road construction, surveying, and monitoring (CPAI 2018). Once the airstrip is constructed, air traffic to the Project area would likely increase to multiple daily flights throughout the life of the Project, although at slightly lower levels during the drilling and operations phases. Helicopter traffic would occur on a periodic basis throughout the life of the Project. . . .</p> <p>Until recently, air traffic, particularly helicopter traffic, has been the most commonly reported impact on caribou hunting to the Nuiqsut Caribou Subsistence Monitoring Project (CPAI 2018; SRB&amp;A 2018a, 2019). Air traffic could cause direct and indirect disturbances to caribou availability both within and outside of the alternatives analysis area. Nuiqsut hunters have observed that caribou behavior often changes in response to air traffic, particularly helicopter traffic and fixed-wing traffic at low altitudes.</p>
PDF 69	<p>Higher levels of fixed-wing aircraft and helicopter traffic resulting from the lack of year-round access would overlap with peak caribou hunting months, which could result in a greater frequency of air traffic disturbances to caribou, resulting in decreased harvester success for Nuiqsut hunters during individual hunting trips. The increase in air traffic would likely not be enough to outweigh the benefits of reduced deflection of caribou as they migrate toward Nuiqsut’s hunting grounds to the west of the community. While air-traffic volumes would be somewhat higher, air traffic generally causes localized disturbances whereas roads can cause larger effects on caribou movement and distribution.</p>
PDF 82	<p>Ice roads associated with Option 2 would occur over a larger area, resulting in a greater area of disturbance for TCH caribou. In addition, summer Project activities at Point Lonely and along the ice road route, including construction noise, litter clean up (known locally as stick picking), human presence, and air traffic, which would be somewhat higher under Option 2, could affect caribou during the calving and insect relief seasons. This increased disturbance could result in alterations to caribou distribution closer to Nuiqsut and increased disturbance of calving and migrating caribou.</p>
PDF 109	<p>During summer, spill containment equipment would likely be staged or deployed using helicopters.</p>

Pdf 194 -99, 236 -44, 261 -93	Traditional knowledge compilation has numerous references to helicopter disturbances.
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