Appendix A:
Interagency/Intergovernmental Coordination and Public Participation

Table 1 Federal Agencies Contacted with the Notice of Availability

Federal Agencies	
Bureau of Indian Affairs Alaska Regional Office 709 West 9th Street PO Box 21647	Bureau of Indian Affairs Anchorage Agency 3601 C Street, Ste 1100 Anchorage, AK 99503-5947
Bureau of Land Management Anchorage Field Office Attn: Bonnie Milton 4700 BLM Road Anchorage, AK 99507-2599 blm_ak_afo_general_delivery@blm.gov	Federal Aviation Administration Alaska Region Attn: Kerry Long 222 West 7th Avenue, # 14 Anchorage, AK 99513 jean.wolfers-lawrence@faa.gov
National Park Service Alaska Regional Office 240 West 5th Avenue, Ste 114 Anchorage, AK 99501	U.S. Department of Agriculture Natural Resources Conservation Service Attn: Samia Savell 1508 E Bogard Rd Wasilla, AK 99654 Samia.Savell@usda.gov
U.S. Department of Interior Office of Environmental Policy & Compliance Anchorage Regional Office Attn: Philip Johnson 1689 C Street, Room 119 Anchorage, AK 99501-5126 NEPA_OEPC@ios.doi.gov	U.S. Department of Transportation Federal Highway Administration Alaska Division Attn: Sandra Garcia-Aline 709 West 9th Street, Room 851 PO Box 21648 Juneau, AK 99802-1648 sandra.garcia-aline@dot.gov
U.S. Environmental Protection Agency Region 10 Policy and Environmental Review Branch Attn: Rebecca Chu 1200 Sixth Ave, Suite 155 Seattle, WA 98101 Chu.Rebecca@epa.gov	U.S. Fish and Wildlife Service Ecological Services Branch Attn: Doug Cooper 4700 BLM Road Anchorage, AK 99507 douglass_cooper@fws.gov

Table 2 State Agencies/Office Contacted with the Notice of Availability

State Agencies/Offices	
Alaska Department of Environmental Conservation Division of Air Quality Attn: Alice Edwards 410 Willoughby Avenue, Ste 303 PO Box 111800 Juneau, AK 99801 alice.edwards@alaska.gov	Alaska Department of Environmental Conservation Division of Environmental Health Attn: Christina Carpenter 555 Cordova Street Anchorage, AK 99501 christina.carpenter@alaska.gov
Alaska Department of Environmental Conservation Division of Spill Prevention and Response Attn: Tiffany Larsen 410 Willoughby Avenue, Ste 302 PO Box 111800 Juneau, AK 99811-1800 tiffany.larson@alaska.gov	Alaska Department of Environmental Conservation Division of Water Attn: Randy Bates 555 Cordova Street Anchorage, AK 99501-2617 randy.bates@alaska.gov
Alaska Department of Fish and Game Division of Wildlife Conservation Attn: Cynthia Wardlow 333 Raspberry Road Anchorage, AK 99518-1599 cynthia.wardlow@alaska.gov	Alaska Department of Military and Veterans Affairs Major General Torrence Saxe PO Box 5800 Rm C-211 Camp Denali JBER, AK 99505 torrence.saxe@alaska.gov
Alaska Department of Natural Resources Commissioner Attn: Corri Feige 550 West 7th Avenue, Ste 1400 Anchorage, AK 99501 corri.feige@alaska.gov	Alaska Railroad Corporation Attn: Tim Sullivan 327 West Ship Creek Avenue PO Box 107500 Anchorage, AK 99510 sullivant@akrr.com
Alaska Resources Library and Information Services 3211 Providence Drive, Ste 111 Anchorage, AK 99508	Alaska State Court Law Library 303 K Street Anchorage, AK 99501
Alaska State Department of Natural Resources, Office of History and Archaeology, Alaska State Historic Preservation Officer, Attn: Judith Bittner	Senator Lisa Murkowski Attn: Kevin Sweeney 510 L Street, Ste 550 Anchorage, AK 99501
State of Alaska Office of the Governor Attn: Mike Dunleavy PO Box 110001 Juneau, AK 99811-0001	Senator Dan Sullivan 510 L Street Suite 750 Anchorage, AK 99501
Representative Don Young 471 W. 36th Avenue, Suite 201 Anchorage, AK 99503	Alaska Department of Fish and Game Division of Sport Fish 333 Raspberry Road Anchorage, AK 99518-1599 jay.baumer@alaska.gov
Alaska Department of Fish and Game Division of Habitat 333 Raspberry Road Anchorage, AK 99518-1599 ronald.benkert@alaska.gov	

Table 3 Local Agencies/Offices Contacted for the Notice of Availability

Local Agencies/Offices	
Anchorage Historic Preservation Commission Municipality of Anchorage c/o Planning Dept. Kristine Bunnell, Senior Planner PO Box 196650 Anchorage, AK 99519-6650 3ristine.bunnell@anchorageak.gov	Municipality of Anchorage Attn: Dave Bronson 632 West Sixth Avenue, Ste 840 Anchorage, AK 99501
Municipality of Anchorage Anchorage Community Development Authority 245 West 5th Avenue, Ste 122 Anchorage, AK 99501 info@acda.net	Municipality of Anchorage Community Planning & Development Attn: Michelle McNulty 4700 Elmore Road Anchorage, AK 99507 michelle.mcnulty@anchorageak.gov
Ted Stevens Anchorage International Airport Attn: Jim Szczesniak PO Box 196960 Anchorage, AK 99519 jim.szczesniak@alaska.gov	Anchorage Assembly Attn: Barbara Jones PO Box 196650 Anchorage, AK 99519
Port MacKenzie Matanuska-Susitna Borough Attn: Marc Van Dongen 350 East Dahlia Avenue Palmer, AK 99645	Port of Anchorage Attn: Stephen Ribuffo 2000 Anchorage Port Road Anchorage, AK 99501

Table 4 Other Stakeholders Contacted for the Notice of Availability

Other Stakeholders	
Eagle River Community Council Morris Pickel, Jr., President 12002 Business Blvd. #123 Eagle River, Alaska 99577 eaglercommunitycouncil@gmail.com	Fairview Community Council Allen Kemplen, Chair 1057 West Fireweed Ln Anchorage, AK 99503 president@fairviewcommunity.org info@fairviewcommunity.org
Government Hill Community Council Jody Sola, President 1057 West Fireweed Ln Anchorage, AK 99503 ghccpres@gmail.com	Mountain View Community Council Kirsten Swann, President 3701 Mountain View Drive Anchorage, AK 99508 kirstenswann00@gmail.com
Northeast Community Council T'Shalla Baker, President 1057 West Fireweed Ln Anchorage, AK 99503	South Fork Community Council Karl von Luhrte, President 8609 Acadia Dr Anchorage, AK 99577 sofccak@gmail.com

Table 5 Tribal Entities Contacted for Government-to-Government Consultation and the Notice of Availability

Tribal Entities	
Chickaloon Village Traditional Council Mr. Gary Harrison, Traditional Chief or Mr. Doug Wade, Chairman PO Box 1105	Native Village of Eklutna Traditional Council Mr. Aaron Leggett, President 26339 Eklutna Village Road Chugiak, AK 99567
Knik Tribal Council Mr. Richard Porter, CEO PO Box 871565 Wasilla, AK 99687	Native Village of Tyonek Mr. Arthur Standifer, President PO Box 82009 Tyonek, AK 99682
Eklutna, Inc. Kyle Foster, CEO 16515 Centerfield Drive, Ste 201 Eagle River, AK 99577	Cook Inlet Region, Inc (CIRI) Attn: Sophie Minich PO Box 93330 Anchorage AK 99509-3330

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Anchorage Fish And Wildlife Conservation Office
4700 Blm Road
Anchorage, AK 99507
Phone: (907) 271-2888 Fax: (907) 271-2786

In Reply Refer To: September 21, 2021
Consultation Code: 07CAAN00-2021-SLI-0390
Event Code: 07CAAN00-2021-E-01187
Project Name: RW 34 Extension

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, and proposed species, designated critical habitat, and some candidate species that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Please note that candidate species are not included on this list. We encourage you to visit the following website to learn more about candidate species in your area: http://www.fws.gov/alaska/fisheries/fieldoffice/anchorage/endangered/candidate_conservation.htm

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Anchorage Fish And Wildlife Conservation Office
4700 Blm Road
Anchorage, AK 99507
(907) 271-2888

Project Summary

Consultation Code: 07CAAN00-2021-SLI-0390
Event Code: Some(07CAAN00-2021-E-01187)
Project Name: RW 34 Extension
Project Type: DEVELOPMENT
Project Description: The USAF proposes to extend the north-south runway at Joint Base Elmendorf-Richardson by approximately 400' to reach a total runway length of 10,000. The project is needed to improve F-22 operational efficiency. The project would be constructed between 2022-2025.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@61.268544750000004,-149.79433958347076,14z

Counties: Anchorage County, Alaska

Endangered Species Act Species

There is a total of 0 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Golden-plover *Pluvialis dominica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 20 to Aug 15
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Feb 1 to Sep 30

NAME	BREEDING SEASON
Hudsonian Godwit *Limosa haemastica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 15 to Jul 31
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds May 1 to Aug 15
Olive-sided Flycatcher *Contopus cooperi* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3914	Breeds May 20 to Aug 31
Short-billed Dowitcher *Limnodromus griseus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9480	Breeds Jun 1 to Aug 10

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12

(0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

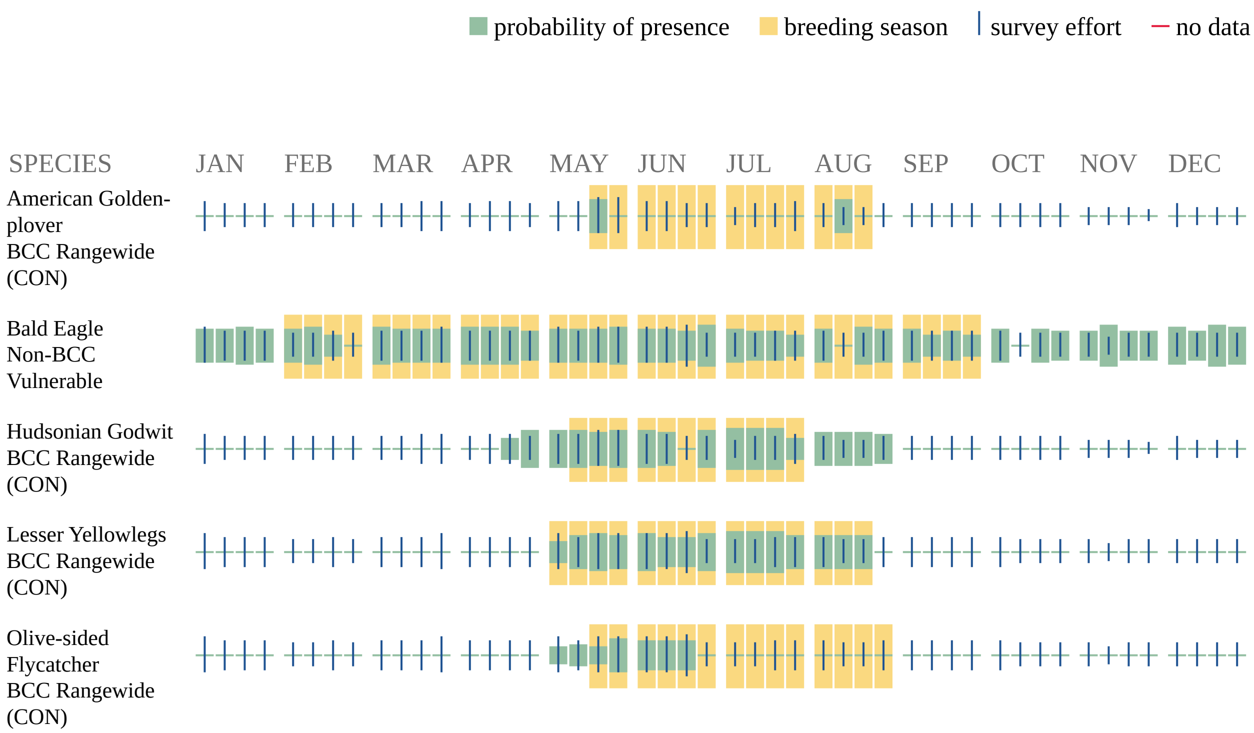
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Short-billed Dowitcher
BCC Rangewide
(CON)

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?
To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

FRESHWATER EMERGENT WETLAND

- PEM1B
- PEM1F

FRESHWATER FORESTED/SHRUB WETLAND

- PFO1B
- PSS1B
- PSS4B

DEPARTMENT OF THE AIR FORCE
PACIFIC AIR FORCES

10/1/2021

Dear Ms. Mahoney,

The U.S. Air Force (USAF) completed the EIS Proposal to Improve F-22 Operational Efficiency at JBER_Final EIS_Feb 2018 (https://www.jber.jb.mil/Portals/144/Services-Resources/environmental/Completed-NEPA/Environmental-Vol%201-JBER-F22-FEIS-Feb2018_full.pdf) that analyzed six alternatives involving various permutations of shifting F-22 flights from one runway to another. Three of those alternatives also involve extension of the North-South runway (16/34) (runway 16 is for arrivals from the North and runway 34 is for departures to the North) along with pattern changes and redistribution of arrivals/departures. None of the alternatives previously presented involved increases in total sorties (individual flights).

To support this NEPA effort and in accordance with the Endangered Species Act (ESA), USAF completed an analysis of the potential effects of the proposed action on the endangered Cook Inlet beluga whale (2016). This ESA analysis focused on two alternatives (C and E), which were considered the most impactful alternatives to belugas due to the size of the water area ensonified under the flight path over Knik Arm. Neither alternative was ultimately selected in the EIS Record of Decision, but Alternative C is similar to the chosen alternative (Alternative F). Both involved an extension of the N-S runway but Alternative C involved the majority of both departures and arrivals on the N-S runway (i.e. over the western edge of Eagle Bay) while Alternative F involved the majority of departures from the E-W runway (over Cairn Point) and the majority of arrivals from the N-S runway. Alternative F was analyzed and included in the 2016 ESA consultation (see Table A-12 in the analysis), it just wasn't highlighted. Ultimately, this analysis resulted in a likely to affect, not likely to adversely affect determination. Informal consultation under Section 7 of the ESA concluded with issuance of a letter of concurrence (LOC) (NMFS # AKR-2016-9561) on 5 Aug, 2016.

Since the issuance of this LOC, USAF has developed plans for the runway extension (under the chosen Alternative F) but determined a 400-ft northward shift of the entire extended runway would be necessary to meet federal standards for ILS runway lighting. A Supplemental Environmental Assessment is in development to assess potential effects of this runway extension, including the necessary northward shift. As a part of this process, USAF has examined the need to reinitiate informal consultation under NMFS # AKR-2016-9561. During the course of this examination, it became clear the only change from what was presented in the 2016 ESA consultation, was the shift of the extended runway northward an additional 400-500 feet.

JBER flight operations personnel (flight planners hereafter called "Flight Ops"), concluded that the shifted runway extension would equate to an approximate 500-foot northward shift in the final approach fix (where the jets begin their descent) and presumably a 500-foot northward shift in the modeled noise footprints (Maj. R. Pecek, 2021, personal communication, 4 March). Calculations from the acoustician who conducted the original analysis in 2016 (Jay Austin, Leidos), estimated this northward shift in the final approach fix would equate to a minimal drop in altitude above water (approximately 25 feet) given the shallow glide slope (3 degrees) (J. Austin, 2021, personal communication, 4 March). Mr. Austin further estimated this decrease in altitude over water would equate to less than a 1 dB increase in waterborne SPL and that the risk of harassment, as calculated in the analysis, would not change. Additionally, Flight Ops noted the lowest modeled altitudes (509 feet MSL) in the ESA analysis were overly conservative and should be 1184 MSL (Maj M. Guertin, 2021, personal communication, 8 March).

Given that the only difference from what was presented in the 2016 analysis and the current runway extension proposal is the 400-500-foot operational shift northward and that the extension would not result in a different effects determination, in addition to the fact that the jets actually remain higher over the water than what was presented, JBER has determined that the likely effects from the proposed extension of the North-South runway would be covered under the current LOC (NMFS # AKR-2016-9561). Consequently, and since none of the other criteria for re-initiation of consultation under 50 CFR § 402.16 have been met, the USAF has further determined that re-initiation of consultation under NMFS # AKR-2016-9561 is not required for this project.

If you have any questions or concerns please contact me at (907) 602-0860 or christopher.garner.9@us.af.mil

Christopher Garner
Biologist , 673 CES/CEIEC
JBER, Alaska

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS, JOINT BASE ELMENDORF-RICHARDSON
JOINT BASE ELMENDORF-RICHARDSON, ALASKA

1 October 2021

MEMORANDUM FOR Tribal Entities listed in Table 5.

FROM: 673d Air Base Wing and Joint Base Elmendorf-Richardson Commander
10471 20th Street
JBER AK 99506

SUBJECT: Government-to-Government Consultation Offer

1. The United States Air Force (USAF) is preparing a Supplemental Environmental Assessment (SEA) under the National Environmental Policy Act (NEPA) to evaluate potential environmental impacts associated with the Proposal to Improve F-22 Operational Efficiency at Joint Base Elmendorf-Richardson (JBER), Alaska. As part of the NEPA process, government-to-government consultation with Federally Recognized Native American tribal entities is required per Executive Order 13175, *Consultation and Coordination With Indian Tribal Governments*; Department of Defense Instruction (DoDI) 4710.02, *DoD Interactions with Federally Recognized Tribes*; and Department of the Air Force Instruction (DAFI) 90-2002, *Interactions with Federally Recognized Tribes.*

2. The USAF prepared an Environmental Impact Statement (EIS) in 2018 to disclose the environmental consequences of the Proposed Action, but substantial changes occurred during design, resulting in a changed project footprint. Additionally, new information relevant to the environmental concerns of the Proposed Action emerged after the USAF signed the Record of Decision (ROD) in September 2018. Pursuant to the changes and new information, the USAF will supplement the 2018 EIS. The original EIS can be found online at: https://www.jber.jb.mil/Portals/144/Services-Resources/environmental/Completed-NEPA/Environmental-Vol%201-JBER-F22-FEIS-Feb2018_full.pdf

3. The changes to the Proposal to Improve F-22 Operational Efficiency compelling the USAF to supplement the EIS involve wetland impacts, borrow areas, disposal areas, and design features. As part of the Proposed Action, the USAF would extend the north-south runway (Runway 16/34) on JBER by approximately 2,900 feet and alter flight operations to address the existing challenges to flight operations, including efficiency and safety. The annual F-22 sorties would have departures primarily on Runway (RW) 24 and arrivals primarily on an extended RW 16. The Proposed Action also includes re-routing Airlifter Drive, excavating 12 million cubic yards of soil, constructing ground improvements to stabilize the Fish and Triangle lake hydrology, and several fill and disposal areas.

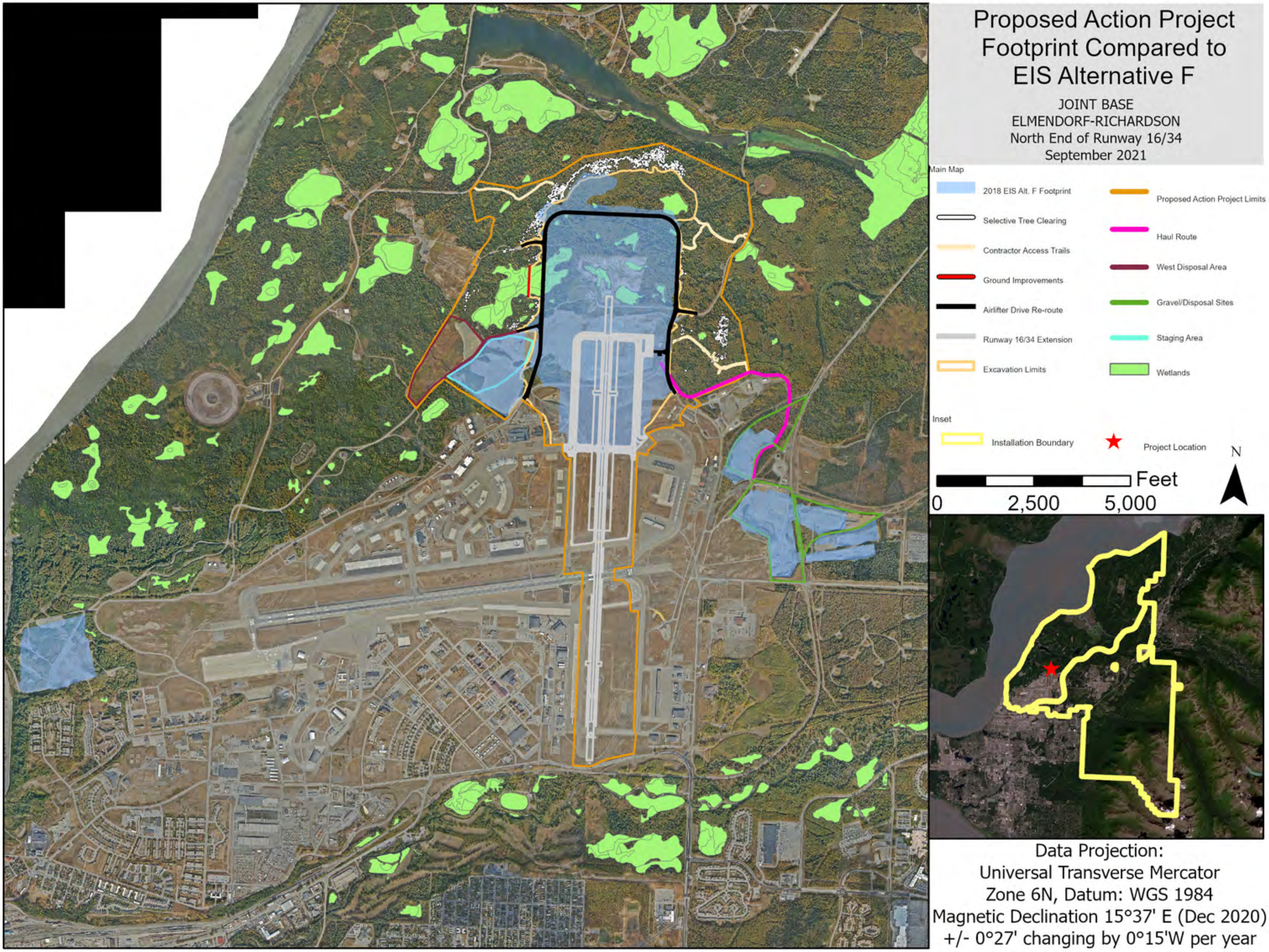
4. New information relevant to the environmental concerns of the Proposed Action includes the Approved Jurisdictional Determination (AJD) that wetlands in the Proposed Action area are not regulated under the Clean Water Act (CWA), the documentation of previously unknown cultural resources, the discovery of soils containing per- and polyfluoroalkylated substances (PFAS) inside the excavation limits, and the Bird-Aircraft Strike Hazard (BASH) assessment. The attached Project

Location Map depicts the changes to the project footprint and inclusion of additional design details that were not available when the EIS was published.

5. I request any comments, concerns, or suggestions you may have, including concerns regarding the Proposed Action that may affect protected tribal rights or resources related to the Proposal to Improve F-22 Operational Efficiency. If you determine that this action affects protected tribal rights or resources and wish to consult or discuss this, the USAF requests your response within 30 days of receiving this consultation request; however, a lack of response does not preclude your ability to consult or request government-to-government consultation on this project at any time. If you have any questions, please contact our Tribal Liaison Officer, Joy Boston, at 907-551-1598 or joy.boston.2@us.af.mil. Thank you in advance for your assistance in this effort.

KIRSTEN G. AGUILAR
Colonel, USAF
Commander

Attachment:
Proposed Action Project Footprint Compared to EIS Alternative F - September 2021



Proposed Action Project Footprint Compared to EIS Alternative F
JOINT BASE ELMENDORF-RICHARDSON
North End of Runway 16/34
September 2021
Main Map
2018 EIS Alt. F Footprint
Selective Tree Clearing
Contractor Access Trails
Ground Improvements
Airlifter Drive Re-route
Runway 16/34 Extension
Excavation Limits
Proposed Action Project Limits
Haul Route
West Disposal Area
Gravel/Disposal Sites
Staging Area
Wetlands
Inset
Installation Boundary
Project Location
N
Feet
0
2,500
5,000
Data Projection:
Universal Transverse Mercator
Zone 6N, Datum: WGS 1984
Magnetic Declination 15°37' E (Dec 2020)
+/- 0°27' changing by 0°15'W per year

From:	Richard "Dick" Weldin
To:	BOSTON, JOY E CIV USAF PACAF 673 ABW/CDP; Kyle Foster
Subject:	[Non-DoD Source] Government to Government Consultation Offer
Date:	Thursday, October 21, 2021 8:39:47 AM

Hi Joy,

We received a Government to Government Consultation Offer Letter dated October 1, 2021. This message is in response to that letter, please let me know if you would also like a hard copy letter on Eklutna letterhead.

We would like to know if the Geotech Information for this project has shown that there is sufficient Class A Borrow Material to support all the structural fill and all the crushing/material processing operation required to make asphalt aggregate and base course?

Our concern is that if this is not the case, supplemental Borrow Material will be required from the existing Base Gravel Source located on NALA Land.

Our second question is: Are the Waste Disposal Sites shown on the maps sufficient to contain the approximately 12 million yards of waste excavation from this project?

Our concern is that additional NALA Land will be required for Waste Disposal if the current sites are not sufficient.

Our third question is: During this project if additional Waste Disposal Sites or Borrow Sites become necessary, will Eklutna be notified and have the opportunity to comment?

Thank you Joy,

Dick Weldin
Director of Mining
Eklutna Inc.
907 250 9601

Sent from Mail for Windows

16515 Centerfield Drive, Suite 201
Eagle River, AK 99577
P: 907.696.2828
F: 907.696.2845
www.eklutnainc.com

October 26, 2021

Joy Boston
10471 20th Street Room 127
JBER AK 99506

Re: Government-to-Government Consultation Offer – Supplemental Environmental Assessment, Proposal to Improve F-22 Operational Efficiency at JBER

Dear Ms. Boston:

Thank you for providing Eklutna, Inc. (Eklutna) the opportunity to comment on the Supplemental Environmental Assessment (SEA) regarding the Proposal to Improve F-22 Operational Efficiency at Joint Base Elmendorf-Richardson (JBER). We are seeking clarification on questions we have pertaining to waste and borrow sites on North Anchorage Land Agreement (NALA) lands (questions below). The NALA lands are Eklutna entitlement lands, and thus, actions on these lands will impact Eklutna's future use of these lands.

Questions:

1) Does the geotechnical information for this project area, described in the SEA, show that there is sufficient Class A Borrow Material to support all the structural fill and crushing/material processing required to make asphalt aggregate and base course?

Our concern is that if this is not the case, supplemental Borrow Material will be required from the existing Base Gravel Source located on NALA Land.

2) Are the Waste Disposal Sites shown on the maps sufficient to contain the approximately 12 million yards of waste excavation from this project?

Our concern is that additional NALA Land will be required for Waste Disposal if the current sites are not sufficient.

3) During this project will there be additional Waste Disposal Sites or Borrow Sites becoming necessary? If so, will Eklutna be notified and have the opportunity to comment?

Eklutna would like to see these questions addressed within the EIS process and would appreciate a direct response on these questions as well. Please feel free to contact Dick Weldin at rweldin@eklutnainc.com with any questions or responses.

Sincerely,

Kyle Smith

Kyle Smith
Director of Land Assets

NOTICE FOR EARLY PUBLIC REVIEW OF A PROPOSED ACTIVITY WITHIN WETLANDS
UNITED STATES AIR FORCE

2021 Supplemental Environmental Assessment for the Proposal to Improve F-22 Operational Efficiency at Joint Base Elmendorf-Richardson, Alaska

The U.S. Air Force (USAF) invites public input on any practicable alternatives for a proposed activity within wetlands at Joint Base Elmendorf-Richardson (JBER), Alaska. The Proposed Action involves an extension of the north-south runway (RW 34) that was previously examined and selected by the USAF in the 2018 Environmental Impact Statement and Record of Decision (RoD) for the *Proposal to Improve F-22 Operational Efficiency at Joint Base Elmendorf-Richardson, Alaska*. (https://www.federalregister.gov/documents/2018/08/23/2018-18274/record-of-decision-for-the-proposal-to-improve-f-22-operational-efficency-at-joint-base). The project would provide the USAF with the flexibility to distribute F-22 departures and arrivals on JBER's runways to maximize airspace training time and safety.

After the ROD was signed, changes were made to the final design and new information was collected related to the potential environmental impacts. The proposed runway extension will be located at the north end of Runway 34 where freshwater wetlands are located. Implementation of the final design could add approximately 10.6 acres of wetlands to the impacts described for the alternative selected in the 2018 ROD. The final design will result in a total approximate wetland impact of 38.5 acres.

The USAF is performing supplemental environmental analysis in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. This early public notice is required by Executive Order 11990, "Protection of Wetlands." The USAF prepared and made this notice available to the public in accordance with 32 CFR 989 and Air Force Manual 32-7003 for actions proposed within wetlands. Subsequent public notice required by NEPA will be made once the document is available for review and comment.

Written comments and inquiries should be directed to JBER Public Affairs, 10480 Sijan Ave., Suite 123, JBER, AK 99506. Emailed comments can be submitted to jber.pa@us.af.mil. Comments may also be submitted on the phone at (907) 552-4493.

ANCHORAGE DAILY NEWS
AFFIDAVIT OF PUBLICATION

Account #: 101705 US ARMY CORPS OF ENG. ALASKA DISTRICT
CEPOA-PM-ESP PO BOX 6898, JBER, AK 99506

Order #: W0025792 Cost: $244.06

STATE OF ALASKA
THIRD JUDICIAL DISTRICT

Adam Garrigus being first duly sworn on oath deposes and says that she is a representative of the Anchorage Daily News, a daily newspaper. That said newspaper has been approved by the Third Judicial Court, Anchorage, Alaska, and it now and has been published in the English language continually as a daily newspaper in Anchorage, Alaska, and it is now and during all said time was printed in an office maintained at the aforesaid place of publication of said newspaper. That the annexed is a copy of an advertisement as it was published in regular issues (and not in supplemental form) of said newspaper on

10/24/2021

and that such newspaper was regularly distributed to its subscribers during all of said period. That the full amount of the fee charged for the foregoing publication is not in excess of the rate charged private individuals.

Signed Adam Garrigus

Subscribed and sworn to before me
this 25th day of October 2021.

Notary Public in and for
The State of Alaska.
Third Division
Anchorage, Alaska

MY COMMISSION EXPIRES
7/14/2024

**NOTICE FOR EARLY PUBLIC REVIEW
OF A PROPOSED ACTIVITY WITHIN WETLANDS
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Pub: October 24, 2021

NOTARY PUBLIC
JADA L. NOWLING
STATE OF ALASKA
MY COMMISSION EXPIRES July 14, 2024

MAT-SU VALLEY FRONTIERSMAN
AFFIDAVIT OF PUBLICATION

See Proof on Next Page

5751 E. MAYFLOWER CT.
Wasilla, AK 99654
(907) 352-2250 ph
(907) 352-2277 fax

UNITED STATES OF AMERICA, STATE OF ALASKA, THIRD DIVISION BEFORE ME, THE UNDERSIGNED, A NOTARY PUBLIC, THIS DAY PERSONALLY APPEARED BEFORE Brooke Jacquez WHO, BEING FIRST DULY SWORN, ACCORDING TO LAW, SAYS THAT SHE IS THE LEGAL AD CLERK OF THE PUBLISHED AT WASILLA AND CIRCULATED THROUGH OUT MATANUSKA SUSITNA BOROUGH, IN SAID DIVISION THREE AND STATE OF ALASKA AND THAT THE ADVERTISEMENT, OF WHICH THE ANNEXED IS A TRUE COPY, AND THAT THE RATE CHARGED THEREIN IS NOT IN EXCESS OF THE RATE CHARGED PRIVATE INDIVIDUALS, WAS PUBLISHED ON THE FOLLOWING DAYS:

PUBLICATION DATES:
24 Oct 2021

Notice Name: RW Ext EPN

Brooke Jacquez

VERIFICATION

STATE OF ALASKA
MATANUSKA-SUSITNA BOROUGH

Signed or attested before me on this

24th day of October, A.D. 2021.

Nancy E Downs
Notary Public for the state of Alaska
US Army Corps of Engineers

NANCY E. DOWNS
Notary Public
State of Alaska
My Commission Expires
August 25, 2023

NOTICE FOR EARLY PUBLIC REVIEW OF A PROPOSED ACTIVITY WITHIN WETLANDS
UNITED STATES AIR FORCE

2021 Supplemental Environmental Assessment for the Proposal to Improve F-22 Operational Efficiency at Joint Base Elmendorf-Richardson, Alaska

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Frontiersman
Publish Dates: Oct 24, 2021

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS, 673D AIR BASE WING
JOINT BASE ELMENDORF-RICHARDSON, ALASKA

MEMORANDUM FOR ALASKA DEPARTMENT OF NATURAL RESOURCES
OFFICE OF HISTORY AND ARCHAEOLOGY
ALASKA STATE HISTORIC PRESERVATION OFFICER
ATTENTION: JUDITH E. BITTNER

FROM: 673 CES/CEIEC
6326 Arctic Warrior Drive
JBER AK 99506

SUBJECT: Archaeological Survey for North Runway Extension, Joint Base Elmendorf-Richardson

1. **Purpose and Need:** The Joint Base Elmendorf-Richardson (JBER) Environmental Conservation Section (673d CES/CEIEC) is coordinating consultation under Section 106 of the National Historic Preservation Act (NHPA) of 1966 (54 USC § 300101 et seq.) and its implementing regulations (36 CFR § 800) for the extension of the north/south runway. The purpose of this letter is to provide you the report on the archaeological investigation of previously unsurveyed portions of the project's area of potential effect (see attached report) and a second report on the (unevaluated) obstruction lights on the flightline. We request your concurrence on several determinations of eligibility and assessments of effect.

2. **Project Description and Area of Potential Effect:** The 3rd Wing at JBER and Headquarters Pacific Air Forces (HQ PACAF) identified the need to maintain and improve F-22 operational efficiency as measured by pilot training time in the training airspace. An Environmental Impact Statement (EIS) was prepared to evaluate the potential environmental impacts of this proposed action in compliance with the National Environmental Policy Act of 1969 (42 USC 4331 et seq.). The EIS was finalized and the Record of Decision was signed in 2018. In the EIS, the preferred alternative included excavating existing terrain to remove topographic barriers, extending the north/south runway, relocating Airlifter Drive, and changes to flight operations. Your office was notified that the project would result in no historic properties affected on April 21, 2016. After some discussion, you responded that you concurred that Alternatives A, D, E, and No Action would result in no historic properties affected, but withheld concurrence that Alternatives B, C, and F would result in no adverse effect until additional archaeological surveys were completed. You then agreed in a letter dated September 14, 2017, that the project (all alternatives) would result in no direct effect on historic properties and no adverse indirect effect on historic properties.

   However, during the design process, several substantial changes to the proposed action were required. The volume of excavated material was reduced from approximately 15 million cubic yards (mcy) to 12mcy, expansion of the grading limits in the north end of construction area, the addition of selective tree clearing, a change in the disposal areas, additional gravel extraction/disposal areas, newly identified areas of PFAS containing soil requiring avoidance/management, sourcing of sub-base material is now on-post, construction of a barrier wall adjacent Fish Lake and Triangle Lake wetland complex to address drainage issues resulting from the runway extension, and increasing the length of runway extension has increased to 2,900 feet. As a result, JBER is now preparing a supplemental Environmental Assessment (SEA) to address potential effects of these aspects of the project, as well as any data gaps in the 2018 EIS.

The area of potential effect (Figure 1) consists of the runway extension, areas to be excavated and fill disposal areas, the ground improvements near Fish and Triangle lakes, the new route of Airlifter Drive, areas of selective tree clearing, access routes, and staging areas.

Figure 1. *Area of potential effect for the JBER north/south runway extension.*

3. **Historic Properties and the Area of Potential Effect:** The majority of the area of potential effect has been surveyed previously (Figure 2). Most of the identified sites have been found not eligible for the National Register of Historic Places (NRHP). One historic building and one historic district are in the area of potential effect and are listed by the AHRS as eligible for the NRHP. ANC-02005 is a corrugated metal, arched roof bunker structure that contributes to ANC-02577 (Bunker/Igloo Complex Historic District). However, these sites have been destroyed by development of the North End Borrow Pit. The bunkers and igloos were mitigated by the Advisory Council's program comment for ammunition storage facilities.[1] [2] Building 18762 (ANC-03219) was a weapons shop used to assemble rocket munitions built in 1955. It is eligible for the NRHP due to its role in the Cold War intercept mission. It is near the north end of the existing flight line. The project does not include any changes to this building.

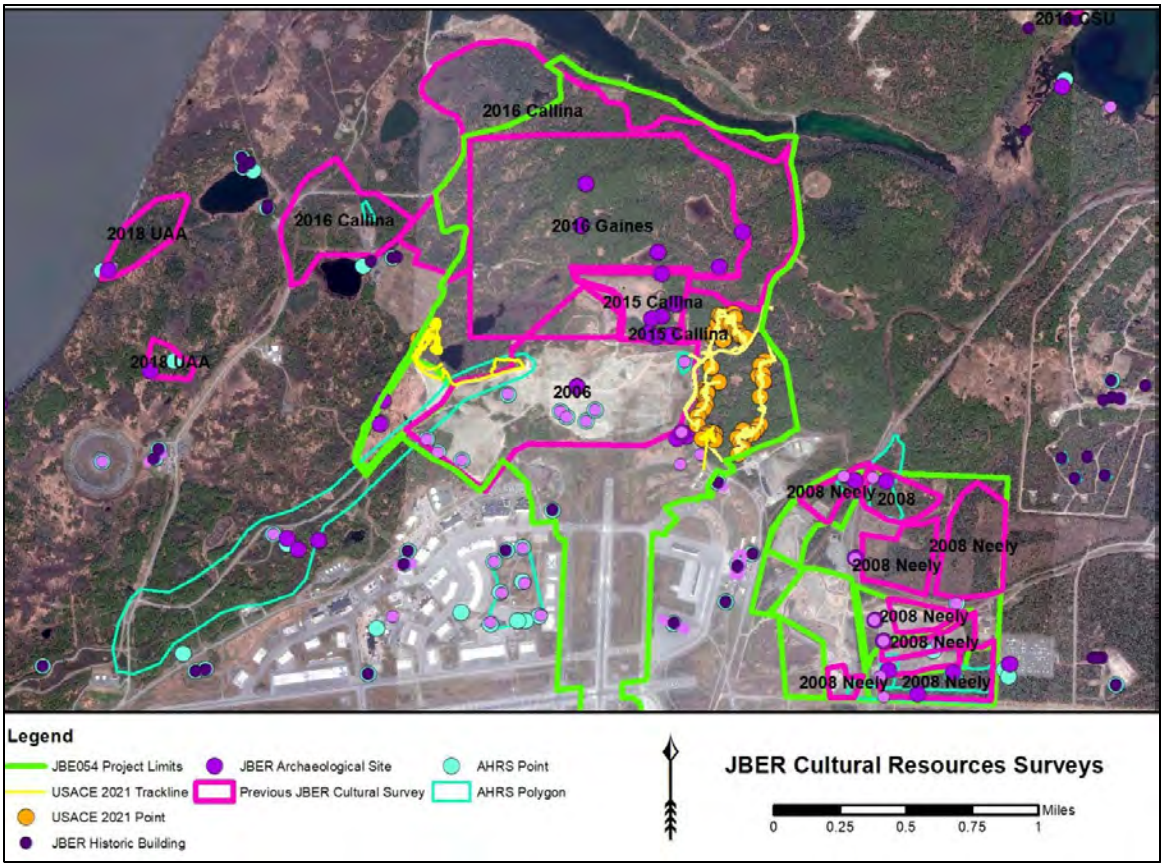

Figure 2. *Area of potential effect and previously surveyed areas.*

There are also three cultural resources in the area of potential effect that have not been evaluated, according to the attached report. As described in Blanchard et al. (2021, recently submitted), ANC-00431 was two pit features and scattered historic debris that was likely destroyed some time in 2010. Similarly, ANC-00432 (concrete bunker) was 350 meters northwest of ANC-00432 and was probably destroyed during the same construction project. Because both sites have not been relocated, despite multiple searches, the proposed project will not affect them. According to the attached report, ANC04392 (Industrial Weigh Station, Building

[1] Advisory Council on Historic Preservation Program Comment for World War II and Cold War Era (1939-1974) Ammunition Storage Facilities.

[2] US Department of Transportation, Maritime Administration. 2007. Cultural Resource Monitoring Plan: Construction of the POA Haul Road and Material Extraction at the Cherry Hill and North End Borrow Pits, Elmendorf Air Force Base. Prepared by the Anchorage Port Expansion Team.

74438) has not been evaluated; however, it was determined not eligible and SHPO concurred in 2018.[3] Table 1 provides an update to Table 2 in the attached report, as well as newly identified sites.

4. **2021 Archaeological Survey Results:** Approximately 194 acres in the area of potential effect had not previously been surveyed by archaeologists. The attached report provides the methods and results of that survey. Five new cultural resources and one previously reported site are described and evaluated in the report. Their AHRS numbers, descriptions, and determinations of eligibility for the NRHP are included in Table 2. A summary of the sites and determinations of NRHP eligibility follows.

Table 1. Corrections to Table 2 in attached archaeology report and resources evaluated (bold).

AHRS No	Site Name	Description	NRHP Status
ANC-431	ANC-431	Two depressions and scattered historic debris; likely World War II; site destroyed.	Unevaluated (destroyed)
ANC-432	ANC-432	Concrete bunker; World War II	Unevaluated (destroyed)
ANC-2005	Corrugated Metal Structure	Corrugated metal and concrete bunker; Cold War	Contributing (ANC-2577) (destroyed)
ANC-2577	Bunker/Igloo Complex Historic District	Grouping of corrugated galvanized steel and concrete bunkers arranged in a circular layout and buried in hillsides and earthworks; Cold War	Not eligible (destroyed)
ANC-2978	**Wooden Hut**	**Signal Corps radio transmission building; World War II**	**Eligible (A, D)**
ANC-3219	Building 18762, Weapons Shop	Built 1955. Used to assemble and store rocket munitions vital to the Cold War interceptor mission in Alaska.	Eligible
ANC-4392	Building 74438, Scale Building	Built 1972. Industrial weigh station supporting C-130 engine maintenance operations.	Not eligible (change from report)
ANC-4712	**Hillberg Ski Area Building**		**Not eligible**
ANC-4713	**Hillberg Pulley System**	**Possibly associated with construction or operation of Hillberg Ski Area (built in 1950); no date**	**Not eligible**
ANC-4714	**Historical Debris Scatter and Building Platform**	**Earthen building platform and associated debris scatter, military; no date**	**Not eligible**
ANC-4715	**Historical Debris Scatter near Wooden Staircase**	**Scattered historic debris, military and domestic; Post World War II, possibly Cold War**	**Not eligible**
ANC-4716	**Multi-Cabin Site**	**Multiple log structures and scattered Signal Corps debris; likely World War II**	**Eligible (A, D)**
ANC-4717	**Collapsed Building and Outhouse**	**One wood building and associated outhouse; no date**	**Unevaluated**
None	**Fighting positions**	**Various fighting positions throughout survey area; no date**	**Not eligible**
None	**Obstruction lights**	**Established 1942. Lights placed on aircraft obstructions for safety purposes**	**Not eligible**

[3] Paul Maggioni and Robert Bowman. 2018. *Cultural Resources Services Cold War Survey: Historic Building Inventory at Joint Base Elmendorf-Richardson, Alaska*, prepared by LG2 Environmental Solutions, Inc.

ANC-02978, Wooden Hut. ANC-02978 is a mostly collapsed, modified Quonset Hut with scattered historic debris. This included radio transmission equipment affiliated with the Signal Corps. This site was first reported in 2008 and found not eligible for the NRHP due to a lack of significance and integrity. The 2021 re-examination of the site found that it the site did retain integrity and that the equipment dated from both World Wars I and II, indicating that it likely one of the earliest Signal Corps stations established on base as it was being established. The Signal Corps played a critical role in communications and aircraft safety throughout the war. For that reason, it is **recommended eligible for the NRHP under Criterion A**. The decision was made to not disturb the site, as there was a substantial collection of diagnostic debris visible on the surface. This indicates a strong likelihood that they site contains data important to our understanding of the operations of the Signal Corps during the early development of Elmendorf Air Field and Fort Richardson; therefore, the site is **recommended as eligible for the NRHP under Criterion D**.

ANC-04712, Hillberg Ski Area Building. This structure is not in JBER's Real Property Inventory and has no facility number. It is a standing wood building that is likely a warming hut associated with Hillberg Ski Area, which began operation in 1950. It could not be determined when this structure was constructed. Most of the older structures at this recreational area have been found not eligible for the NRHP. Similarly, JBER agrees with the recommendation that **this building is also not eligible for the NRHP**.

ANC-04713, Hillberg Pulley System. The Hillberg Pulley System consists of several poles and pulleys that are also likely associated with the construction or early operation of Hillberg Ski Area. Despite the presence of multiple manufacturer's plates on the equipment, the construction date of these objects could not be narrowed down. They are not connected to the existing chair lift equipment and are heavily overgrown, which implies they have been unused for some time. The recreation area has little historic significance or associations; therefore, the pulley system is recommended as **not eligible for the NRHP**.

ANC-04714, Historical Debris Scatter and Building Platform. This site includes a scatter of historic debris, multiple fighting positions, and a rectangular depression that may be a building footprint. Based on aerial imagery, the site probably dates after 1952. No documentation of the site was found and the artifacts do not provide any clues as to what activity occurred at the site. JBER agrees with the recommendation that **this site is not eligible for the NRHP**.

ANC-04715, Historical Debris Scatter near Wooden Staircase. This site is near an abandoned road and wooden staircase. The historic debris includes domestic and military debris, some of which date to the Cold War era. This is supported by historic aerial imagery and base maps, which show fuel and munitions dispersal areas. The diagnostic artifacts indicate the site dates to the Cold War period and is associated with munitions storage, which is not a historically significant theme for the Cold War era.[4] JBER agrees with the recommendation that **this site is not eligible for the NRHP**.

ANC-04716, Multi-Cabin Site. This site includes seven partially standing, hand-hewn log cabins, two other wooden structures, several fighting positions, and scattered historic debris. The artifacts are primarily equipment associated with the Signal Corps, although their date of manufacture and function could not be determined. Historic aerial images and base maps do not provide any insight into when the cabins were built. It is unlikely that they are from a homestead, as no claims were filed in this area. However, it is possible that they predate the military and were re-used by the military during the earliest development of Elmendorf Air Field and Fort Richardson in 1940and 1941. This practice has been documented in several locations on

[4] Marsha Prior, Karen Van Citters, and Duane Peter. 2017. *National Register of Historic Places Themes and Historic Context for Air Force, Army, and Navy in the Cold War*. Prepared for US Air Force Air Command Series, Report of Investigations Number 99. Prepared by Geo Marine, Inc./Versar, Inc, Richardson, Texas.

JBER.[5] Because this is a significant period in the installation's history and has the potential to address multiple research questions, the site is **eligible for the NRHP under Criteria A and D**.

ANC-04717, Collapsed Wooden Building and Outhouse. Although the attached report states that this site was first reported in 2008, that is not the case. Rather, it was discovered by the JBER Cultural Resource Manager in early 2021. The building is constructed from pre-milled notch and groove. National lumber mill sizes were first established in 1924 and standardized milled lumber was widely available by the advent of World War II. The outhouse was built from recycled packing crates with chipping stencils. The markings indicate that they were shipped through Seattle, Washington but the destination is not visible. There were no diagnostic or datable materials observed. The structures most likely date to the military occupation of the area and, given their proximity to ANC-02978, the Signal Corps wooden hut (approx. 90 meters), they may be associated. However, more information is needed to determine if this is the case. Although the attached report recommends that ANC-04717 is not eligible for the NRHP, **JBER recommends that additional work is completed, and the site remain unevaluated**. US Air Force policy dictates that unevaluated properties are treated as eligible until a formal evaluation is completed.

Fighting Positions. The following discussion is meant to supplement the attached archaeological report. Fighting positions include multiple types of excavated ground features used for training. Theoretically, it should be possible to distinguish between the various types. A hasty position will be shallow (no more than 46cm), poorly defined, and with low earthen berms on two sides. A deliberate fighting position will be approximately 2.5m to 3m long with varying widths. It will be at least "armpit" deep and have berms on four sides. Overhead cover may or may not be preserved. There may be sandbags visible along the berms. There will be grenade sumps and possible storage nooks along the rear wall. A one-person deliberate fighting position will be narrower while a two-person position will be about 3m wide. Fighting positions for machine gun positions are made from earth, sandbags, or lumber. If there are clear platforms on two corners, the position was likely of this type. If there is no berm along one long side of the position, it may be a launched missile position. There are several challenges to fighting position identification; the position was reused or modified during later training, elements were removed after training, soil slumped or eroded back into the hole over time, or parapets (berms) were pushed back into the hole or distributed after training. A variety of activities may take place in a training area, mostly relayed to practicing movements and tactics for ground and combat forces. The fighting positions (foxholes), trenches, bunkers, and other earthworks in most training areas on JBER-Richardson result from light and heavy maneuver tactical training. The features found in light and heavy maneuver training areas depend on the training task.[6] Training exercises are short in duration, have occurred continuously in the JBER-Richardson area since at least 1954, and information on specific activities is not documented. In other words, a foxhole may result from any number of training exercises and activities. The fighting positions described in the attached report, therefore, cannot be associated with any specific historic event (Criterion A). The dimensions and placement of features such as fighting positions are entirely dependent on individual leadership decisions during training and are not designed with a broader plan in mind. It is not possible to connect the foxholes as a group to specific periods of significance or training exercises. The fighting positions described in the attached report are not directly associated with any specific historically significant person locally (Criterion B). A hasty fighting position may be needed for offensive or defensive training. It may be created as part of a light or heavy maneuver training exercise. Finally, there is no connection between the design and layout of foxholes, as a group, to any specific unit. Their construction necessarily follows a prescribed design, thus they do not have any unique characteristics of a period (Criterion

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[5] Morgan Blanchard, John R. Hemmeter, Mary Ann Sweeney, Lindsay, Simmons, and Ashley Hannigan. 2018. *Phase II Identification and Evaluation of Archaeological Sites at Joint Base Elmendorf-Richardson, Alaska*. Prepared by Northern Land Use Research Alaska And Argonne National Laboratory. Prepared for US Air Force, 673 Civil Engineering Squadron, JBER.

[6] Adam Smith, Manroop K. Chawla, Sunny Adams, and Daniel D. Archibald. 2010. Military Training Lands Historic Context: Miscellaneous Training Sites. US Army Corps of Engineers, ERD/CERL Report TR-10-8.

C). Fighting positions are ubiquitous across JBER-Richardson. The ones described in the attached report cannot be associated with any specific training event, activity, or period. Therefore, they are not eligible under Criterion D. JBER agrees with the recommendation that **the fighting positions in the area of potential effect are not eligible for the NRHP individually or as a district**.

Obstruction Lights. A full evaluation of the obstruction lights on the flightline is attached. The safe operation of the runway during World War II and the Cold War included various types of obstruction lights. The proposed runway extension will include replacing and relocating some of the existing obstruction lights. According to JBER's Real Property Inventory, the obstruction lights were placed into service in 1942. Further research revealed that there were at least two projects to replace the obstruction lights entirely in the 1960s and 1977. JBER recommends that **the obstruction lights are not eligible for the NRHP due to a lack of integrity**.

5. **Assessment of Effect:** In 2017, your office concurred that the proposed project (all alternatives) would result in no direct effect on historic properties and no adverse indirect effect on historic properties. Some aspects of the project and the area of potential effect have changed. This required additional archaeological surveys and NRHP evaluations. Provided you agree with the recommendations above, JBER has determined that the north/south runway extension will result in the following effects:

Table 2. Assessments of effect

AHRS No	NRHP status	Description of project aspect	Assessment of effect
ANC-00431	Not Eligible (destroyed)	Excavation	No historic properties affected
ANC-00432		Excavation	
ANC-01180		Fill disposal (removed from project)	
ANC-01181		Fill disposal	
ANC-01182		Fill disposal	
ANC-01183		Fill disposal	
ANC-02003		Excavation	
ANC-02004		Excavation	
ANC-02005		Excavation and fill disposal	
ANC-02008		Excavation	
ANC-02362		Excavation	
ANC-02577		Excavation and fill disposal	
ANC-02578		Excavation	
ANC-02579		Excavation	
ANC-02580		Excavation	
ANC-02982		Fill disposal	
ANC-01172	Not Eligible	Fill disposal	
ANC-01179		Fill disposal (removed from project)	
ANC-01187		Not in APE (railroad) (indirect)	
ANC-02006		Fill disposal	
ANC-02568		Fill disposal, selective tree clearing	
ANC-04148		Excavation	
ANC-04149		Excavation	
ANC-04150		Excavation	
ANC-04151		Excavation	
ANC-04152		Excavation	
ANC-04153		Excavation	
ANC-04154		Excavation	
ANC-04155		Excavation	
ANC-04238		Fill disposal	
ANC-04239		Fill disposal	

ANC-04313		Excavation	
ANC-04314		Selective tree clearing	
ANC-04315		Selective tree clearing	
ANC-04316		Excavation	
ANC-04317		Excavation	
ANC-04392		In APE, will not be affected	
ANC-04712		Fill disposal, selective tree clearing	
ANC-04713		Fill disposal, selective tree clearing	
ANC-04714		Selective tree clearing	
ANC-04715		Selective tree clearing	
Obstruction lights		To be demo'd and replaced	
Fighting positions		Excavation, fill disposal, selective tree clearing (location dependent)	
ANC-02978		Fill disposal (removed from project)	n/a
ANC-03219	Eligible	Adjacent to APE (indirect)	No adverse effect
ANC-04716		Excavation, selective tree clearing	No adverse effect (avoid)
ANC-04717	Unevaluated	Fill disposal (removed from project)	n/a

In order to achieve required glide-slope, up to 12mcy will need to be excavated north of the existing north/south runway. Excavation in some of these areas was begun in 2010, when the "North End Borrow Source" was established by the Port of Anchorage. Several sites were identified as part of that project, found not eligible, and subsequently destroyed (ANC-00431, ANC-00432, ANC-02003, ANC-02004, ANC-02005, ANC-02008, ANC-02362, ANC-02577, ANC-02578, ANC-02579, ANC-02580, and ANC-02582 – no historic properties affected). Many other sites in the excavation area were identified during surveys during the initial EIS for this project and found not eligible (ANC-04313, ANC-04316, ANC-04317, ANC-04148, ANC-04149, ANC-04150, ANC-04151, ANC-04152, ANC-04153, ANC-04154, and ANC-04155 – no historic properties affected).

Most of the selected fill disposal areas (including gravel extraction/disposal areas, identified areas of PFAS containing soil requiring avoidance/management, and construction of a barrier wall adjacent Fish Lake and Triangle Lake wetland complex) were previously surveyed and cultural resources evaluated for the NRHP. Most were found not eligible (ANC-01172, ANC-02006, and ANC-02568 – no historic properties affected). At one point, the fill disposal area was larger than in the final design. As a result, several sites are identified in the attached archaeological report that are no longer in the area of potential effect (ANC-01179, ANC-02978, and ANC-04717 – no assessment of effect).

The extension of the runway also includes management of trees that break the new glide-slope. Some of these sites were identified in previous runway extension surveys and found not eligible (ANC-02568, ANC-04314, and ANC-04315 – no historic properties affected). The 2021 survey also identified several ineligible sites that will be affected by selective tree clearing (ANC-04712, ANC-04713, ANC-04714, ANC-04715 – no historic properties affected). One eligible site - ANC-04716 - is near the edge of the area to be excavated and likely to be affected by selective tree clearing. JBER will avoid effects to the site by establishing a buffer and placing barriers to prevent construction equipment from disturbing the site (no adverse effect to historic properties).

Construction of the extended runway includes changes to the north runway itself. One ineligible building (ANC-04392) is within the area of potential effect and one eligible building (ANC-03219) is adjacent. There is no plan to demolish or change the two buildings (no historic properties affected and no adverse effect to historic properties, respectively). The obstruction lights will be demolished and replaced during the proposed project. The enclosed analysis found them not eligible due to a lack of integrity (no historic properties affected).

We request your concurrence with these assessments of effect. Copies of this letter will be sent to federally recognized tribes (Native Village of Eklutna Traditional Council, Native Village of Tyonek, Knik Tribal Council, and the Chickaloon Village Traditional Council) and the Anchorage Historic Preservation Commission. If you have any questions, please contact Margan Grover, 673 CES/CEIEC, at 384-3467.

Signed 10/22/2021

Jeanne Dye-Porto, GS-14, DAF
Chief, Installation Management Flight

THE STATE
of ALASKA
GOVERNOR MIKE DUNLEAVY

Department of Natural Resources
DIVISION OF PARKS AND OUTDOOR RECREATION
Office of History & Archaeology

550 West 7th Avenue, Suite 1310
Anchorage, AK 99501-3561
907.269-8700
http://dnr.alaska.gov/parks/oha

November 16, 2021

File No.: 3130-1R AF / 2021-01169

Margan A Grover
Cultural Resource Manager
Joint Base Elmendorf-Richardson
673 CES/CEIEC

Subject: North Runway Extension and Determination of Eligibility for Obstruction Light Array

Dear Ms. Grover,

The Alaska State Historic Preservation Office (AK SHPO) received your correspondence and accompanying copy of the report titled *Archaeological Survey for North Runway Extension, Joint Base Elmendorf-Richardson* on October 25, 2021 as well as *North/South Runway Expansion Project Area, JBER Cultural Resources Survey Report* and *Determination of Eligibility for the National Register of Historic Places: Joint Base Elmendorf-Richardson Obstruction Light Array* on October 26, 2021. We have reviewed the documentation in accordance with 36 CFR §60.4 and concur that the Obstruction Light Array is not eligible for the National Register of Historic Places. Therefore, we concur with the finding of No Historic Property Affected for removal and replacement of the Obstruction Light Array.

We have reviewed the documentation provided in compliance with Section 106 and concur with the finding of effect as shown in Table 1. Please note that our office may need to re-evaluate our concurrence if changes are made to the project's scope or design.

Table 1

AHRS #	NRHP Status	Assessment of Effect	Concurrence
ANC-00431 ANC-00432 ANC-01180 ANC-01181 ANC-01182 ANC-01183 ANC-02003 ANC-02004 ANC-02005 ANC-02008 ANC-02362 ANC-02577	Not Eligible (Destroyed)	No Historic Property Affected	Concur

ANC-02578	Not Eligible (Destroyed)	No Historic Property Affected	Concur
ANC-02579			
ANC-02580			
ANC-02582			
ANC-01172	Not Eligible	No Historic Property Affected	Concur
ANC-01179			
ANC-01187			
ANC-02006			
ANC-02568			
ANC-04148			
ANC-04149			
ANC-04150			
ANC-04151			
ANC-04152			
ANC-04153			
ANC-04154			
ANC-04155			
ANC-04238			
ANC-04239			
ANC-04313			
ANC-04314			
ANC-04315			
ANC-04316			
ANC-04317			
ANC-04392			
ANC-04712			
ANC-04713			
ANC-04714			
ANC-04715			
Fighting Positions			
ANC-03219	Eligible	No Historic Property Adversely Affected	Concur
ANC-04716			

As stipulated in 36 CFR 800.3, other consulting parties such as the local government and Tribes are required to be notified of the undertaking. Additional information provided by the local government, Tribes, or other consulting parties may cause our office to re-evaluate our comments and recommendations. Please note that our response does not end the 30-day review period provided to other consulting parties.

Should unidentified historical or archaeological resources be discovered in the course of the project, work must be interrupted until the resources have been evaluated in terms of the

National Register of Historic Places eligibility criteria (36 CFR 60.4), in consultation with our office. Please note that some resources can be deeply buried or underwater, and that fossils are considered cultural resources subject to the Alaska Historic Preservation Act.

Thank you for the opportunity to comment. Please contact Amy Hellmich at amy.hellmich@alaska.gov if you have any questions or we can be of further assistance.

Sincerely,

Judith E Bittner
State Historic Preservation Officer

JEB:ash

Government to Government Consultation

Runway 16/34 Extension Project
February 2, 2022
Dial in phone number: (907) 384-5131

Agenda

- Land Acknowledgement
- Introductions
- Project Description
- Project Map
- Response to Questions from Chickaloon Native Village
- Response to Questions from Eklutna, Inc.
- Next Steps
- Terms & Acronyms

Land Acknowledgement

- Joint Base Elmendorf-Richardson occupies Dena’ina Ełnena, homeland of the indigenous people of Knik Arm. We honor the enduring relationships of the Dena’ina people, culture, communities and land.

Introductions

Native Village of Eklutna
- **Aaron Leggett, President**
- **Marc Lamoreaux, Land & Environment Co-director**
- ***Kyle Robillard,***
- ***Carrie Brophil, Land & Environment Coordinator***

Chickaloon Native Village
- ***Angie Wade, Tribal Historic Preservation Officer***
- ***Jessica Winnestaffer, Environmental Stewardship Director***
- ***Kendra Zamzow, Environmental Program Manager***

Native Village of Tyonek
- **Justin Trenton, Environmental Director**

Introductions

Knik Tribal Council

- ***Richard Porter, Chief Executive Officer***
- ***Bob Charles, Cultural Resources Representative***
- **Richard Martin, Historic Preservation Officer**
- ***Theo Garcia,***

Eklutna, Inc.

- **Dick Weldin, Director of Construction and Mining**
- ***Kyle Smith, Director of Land Assets***

Cook Inlet Region Incorporated

- ***Suzanne Settle, VP Energy, Land, and Resources***
- ***Christopher Jimenez***

Introductions

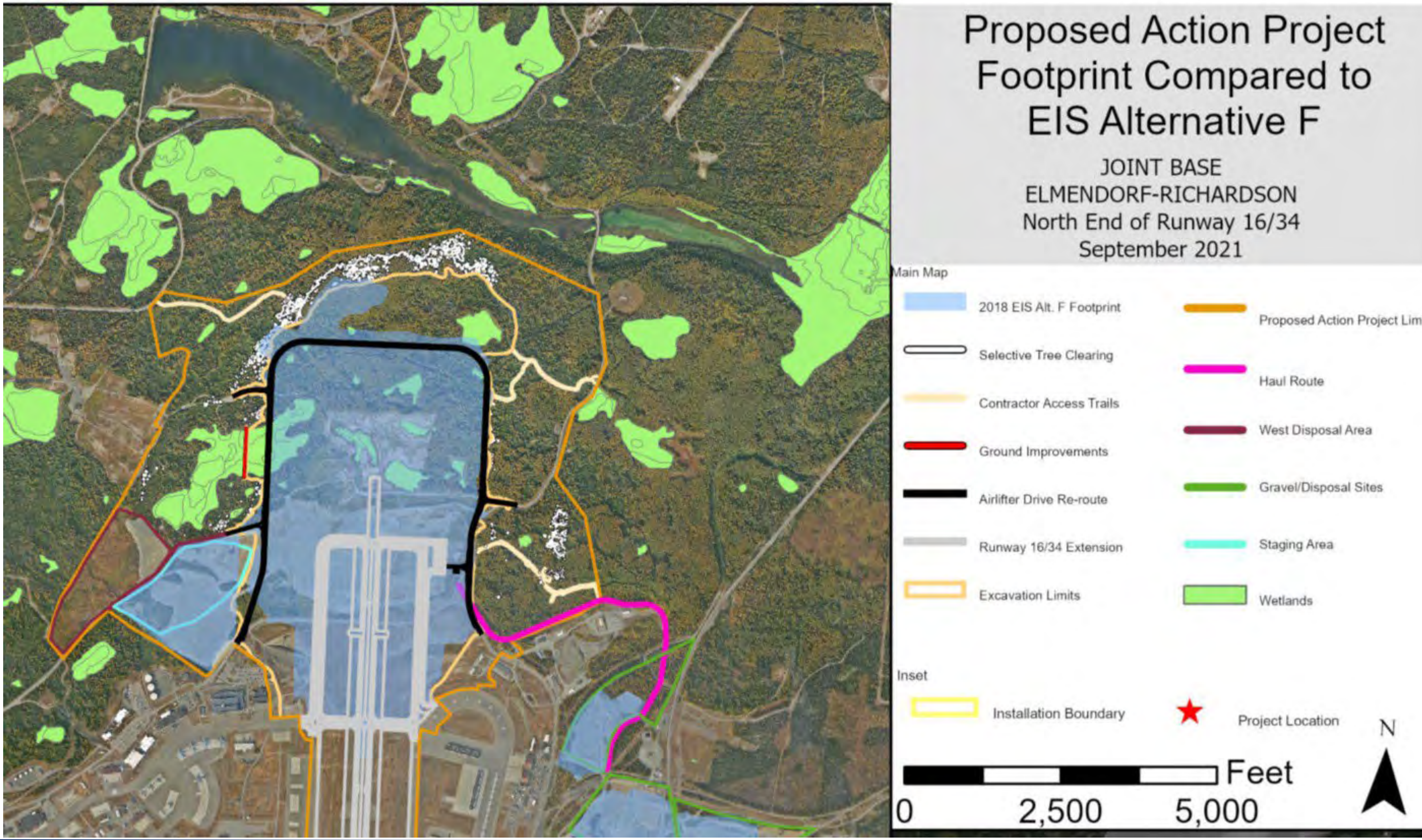
JBER

- *Don Weckhorst, Executive Director*
- *Peter Teller, Civil Law Supervisory Attorney*
- Lindsay Cronin, Environmental and Real Property Attorney
- Lt Alexandra Smith, Public Affairs
- Mark Prieksat, Deputy Commander Civil Engineer Squadron
- Jeanne Dye-Porto, Chief of Installation Management
- Kylene Lang, Chief of Environmental Resources
- Charlene Johnson, NEPA Program Manager
- Margan Grover, Cultural Resource Manager
- Beth Madison, Project Engineer
- Amanda Andraschko, ALCOM Native Liaison
- Joy Boston, Tribal Liaison

Project Description

- **Extend runway 16/34 was Alternative F, selected in the 2018 Record of Decision (*No Change*)**
- **Improve the operational efficiency of F-22 training at JBER (*No Change*)**
- **Project changes necessary during design phase**
  - **Redesign of Airlifter Drive for safety**
  - **Integration of ground improvements to minimize effects to wetlands and Fish & Triangle Lakes**
  - **400-ft extension of runway to accommodate ILS standards**
  - **Modify gravel borrow and excess overburden stockpile locations**

Project Map



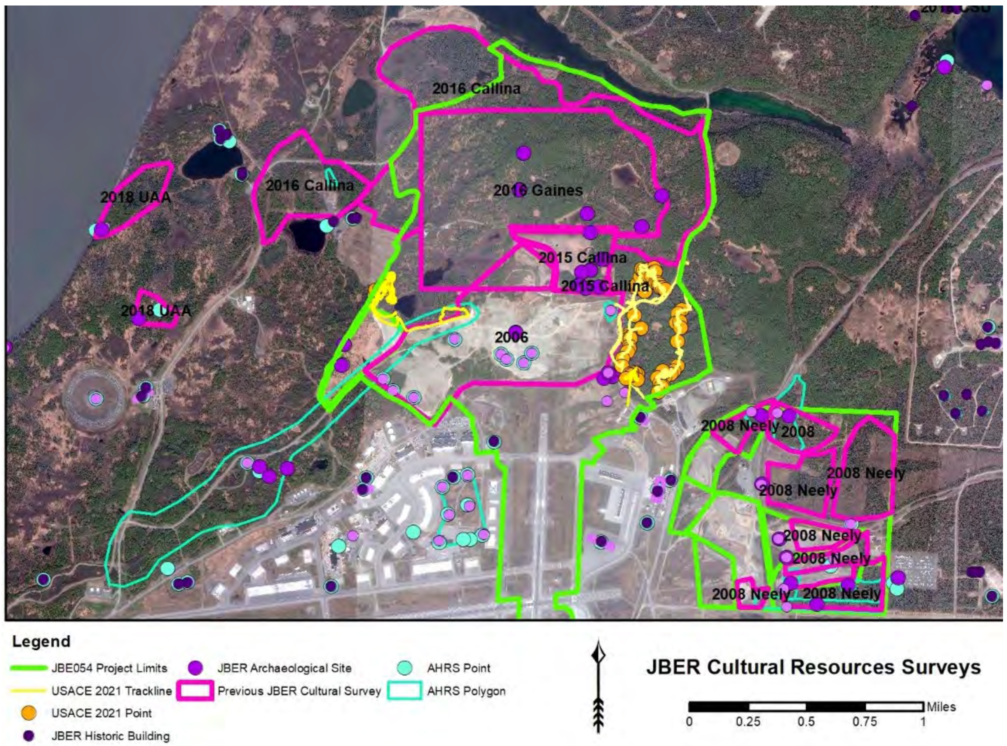
Proposed Action Project Footprint Compared to EIS Alternative F
JOINT BASE ELMENDORF-RICHARDSON
North End of Runway 16/34
September 2021
Main Map
2018 EIS Alt. F Footprint
Selective Tree Clearing
Contractor Access Trails
Ground Improvements
Airlifter Drive Re-route
Runway 16/34 Extension
Excavation Limits
Proposed Action Project Limits
Haul Route
West Disposal Area
Gravel/Disposal Sites
Staging Area
Wetlands
Inset
Installation Boundary
Project Location
N
Feet
0
2,500
5,000

Questions from Chickaloon Native Village

- Is there documentation of previously unknown cultural resources?

- Have new cultural resources surveys been completed? If not yet, CNV would like to participate

Cultural Resources



Area of potential effect

- Runway Extension
- Areas to be excavated & fill disposal areas
- Ground improvements near Fish/Triangle lakes
- New route of Airlifter Drive
- Areas of selective tree clearing
- Construction access routes
- Staging areas
- ➢ Expanded from previous archaeological surveys

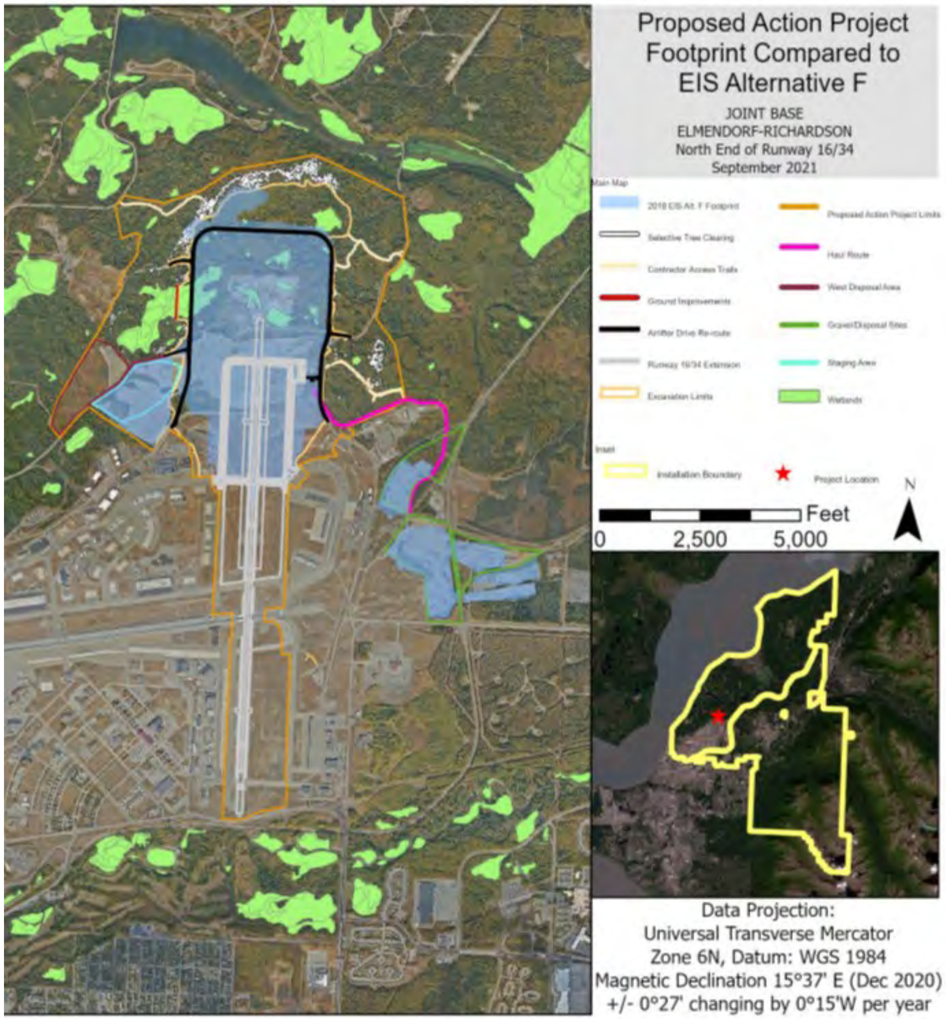
2021 Archaeological Surveys

- 194 acres
- Six new sites reported, as well as fighting positions throughout
  - Re-evaluated one site as eligible (ANC-02978)
  - Four sites not eligible
  - One new site eligible
- All dated to after Elmendorf was established

Questions from Chickaloon Native Village

- What will be the impact to wetlands? What is the extent of wetlands impact?
- What is the way forward regarding impacted wetlands?

Wetlands



- **Original 27.9 acres; Now 38.5 acres**
  - Airlifter Drive original design was impracticable (safety)
  - Additional investigation re: protection to Fish and Triangle Lakes required more fill to wetlands to conserve impacts to lakes.
- **All wetlands Jurisdictionally Isolated – no USACE permit requirements**
- **Subject to EO 11990 – all measures to avoid/minimize executed**
- **Mitigation as originally proposed in 2018 ROD**

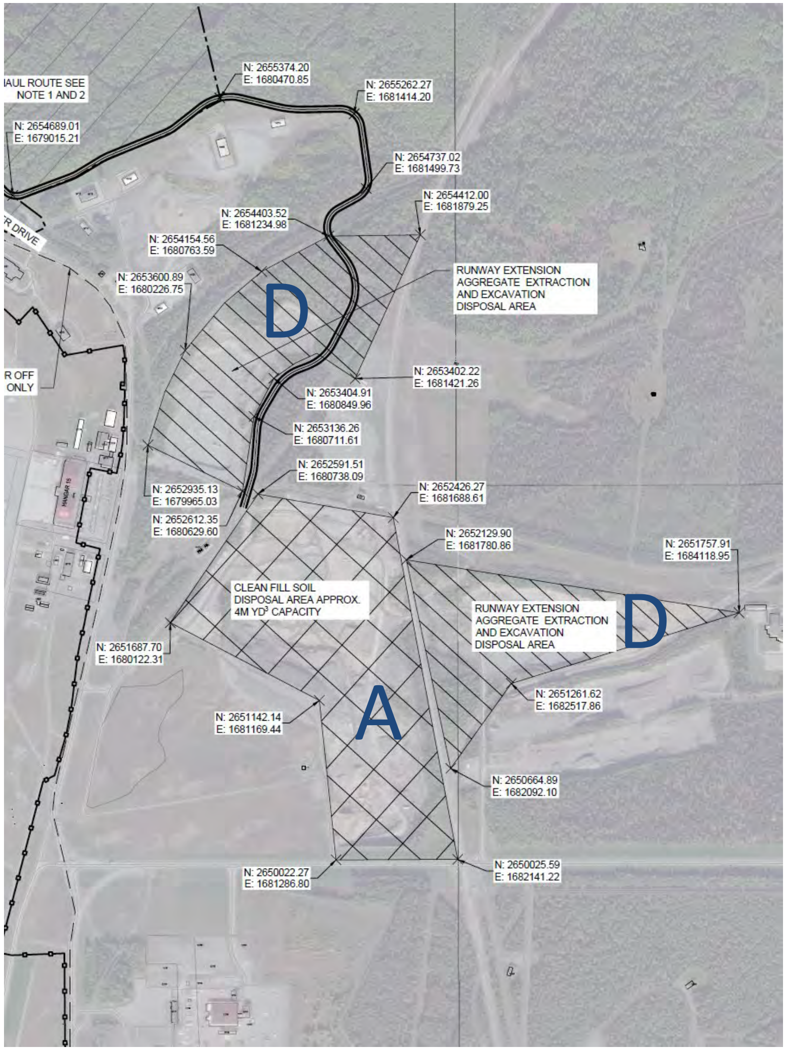
Questions from Eklutna Inc.

- Is there sufficient Class A borrow material to support all structural fill and crushing/material processing required to make asphalt aggregate and base course?

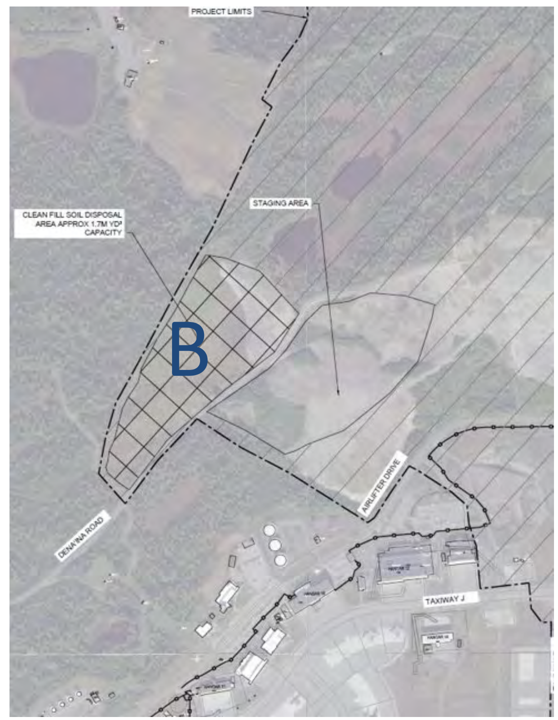
- If the above answer is no, then …
- Are the overburden disposal sites shown on the map sufficient to contain the approximately 12 million yards of overburden excavation from this project?

- Will additional overburden disposal sites or borrow sites be necessary? If yes, will Eklutna be notified and have the opportunity to comment?

Borrow/Overburden Areas



- **A) 4 mcy Capacity**
- **B) 1.7 mcy Capacity**
- **C) >5 mcy in cut/fill balance**
- **D) 3 sites w/ 9mcy <2 miles**



Next Steps

- Supplemental EA Public Review anticipated in February
  - 30-Day review and comment period
  - Comments encouraged and welcomed
  - Tribes will be notified as soon as the document is available
- Intent for construction 2022 through 2025

Terms & Acronyms

- EA – Environmental Assessment
- EIS – Environmental Impact Statement
- EO – Executive Order
- ILS – Instrument Landing System
- mcy – million cubic yards
- NALA – North Anchorage Land Agreement (1982)
- ROD – Record of Decision
- USACE – U.S. Army Corps of Engineers

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS, JOINT BASE ELMENDORF-RICHARDSON
JOINT BASE ELMENDORF-RICHARDSON, ALASKA

MEMORANDUM FOR: PARTICIPANTS

FROM: 673 ABW/CDP
10471 20th Street
JBER AK 99506

SUBJECT: Meeting Minutes, February 2, 2022 Government-to-Government Consultation

1. Government-to-Government (G2G) consultation regarding the Joint Base Elmendorf-Richardson (JBER) Runway 16/34 Extension Project Supplemental Environmental Impact Statement (EIS) was held February 2, 2022 at 10 a.m. via Microsoft Teams.

2. The meeting began with a welcome to all participants, review of the meeting agenda, and reading of a land acknowledgement. Next, all participants were invited to introduce themselves, their organization and role (see attachment 1).

3. The following documents were provided to participants:
   a. Runway 16/34 Extension Project Supplemental EIS Government-to-Government powerpoint briefing slides (see Attachment 2)
   b. CR01 Archaeological Survey for North Runway Extension (via DoDSafe)
   c. CR02 Cultural Resources Survey Report, North/South Runway Expansion Project Area (via DoDSafe)
   d. W01 Wetland Delineation Report from the US Army Corps of Engineers (USACE) (via DoDSafe)
   e. W02 Approved Jurisdictional Determination Letter (via DoDSafe)

4. Project Description and Map: The 2018 Record of Decision (ROD) and the purpose of the project, to improve the operational efficiency of F-22 training at JBER, remain the same. There are necessary project changes identified during the project design phase which require a supplemental EIS, they include:
   a. Redesign of Airlift Drove for safety
   b. Integration of ground improvements to minimize effects to wetlands, Fish and Triangle Lakes
   c. A 400-foot extension of the runway to accommodate Instrument Landing System standards
   d. Modification to gravel borrow and excess overburden stockpile locations

   A project map showing the modified project footprint compared to the 2018 EIS was described.

5. In response to October 2021 correspondence offering Government-to-Government consultation, Chickaloon Native Village submitted the following questions
   a. Is there documentation of previously unknown cultural resources? Have new cultural resources surveys been completed? If not yet, Chickaloon Native Village would like to participate.
   b. Ms. Grover described the area of potential effect based on the project area modification. She shared the results of 2021 archaeological surveys in which 194 acres were evaluated. Six new sites were reported as well as fighting position throughout the acreage. Of the six sites, one was re-evaluated as eligible, four were not eligible and one new site was eligible for inclusion.

c. Ms. Winnestaffer expressed interest in being invited to participate in cultural field surveys. Ms. Wade stated that representatives from Eklutna Native Village and Knik Tribe would like invitations to participate in archaeological surveys. Mr. Lamoreaux asked Ms. Grover to describe any Dene sites found during the 2021 archaeological surveys. Ms. Grover stated there were no Dene sites found in the newly surveyed areas. Ms. Wade stated that a foxhole is not a mutually exclusive site, it could also be a cultural depression which requires further investigation as it may be both a cultural and military site. Ms. Grover concurred and wants to implement a testing strategy. She categorized the 2021 archaeological survey areas as lower potential for Dene sites because they are not overlooking waterways, are on elevated ground and due to terrain and geography of the survey areas. Ms. Grover offered to take tribe representatives to the areas of potential effect in Spring 2022 before project earthworks begin. Ms. Wade and Mr. Lamoreaux expressed interest in this opportunity.

d. What will be the impact to wetlands? What is the extent of wetlands impact? What is the way forward regarding impacted wetlands?

e. Ms. Johnson explained the original EIS footprint included 27.9 acres of wetlands and the supplemental EIS includes 38.5 acres of wetlands. Safety modifications to Airlifter Drive and new ground improvements to protect Fish and Triangle Lakes drove the increase in impacted wetlands. Ms. Johnson stated all impacted wetlands are jurisdictionally isolated, there is no surface water connection to navigable waters thus eliminating the need to comply with USACE permit requirements. All impacted wetlands are subject to Executive Order 11990 and all measures were made to avoid and minimize impact to wetlands. Mitigation remains the same as originally proposed in the 2018 ROD; wetlands mitigation will be accomplished via land credits.

f. Mr. Charles asked if compensatory mitigation such as constructed wetlands for runway drainage were considered in the EIS. Ms. Johnson replied they were not due to Bird Aircraft Strike Hazard program requirements and the incompatibility of standing water on airfields, that attract birds and create safety hazards to aircraft. Mr. Wright stated that if ponds (Fish and Triangle Lakes) near the end of the runway are risk factors, then perhaps they should be filled. He asked if waterfowl use Fish and Triangle Lakes. Ms. Johnson answered that USDA conducted a year-long study of bird use of the lakes and determined the risk was not high enough to mandate filling the lakes. She also stated that USAF and USDA personnel use various techniques to mitigate bird activity all over the airfield.

6. In response to October 2021 correspondence offering Government-to-Government consultation, Eklutna Inc. submitted the following questions:

a. Is there sufficient Class A borrow material to support all structural fill and crushing/material processing required to make asphalt aggregate and base course? If no, are the overburden disposal sites show on the map sufficient to contain the approximately 12 million yards of overburden excavation from this project? Will additional overburden disposal site or borrow sites be necessary? If yes, will Eklutna be notified and have the opportunity to comment?

b. In response to the material sufficiency question, yes, USACE geotechnical borings and LIDAR survey show there is sufficient material for asphalt aggregate and base course. The project contractor will use existing material from on base, although if additional material is required, the contractor will be responsible for sourcing it; the USAF cannot direct the contractor to a specific source. Overburden sites are sufficient to support this project, overburden materials will remain on JBER, they will not be transported off-base. Mr. McElroy added that JBER is required by its permit to reclaim areas A and B depicted on the borrow/overburden slide. A question was asked about overburden areas evaluated for archaeological resources. Mr. McElroy said areas A and D were previously surveyed before permits were granted and extraction began, and area B was surveyed in the early 2000s.

7. The next steps of the project were explained. There will be a 30-day public review and comment period related to the supplement Environmental Assessment (EA); this is expected to being in late February 2022. Tribes will be notified as soon as the supplemental EA is available, and all are encouraged welcome to provide comments. The intent is for construction to begin in 2022 and end in 2025.

8. Closing: Mr. Weckhorst gave closing remarks and thanked all for their participation. The meeting was adjourned a little after 11 a.m.

JOY E. BOSTON, GS-13
Native Liaison

2 Attachments:
1. Runway 16/34 Extension G2G Attendees
2. Runway 16/34 Extension Supplemental EIS G2G Slides

Attachment 1: Runway 16/34 Extension G2G Attendees

Name	Organization / Title	E-mail
Aaron Leggett	Native Village of Eklutna	aleggett@anchoragemuseum.org
Marc Lamoreaux	Native Village of Eklutna	marcl@eklutna.org
Carrie Brophil	Native Village of Eklutna	cbrophil@eklutna.org
Angie Wade	Chickaloon Native Village	alwade@chickaloon-nsn.gov
Jessica Winnestaffer	Chickaloon Native Village	jewinnestaffer@chickaloon-nsn.gov
Fran Seager-Boss	Chickaloon Native Village	fseagerboss@gci.net
Norma Johnson	Chickaloon Native Village	
Bob Charles	Knik Tribal Council	bcharles@kniktribe.org
Richard Porter	Knik Tribal Council	rporter@kniktribe.org
Theo Garcia	Knik Tribal Council	tgarcia@kniktribe.org
Christopher Jimenez	Cook Inlet Region Incorporated	cjimenez@ciri.com
Andrea Jacuk	Cook Inlet Region Incorporated	ajacuk@ciri.com
Don Weckhorst	673 ABW Executive Director	donald.weckhorst@us.af.mil
Lindsay Cronin	673 ABW Environmental and Real Property Attorney	lindsay.cronin@us.af.mil
Lt Lexi Smith	673 ABW Public Affairs	alexandra.smith.9@us.af.mil
Erin Eaton	673 ABW Public Affairs	
Mark Prieksat	673 CES Deputy Commander	mark.prieksat@us.af.mil
Jeanne Dye-Porto	673 CES Chief of Installation Management	jeanne.dye-porto@us.af.mil
Kylene Lang	673 CES Chief of Environmental Resources	kylene.lang@us.af.mil
Charlene Johnson	673 CES NEPA Program Manager	charlene.johnson.3@us.af.mil
Margan Grover	673 CES Cultural Resource Manager	margan.grover@us.af.mil
Beth Madison	673 CES Project Engineer	elizabeth.madison@us.af.mil
Bob McElroy	673 CES	robert.mcelroy@us.af.mil
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PUBLIC NOTICE

NOTICE OF AVAILABILITY

Draft Supplemental Environmental Assessment, Finding of No Significant Impact, and Finding of No Practicable Alternative for the Proposal to Improve F-22 Operational Efficiency at Joint Base Elmendorf-Richardson, Alaska

The United States Air Force (USAF) announces the availability of the draft *Proposal to Improve F-22 Operational Efficiency at Joint Base Elmendorf-Richardson, Alaska* Supplemental Environmental Assessment (SEA), draft Finding of No Significant Impact (FONSI), and draft Finding of No Practicable Alternative (FONPA) for public review and comment. These documents were prepared pursuant to the National Environmental Policy Act (NEPA) of 1969 to evaluate the potential environmental and socio-economic impacts associated with implementing the proposed action.

This effort supplements the Environmental Impact Statement (EIS) prepared by the USAF in 2018 to examine the environmental consequences of the changes to the flight operations and runway usage at JBER. In September 2018, the USAF signed a Record of Decision (ROD) selecting Alternative F, which consisted of extending JBER's Runway 16/34 north 2,500 feet and using the extended runway for more efficient F-22 flight operations. The original EIS can be found online at: https://www.jber.jb.mil/Portals/144/Services-Resources/environmental/Completed-NEPA/Environmental-Vol%201-JBER-F22-FEIS-Feb2018_full.pdf

After the preferred alternative was chosen in 2018, the USAF received new information relevant to the environmental concerns of the runway extension and associated improvements. This information included the Approved Jurisdictional Determination (AJD) that wetlands in the proposed action area are not regulated under the Clean Water Act (CWA), the documentation of previously unknown cultural resources, the discovery of soils containing per- and polyfluoroalkylated substances (PFAS) inside the excavation limits, and a preliminary Bird-Aircraft Strike Hazard (BASH) assessment.

In addition to the new information, the design of the planned runway extension also evolved. The preferred alternative examined by this supplemental EA would extend the north-south runway (Runway 16/34) on JBER by approximately 2,900 feet (an addition of approximately 400 feet), re-route Airlifter Drive for safety, construct ground improvements to stabilize the Fish and Triangle Lake hydrology, and change several fill and disposal areas.

The draft SEA, draft FONSI, and draft FONPA are available for a period of 30-days following the publication of this notice. These documents are also available for review at:

- Joint Base Elmendorf-Richardson Library, Bldg. 7, JBER-R, AK 99505
- Anchorage Public Library, 3600 Denali St., Anchorage, AK 99503
- Chugiak-Eagle River Library, 12001 Business Blvd. #176, Eagle River Town Center, Eagle River, AK 99577

The documents are also available online in the "Public Documents and Notices" Section of: https://www.jber.jb.mil/Services-Resources/Environmental/. Written comments and inquiries should be directed to JBER Public Affairs, 10480 Sijan Ave., Suite 123, JBER, AK 99506. Emailed comments can be submitted to jber.pa@us.af.mil. Comments received by 23 April 2022 will be considered when preparing the final FONSI.

PRIVACY ADVISORY NOTICE

Public comments on this Draft EA are requested pursuant to NEPA, 42 United States Code 4321, et seq. All written comments received during the comment period will be made available to the public and considered during the final EA preparation. Providing private address information with your comment is voluntary and such personal information will be kept confidential unless release is required by law. However, address information will be used to compile the project mailing list and failure to provide it will result in your name not being included on the mailing list.

Appendix B:
Supporting Documents

DEPARTMENT OF THE ARMY
ALASKA DISTRICT, U.S. ARMY CORPS OF ENGINEERS
REGULATORY DIVISION
P.O. BOX 6898
JBER, AK 99506-0898

December 15, 2020

Regulatory Division
POA-2019-00676

U.S. Air Force
724 Quarter Master Rd.
JBER, Alaska 99505

Dear Dr. Mark Prieksat:

This is in response to your September 11, 2020, letter requesting an approved jurisdictional determination (AJD) for a parcel of land located within Section 34, T. 14 N., R. 3 W., Seward Meridian; Latitude 61.265857º N., Longitude 149.793414º W.; Joint Base Elmendorf-Richardson; near Anchorage, Alaska.

Based on our review of the information you provided and available to us, wetland delineation report dated September 2020, and an on-site inspection on July 13th through July 14th, we have determined that the subject parcel contains wetland and waters which are not waters of the United States (U.S.) under our regulatory jurisdiction. The wetlands and waters on your property do not have a surface hydrologic connection to a traditional navigable waters (TNW), and are therefore not considered a water of the U.S. Therefore, a Department of the Army (DA) permit is not required for any activities which may occur on your property.

A copy of the AJD form is enclosed and will be available at the following address: www.poa.usace.army.mil/Missions/Regulatory/JurisdictionalDeterminations under the above file number.

This jurisdictional determination does not establish any precedent with respect to any other jurisdictional determination under Section 404 of the Clean Water Act.

The wetlands and waters on your parcel were reviewed pursuant to Section 404 of the Clean Water Act, which requires that a DA permit be obtained for the placement or discharge of dredged and/or fill material into waters of the U.S., including wetlands, prior to conducting the work (33 U.S.C. 1344).

For regulatory purposes, the Corps of Engineers defines wetlands as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

This AJD is valid for a period of five years from the date listed on the AJD form, unless new information supporting a revision is provided to us before the expiration date. Also, enclosed is a Notification of Administrative Appeals Options and Process and Request for Appeal form regarding this approved jurisdictional determination (see section labeled “Approved Jurisdictional Determination”).

Nothing in this letter excuses you from compliance with other Federal, State, or local statutes, ordinances, or regulations.

Please contact me via email at: Andrew.W.Gregory@usace.army.mil, by mail at the address above, by phone at (907) 753-2791, or toll free from within Alaska at (800) 478-2712, if you have questions. For more information about the Regulatory Program, please visit our website at: www.poa.usace.army.mil/Missions/Regulatory.

Sincerely,

Andrew W. Gregory
Regulatory Specialist

Enclosures

U.S. ARMY CORPS OF ENGINEERS
REGULATORY PROGRAM
APPROVED JURISDICTIONAL DETERMINATION FORM (INTERIM)
NAVIGABLE WATERS PROTECTION RULE

I. ADMINISTRATIVE INFORMATION

Completion Date of Approved Jurisdictional Determination (AJD): 12/4/2020
ORM Number: POA-2019-00676
Associated JDs: N/A or ORM numbers and identifiers (e.g. HQS-2020-00001-MSW-MITSITE).
Review Area Location[1]: State/Territory: Alaska City: JBER County/Parish/Borough: Muncipality of Anchorage
Center Coordinates of Review Area: Latitude 61.265857º N Longitude 149.793414º

W II. FINDINGS

A. Summary: Check all that apply. At least one box from the following list MUST be selected. Complete the corresponding sections/tables and summarize data sources.

- ☐ The review area is comprised entirely of dry land (i.e., there are no waters or water features, including wetlands, of any kind in the entire review area). Rationale: N/A or describe rationale.
- ☐ There are "navigable waters of the United States" within Rivers and Harbors Act jurisdiction within the review area (complete table in Section II.B).
- ☐ There are "waters of the United States" within Clean Water Act jurisdiction within the review area (complete appropriate tables in Section II.C).
- ☒ There are waters or water features excluded from Clean Water Act jurisdiction within the review area (complete table in Section II.D).

B. Rivers and Harbors Act of 1899 Section 10 (§ 10)[2]

§ 10 Name	§ 10 Size		§ 10 Criteria	Rationale for § 10 Determination
N/A.	N/A	N/A	N/A.	N/A.

C. Clean Water Act Section 404

Territorial Seas and Traditional Navigable Waters ((a)(1) waters):[3]				
(a)(1) Name	(a)(1) Size		(a)(1) Criteria	Rationale for (a)(1) Determination
N/A.	N/A.	N/A.	N/A.	N/A.

Tributaries ((a)(2) waters):				
(a)(2) Name	(a)(2) Size		(a)(2) Criteria	Rationale for (a)(2) Determination
N/A.	N/A.	N/A.	N/A.	N/A.

Lakes and ponds, and impoundments of jurisdictional waters ((a)(3) waters):				
(a)(3) Name	(a)(3) Size		(a)(3) Criteria	Rationale for (a)(3) Determination
N/A.	N/A.	N/A.	N/A.	N/A.

Adjacent wetlands ((a)(4) waters):				
(a)(4) Name	(a)(4) Size		(a)(4) Criteria	Rationale for (a)(4) Determination
N/A.	N/A.	N/A.	N/A.	N/A.

[1] Map(s)/figure(s) are attached to the AJD provided to the requestor.
[2] If the navigable water is not subject to the ebb and flow of the tide or included on the District's list of Rivers and Harbors Act Section 10 navigable waters list, do NOT use this document to make the determination. The District must continue to follow the procedure outlined in 33 CFR part 329.14 to make a Rivers and Harbors Act Section 10 navigability determination.
[3] A stand-alone TNW determination is completed independently of a request for an AJD. A stand-alone TNW determination is conducted for a specific segment of river or stream or other type of waterbody, such as a lake, where upstream or downstream limits or lake borders are established. A stand-alone TNW determination should be completed following applicable guidance and should NOT be documented on the AJD Form.

D. Excluded Waters or Features

Excluded waters ((b)(1) – (b)(12)):[4]				
Exclusion Name	Exclusion Size		Exclusion[5]	Rationale for Exclusion Determination
NWD1	0.35	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet.
NWD4	0.19	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet.
NWD6	0.29	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet.
NWD8	6.18	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet.
NWD11	0.49	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet.
EW2	4.51	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet.
EW9	0.18	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet.

[4] Some excluded waters, such as (b)(2) and (b)(4), may not be specifically identified on the AJD form unless a requestor specifically asks a Corps district to do so. Corps districts may, in case-by-case instances, choose to identify some or all of these waters within the review area.
[5] Because of the broad nature of the (b)(1) exclusion and in an effort to collect data on specific types of waters that would be covered by the (b)(1) exclusion, four sub-categories of (b)(1) exclusions were administratively created for the purposes of the AJD Form. These four sub-categories are not new exclusions, but are simply administrative distinctions and remain (b)(1) exclusions as defined by the NWPR.

Excluded waters ((b)(1) – (b)(12)):[4]				
Exclusion Name	Exclusion Size		Exclusion[5]	Rationale for Exclusion Determination
EW5	2.66	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet.
EW8	1.11	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet.
EW12	1.46	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet.
EW5(ref)	0.10	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet.
EW16	0.26	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet.
EW18	0.71	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet. Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet.
EW12(Ref)	0.09	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet.

Excluded waters ((b)(1) – (b)(12)):[4]				
Exclusion Name	Exclusion Size		Exclusion[5]	Rationale for Exclusion Determination
2014-531-W3-w2	0.52	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet.
WRADP7	1.04	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet.
WRADP7(ref)	0.86	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet.
SW7	0.33	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet.
SW9	0.23	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet.
SW5	0.44	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet.
WRADP22	0.08	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet.
WRADP1/20/22	1.13	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet.

Excluded waters ((b)(1) – (b)(12)):[4]				
Exclusion Name	Exclusion Size		Exclusion[5]	Rationale for Exclusion Determination
WWD2, WRADP6	0.31	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet.
WRADP12/13/16	4.31	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. Hydrologically connected to Fish and Triangle Lake below the surface of a dense floating mat, however, this depression is surrounded by uplands has no distinguishable inlet or outlet.
SW2/3, WPP2/3, WRADP8/9/10/11/18	18.87	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. Hydrologically connected to Fish and Triangle Lake below the surface of a dense floating mat, however, this depression is surrounded by uplands has no distinguishable inlet or outlet.
WRADP4/5	1.2	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet.
SW2(ref)	0.35	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. Hydrologically connected to Fish and Triangle Lake below the surface of a dense floating mat, however, this depression is surrounded by uplands has no distinguishable inlet or outlet.
SW6	0.08	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. These depressions are surrounded by uplands have no distinguishable inlet or outlet.
WRADP3	0.12	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat.

Excluded waters ((b)(1) – (b)(12)):[4]				
Exclusion Name	Exclusion Size		Exclusion[5]	Rationale for Exclusion Determination
				These depressions are surrounded by uplands have no distinguishable inlet or outlet.
WRADP19/21	2.31	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. Hydrologically connected to Fish and Triangle Lake below the surface of a dense floating mat, however, this depression is surrounded by uplands has no distinguishable inlet or outlet.
WRADP14/15	1.64	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. Hydrologically connected to Fish and Triangle Lake below the surface of a dense floating mat, however, this depression is surrounded by uplands has no distinguishable inlet or outlet.
WRADP17	5.2	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. Hydrologically connected to Fish and Triangle Lake below the surface of a dense floating mat, however, this depression is surrounded by uplands has no distinguishable inlet or outlet.
WWD4	1.17	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. Hydrologically connected to Fish and Triangle Lake below the surface of a dense floating mat, however, this depression is surrounded by uplands has no distinguishable inlet or outlet.
WWD4(ref)	0.78	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. Hydrologically connected to Fish and Triangle Lake below the surface of a dense floating mat, however, this depression is surrounded by uplands has no distinguishable inlet or outlet.

Excluded waters ((b)(1) – (b)(12)):[4]				
Exclusion Name	Exclusion Size		Exclusion[5]	Rationale for Exclusion Determination
WWD6	0.64	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. Hydrologically connected to Fish and Triangle Lake below the surface of a dense floating mat, however, this depression is surrounded by uplands has no distinguishable inlet or outlet.
WWD1	0.56	acre(s)	(b)(1) Non-adjacent wetland.	Isolated wetland located within Elmendorf Moraine which is covered in kettle wetlands left by melting blocks of ice during glacial retreat. Hydrologically connected to Fish and Triangle Lake below the surface of a dense floating mat, however, this depression is surrounded by uplands has no distinguishable inlet or outlet.
PAB (Pond)	0.57	acre(s)	(b)(1) Lake/pond or impoundment that does not contribute surface water flow directly or indirectly to an (a)(1) water and is not inundated by flooding from an (a)(1)-(a)(3) water in a typical year.	Unnamed pond is within the Elmendorf Moraine which is covered by kettles. Kettles on the moraine created by melting blocks of ice during glacial retreat can contain ponds/lakes. Hydrologically connected to Fish and Triangle Lake below the surface of a dense floating mat, however, this depression has no distinguishable inlet or outlet.
Fish Lake	N/A.	acre(s)	(b)(1) Lake/pond or impoundment that does not contribute surface water flow directly or indirectly to an (a)(1) water and is not inundated by flooding from an (a)(1)-(a)(3) water in a typical year.	Fish Lake is within the Elmendorf Moraine which is covered by kettles. Kettles on the moraine created by melting blocks of ice during glacial retreat can contain ponds/lakes. Hydrologically connected to Triangle lake below the surface of a dense floating mat, however, this depression has no distinguishable inlet or outlet.
Triangle Lake	N/A	acre(s)	(b)(1) Lake/pond or impoundment that does not contribute surface water flow directly or indirectly to an	Triangle Lake is within the Elmendorf Moraine which is covered by kettles. Kettles on the moraine created by melting blocks of ice during glacial retreat can contain ponds/lakes. Hydrologically connected to Fish Lake below the

Excluded waters ((b)(1) – (b)(12)):[4]				
Exclusion Name	Exclusion Size		Exclusion[5]	Rationale for Exclusion Determination
			(a)(1) water and is not inundated by flooding from an (a)(1)-(a)(3) water in a typical year.	surface of a dense floating mat, however, this depression has no distinguishable inlet or outlet.

III. SUPPORTING INFORMATION

A. Select/enter all resources that were used to aid in this determination and attach data/maps to this document and/or references/citations in the administrative record, as appropriate.

☒ Information submitted by, or on behalf of, the applicant/consultant: Wetland Delineation Report prepared by U.S. Army Corps of Engineers, Alaska District, Civil Works, Environmental Resources Section dated September 2020.

This information is sufficient for purposes of this AJD.

Rationale: Regulatory participated during the wetland delineation field work and conducted extensive reconnaissance on areas of lower relief to determine whether surface water connection existed; no channelized water connection was found.

☒ Data sheets prepared by the Corps: As provided in the 2020 Wetland Delineation Report in file.

☒ Photographs: Aerial and Other: As provided in the 2020 Wetland Delineation Report in file.

☒ Corps site visit(s) conducted on: July 13th through July 17th 2020

☐ Previous Jurisdictional Determinations (AJDs or PJDs): ORM Number(s) and date(s).

☒ Antecedent Precipitation Tool: *provide detailed discussion in Section III.B*.

☒ USDA NRCS Soil Survey: NRCS Online Soil Survey

☒ USFWS NWI maps: NWI Online Web mapper

☒ USGS topographic maps: USGS Online National Map

Other data sources used to aid in this determination:

Data Source (select)	Name and/or date and other relevant information
USGS Sources	N/A.
USDA Sources	NRCS Soils Map for the area.
NOAA Sources	N/A.
USACE Sources	N/A.
State/Local/Tribal Sources	N/A.
Other Sources	1) Joint Base Elmendorf-Richardson (JBER) Wetland Inventory; LiDaR infrared elevation data 2) Memorandum for the Record dated December 4th, 2020 on administrative file.

B. Typical year assessment(s): The APT Tool was used by creating a graph and table titled, "Antecedent Precipitation v Normal Range, which is based on NOAA's Daily Global Historical Climatology Network" (see attached). The first observation date was the first day of field data collection: July 15, 2020. The periodic range was the 30-day period preceeding the first observation date. The geographic range included weather stations within 30 miles from wetland delineation study area. The wetness conditions on the field site date (

July 15, 2020) was determined to be normal; in June it was determined to be dry; and in May it was determined to be dry. The Natural Resources Conservation Service (NRCS) National Water Climate Center's precipitation data for Anchorage Hillside SNOTEL site indicated that precipitation for 2020 was above average with 22.7'' for the calendar year on July 6th compared to the 1981-2010 average of 17.6''. Overall, the conditions were determined to be normal for the site.

C. **Additional comments to support AJD:** In conclusion a total of 60.75 acres of wetlands and 8.18 acres of fresh water lakes were determined to be excluded as per Exclusion Class (b)(1).

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: U.S. Air Force	File Number: POA-2019-00676	Date: 12/22/2020

	Attached is:	See Section below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)	A
	PROFFERED PERMIT (Standard Permit or Letter of permission)	B
	PERMIT DENIAL	C
X	APPROVED JURISDICTIONAL DETERMINATION	D
	PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://www.usace.army.mil/CECW/Pages/reg_materials.aspx or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact:	If you only have questions regarding the appeal process you may also contact:
Andrew Gregory, Regulatory Specialist Alaska District Corps of Engineers CEPOA-RD-S P.O. Box 6898 JBER, AK 99506-0898 (907) 753-2791	Regulatory Program Manager U.S. Army Corps of Engineers, Pacific Ocean Division CEPOD-PDC, Bldg 525 Fort Shafter, HI 96858-5440

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

______________________________ Signature of appellant or agent.	Date:	Telephone number:

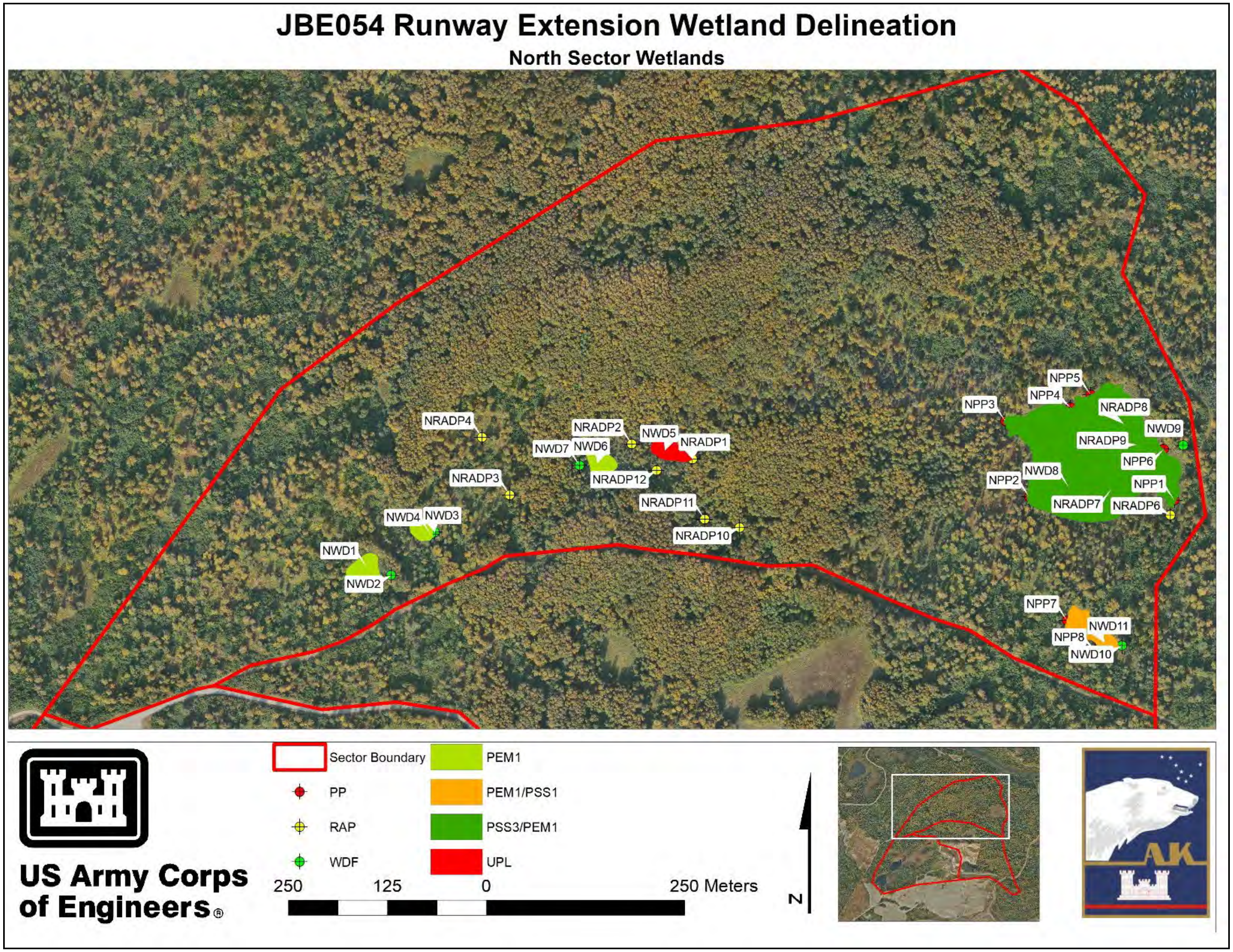


Figure 7. North Sector Wetlands

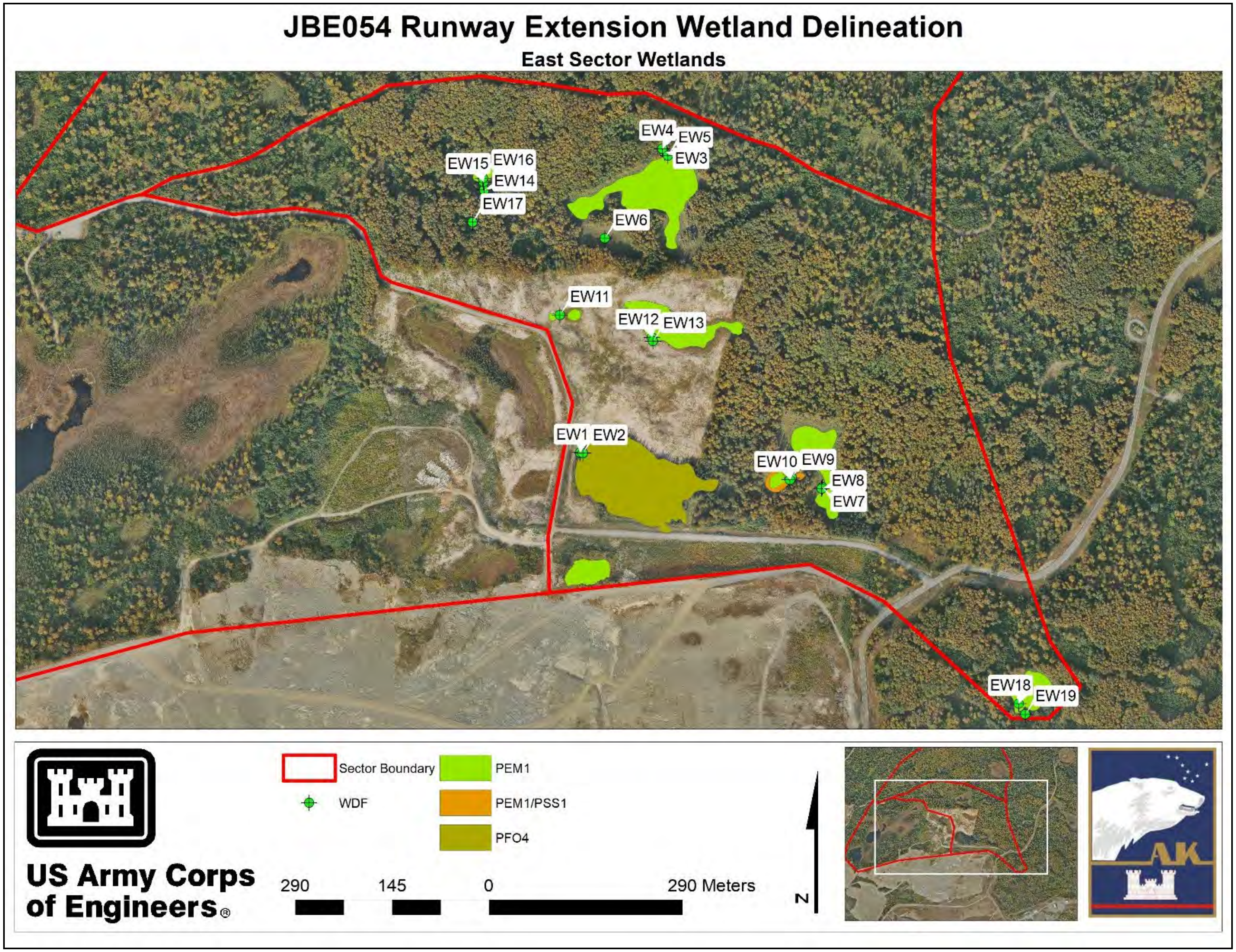


Figure 13. East Sector Wetlands

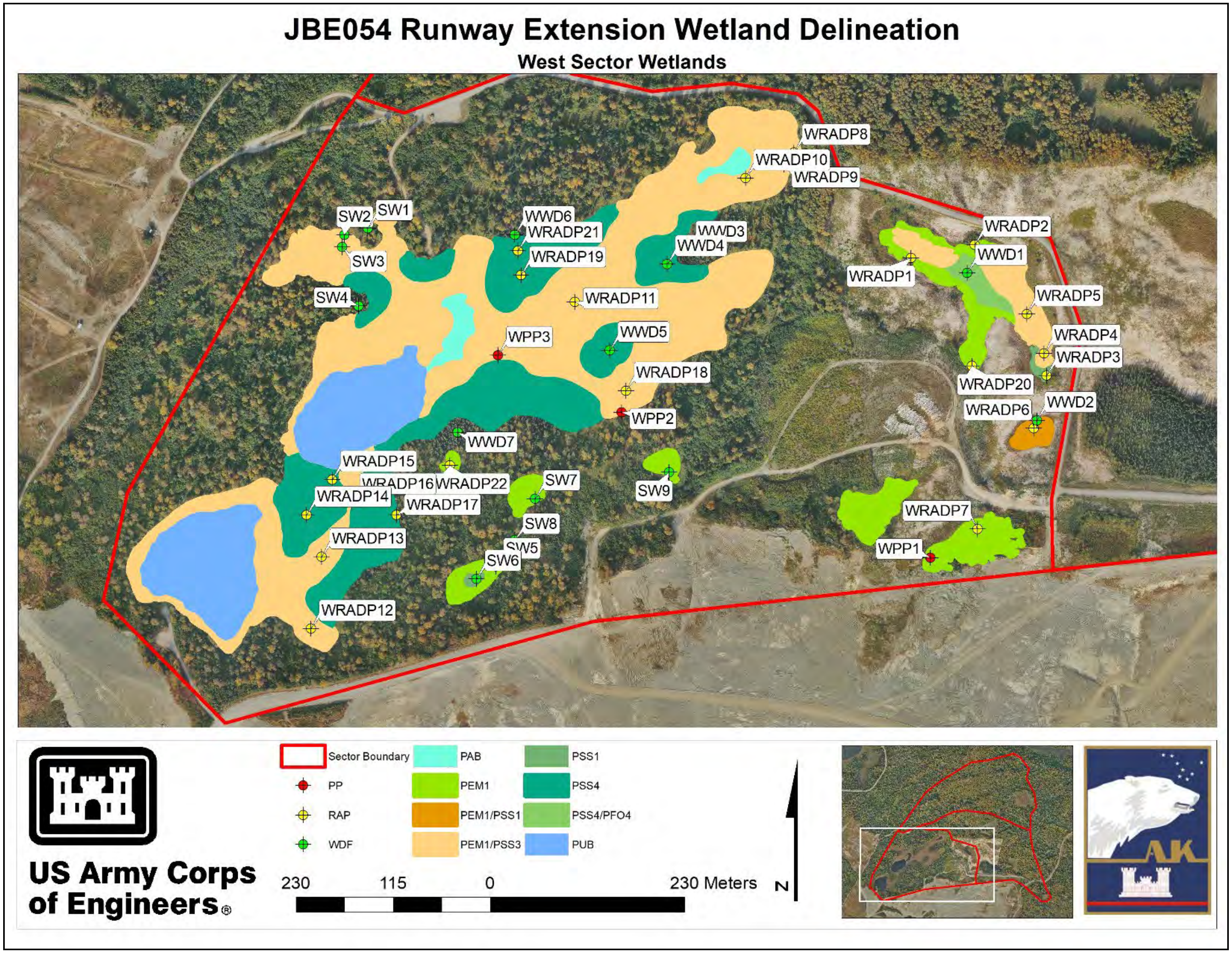
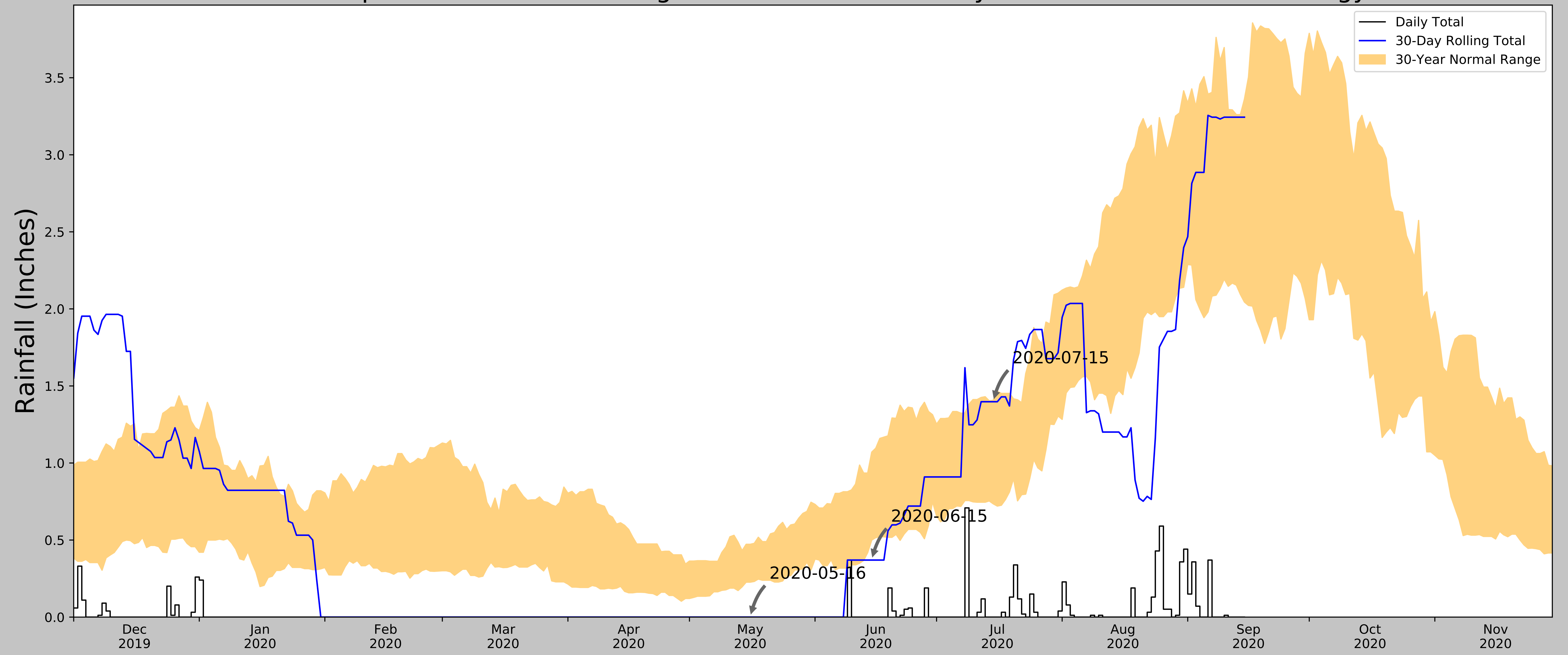


Figure 21. West Sector Wetlands

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	61.27441, -149.79534
Observation Date	2020-07-15
Elevation (ft)	285.18
Drought Index (PDSI)	Not available
WebWIMP H_2O Balance	Dry Season

30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2020-07-15	0.735039	1.406693	1.397638	Normal	2	3	6
2020-06-15	0.500394	1.070472	0.370079	Dry	1	2	2
2020-05-16	0.226772	0.472441	0.0	Dry	1	1	1
Result							Drier than Normal - 9

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days (Normal)	Days (Antecedent)
ANCHORAGE MERRILL FLD	61.2169, -149.855	138.123	4.441	147.057	2.651	7834	89
ELMENDORF AFB	61.25, -149.8	191.929	1.694	93.251	0.92	3007	0
ANCHORAGE 4.5 E	61.213, -149.7649	224.081	4.362	61.099	2.229	1	0
ANCHORAGE 4.8 E	61.2047, -149.7563	229.987	4.988	55.193	2.52	1	0
ANCHORAGE 3.1 ESE	61.2059, -149.8112	133.858	4.763	151.322	2.864	3	0
ALASKA PACIFIC UNIV	61.1889, -149.8056	220.144	5.918	65.036	3.048	425	0
CAMPBELL CREEK SCI CR	61.1639, -149.7778	257.874	7.658	27.306	3.655	6	0
FT RICHARDSON WTP	61.2272, -149.6503	470.144	5.82	184.964	3.695	74	1
EAGLE RIVER 3.1 NNE	61.3659, -149.5501	255.906	10.3	29.274	4.936	1	0

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers

Memorandum for Record

Attention: Julianne Turko, AFCEC/CZN and Charlene Johnson, 673 CES/CEIC

Date: March 25,2021

Subject: Community Noise Evaluation

From: Jim Campe, AFCEC/CZN Noise SME

Background: The U.S. Air Force (USAF) proposes to shift Runway 16/34 on Joint Base Elmendorf-Richardson (JBER) 400 feet north of its existing location. The runway would be extended 400 feet on the north end and the threshold on the south end would be moved 400 feet to the north. As part of this action a hill located between the north end of the runway and Sixmile Lake would be shortened from 104 meters MSL to 100 meters MSL. The number of airfield operations would not change from those described in Alternative F in the Proposal to Improve F-22 Operational Efficiency Environmental Impact Statement and Record of Decision (2018 EIS). This memorandum discusses the airborne noise impacts to the off-base community of Mountain View AK and why additional noise modeling would not be necessary.

Assumptions: This analysis assumes the following:

- The total number of airfield operations would not change for either Runway 16/34 or 06/24 from that evaluated in the 2018 EIS.
- The 400-foot extension is additive to the 2,500-foot extension of runway as described in the 2018 EIS.
- Operational runway thresholds on runway 16/34 shift 400 feet to the north.
- All flight tracks, operations, aircraft mix, and all other flight data on Runway 06/24 remains as described in the 2018 EIS.
- All static operations, i.e., preflight and maintenance engine runups, remain the same both in number and location.
- The hill cut north of the runway is 3.4 miles north of the closest residence in Mountain View and is too distant to affect noise levels at the community.
- Existing greenbelt between the south end of Runway 16/34 and Mountain View would remain in place.
- F-22 on final approach have a flight profile slope equaling a 1:25 slope horizontal/vertical and a 1:10 slope on departures.

Noise Analyses: Under Alternative F in the 2018 EIS, the 65 decibel noise contour approaches close to the Mountain View community but does not quite overlap in the community. Operating conditions with departures on Runway 24 equaling approximately 76 percent of all departures and 80 percent of the total arrivals on Runway 16 are the main contributors to these noise contours. When breaking down noise levels from the sources of Runway 06/24 and Runway 16/34, discrete noise levels resulting from operations on Runway 06/24 would not change its contribution to the noise contours. On the other hand, moving the runway 400 feet north and operations on Runway 16/34 shifts the noise levels accordingly by 400 feet for its contribution to the noise contours. Looking closer into the operations on Runway 16/34 indicate only 144 arrivals on Runway 34 and five departures on Runway 16. These are the operations that fly closest to Mountain View and likely the noisiest. However, a 400-foot horizontal shift with a 1:25 slope and 1:10 slope on arrivals and departure, respectively, equates to only a 16-foot and 40-foot vertical change.

Conclusion: Shifting the runway 400 foot to the north would slightly reduce noise levels at Mountain View. Operations on Runway 06/24 would not change and the contribution of noise on the noise contours would not be affected. Operations on Runway 16/34 would be shifted 400 feet to the north and Runway 16 arrivals would shift 400 feet farther from the receptors at Mountain View, thus reducing noise levels slightly. Runway 16 departures and 34 arrivals would be few, but since the flight profile would be slightly higher at 40 and 16 feet, respectively, noise levels would be very slightly reduced. No other factors that affect noise contours, such as ground impedance or terrain considerations would be changed. Overall, noise levels would be expected to be slightly less, and a quantitative noise modeling analysis would not be warranted for such slight changes.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

August 5, 2016

Mark A. Prieksat, Ph.D.
Chief, Installation Management Flight
730 Quartermaster Road
JBER, Alaska 99505

Re: Proposal to Improve F-22 Operational Efficiency at Joint Base Elmendorf-Richardson (JBER) Letter of Concurrence, NMFS #AKR-2016-9561

Dear Dr. Prieksat:

The National Marine Fisheries Service (NMFS) has completed informal consultation under section 7(a)(2) of the Endangered Species Act (ESA) regarding the proposed action to improve F-22 operational efficiency at JBER, Alaska (Figure 1). The Department of the Air Force (Air Force) requested written concurrence that the proposed action may affect, but is not likely to adversely affect, the endangered Cook Inlet beluga whale (*Delphinapterus leucas*), Cook Inlet beluga whale critical habitat, or the endangered western Distinct Population Segment (DPS) of the Steller sea lion (*Eumetopias jubatus*). There is no designated critical habitat for the Steller sea lion within the action area. Based on our analysis of the information you provided to us, and additional literature cited below, NMFS concurs with your determination. A complete administrative record of this consultation is on file in this office.

Consultation History
NMFS received your request for consultation and attached biological evaluation (BE) on April 7, 2016. Our office and Air Force personnel exchanged further information about the project via email between June 20 and July 15, 2016.

Description of the Proposed Action
The Air Force is preparing an Environmental Impact Statement (EIS) to evaluate the potential environmental consequences of proposed improvements to F-22 operational efficiency at JBER. Under the proposed action, there would be no change in the number of F-22 aircraft or the number of F-22 operations. F-22 aircraft would continue to conduct up to approximately 5,710 sorties per year from JBER, an average of about 22 sorties per work day. A sortie may consist of multiple operations, with an operation being a departure, arrival, or half of a closed pattern. Six alternatives are being considered to achieve the proposed action. Three alternatives would redistribute F-22 operations among the east-west and north-south runways (RW 06/24 and RW 16/34, respectively; Alternatives A, D, and E). In addition to redistribution of F-22 operations among the runways, the other three alternatives (Alternatives B, C, and F) would involve

extending the north end of RW 16/34 by 610 to 762 m (2,000 to 2,500 ft). F-22 arrivals and departures on an extended runway would cross Knik Arm at lower altitudes than would arrivals and departures on the existing RW 16/34. Also, the grading associated with the extension of RW 16/34 could allow for future establishment of an instrument approach by F-22s from the north, which is not conducted at present.

The BE and analysis considered therein focus on the two alternatives that represent the minimum and maximum of the changes in flight operations that could be selected by the Air Force (Alternatives C and E). Total sorties and flight operations by runway under each of these two alternatives are summarized in Table 1. Extension of RW 16/34 under Alternative C would require engineering design, as well as environmental surveys and analysis, before it could be built. The potential effects of that construction, should a decision be made to proceed with the design, would need to be addressed separately. Implementation of Alternative C, if chosen, is unlikely to occur before 2019. Implementation of Alternative E, which does not involve a runway extension, would not occur before mid-2017.

Table 1. Total sorties by runway (adapted from BE, Table 1), JBER, Alaska.

Scenario[1]	Departures				Arrivals			
	RW34	RW06	RW24	RW16	RW34	RW06	RW24	RW16
Existing Operations[2]	1,422 (27%)	970 (19%)	3,313 (64%)	5 (0%)	444 (8%)	5,231 (92%)	7 (0%)	28 (0%)
Alternative C	4,235 (74%)	900 (16%)	570 (10%)	5 (0%)	144 (3%)	800 (14%)	7 (0%)	4,759[3] (83%)
Alternative E	470 (8%)	900 (16%)	4,335 (76%)	5 (0%)	444 (8%)	5,231 (92%)	7 (0%)	28 (0%)

[1]Each sortie normally includes one departure operation and one arrival operation and may include a second approach. Sorties/year are representative for the BE analysis and are based on both F-22 squadrons at full strength all year.
[2]Assumes runway use adheres to the runway distribution in Air Force (2011).
[3]Assumes a new F-22 flight profile and approach for the extended runway.

Action Area

The action area is defined in the ESA regulations (50 CFR 402.02) as the area within which all direct and indirect effects of the project will occur. The action area is distinct from and larger than the project footprint because some elements of the project may affect listed species some distance from the project footprint. The action area, therefore, extends out to a point where no measurable effects from the project are expected to occur.

Since 1997 NMFS has used generic sound exposure thresholds to determine whether an activity produces underwater sounds that might result in impacts to marine mammals (70 FR 1871). NMFS is currently developing comprehensive guidance on sound levels likely to cause injury and behavioral disruption to marine mammals. However, until such guidance is available, NMFS uses the following conservative thresholds of underwater sound pressure levels[1], expressed in

[1] Sound pressure is the sound force per unit micropascals (μPa), where 1 pascal (Pa) is the pressure resulting from a force of one newton exerted over an area of one square meter. Sound pressure level is expressed as the ratio of a measured sound pressure and a reference level. The commonly used reference pressure level in acoustics is 1 μPa.

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root mean square[2] (rms), from broadband sounds that cause behavioral disturbance, and referred to as Level B harassment under section 3(18)(A)(ii) of the Marine Mammal Protection Act (MMPA):

- impulsive sound: 160 dB re 1 μPa_{rms}
- continuous sound: 120 dB re 1μPa_{rms}

NMFS uses the following conservative thresholds for underwater sound pressure levels from broadband sounds that cause injury, referred to as Level A harassment under section 3(18)(A)(i) of the MMPA:

- 180 dB re 1μPa_{rms} for whales
- 190 dB re 1μPa_{rms} for pinnipeds (seals and sea lions)

In addition, NMFS uses the following thresholds for in-air sound pressure levels from broadband sounds that cause Level B behavioral disturbance under section 3(18)(A)(ii) of the MMPA:

- 100 dB re 20μPa_{rms} for non-harbor seal pinnipeds

NMFS defines the action area for this project as the area within which F-22 flight activities associated with the proposed action have the potential to produce in water sound levels ≥120 dB re 1μPa_{rms} (i.e., the point where no measurable effect from the project would occur). As described in the BE, this area includes Knik Arm waters adjacent to JBER between approximately Ship Creek and Eagle Bay on the east side of Knik Arm and between Point MacKenzie and a point northeastward of Goose Bay on the west side of Knik Arm; as well as a portion of northern Cook Inlet (Figure 1).

Listed Species and Critical Habitat

Cook Inlet Belugas

The best available historical abundance estimate of the Cook Inlet beluga population was from a survey in 1979 which resulted in an estimate of 1,293 belugas (Calkins 1989). NMFS began conducting comprehensive and systematic aerial surveys of the beluga population in 1993. These surveys documented a decline in abundance from 653 belugas in 1994 to 347 belugas in 1998, a decline of nearly 50%. In response to this decline, in 2000, NMFS designated the Cook Inlet beluga population as depleted under the Marine Mammal Protection Act. Abundance data collected since 1999 indicate that the population did not increase, and the lack of population growth led NMFS to list the Cook Inlet beluga as endangered under the ESA on October 22, 2008 (73 FR 62919). The most recent comprehensive abundance survey (from 2014) indicates a population estimate of 340 belugas, with the population continuing to show a negative trend since 1999 (Shelden et al. 2015).

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and the units for underwater sound pressure levels are decibels (dB) re 1 μPa.

[2] Root mean square (rms) is the square root of the arithmetic average of the squared instantaneous pressure values.

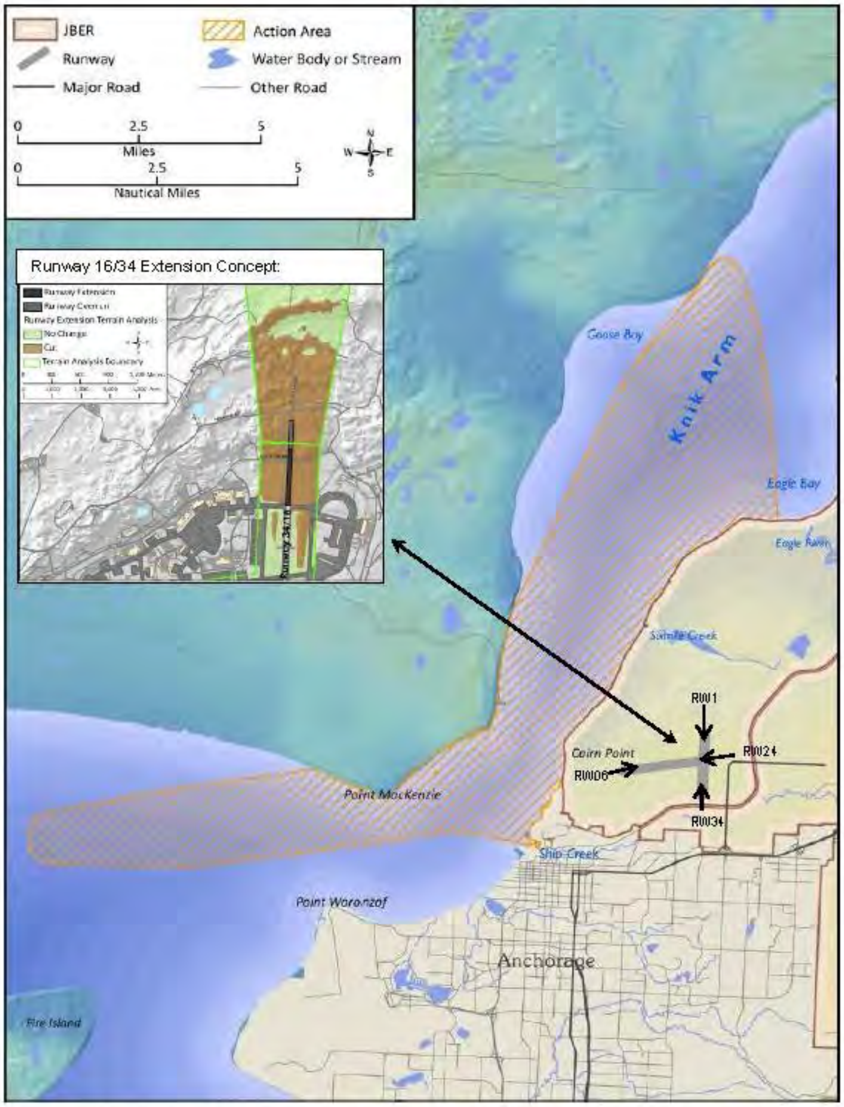

Figure 1. Approximate action area for proposed F-22 operational efficiency improvements, JBER, Alaska (adapted from BE, Figure 2); the inset map provides a conceptual illustration of the potential runway extension (from Air Force Civil Engineer Center 2015).

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The distribution of Cook Inlet belugas has changed significantly since the 1970s. Fewer sightings of belugas in the lower Inlet in recent decades (Hansen and Hubbard 1999; Rugh et al. 2000; Speckman and Piatt 2000; Rugh et al. 2010) indicate that the summer range has contracted to the mid and upper Inlet, coincident with their decline in population size (Goetz et al. 2012). Multiple data sources indicate that belugas exhibit seasonal shifts in distribution and habitat use within Cook Inlet. These seasonal shifts appear to be related to seasonal changes in the physical environment (e.g., ice and currents) and to shifts in food sources, specifically the timing of fish runs (NMFS 2015). Generally, belugas spend the ice-free months in the upper Inlet, often at discrete high-use areas (McGuire et al. 2014), then expand their distribution south and into more offshore waters of the middle Inlet in winter (Hobbs et al. 2005), although some portion of the beluga population is present in Upper Cook Inlet throughout the year.

Both individual belugas and groups are seasonally common in upper Cook Inlet and Knik Arm, adjacent to JBER. A year-round shore and boat-based observational study in Knik Arm (July 2004 to July 2005) revealed seasonal patterns in habitat use and abundance of this area, with peak abundances in fall (September) declining to lowest numbers in winter, and highest use of waters near river mouths and mud flats (Funk et al. 2005). Belugas have been noted to transit between stream mouths, where behaviors including milling, feeding, and socializing by belugas have been observed (Stewart 2010). In Knik Arm these activity areas include Sixmile Creek, Eagle Bay, Eagle River, and near Point MacKenzie, with transit of belugas primarily along the east side of the Lower Knik Arm (Funk et al. 2005; Stewart 2010). Most beluga activity in Knik Arm has been noted during August, September, and October, coinciding with the coho salmon run (NMFS 2008).

Belugas produce sounds for both communication and echolocation. NMFS categorizes belugas in the mid-frequency functional hearing group, which as a group, likely can hear frequencies between 0.15 and 160 kHz in water (NOAA 2015).

Information on Cook Inlet beluga biology and habitat (including critical habitat) is available at: http://alaskafisheries.noaa.gov/pr/ci-belugas.

Western DPS Steller Sea Lions

The Steller sea lion was listed as a threatened species under the ESA on November 26, 1990 (55 FR 49204). In 1997, NMFS reclassified Steller sea lions into two distinct population segments (DPS) based on genetic studies and other information (62 FR 24345); at that time the eastern DPS was listed as threatened and the western DPS was listed as endangered. On November 4, 2013, the eastern DPS was removed from the endangered species list (78 FR 66139). Information on Steller sea lion biology and habitat (including critical habitat) is available at: http://alaskafisheries.noaa.gov/pr/steller-sea-lions.

We are aware of only a very few reports of Steller sea lion sightings in the vicinity of the action area: three Steller sea lion sightings (thought to be a single animal observed three times) were recorded in June 2009 near the Port of Anchorage (Integrated Concepts and Research Corporation 2009); and a Steller sea lion was observed in Eagle Bay in October 2009 (Department of the Army 2010).

The ability to detect sound and communicate underwater is important for a variety of Steller sea lion life functions, including reproduction and predator avoidance. NMFS categorizes Steller sea lions in the otariid pinniped functional hearing group, which likely can hear frequencies between 0.1 and 48 kHz in water (NOAA 2015).

Critical Habitat
NMFS designated critical habitat for the Cook Inlet beluga on April 11, 2011 (76 FR 20180; Figure 2). NMFS excluded all waters off the Port of Anchorage east of a line connecting Cairn Point (61°15.4′ N., 149°52.8′ W.) and Point MacKenzie (61°14.3′ N., 149°59.2′ W.) and north of a line connecting Point MacKenzie and the north bank of the mouth of Ship Creek (61°13.6′ N., 149°53.8′ W.). The action area is located within designated critical habitat for the Cook Inlet beluga and also within the exclusion zone of this critical habitat.

The action area is not located within Steller sea lion critical habitat, and the nearest site designated as critical habitat (Nagahut Rocks haulout) is more than 250 km (155 mi) south of the action area.

Effects of the Action
For purposes of the ESA, "effects of the action" means the direct and indirect effects of an action on the listed species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action (50 CFR 402.02). The applicable standard to find that a proposed action is "not likely to adversely affect" listed species or critical habitat is that all of the effects of the action are expected to be insignificant, discountable, or completely beneficial. Insignificant effects relate to the size of the impact and are those that one would not be able to meaningfully measure, detect, or evaluate, and should never reach the scale where take occurs. Discountable effects are those that are extremely unlikely to occur. Beneficial effects are contemporaneous positive effects without any adverse effects to the species.

Effects of the proposed action include F-22 overflight noise transmitted into the water, and the physical presence and/or shadow of low-flying aircraft. Given that Steller sea lions have been rarely observed in the action area, the possibility of a western DPS Steller sea lion being exposed to the F-22 overflights is extremely unlikely. Therefore, we conclude the potential effects of the proposed action on western DPS Steller sea lions are discountable. Because the proposed action would occur over 250 km (155 mi) from the nearest Steller sea lion critical habitat, it is not expected to impact any of the physical or biological features that define critical habitat for Steller sea lions. Below we consider the potential effects of the proposed action on Cook Inlet belugas and Cook Inlet beluga critical habitat.

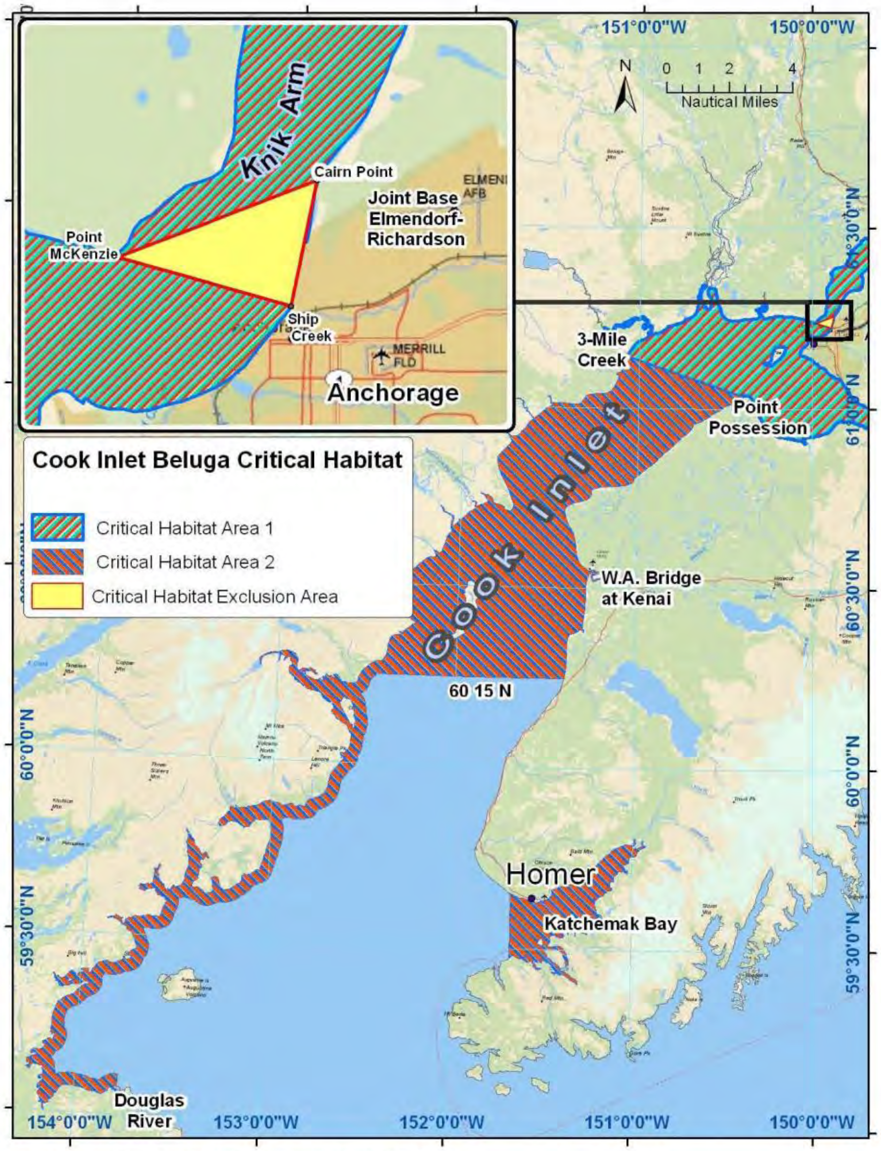

Figure 2. Cook Inlet beluga critical habitat.

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Aircraft Noise Background

Sound is transmitted from an airborne source to a receptor underwater by four principal means (Richardson et al. 1995; Eller and Cavanagh 2000): direct path, refracted upon passing through the air-water interface; direct refracted paths reflected from the bottom in shallow water; lateral (evanescent) transmission through the interface from the airborne sound field directly above; and scattering from interface roughness due to wave motion (Urick 1972; Richardson et al. 1995). Aircraft noise is chiefly transmitted from air into the water within a narrow band centered on the flight path. A large portion of the acoustic energy is reflected from the air-water interface during transmission of sound from air to water. For an overhead sound source, such as an aircraft, most sound at angles greater than 13 degrees from the vertical is reflected and does not penetrate the water (Richardson et al. 1995), especially in calm conditions. The area of maximum transmission can therefore be visualized as a 13-degree cone (26-degree aperture), with the aircraft at its apex.

Aircraft will be potentially audible in water longer as they climb and the base of the cone increases. However, the acoustic energy reaching the water surface diminishes with the aircraft's increasing altitude. Outside this cone of maximum transmission, sound is reflected back into the air, except where appropriately oriented faces of waves and chop enable some sound to be transmitted shallowly into the water. When the sea surface is rough, a common condition in Cook Inlet, reflectance of noise energy is highly variable, depending on the angle at which incoming sound waves impact individual wave surfaces.

Blackwell and Greene (2003) measured in-air and underwater (10 m [33 ft]) overflight noise from F-15 aircraft on approach for landing at the former Elmendorf AFB (now JBER). The overflight sounds were detectable in only two of the eleven F-15 overflights recorded; one of these detected flights passed directly overhead (i.e., at 90 degrees), while the other was nearly overhead (80 degrees). The peak in-water sound pressure level measured was 134 dB re 1 μPa_{rms} for the F-15 directly overhead; and 122 dB re 1 μPa_{rms} for the overflight nearly overhead. The authors attributed the low rate of F-15 detectability to two factors: angles exceeding 13 degrees from vertical, which reduced penetration of sound energy into the water, and high ambient in-water noise. The BE noted that F-22 engines are more powerful than those used in F-15 or F-16 aircraft, and have the potential to be louder than engines of F-16, F-15C, or F-15E aircraft, if other factors (such as altitude and angle of climb) that influence perception of noise on the ground are held constant.

The Air Force used airspeeds reported by F-22 pilots to calculate time spent over Knik Arm and upper Cook Inlet in configurations that generate in-water sound pressure levels greater than 120 dB re 1 μPa_{rms}. The total time per flight event in flight configurations that result in underwater sound levels greater than 120 dB re 1 μPa_{rms} was estimated at between 3 and 136 seconds, with the number of seconds depending on the flight procedure being conducted. Due to the F-22's airspeed, at any given point within the overflown portion of Cook Inlet waters, exposures to underwater sound levels greater than 120 dB re 1 μPa_{rms} would be very brief—approximately 2 to 5 seconds. Consecutive overflights (e.g., two-aircraft departures) could cause the period of exposure to sound levels greater than 120 dB re 1 μPa_{rms} to be longer (e.g., up to about 10 seconds).

Noise from military jet aircraft, which is generated primarily by turbulent mixing of air, is concentrated in relatively low frequency bands, primarily below 4 kHz (Sharp et al. 2001; see also, BE, Figure A-2), which is below the best hearing range of belugas. Spectral characteristics of F-22 noise in water have not been measured, but according to the BE, they are expected to be similar to dominant ambient noise sources in the action area, which would decrease the detectability of jet aircraft noise that is at or near the same levels as the ambient noise. Although beluga hearing is most sensitive at frequencies from about 10 to 80 kHz, their overall hearing range extends from about 40 Hz to at least 130 kHz (Awbrey et al. 1988; Finneran et al. 2005; NMFS 2008). Based on this, belugas would likely be able to detect sounds made by F-22s that sufficiently exceed background noise levels.

Beluga exposures to elevated sound levels from aircraft overflight would be brief in duration (seconds) as the aircraft passes overhead, and would diminish rapidly due to the aircraft's speed. A beluga that is below the surface would need to be nearly directly underneath the overflight in order to be exposed to elevated sound levels, due to lack of or greatly diminished transmission of sound into water at angles greater than 13 degrees from the vertical. Furthermore, a noise would generally need to be louder than ambient noise levels to be perceived by a beluga. A beluga at the surface of the water (i.e., breathing) during an overflight would have a minimal chance of being exposed to in-air noise because odontocetes, including belugas, are believed to receive sounds primarily through their lower jaw, including the pan bone region (side of the jaw) and the rostrum (tip of the lower jaw) (Mooney et al. 2008). The lower jaw areas are seldom above water, even when the whale is on the surface.

<u>Aircraft Noise Effects Analysis</u>

As detailed in the BE, modeling was used to estimate the maximum in-water sound pressure levels associated with all expected flight profiles that would be used by F-22s at JBER, and to delineate the acoustic footprints of all areas where in-water sound pressure levels exceeded 120 dB re 1μPa_{rms}. For simplicity, this analysis assumed equal transmission of sound waves across the air-water interface for anywhere 120 dB re 1μPa_{rms} is exceeded at the water surface. By ignoring the angle of incoming sound waves, different sea states causing sound to enter the water in multiple transmission paths and lateral surface scattering can be conservatively accounted for by calculating the largest possible footprint. This analysis also assumed that the footprint extends from the surface to the bottom, even for areas outside the 13-degree cone where sound energy would be limited to the first few meters of the water column. Because sound waves would have decreased to below threshold noise levels prior to reaching the bottom at any but the shallowest water depths, reflected sound energy from the bottom was not considered as part of the analysis.

The Air Force evaluated the modeled sound profiles of F-22 overflights in relation to the five major categories of acoustic effect, including direct trauma, auditory fatigue, auditory masking, stress response, and behavioral reactions. The maximum modeled in-water sound pressure level of an F-22 overflight did not exceed 136.8 dB re 1 μPa_{rms} for a duration of a few seconds, which was not considered sufficiently intense or long-lasting to result in direct trauma or auditory fatigue. Because predicted F-22 overflight in-water noise levels were often close to ambient in-

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water noise levels, and the noise from aircraft would only be heard for a few seconds at any given point within the water, masking of beluga vocalizations, should they occur during an overflight, would at most occur for only a few seconds.

Regarding behavioral effects (and possible physiological stress response), the Air Force used a probabilistic mathematical function (termed a behavioral response function [BRF]) to estimate the probability that belugas will show behavioral effects (and possible physiological stress response) at given received sound levels. This BRF was developed by the Navy and NMFS for analysis of Navy projects. Similar to the NMFS thresholds (identified above regarding identification of the action area), the BRF relies on the assumption that sound poses a negligible risk to marine mammals below a certain "basement" sound level. Above this basement exposure level, the probability of a response increases with increasing sound pressure level (U.S. Navy 2008; Finneran and Jenkins 2012), as shown in Figure 3. Although the behavioral response function has limitations, we consider it the best science available at this time.

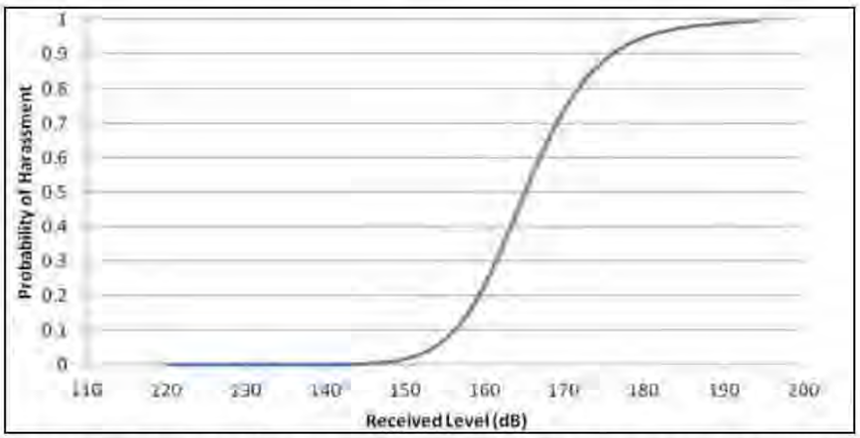

Figure 3. Behavioral response function curve for odontotocetes (BE, Figure A-1; source, U.S. Navy 2008).

The average number of potential behavioral reactions per year was calculated for each proposed alternative based on the predicted footprints of all areas where sound levels exceeded 120 dB re 1 μPa_{rms}, monthly estimated beluga density, and the probability of behavioral response. The overall average beluga density was estimated by dividing the latest beluga population estimate of 340 individuals (Shelden et al. 2015) by 2,800 km^2, the area estimated to contain 95% of the Cook Inlet beluga population (Rugh et al. 2010). Seasonally-adjusted monthly density estimates were then derived from this overall density estimate using data on beluga sighting rates in lower Knik Arm documented between 2007 and 2011 (BE, Appendix A). For months with the highest sighting rate, the overall density estimate of 0.12 belugas/km^2 was used, while in months with lower sightings rates, the density estimate was scaled down based on relative differences in

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sighting rates. For comparison, independently derived density estimates based on observations within the action area (Cairn Point, Sixmile Creek, Point MacKenzie) ranged from a low of 0.0051 belugas/km^2 in May to a high of 0.0846 belugas/km^2 in September (KABATA 2010).

The number of beluga behavioral reactions associated with the proposed action was estimated at 0.012 to 0.047 per year. When added to the estimated number of beluga behavioral reactions associated with existing aircraft operations (approximately 0.018 per year), the total number is still fractionally small (0.0230 to 0.065 per year).

Given the short time during which any increased noise would be detectable to belugas, and the low probability of belugas occurring within the path of maximum sound pressure level, we conclude that acoustic effects on belugas associated with the proposed action are insignificant and discountable.

Visual Effects

In addition to sound, Cook Inlet belugas could react to the physical presence and/or shadow from low flying aircraft. The visual aspect of an F-22 overflight of the action area would be minimal because of its altitude, small size, and rapidity of the overflight. The F-22's closest approach to the water surface ranges from 536 to 18,158 feet mean sea level (MSL), depending on the flight procedure being conducted. The F-22 is similar in size to an F-15 or F-16 and is much smaller than cargo aircraft, such as the C-17 and C-130, and the E-3A Sentry (AWACS) aircraft, which are currently based at JBER. F-22 climb rates on departure exceed the climb rate of F-15 and F-16 aircraft, enabling them to be at higher altitude when they cross over the Knik Arm and upper Cook Inlet, than F-15 or F-16 aircraft. Descent rates during runway approaches are roughly the same for all three aircraft types. Airspeeds in the runway vicinity are similar for all three aircraft types meaning that the duration of the visual experience is similar. Given the altitude, small size, and rapidity of F-22 overflights, visual disturbance of belugas is not expected. We therefore conclude that any visual effects of the F-22 overflight activities are discountable.

Effects on Cook Inlet Beluga Critical Habitat

NMFS identified five physical and biological features essential for conservation of Cook Inlet belugas (also known as primary constituent elements, or PCEs) in the final rule to designate critical habitat (76 FR 20180; April 11, 2011). The proposed action may impact Cook Inlet beluga critical habitat by briefly increasing underwater noise levels. We evaluate effects to each of the physical and biological features below. We note that addressing the effects of a potential future extension of RW 16/34 on critical habitat would require additional information; therefore, such effects would need to be addressed separately.

1. Intertidal and subtidal waters of Cook Inlet with depths <30 feet (MLLW) and within 5 miles of high and medium flow anadromous fish streams.

Because there would be no onshore or in-water construction, earth moving, or vegetation removal associated with the proposed redistribution of F-22 operations among existing runways to achieve operational efficiency at JBER, there would be no effects on this habitat feature.

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2. Primary prey species consisting of four species of Pacific salmon (Chinook, sockeye, chum, and coho), Pacific eulachon, Pacific cod, walleye pollock, saffron cod, and yellowfin sole.

Overflights by F-22s, including elevated sound levels, are not expected to affect prey species consumed by Cook Inlet belugas. In the action area, these primarily include four salmon species and Pacific eulachon; however, Pacific cod, walleye pollock, saffron cod, and yellowfin sole may also be present. Salmon and most marine fish are hearing generalists, with their best hearing sensitivity at low frequencies (below 300 Hz), where they can detect particle motion induced by low frequency sound at high intensities (Amoser and Ladich 2005; Popper and Hastings 2009). Studies of Atlantic salmon conclude that they are unlikely to detect sounds originating in air (Hawkins and Johnstone 1978). It is unlikely that the fish species comprising beluga prey would detect the noise from any jet overflights. Given the low projected in-water sound pressure levels, short duration, and intermittent nature of elevated sound associated with F-22 overflights, the Air Force concluded that if overflight sounds were detected by fish species, any effects would be short-term and minor. We agree with this determination, and conclude that the effects to this habitat feature resulting from the proposed action are insignificant and discountable.

3. Waters free of toxins or other agents of a type and amount harmful to Cook Inlet beluga whales.

There would be no introduction of toxins or other agents of a type or amount harmful to Cook Inlet belugas as part of the proposed action. The only potential effect of this sort would stem from an unexpected F-22 crash into Cook Inlet. Therefore, NMFS concludes that any effects to this habitat feature resulting from the proposed action are discountable.

4. Unrestricted passage within or between the critical habitat areas.

The proposed action would occur strictly on land (storage) or in the air (overflights). No in-water structures or obstructions would result from the proposed activities, and, based on the analysis of likely acoustic effects above, the sound levels will not be continuous or high enough to restrict passage between critical habitat areas. Consequently, NMFS concludes that any effects to this habitat feature resulting from the proposed action are extremely unlikely, and therefore, discountable.

5. Waters with in-water noise below levels resulting in the abandonment of critical habitat areas by Cook Inlet beluga whales.

Based on the aircraft overflight analysis using the odontocete behavioral response function, there would be very limited increases in in-water noise levels, and any such increases would be very unlikely to result in the abandonment of habitat by Cook Inlet belugas. Consequently, NMFS concludes that any effects on this habitat feature from the proposed action are very unlikely, and therefore, discountable.

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Conclusion
Based on this analysis, NMFS concurs with your determination that the proposed action may affect, but is not likely to adversely affect, the Cook Inlet beluga, Cook Inlet beluga critical habitat, or the western DPS of the Steller sea lion. Reinitiation of consultation is required where discretionary federal involvement or control over the action has been retained or is authorized by law and if (1) take of listed species occurs, (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered, (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this concurrence letter, or (4) a new species is listed or critical habitat designated that may be affected by the identified action (50 CFR 402.16).

Please direct any questions regarding this letter to Tammy Olson at tammy.olson@noaa.gov or 907-271-2373.

Sincerely,

Robert D Mecum
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Analysis of Potential Effects of F-22 Overflights on Harbor Seals in Mid-Lower Knik Arm, Alaska

Joint Base Elmendorf-Richardson, Alaska

PREPARED BY:

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8 March 2022

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GLOSSARY OF ABBREVIATIONS AND ACRONYMS

µPa	Micro Pascals
AF	Air Force
AFB	Air Force Base
AICUZ	Air Installation Compatible Use Zone
BE	Biological Evaluation
CEIEC	Civil Engineer Installation Environmental Conservation
CEQ	Council on Environmental Quality
CES	Civil Engineer Squadron
CIBW	Cook Inlet beluga whale
CFR	Code of Federal Regulations
DOPAA	Description of the Proposed Action and Alternatives
DPD	Detected Positive Days
EA	Environmental Assessment
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FONPA	Finding of No Practicable Alternative
FONSI	Finding of No Significant Impact
ILS	Instrument Landing System
JBER	Joint Base Elmendorf-Richardson
LA_{max}	Maximum A-weighted Instantaneous rms SPL
LoC	Letter of Concurrence
MAC	Mother Attraction Calls
MAJCOM	Major Command
MOA	Memorandum of Agreement
MSL	Mean Sea Level
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
PACAF	Pacific Air Forces
POA	Port of Anchorage
PREIAP	Planning Requirements for the Environmental Impact Analysis Process
PTS	Permanent Threshold Shift
ROD	Record of Decision
RW	Runway
SEA	Supplemental Environmental Assessment
SEL	Sound Exposure Level
SHPO	State Historic Preservation Officer
SPL	Sound Pressure Level
TTS	Temporary Threshold Shift
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USC	United States Code
USFWS	United States Fish and Wildlife Service

1.0 DESCRIPTION OF THE ACTION

1.1 Introduction

In support of the development of an Environmental Impact Statement to Improve the Efficiency of F-22 Operations at Joint Base Elmendorf-Richardson (JBER), the Air Force prepared a Biological Evaluation (BE) of the effects of F-22 overflights on Cook Inlet beluga whales (CIBW) to enable informal consultation with the National Marine Fisheries Service (NMFS). In the BE, published in 2016, the Air Force determined the Preferred Alternative may affect but was unlikely to adversely affect CIBW. NMFS concurred with the Air Force's determination on 5 August 2016. The Air Force BE and NMFS letter of concurrence (LoC) are available on the JBER Environmental website in Appendix A to the 2018 EIS (https://www.jber.jb.mil/Portals/144/Services-Resources/environmental/Completed-NEPA/Environmental-Vol%202-JBER-F22-FEIS-Appendices-Feb2018.pdf).

The special-status species section of the 2018 EIS focused on the hydro-acoustic (in-water) impacts of aircraft noise on marine mammals. It did not include discussion of potential impacts on marine mammals such as harbor seals with amphibious hearing. The Air Force determined, after publication of that EIS that analysis of the effects of in-air noise on harbor seals could provide useful information. The purpose of this document is to present the best available information pertaining to the biology of amphibious marine mammals and the potential effects of F-22 overflights, consistent with the action proposed by the Air Force at JBER. This analysis is intended to support the environmental impact analysis process (EIAP) described further in the Supplemental Environmental Assessment (SEA) for the Proposal to Improve F-22 Operational Efficiency at Joint Base Elmendorf-Richardson, Alaska.

1.2 Description of the Proposed Action

The Joint Base Elmendorf-Richardson-based F-22s of the 3rd Wing are subject to runway use restrictions that negatively impact the ability of F-22 pilots to travel the most direct routes to and from training airspaces north and west of Joint Base Elmendorf-Richardson. Runway use restrictions result from (1) the F-22 Plus-Up Environmental Assessment/ Finding of No Significant Impact, which allows not more than 25 percent of annual departures on Runway 34 (going north), with approximately 75 percent departing Runway 06/24 (going east and west, respectively) (Figure 1); (2) Federal Aviation Administration opposite direction operations policy, which disallows opposite departures and arrivals on the same runway and results in approximately 37.5 percent of annual F-22 departures on Runway 24 (going west) and 37.5 percent on Runway 06 (going east); and (3) airspace congestion associated with civil aircraft operations to the south in the Anchorage Bowl. Runway use restrictions affect the pilot's ability to select the optimal runway for departure and/or arrival and reduce the time available for pilot training in the Joint Pacific Alaska Range Complex training airspace. Allowing for more departures and arrivals to occur on runways leading more directly to and from training airspace would result in more efficient flight operations.

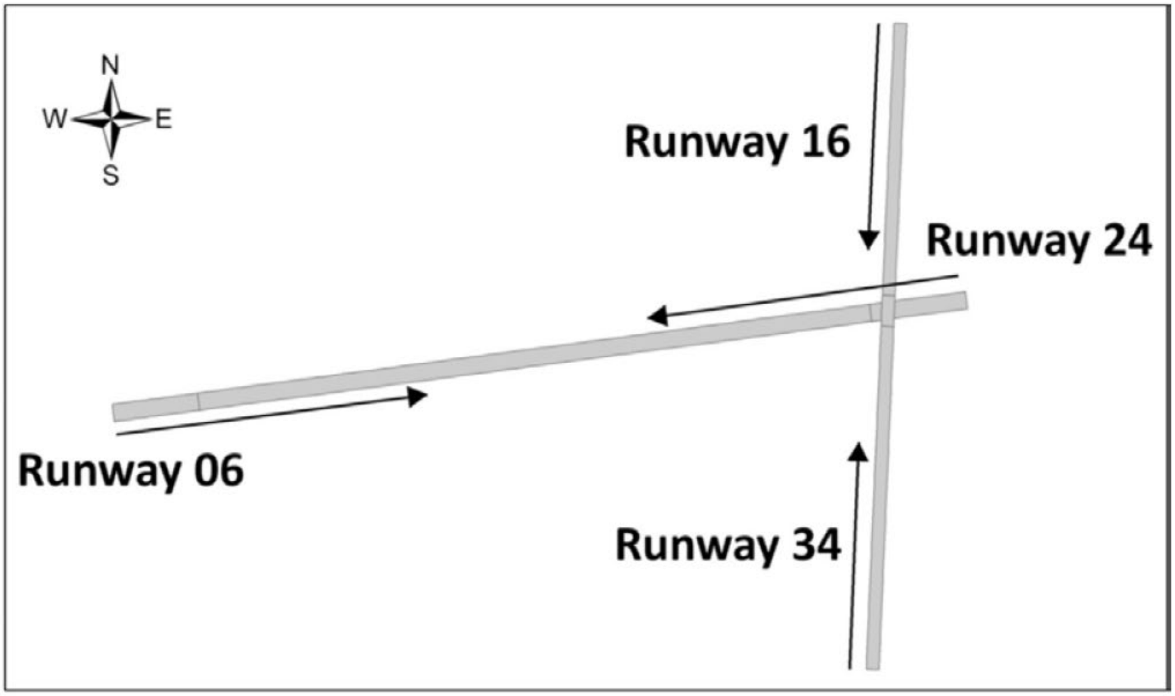

Figure 1 JBER-Elmendorf runways and operational directions (JBER, 2016).

Six alternatives, plus the No Action Alternative, were identified and addressed in the Environmental Impact Statement, Proposal to Improve F-22 Operational Efficiency at Joint Base Elmendorf-Richardson, Alaska, Final Environmental Impact Statement. On 28 September 2018, The Air Force issued a Record of Decision announcing its decision to implement Alternative F, which consists of extending Runway 16/34 to the north for a distance of 2,500 feet (762 m)to result in a 10,000-foot[1] (3048 m) north-south runway and using the extended runway for more efficient F-22 flight operations. During the time that all preparatory actions, including funding, agency coordination, and construction, were being implemented for Alternative F, the Air Force has, as part of the Record of Decision, implemented Alternative A for more efficient flight operations.

Alternative A, now current operations, primarily have F-22 departures on RW 34 and arrivals on RW 06 (Figure 2). Alternative A would allow F-22 operations to depart directly toward the most commonly used training airspaces.

Under all alternatives, there would be no change to 3Wg F-22s conducting the required percentage (30 percent) of sorties after dark (i.e., about one hour after sunset) to fulfill the annual after-dark flying requirement under the Air Force's initiative to increase readiness. Aircrews operating from JBER-Elmendorf can normally fulfill the annual night flying requirements during winter months without flying after 10:00 PM or before 7:00 AM to be consistent with the JBER-Elmendorf noise abatement program. After 10:00 PM or before 7:00 AM is defined as environmental night for the purpose of assessing acoustical effects.

[1] Current design increases this by 400 feet (122 m)

Alternative F would extend RW 16/34 to the north to establish a 10,000-foot (3048 m) runway[2] (Figure 3). Alternative F increases RW 24 departures by focusing departures from both the 90 FS and the 525 FS on RW 24 to the extent practicable. RW 16 would become the primary F-22 arrival runway.

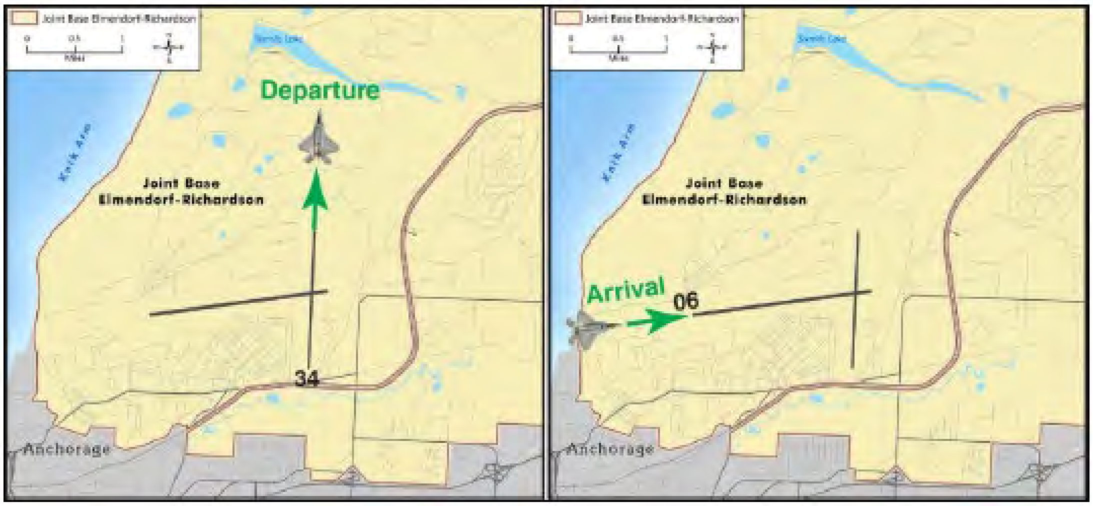

Figure 2 Alternative A (Current Operations) Representation: RW 34 for Departure, RW 06 Arrival (USAF, 2018)

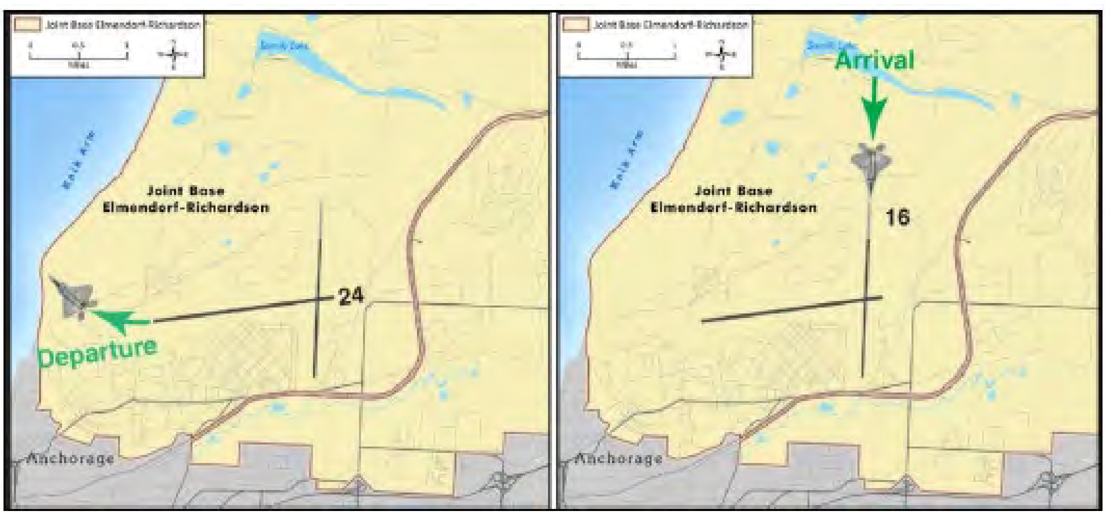

Figure 3 Alternative F Representation: RW 24 for Departure; RW 16 Arrival; RW 16/34 (USAF, 2018)

[2] Current design increases this by 400 feet (122 m)

1.2.1 F-22 overflight sound modeling

The Air Force prepared a Biological Evaluation (BE) of the effects of the Preferred Alternative on Cook Inlet beluga whales (CIBW) in 2016 to enable informal consultation with National Marine Fisheries Service (NMFS) pursuant to Section 7(a)(2) of Endangered Species Act of 1973, as amended (ESA) (16 U.S.C. 1531 *et. seq.*). This effort included modeling of estimated sound pressure levels in-air and underwater resulting from various F-22 flight configurations under all alternatives including Alternative A (current operations) and the Alternative F (preferred alternative). Ultimately, the Air Force determined that the Preferred Alternative may affect but was unlikely to adversely affect CIBW. NMFS concurred with the Air Force's determination on 5 August 2016. The Air Force BE and NMFS letter of concurrence (LoC) is available on the JBER Environmental website in Appendix A to the 2018 EIS (https://www.jber.jb.mil/Portals/144/Services-Resources/environmental/Completed-NEPA/Environmental-Vol%202-JBER-F-22-FEIS-Appendices-Feb2018.pdf)

1.2.2 Changes since completion of consultation

Since the BE and 2018 EIS were prepared, the design of the runway required a northward shift of approximately 400 feet (122 m) to meet instrument landing system requirements that weren't accounted for in the original design. Based on the flight profile for the F-22, this northward shift would only reduce the altitude of aircraft over the Knik Arm by about 25 feet (7.6 m) and would not constitute a meaningful change to underwater noise levels with the potential to affect CIBW.
Additionally, data in the noise analysis used for the 2016 BE was based on overflight altitudes conservatively lower than actual flight patterns flown by F-22s (3Wg OSS, personal communication). Arrivals from the west, over Knik Arm near Cairn Point, occur at a minimum altitude over-water of 709 feet (216 m) mean sea level (MSL). The lowest over-water altitude for arrivals on Runway 16, over Knik Arm near Eagle Bay would be 1,184 feet (361 m) MSL. Under typical arrival and departure scenarios, however, the outside downwind altitude is approximately 2,200 feet (671 m) MSL, which is higher than the original altitude modeled, at 1,700 feet (518 m) MSL (3Wg OSS, personal communication, 24 Feb 2022).

The BE focused on potential effects to the endangered Cook Inlet beluga whale and thus did not consider the potential effects to harbor seals (*Phoca vitulina*) which are seasonally common in Knik Arm and, like all marine mammals, are protected under provisions of the Marine Mammal Protection Act of 1972 (MMPA), as amended (16 U.S.C. 1371(a)(5)).

The Marine Mammal Protection Act (MMPA) established, with limited exceptions, a moratorium on the "taking" of marine mammals in waters or on lands under U.S. jurisdiction. The act further regulates "takes" of marine mammals in the high seas by vessels or persons under U.S. jurisdiction. The term take, as defined in Section 3 (16 United States Code [USC] 1362) of the MMPA, means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." Harassment was further defined in the 1994 amendments to the MMPA, which provided for two levels thereof, Level A (potential injury) and Level B (potential disturbance).

The National Defense Authorization Act of fiscal year 2004 (Public Law 108-136) amended the definition of harassment for military readiness activities. Military readiness activities, as defined in Public Law 107-314, Section 315(f), includes all training and operations related to combat, and the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat. This definition, therefore, includes flight operation of F-22 and other military aircraft. The amended definition of harassment for military readiness activities such as F-22 flight operations is any act that:

• Injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild ("Level A harassment"), or

• Disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns including but not limited to migration, surfacing, nursing, breeding, feeding, or sheltering to a point where such behavioral patterns are abandoned or significantly altered ("Level B harassment") (16 USC 1362 [18][B][i],[ii]).

NMFS often uses generic sound exposure thresholds to assess the potential for behavioral harassment (level B harassment) of marine mammals from noise-generating activities (70 FR 1871). The level B behavioral threshold for continuous noise is a root mean squared (rms) sound pressure level (SPL) of 120 dB_{rms} re: 1 µPa for submerged marine mammals regardless of species and 90 dB_{rms} re: 20 µPa (unweighted) for harbor seals exposed to continuous noise in-air. However, in accordance with the amended definition for harassment as a result of military readiness activities (PL 108-136), such exposures would not be considered level B harassment unless they caused or were likely to cause disruption of natural behavioral patterns to the point of significant alteration or abandonment of these natural behaviors ((16 USC 1362 [18][B][i],[ii]).

This document analyzes the potential effects to the harbor seal as a result of F-22 overflights. Since the BE analyzed potential effects to a cetacean, the analysis therein focused on waterborne sound, specifically sound > 120 dB_{rms} re: 1 µ Pa. Harbor seals, however, have amphibious hearing (both in air and underwater) and thus require an analysis in both mediums. Fortunately, the model used for the BE also produced in-air SPL just above the surface of the water in LAMax (maximum A-weighted instantaneous rms SPL) which was then converted to unweighted SPL in dBrms re: 20 µ Pa just above the surface of the water (see the BE for method). Mapping of in-water SPL in the BE used sound bins that did not allow for depiction of corresponding bins starting at 90 dB in air but rather starting at 88 dB. Rather than creating a new map, JBER uses this lower SPL to depict the approximate isopleth for SPLs that include 90 dB. The action area and estimated water surface area affected by sound greater than an unweighted SPL of 88 dB_{rms} re: 20 µPa just above the surface of the water and 120 dB_{rms} re: 1 µPa just below the surface of the water for both Alternative F (Preferred Alternative) and Alternative A (current operations) are depicted in Figure 4 and Figure 5, respectively.

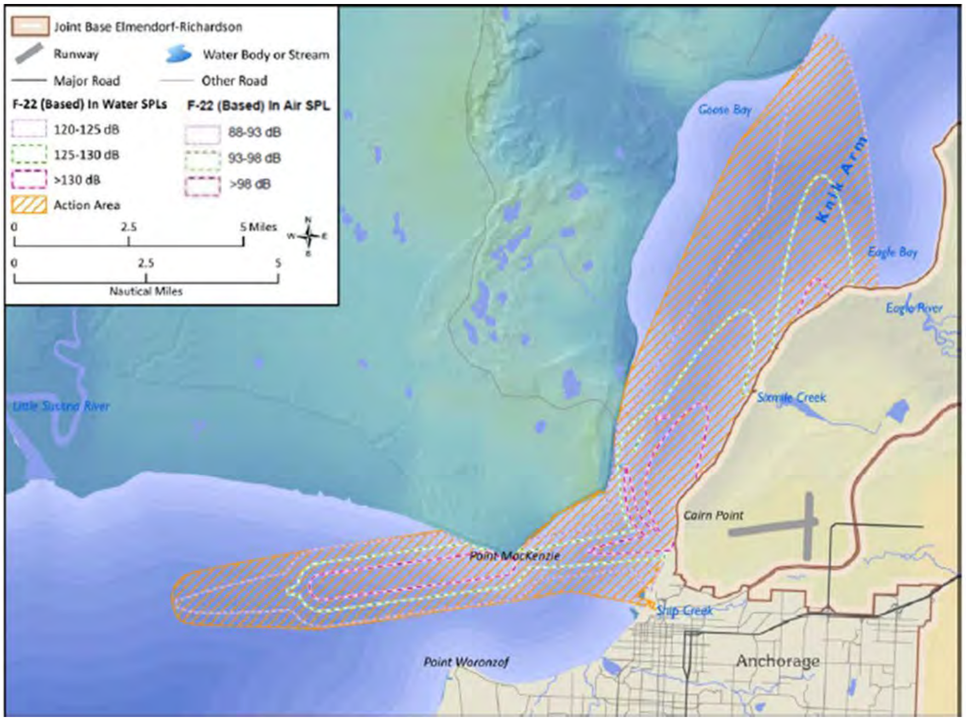

Figure 4 Water surface area affected by F-22 related in-air SPL > 88 dB re 20 µPa (unweighted) and waterborne SPL> 120 dB re 1 µPa (unweighted) under the Preferred Alternative

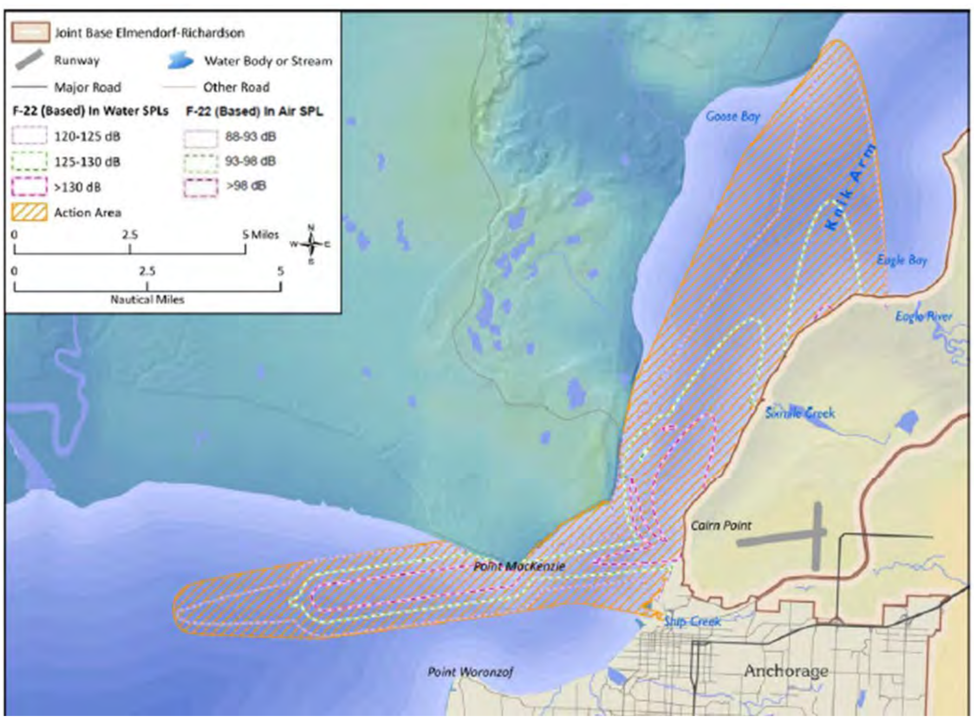

Figure 5 Water surface area affected by F-22 related in-air SPL > 88 dB re 20 µPa (unweighted) and waterborne SPL> 120 dB re 1 µPa (unweighted) under the Alternative A (current operations)

As reported by F-22 pilots during interviews, airspeeds when crossing the Knik Arm range from 180 to

440 knots (~93-226 m/s). Reported airspeeds were used to calculate time spent over Knik Arm in configurations that generate in-water SPL greater than 120 dB. The total time per flight event in flight configurations that result in underwater noise levels greater than 90 dB in-air and 120 dB underwater within the Knik Arm is between 3 and 136 seconds with the number of seconds depending on the flight procedure being conducted. Due to the F-22's airspeed, at any given point within the overflown portion of Knik Arm, exposures to noise levels greater than these levels would be very brief—approximately 2 to 5 seconds. Consecutive overflights (e.g., "two-ship" departures) could cause the period of exposure to noise level greater than 90 and 120 dB SPL to be longer (e.g., up to about 10 seconds).

F-22 flight profiles, to include minimum altitude over water and number of events as well as corresponding estimates of resulting in-air and underwater SPL with duration of time at that SPL for both Alternative A and F are depicted in Table 1.

JBER uses the modeling effort completed in the BE, in addition to other pertinent flight profile details, to assess the potential for F-22 overflights (as described for both alternatives A and F) to affect harbor seals (*Phoca vitulina*) within the action area, both in-air and underwater.

F-22 Flight Profile	Lowest Altitude over water (MSL) meters	Noise Levels			Ops Tempo				Duration of noise in air and water			
					Preferred Alternative		Current Operations		Preferred Alternative		Current Operations	
		LAmax Just Above Surface (dBArms re 20 µPa)	SPL Just Above Surface (dBrms re: 20µPa)	SPL Just Below Surface (dBrms re: 1 µPa)	Annual Total Events	Events/ average flying day	Annual Total Events	Events/ average flying day	Annual duration @ >90 dB in-air & > 120 dB in water (min)	Daily average duration @ >90 dB in-air & > 120	Annual duration @ >90 dB in-air & > 120 dB in water (min)	Daily average duration @ >90 dB in-air & > 120 dB in water (min)
A/B EEEGL Departure on RW 24	2973	87.4	90.4	122.4	173.41	0.48	18.8	0.05	9.02	0.02	0.98	0.00
Mil EEEGL Departure on RW 24	715	101.1	104.1	136.1	4161.58	11.40	451.21	1.24	4652.25	12.75	504.41	1.38
Arrivals (ILS) on RW 06	216	101.8	104.8	136.8	332.84	0.91	1998.48	5.48	754.38	2.07	4529.54	12.41
ALL VFR approaches (overhead break) AND visual closed patterns	216	90.5	93.5	125.5	617.20	1.69	4036.9	11.06	273.32	0.75	1787.68	4.90
Mil EEEGL 2 Departure on RW 34	1221	95.1	98.1	130.1	468.59	1.28	4322.0	11.84	368.96	1.01	3403.12	9.32
ILS to RW 16	361	95.4	98.4	130.4	1665.64	4.56	0.00	0.00	1875.58	5.14	0.00	0.00
Re-entry Pattern (initial approach)	518	91.3	94.3	126.3	1.20	0.00	7.84	0.02	1.34	0.00	8.72	0.02
TOTAL					**7420.46**	**20.32**	**10835.23**	**29.69**	**7934.85**	**21.74**	**10234.45**	**28.03**

Table 1. F-22 Flight profiles resulting in estimated sound pressure levels above 90 dBrms re 20 µPa (in-air) and 120 dBrms re 1 µPa (in-water) including number of events and duration of time over indicated SPL's for both the preferred alternative and current operations (JBER, 2016; 3Wg OSS, personal communication, 24 Feb 2022)

2.0 ACTION AREA

2.1 Marine/Estuarine Habitat Conditions Within the Action Area: Knik Arm

Knik Arm represents the northernmost extension of upper Cook Inlet and its waters bound approximately 20 miles of the northwestern portion of JBER. The Arm is typified by high turbidity, extreme tidal variation, strong tidal currents, expansive mudflats exposed at low tides and high winter ice scour. Several glacial rivers flow into Knik Arm, depositing a large amount of silt into its waters. Strong tidal currents distribute this silt throughout the Arm and re-suspend previously deposited silt. These two inputs, in addition to erosion from bluffs along the Arm, contribute to a high suspended sediment load which inhibits light penetration beyond the surface layer and is thought to result in low water column primary productivity.

Knik Arm is approximately 31 miles long by 5 miles wide and is highly variable in depth with a central trench in the southernmost aspect of the Arm reaching depths of 160 feet at mean lower low water (MLLW). This trench broadens and shoals northward from the constriction at Cairn Point, eventually splitting into two shallower channels that follow both coasts around a large mudflat centered between Goose and Eagle Bays. The channel in Eagle Bay reaches depths of 30 feet MLLW and is closely associated with the shoreline of JBER, a nearly contiguous stretch of eroding bluffs reaching elevations of 150 feet. The bathymetry north of Eagle Bay is dominated by mudflats exposed at MLLW and intersected by shifting networks of narrow tidal channels.

Tides in Knik Arm are semi-diurnal (two high and low tide events per lunar day[3]) with a maximum tidal range (difference between high and low water events) approaching 40 feet. Tidal velocities vary greatly depending on location in Knik Arm but often exceed seven knots during the ebb-tide with flooding velocities measuring somewhat less (Smith, 2004). Strong horizontal and vertical current shears exist throughout the arm most likely combining with the strong tidal flux to create a well-mixed water column with vertically uniform temperatures (7°- 8° C) and brackish salinities (4-8 Practical Salinity Units)[4] (Smith et al. 2005). Mean sea ice concentration (relative measure of the surface area of water that is actually covered with ice) in Knik Arm between 1 December and 28 February is 70-80% and 30-60% in March (Mulherin et al, 2001). The dates of first significant ice (10% ice concentration at the Phillips Platform) and ice-out in northern Cook Inlet have varied widely over the last 30 years with a median "first ice" date of 23 November and a median ice-out date of 9 April (Mulherin et al., 2001).

2.2 Description of the Soundscape in the Action Area

Castellote et al. (2016, 2018) analyzed acoustic recordings from moorings deployed from 2009-2012 in seven locations within lower, mid and upper Cook Inlet including three within or adjacent to the action area for this project (Eagle River mouth, Sixmile and Cairn Point). Objectives of this work included description of waterborne anthropogenic noise sources, their acoustic characteristics and frequency of occurrence as well as description of natural background noise (i.e. periods devoid of anthropogenic noise) at each site. Eagle River had the lowest mean background levels[5] (97.9 +/- 5.8 dB) of any of the ten monitored locations, much lower than Cairn Point (114.3 +/- 6.1dB) and Sixmile (116.0 +/- 10.1 dB) which, along with Fire Island, were the locations most affected by flow noise from strong tidal currents.

[3] One lunar day = 24.8 hrs
[4] Temperatures and salinities were taken in July and August near the Cairn Point
[5] Quietest 30 seconds of the quietest day per site.

Overall, nine anthropogenic noise sources were identified including two general classes of jet aircraft: "commercial or military non-fighter" and "military fighter". Eagle River had the lowest anthropogenic noise occurrence and mean SPL (98.8 dB_{rms} re 1 µPa) of all analyzed locations with the main contributors of noise being jet aircraft and outboard motors. They reported mean waterborne SPL rms levels attributed to fighter jets at 95.3 dB re: 1 µPa (max 104.8 dB re: 1 µPa) at Eagle River and at a mean of 124.8 dB re: 1 µPa (max 135.4 dB re: 1 µPa) at Cairn Point but noted that the Eagle River mooring was a much greater distance from the flight path than was the Cairn Point mooring (i.e. indicating that the levels would be higher for areas under the flight path). Similarly, jet aircraft (non-fighter) noise was highest at Cairn Point with a mean SPL of 125.7 dB_{rms} re 1 µPa (max. 135.9 dB_{rms} re 1 µPa). Most fighter jet events had peak energy between 198-500 Hz (Castellote et al., 2016) with third octave band peak energy commonly occurring in the 315 Hz band (Castellote et al., 2018). Jet noise in-air has the most energy in frequency bands below 4 kHz (see Figure 6) (JBER, 2016). The duration of military fighter jet noise events was short with an overall average of 10.4 sec (Castellote et al., 2018).

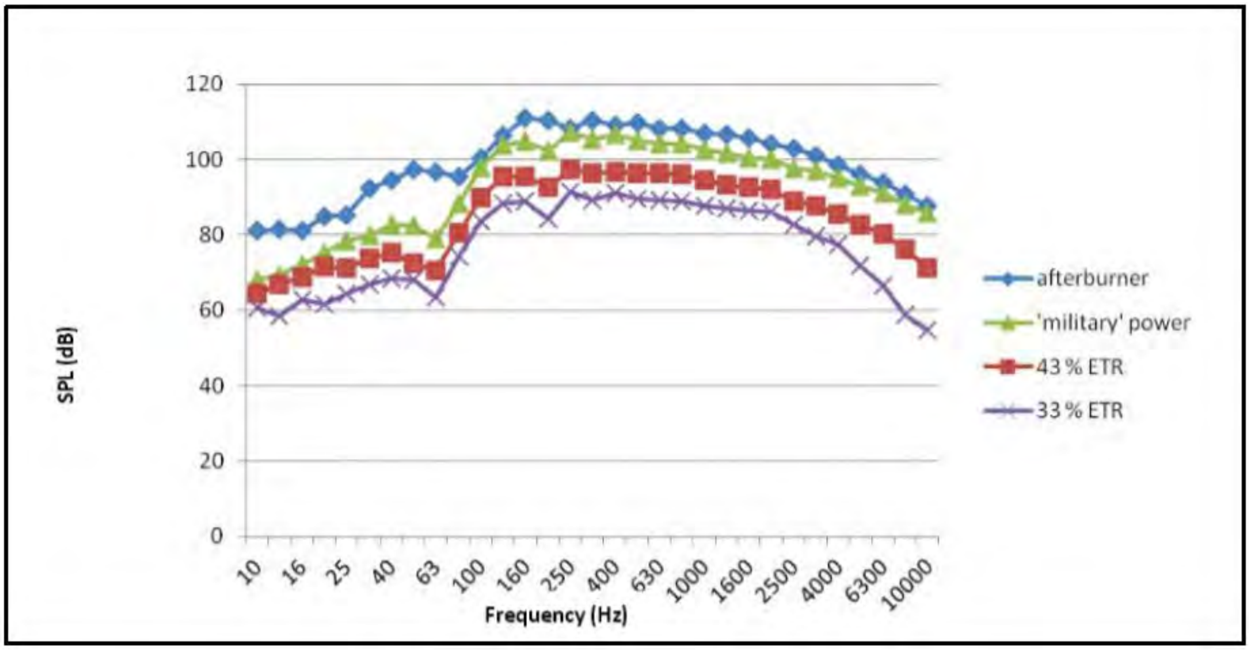

Figure 6. Spectrum levels [(unweighted SPL dB re: 20 µPa (In-Air)] between 10-10000 Hz generated by F-22 Overflight at 1000 ft AGL in several aircraft configurations. Figure from JBER, 2016

We are unaware of any published studies of measured in-air sound levels within the action area. However, air traffic in Anchorage and the surrounding area, to include the action area, is high with a wide variety of aircraft operating from an international airport (Ted Stevens Anchorage International Airport) as well as a busy seaplane base (Lake Hood) and commercial service airport (Merrill Field), in addition to military air operations and numerous private and regional airports to the north, east, and south of JBER. Ted Stevens Anchorage International Airport (TSAIA) had 261,961 aircraft operations from April 2018-April 2019 (FAA, 2022a) and is ranked as the fourth largest airport in the world (in terms of cargo throughput) (TSAIA, 2022). Lake Hood, near TSAIA is the busiest seaplane base in the world with 74,189 operations noted in 2017 (FAA, 2022b). Merrill field has ranked among the busiest airports in the U.S. (15th in 1984, 72nd in 2010) (MOA, 2022) with 126,234 operations in 2018 (FAA, 2022c). Assuming that these annual statistics, despite being from different years, are representative of actual yearly operations, the total estimated non-military aircraft operation within and adjacent to the action area for this project equals 462,384 flights per year or ~1266 flights per day.

3.0 DESCRIPTION OF HARBOR SEALS IN COOK INLET, ALASKA

3.1 Range and Distribution of Harbor Seals in Cook Inlet, Alaska

Harbor seals (*Phoca vitulina*) are widely distributed in both the Atlantic and Pacific Oceans. This species is associated closely with coastal waters and is sometimes found in rivers and lakes (Pitcher, 1984). Their range in Alaska extends along the coast from British Columbia north to Kuskokwim Bay and west throughout the Aleutian Islands (Pitcher, 1984). Most harbor seals are associated closely with coastal waters, although occasional observations of seals up to 100 km offshore in the Gulf of Alaska have been made (Fiscus et al., 1976 as cited in Pitcher and Calkins, 1979). Harbor seals do not appear to make long annual migrations like some species of marine mammals. However, some long-distance movements of tagged animals in Alaska have been recorded (Angliss and Allen 2009) and considerable local movements can occur (Pitcher, 1984). Genetic testing of tagged harbor seals from lower Cook Inlet indicates significant genetic variation between the harbor seals in Cook Inlet and other population of seals across Alaska, suggesting limited movement into or out of the inlet (Boveng et al., 2012). The satellite tracks of seals tagged in lower Cook Inlet, however, showed movement into and out of the Gulf of Alaska into waters surrounding the northern and western Kodiak archipelago, but most of these forays occurred outside of the breeding season and these seals typically eventually returned to their capture area (Boveng et al, 2012). Trip distances of these tagged seals varied between 10 and 250 km with shorter trips occurring during breeding and pupping season. Local movements are generally associated with such factors as tides, weather, season, food availability, and reproduction (Pitcher, 1984; Angliss and Allen 2009).

Harbor seals present within Cook Inlet are managed by NMFS as part of the Cook Inlet/Shelikof stock although little is known about harbor seals in the upper Cook Inlet. The 2018 NMFS abundance estimate for this stock is 28,411 seals with a decreasing 8 year trend (-111 seals/year) and probability that the stock is decreasing of 0.609 (Mutto et al., 2020). The Cook Inlet/Shelikof stock is distributed from Anchorage into lower Cook Inlet during summer, and from Lower Cook Inlet through Shelikof Strait to Unimak Pass during winter (Boveng et al., 2012). Large numbers concentrate at the river mouths and embayments of Lower Cook Inlet, including the Fox River mouth in Kachemak Bay, and several haul outs have been identified on the southern end of Kalgin Island (Rugh et al., 2005; Boveng et al., 2012). There are estimated to be thousands of harbor seal haul out sites in the Gulf of Alaska (Pitcher and Calkins, 1979) with over 200 sites recorded in Lower Cook Inlet alone (Montgomery et al.,2007).
Although primarily aquatic, harbor seals also utilize terrestrial environments ("haul-outs") for multiple reasons including rest, thermal regulation (especially during the molt), pupping, nursing and predator avoidance (Pitcher, 1984; Paterson et al., 2012; Terhune, 1985). Harbor seals are generally solitary foragers but are considered loosely gregarious on land (Scheffer & Slipp, 1944), a trait that facilitates aggregations of tens to hundreds (even thousands) of seals per haul-out during the breeding season (Shaughnessy and Fay, 1977)

The number of Alaskan harbor seals hauled out peaks in May-June (pupping season) and in July-September (associated with the molt) (Ashwell-Erickson et al., 1986; Jemison and Kelly, 2001) with less frequent haul-outs in late fall and winter (Boveng et al., 2012). Harbor seals in Prince William Sound, Alaska, spend 68-75% of their overall time from September-April in the water with a linear decay to 60% in May and 40% in July (Frost et al., 2001). The authors suggested that decreased duration of time spent in water during May-July was indicative of increased time hauled out for pupping, breeding, and molting (Frost et al., 2001).

Throughout their range in Alaska, harbor seals prefer to haul-out on tidally exposed habitats including reefs, offshore rocks and islets, mud and sand bars, sand and gravel beaches, and floating and shorefast ice (Burns, 2009; Pitcher and Calkins, 1979) and tend to haul-out less frequently on simple, exposed coasts (Burns and Gol'tsev, 1984). Montgomery et al. (2007) found that harbor seals in central and lower Cook Inlet hauled out in greater numbers at sites that contained rocky substrate, were near available prey and deep water (20m or greater) and were further from high anthropogenic disturbance.

The study area for Montgomery et al. (2007) did not overlap with the project area as outlined in the F-22 SEA, nor are we aware of any directed studies of harbor seal abundance or distribution in the upper Cook Inlet. There are, however, platforms of opportunity that have documented locations and numbers of harbor seals in the upper inlet during the course of other studies. National Oceanic and Atmospheric Administration (NOAA) biologists, for instance, have recorded data on harbor seal sightings, to include haul-outs, during the course of their spring (mostly flown in June) Cook Inlet beluga whale abundance estimate surveys. While these opportunistic observations do not provide abundance estimates, they do provide relative data on harbor seal presence and numbers during the pupping season (June) throughout upper Cook Inlet to include areas with consistent concentrations of harbor seals. As shown in Figure 7, relatively large aggregations of harbor seals are consistently observed near the McArthur River (max. daily June count=172; avg=21.7), Chickaloon Bay/River (max=207; avg=82.1), Theodore River (max=320, avg =74.1), Lewis River (max=200; avg=38.9) and the Big Susitna River/Delta (max=500; avg=111.5) (Rugh et al., 2005; Shelden et al., 2013; Shelden et al., 2015; Shelden et al., 2017, Shelden et al., 2019). Other than use of the Chickaloon Bay/River in Turnagain Arm, harbor seal use of the eastern side of Upper Cook inlet appears much lower than use of the western side (Figure 8) as was observed in the lower Cook Inlet as well (Boveng et al., 2012). Boveng et al. (2011) found that areas in lower Cook Inlet with large numbers of seals hauled out in June also generally had high numbers of pups (i.e., pupping areas), a trend that also likely continues in upper Cook Inlet, especially in the areas of consistent use mentioned above.

Harbor seals were rarely noted in Knik Arm during NOAA aerial surveys with the notable exception of a group of 10 in Eagle Bay in June 2003, a group of 75 in northern Goose Bay in June 2005 and a group of 40 near Knik River in June 2006. Such relatively large aggregations in Knik Arm could be considered rare with only 3 out of 23 years of data (13%) recording seal groups of greater than three animals and with the last observation occurring 16 years ago. Interestingly, Knik Arm was flown the day following each of these sightings and no seals were observed on any of these successive flights.

In addition to these June observations during the pupping season, scientists conducting photo-id studies on Cook Inlet beluga whales in upper Cook Inlet regularly observe haul-outs of up to 300 harbor seals at the Big Susitna River (up to 500 seals in 2021) and 5-40 at the Little Susitna River between the months of May and September (pupping through molting season) (T. McGuire, personal communication, 31 December 2021 and 13 February 2022).

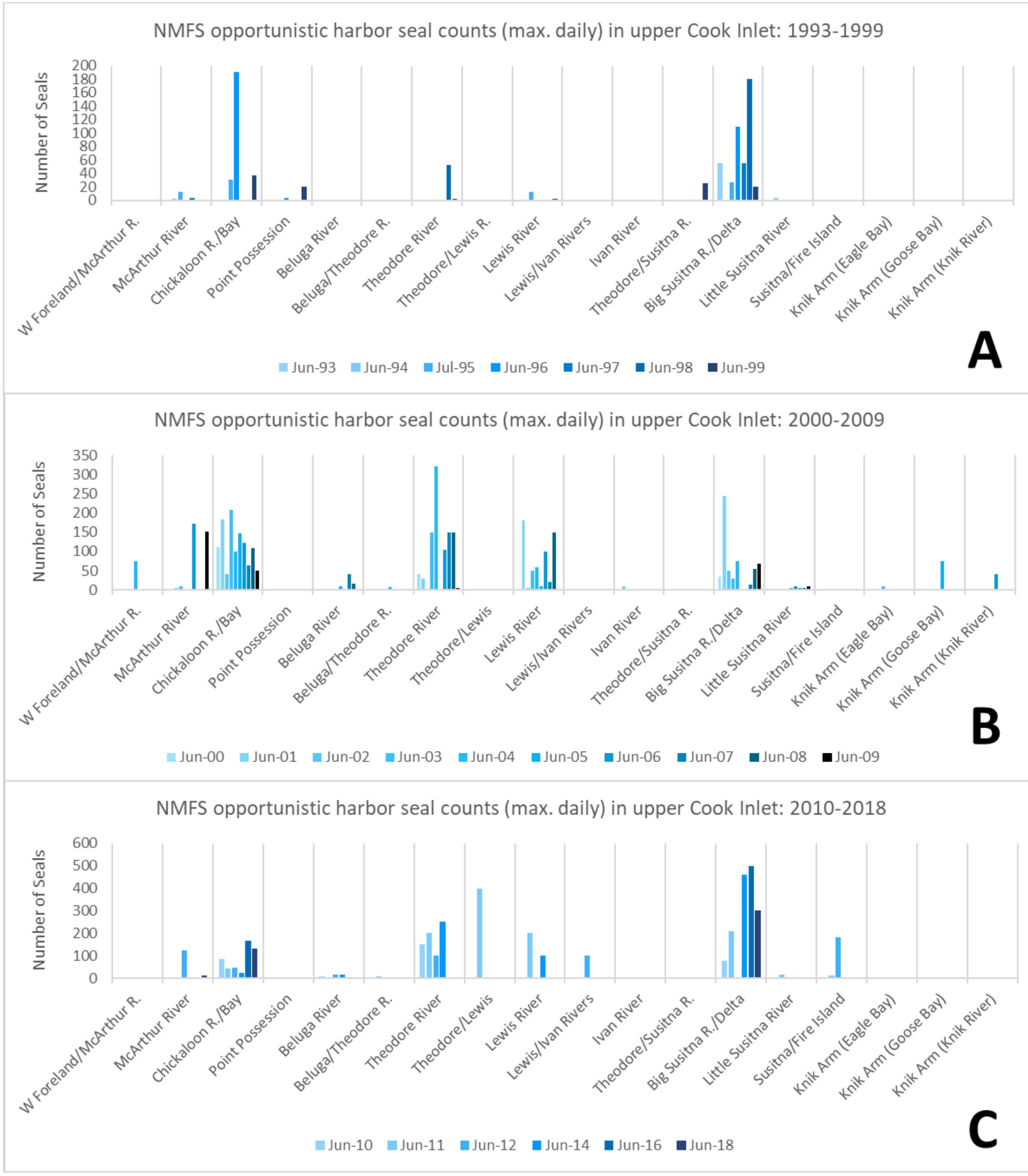

Figure 7. Maximum daily harbor seal numbers per area, recorded opportunistically during spring NMFS aerial surveys of Cook Inlet beluga abundance, Cook Inlet, Southcentral Alaska, 1993-2018 (Rugh et al., 2005; Shelden et al., 2013,2015,2017,2019) NOTE: Only upper inlet (north of West and East Foreland) observations were included. Per each day, groups of seals with different lat/long but the same general location (e.g. Beluga River) were added to the tally for that location. The monthly number shown above is the maximum number of animals counted in a single day per location.

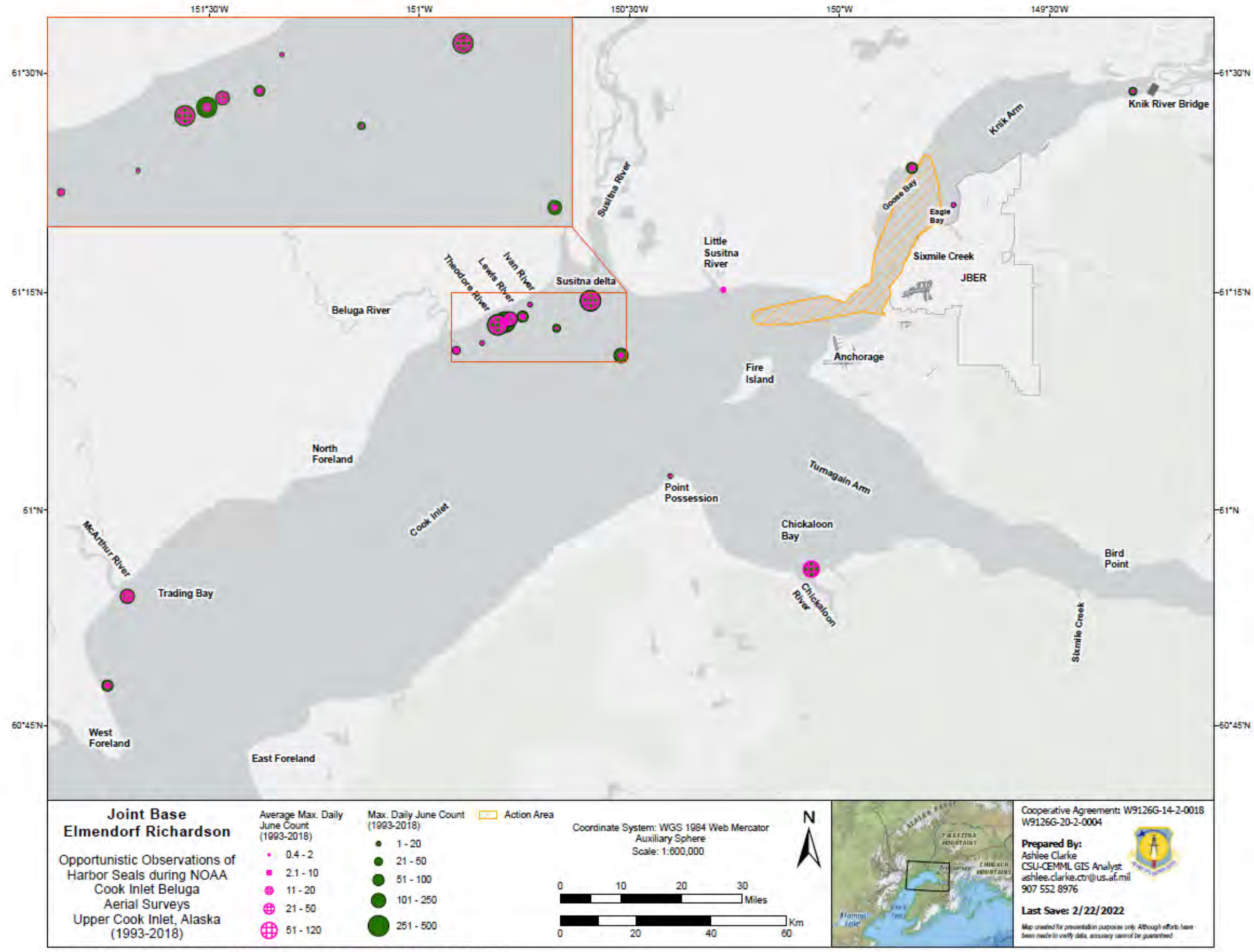

Figure 8. Location and size of maximum daily counts (green circle) and average of maximum daily counts (pink icon inset within green circle) of harbor seals in upper Cook Inlet from opportunistic NOAA aeriel surveys of Cook Inlet beluga whale abundance between (1993-2018). Only June observations are indicated on this map. Action area for F-22 overflights indicated in orange hatch (JBER, 2016). Map produced with data from: (Rugh et al., 2005; Shelden et al., 2013; Shelden et al., 2015; Shelden et al., 2017, Shelden et al., 2019).

3.2 Select Biological Aspects of Harbor Seals

3.2.1 Hearing

The ears of pinnipeds, such as the harbor seal, are amphibious, operating equally well in air and water (Reichmuth et al., 2013). Harbor seals can hear sounds in air from at least 100 Hz to 72 kHz with the most sensitive hearing (bandwidth of hearing within 20 dB of the most sensitive threshold: -4dB re 20μPa at 3.2 kHz) from about 500 Hz to 14 kHz (Reichmuth et al., 2013) (see Aerial in Figure 9) . Underwater, they are sensitive to sound over a wide range of frequencies, from at least 100 Hz to 100 kHz with the most sensitive hearing (bandwidth of hearing within 20 dB of the most sensitive threshold: 55 dB re 1μPa at 18 kHz) between 900 Hz and 41 kHz (Reichmuth et al., 2013) (see Underwater in Figure 9). This suggests that harbor seals would be able to hear noise from an F-22 overflight both in-air and underwater (See section "Description of soundscape in the action area")

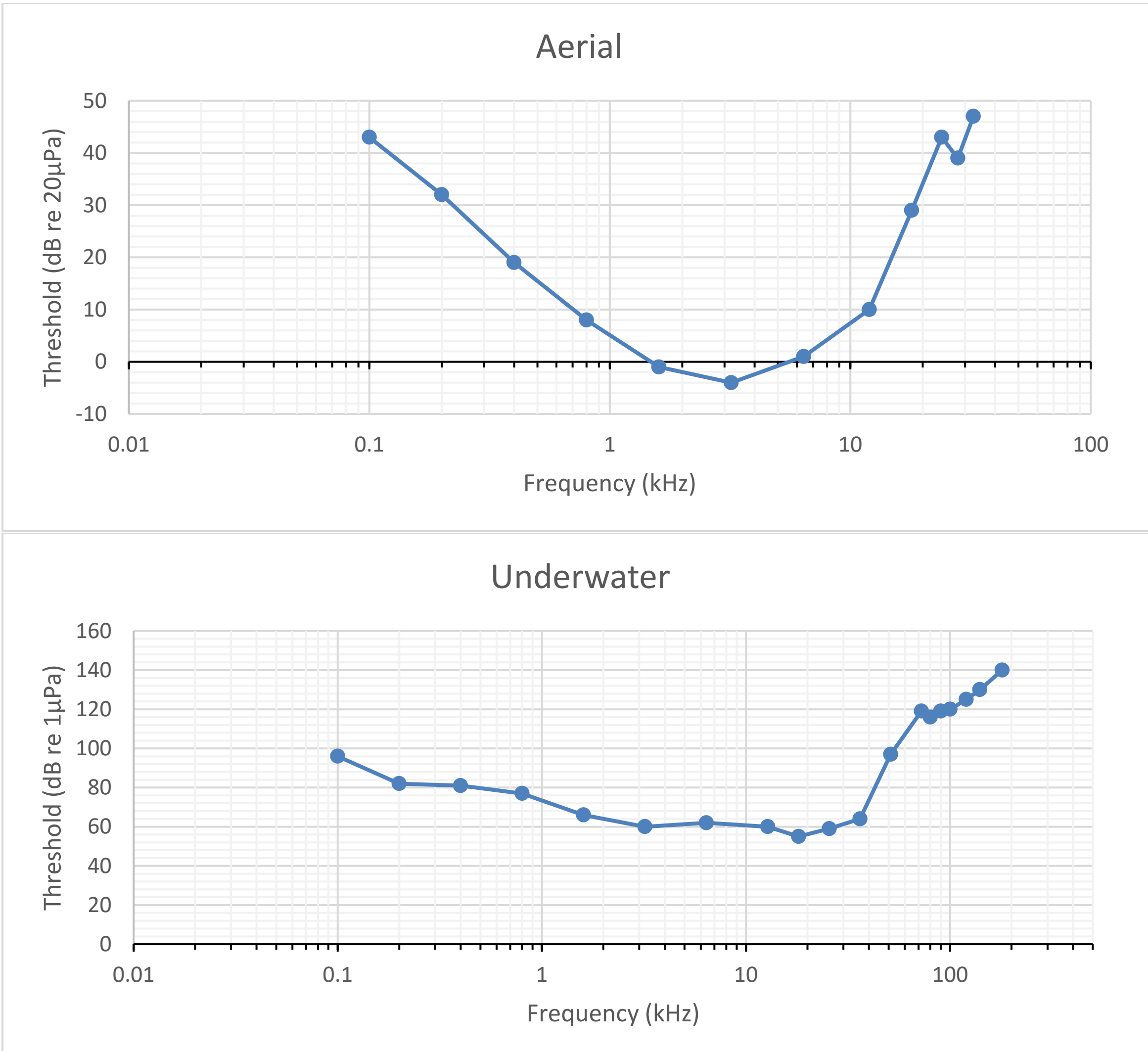

Figure 9 Aerial and underwater audiograms for the harbor seal. (Reichmuth et al., 2013; Kastak and Schustermann, 1998; Wolski et al., 2003; Terhune et al., 1988; Møhl, 1968a and b as cited in Reichmuth et al., 2013; Southall et al., 2005; Kastelein et al., 2009; Cunningham and Reichmuth, 2016)

3.2.2 Predation

Harbor seal predators in Alaska, besides man, include orca (*Orcinus orca*) (Scheffer and Slipp 1944) Steller sea lions (*Eumetopias jubatus*) (Mathews & Adkison (2010), Pacific sleeper sharks (*Somniosus pacificus*) (Hoover, 1988) and likely bald eagles (*Haliaeetus leucocephalus*) are (on pups) (Hayward, 2009).

Orca

The harbor seals main predator, the transient orca, echolocates with broadband pulses with peak energy between 4 and 18 kHz (Barrett-Lennard et al., 1996). The echolocation click trains of transients were less than half as long as those of resident orca and contained 18 times higher percent irregular trains which is thought to make it harder for listening prey to pick out transient echolocation from background noise

(Barrett-Lennard et al., 1996). Additionally, transients click less than resident orca (trains were detected in 31% of sessions with transients vs 95% of sessions with residents), often producing isolated single or paired clicks (Barrett-Lennard et al., 1996). Mammal-eating orcas vocalize significantly less than fish-eating (resident) orcas except after a successful hunt and during surface-active behavior. (Deeke, et al., 2005). North Pacific orcas produce whistles from 1-36 kHz (Miller, 2000; Simonis et al. 2012) and the AT1 subpopulation of transient orca inhabiting Prince William Sound was found to emit low amplitude pulsed calls below 600 Hz when hunting (Saulitis et al., 2005).

Observations from 1975 to 2002 indicate that orcas were occasionally observed in Knik Arm; however, they were relatively common in lower Cook Inlet (Shelden et al. 2003). In June 2015, a possible orca was observed on two consecutive days travelling north up Knik Arm from the Port of Anchorage (B. Mahoney, personal communication, 10 June 2015). More recently, two males from the AT1 subpopulation of transients were observed in Knik Arm on 15 September 2021 near the Port of Anchorage (V. Gill, personal communication, 22 September 2021) during the same time frame that two beluga, one harbor porpoise and one harbor seal were also noted near the Port (POA, 2022). No predation events were observed.

Steller sea lion

Predation of harbor seals by Steller sea lions in Alaska has been documented multiple times and has been implicated as a factor in the decline of harbor seals in Glacier Bay, Alaska (Mathews & Adkison, 2010; Womble & Conlon 2010). Steller sea lion observations in the action area are uncommon with six sightings (likely max of 3 animals) in 2020 and 8 sightings in 2021 near the Port of Anchorage (POA 2021, 2022) with many of those sightings likely of the same animal. Other known sightings include a single Steller sea lion bull observed transiting in Eagle Bay in October 2009 and a single Steller sea lion observed just north of the Port of Anchorage in June 2011 (JBER unpublished data). No predation events have been documented, to our knowledge, in Cook Inlet.

Pacific sleeper shark

Sigler et al. (2006), found fresh harbor seal tissue in Pacific sleeper shark stomachs in the Gulf of Alaska and concluded that they may occasionally be predated (as opposed to scavenged) by sleeper sharks, a hypothesis shared by Taggart et al. (2005) who suggested that predation by sleepers may have contributed to the Glacier Bay harbor seal decline. While normally a benthic species, sleeper sharks in the northern portions of its range are found in shallower water, even up to the surface (Compagno, 1984 as cited in Orlov, 1999). Hulbert et al. (2006) tagged 12 Pacific sleeper sharks in the Gulf of Alaska and found that they made extensive daily vertical movements from below the photic zone where they typically resided during the day to near the surface at night. Overall, the twelve sharks spent most of their time (61%) between 150 and 450 with less time spent at depths greater then 450m (19%), 100-150 m (13%), 50-100 m (6%) and less than 50 m (1%). All 12 sharks ascended above 2 m occasionally (7% of days) with one shark reaching the surface (0-2 m) on 38% of the tagged days. The ambient temperatures recorded during these vertical movements ranged from 4.4°-11.8° C (90% between 5.5° and 8.2° C) with an average of 5.9° C .

The eyes of Pacific sleeper sharks are nearly always (97%) infected with adult female copepods (*Ommatokoita elongata)* that create lesions and likely severe vision impairment (Benz et al., 2002) suggesting reliance on other senses such as olfaction, mechano-sensation and electric sensation to detect prey (Bleckmann & Hoffmann, 1999 as cited in Hulbert 2006). Pacific sleepers are likely ambush predators that rely on quiet approaches (from low hydrodynamic noise) from the cover of darkness (or perhaps turbidity) to attack fast-swimming prey (Hulbert 2006) detected through smell, hearing, electrical sense or some other sensory modality.

To our knowledge, there are no documented observation of predation of harbor seals by Pacific sleeper sharks in Cook Inlet or documented observation of sleeper sharks within Knik Arm.

Bald Eagle

Bald eagles may opportunistically prey on harbor seal pups as noted by Lambourn et al. (2010) who observed a single predation event on a live newborn harbor seal and Hayward (2009) who observed one predation event and two attempted predation events on live harbor seal pups by bald eagles in Washington (Hayward 2009). Hayward et al., (2010) observed bald eagle foraging on a seal rookery in Washington and found that the presence of eagles on the rookery beach positively correlated with the number of harbor seals also on the beach and that seal placentas and dead pups constituted a major dietary component of this population of bald eagles. The authors concluded that the eagles likely did not appreciably affect the seal population on the island given the consumption of afterbirth and already dead pups despite the earlier observed predation event and attempted events (Hayward, 2009). To our knowledge, predation events of harbor seal pups by bald eagles have not been documented.

3.3 Life History

Important harbor seal life history annual cycles include pupping, breeding and molting periods (Hoover, 1988).

3.3.1 Pupping

Pupping in the Gulf of Alaska reportedly occurs from early May to late June with the height occurring just before the middle of June (Bishop, 1967). Harbor seals typically haul out to give birth to a single pup, although they can apparently also give birth in water (Bishop, 1967). Interestingly, harbor seals are apparently able to delay delivery, even after it has started, as observed by Lawson and Renouf (1985) in Newfoundland. During a study on harbor seal parturition, the authors observed 3 out of 10 births in which the laboring female was disturbed as the head of the pup was emerging. In all three cases, the mother moved away from the disturbance, during which time the head of the pup retracted, and obvious contractions ceased. The pups were delivered within a few minutes after the female had settled.

Similarly, disturbance of another five laboring females resulted in a cessation of obvious contractions with subsequent flight of the females into the water. This ability to delay delivery likely facilitates disturbance-free birth.

Harbor seal pups are highly precocial and often enter the water within an hour of birth (Hoover, 1988). This neonatal precociality, necessary in tidally influenced locations where haul-outs flood once or twice per day, strongly suggests the occurrence of some form of early imprinting to ensure that the highly mobile pup does not lose its mother in the water (Renouf et al., 1983). This seems especially true in upper Cook Inlet given its swift, turbid water. Indeed, the first two hours postpartum, during which time the pair apparently bond through frequent nose-to-nose contact, are most critical to the survival of the pup (Johnson, 1977). Lawson and Renouf (1987) further suggested that this critical mutual bond is formed within the first 5 minutes after birth after which a strong tendency of the pup to follow its mother develops. This following activity implies that the pup can recognize its mother (Renouf et al., 1983). The pup generally follows its mother into the water within the first hour and after a brief (~30 min) period of apparent disorientation, begins to swim proficiently (Johnson, 1977). The first nursing event occurs, either on land or in water, around the two-hour mark postpartum and is thought to further strengthen this mother-pup bond (Johnson, 1977).

Pups vocalize nearly continuously while following their mother and it is thought that these calls, which disappear from their vocal repertoire shortly after weaning, may allow the mother to recognize and keep track of her pup, especially while in the water (Renouf, 1985). These calls, dubbed “mother attraction calls” (MAC), are highly individualized, tonal, low frequency (most harmonics below 4 kHz with fundamental frequency between 200-620Hz), short duration (31-1113ms) and are emitted singularly or in series with an inter-call interval as low as 500 ms (Renouf, 1985; Ralls et al., 1985; Perry & Renouf, 1988; Van Parijs & Kovacks 2002; Khan et al., 2006; Sauve, 2014). MAC's propagate both in air and underwater simultaneously and estimates of propagation range vary from as little as a maximum of 8 m[6] Renouf (1980, as cited in Renouf, 1985) up to 128 m and 200 m for the amplitude modulation (AM), frequency modulation (FM) and energy spectrum components of both in-air and underwater calls, respectively (Sauve, 2014).

Perry and Renouf (1988) observed that pups started to call when they were 1 m on average from their mother and that the mother would usually (81% of the time) either approach the pup or stop and wait for them to catch up, initiate nose-to-nose contact (99% of the time) and then continue with the pup, now quiet, following (97% of the time after nose-to nose contact). If the mother did not offer nose-to-nose contact, the pup would usually continue to cry and if the two were separated by 2m or greater, the pup's calls changed, possibly due to stress from increased separation distance. The authors reasoned that this variation in calls between "near" vs "far" pups might allow the mother to evaluate the relative risk of separation from the call alone.

Despite the development of this bond, or perhaps because of its absence, harbor seal pups are occasionally abandoned. Bishop (1967), observing harbor seals hauled out on Tugidak Island, found that desertion of pups, under apparently undisturbed conditions, was common in the first two weeks of May into the latter half of May (early pupping season). Bishop reportedly witnessed many such desertions in which the mother ignored the neonate from birth and never returned to it after separating from it. Permanent separation of a mother and pup within the first week of life is usually fatal to the pup within two weeks (Johnson, 1977). Similar harbor seal pup mortality associated with early-pupping maternal abandonment was noted in other areas within the Gulf of Alaska by Pitcher and Calkins (1979). Harbor seal pup mortality on Tugidak Island in the Gulf of Alaska was mainly attributed to starvation[7] as a direct result of permanent separation of mother and pup with many such separations occurring within the first 1.5 hrs postpartum as a result of natural maternal abandonment as described by Bishop (1967) or by major disturbance (Johnson, 1977).

For mother-pup pairs that remain intact, the lactation period lasts about 3-4 weeks following parturition during which time the pups will gain about 75% of their birth weight (Bishop 1967). Bishop suggested that nursing on Tugidak Island apparently occurs primarily onshore (Bishop 1967) and noted that only one possible nursing event was observed in the water. However, he also noted that the water was sufficiently turbid so as to render the observation, "inadequate". In contrast, Venables and Venables (1955, as cited in Bishop, 1967) suspected that Scottish harbor seal pups up to 3 weeks old nursed strictly in the water. Similarly, Schreer et al. (2010) used stomach temperature telemetry to monitor nursing Canadian harbor seal pups and found that most nursing events in this population also occurred in the water. Bishop reasoned that this difference in nursing practice might be the result of differing nursery topography, with the rocky haul-outs of the Shetland Islands in Scotland favoring water-borne nursing while the smooth beaches of Tugidak Island favored nursing on land.

[6] This assumes the harbor seal critical ration of 25 dB, 70 dB MAC source level, and ambient noise levels of 25 dB spectrum.
[7] Stillbirths, premature births, injuries and illness were also thought to play a minor role in pup mortality on Tugidak Island (Johnson, 1977).

Unlike most other phocids, who fast during lactation, harbor seal mothers resume foraging trips, often accompanied by their pups, by mid-lactation (12 days), returning to the rookery between foraging bouts to nurse (Boness et al., 1994, Bowen, et al., 1999). Boness, et al. (1994), surmised that this strategy is likely required by their small size which may limit the amount of stored energy available to nurse as well as to maintain their own metabolism, a costly combination which leads to the loss of almost 80% of maternal stored body fat by day 19 postpartum (Bowen et al., 1992). Bowen et al. (1999), found that harbor seal pups in Novia Scotia began diving with their mothers from 0-3 days postpartum, an activity that continued, with increasing depth and duration of dive, throughout the lactation period. The authors suggested that these dives were likely not foraging dives for the pups but rather a means to keep in contact with their mother. It is also likely that pups learn, at least to some degree, how and where to forage during these dives.

Mother-pup pairs in the Gulf of Alaska (Tugidak Island) normally remain together constantly for about three weeks after which separations occur periodically for the next week or two (Johnson, 1977),

Weaning occurs about the fifth week postpartum (Johnson, 1977) and is thought to be a gradual process initiated by the mother, similar to other mammalian species (Lawson and Renouf, 1987). In harbor seals, weaning marks the end of parental care. Harbor seal pups appear to fast for a period of 15-17 days immediately after weaning and lose approximately 21% of their weaning mass over the course of the first 5 weeks postweaning period (Muelbert & Bowen, 1993). Weaned pups in the Gulf of Alaska leave the pupping area (Johnson, 1977).

3.3.2 Breeding

Bishop (1967) studied the reproductive life history of harbor seals in the Gulf of Alaska and found that the onset of breeding occurred roughly with the onset of weaning of pups, with most breeding occurring between mid-June and mid-late July (Pitcher, 1984). Breeding occurs mainly at sea but can also occur on land (Bishop, 1967).

Harbor seal breeding depends on ovulation, which occurs about two weeks after weaning, and it appears that breeding bulls do not necessarily zero in on ovulating cows but rather cruise around large aggregations testing for female receptiveness through trial and error (Bishop, 1967). With such a strategy, breeding success likely depends on initiation of a high number of breeding attempts in which the male approaches a lone cow to within 5-6 feet in a characteristic manner and then aggressively attacks (Bishop 1967). Cows can successfully resist such attacks (Bishop, 1967) and are thought to select the male with which they choose to breed and not the other way around (Boness et al., 2006). Coltman et al. (1997) found that male harbor seals at Sable Island, Nova Scotia, made more frequent deep dives, thought to be associated with foraging, during the prebreeding period when cows spend more time onshore attending pups but then gradually decreased these deep dives and increased the number of shallow dives, likely associated with acoustic displays, during the breeding season. The shallow dives occurred predominantly at twilight and night when females, resuming foraging during late lactation, were most likely transiting to and from offshore foraging grounds. During this phase of the breeding season, males spent more time inshore, reduced foraging and increased the amount of time spent on displays (visual and vocal) and inter-male aggression (Boness et al., 2006).

Adult male harbor seals produce at least five underwater vocalization types during the breeding season including low-frequency, broadband “roars” which differ significantly between individuals (Hanggi and Shusterman 1994) and are thought to be used by males to locate and challenge intruders (Hayes et al. 2004) and potentially attract females (Hanggi & Schusterman, 1994). Captive female harbor seals were found to exhibit a significantly higher response to playbacks of male roars, especially dominant male roars (lower in frequency and shorter in duration than calls from subordinate males) as compared to controls (Matthews et al., 2018). This is in keeping with the findings of Boness et al. (2006) who used DNA paternity assessments to determine that female harbor seals likely choose their mate.

Matthews et al. (2017) studied the underwater vocalizations of harbor seals near a haulout site in Glacier Bay National Park, Alaska and recorded breeding calls with an average source level of 144 dBRMS re 1 µPa at 1 m in the 40-500 Hz frequency band (avg. min. frequency =78 Hz) and with an average pulse duration of 3.0s and average total duration of 4.8 sec. Roars from other populations of breeding harbor seals differed in both bandwidth and duration. Californian harbor seals, for instance, produced roars in the frequency band 300-1100 Hz with 2-10 second duration (Hanggi and Schusterman, 1994) while seals off Scotland produced roars from 250-1300Hz with an average duration of ~ 5 seconds (Van Parijs et al., 2000). Van Parijs et al. (2003), compared roar variation across 10 sites throughout the northern hemisphere and determined that vocal variation occurs at the oceanic, regional, population and subpopulation level with genetic barriers the likely explanation for most, but not all the variation. The authors presented evidence for the potential influence of dialects to explain the vocal variation not accounted for by genetics.

3.3.3 Molting

Endothermic animals generate heat internally and homeothermic animals regulate heat to maintain a relatively constant internal temperature, despite the temperature of the surrounding environment. Marine mammals are endothermic homeotherms, meaning that they generate and regulate heat to maintain a consistent internal body temperature. Temperature is the physical manifestation of the thermal energy (heat energy or heat) within an object. In accordance with the second law of thermodynamics, thermal energy and therefore temperature, naturally flows along a gradient from high to low- that is, a hot body in a cold environment will lose heat to the environment.

The temperature gradient between the environment and the internal body temperature of animals living in the more northern latitudes can be as high as 100° C in extreme cases of animals in air and 40° C for animals in water. In order to maintain that gradient, animals employ three main strategies: 1) increasing insulation to lower heat loss, 2) increasing metabolism to increase heat production and 3) adjusting behavior to decrease the magnitude of the gradient (Scholander et al., 1950).

Cold water homeothermy in phocid seals is maintained by thick blubber and peripheral vasoconstriction (Scholander et al., 1950). Phocid pelage is thought to primarily function as insulation when animals are hauled out, especially for pups for whom its insulative value is significant even in water (Kvadsheim & Aarseth, 2002). Other functions likely include camouflage, protection from mechanical injury and reduction of hydrodynamic resistance while swimming (Sokolov, 1962). To maintain this pelage, phocids undergo an annual cycle of regeneration and loss of hair which results in new pelage identical in properties to that which it replaced (i.e. a shorter pelage is not grown for warmer weather, etc.) (Ling, 1970). During this pelage or hair cycle, quiescent epidermal cells in hair follicles proliferate and are keratinized, forming a hair which then pushes the old, dead hair out of the follicle, eventually shedding it in the final stage of the hair cycle often referred to as the molt (Ling, 1970). The epidermal cells of phocids require a minimum temperature of 17° C for such cellular proliferation with an optimal temperature of 37° C (Feltz & Fay, 1966) yet when immersed, phocid skin is cooled to within 1-2° C of the temperature of the water (Irving & Hart, 1957).

Modelling of heat flux of harbor seals in water during the molt showed that even under best conditions- i.e. large seal, temperature of the stratum germinativum[8] at the minimum mitotic temp of 17° C and the speed of the water relative to the surface of the animal at zero m/s- the seal would reach its theoretical maximum sustainable rate of heat production in water temperatures between 8-13° C (Boily, 1995). The water temperature in Knik Arm averages 7-8° C during July and August (Smith et al., 2005) and would only approach a relative speed of 0 if the seal were drifting with the current, but even then the forcing factors of wind and wave action would most likely create some non-zero water flow. Thus, it is clear that harbor seals could not afford, energetically, to molt in the water under real-life conditions. To maintain skin temperature high enough to facilitate hair growth, theory dictates that phocids must increase the amount of time spent hauled out (Boily, 1995; Feltz & Fay, 1966). That harbor seals increase the amount of time out of the water during the molting period is well documented throughout their range including in Alaska (Ashwell-Erickson et al., 1986; Jemison and Kelly, 2001; Frost et al.,2001)

3.4 Harbor Seal Behavioral Reactions to Disturbance

3.4.1 Behavioral reactions while hauled out

Richardson et al. (1995) reviewed pinniped reactions to aircraft overflights and noted that animals hauled out for pupping or molting were the most reactive to aircraft, often displaying anti-predatory behaviors such as increased alertness and fleeing into the water. Disturbance to hauled out animals during such times is likely to carry the greatest chance of impact due to the seal's terrestrial dependence during those sensitive life history periods (Hoover, 1988). For instance, an apparent permanent mother-pup separation on Tugidak Island in the Gulf of Alaska was attributed to a low (61m altitude) helicopter overpass of a hauling area which caused the entire group of harbor seals, including the mother of a newborn pup, to flee into the water. The pup entered the water sometime later but was not observed again with its mother who hauled out on the same beach two days later (Hoover, 1988).

Johnson (1977) observed reactions of harbor seals to natural and anthropogenic (focusing on aircraft overflight) disturbances from May to September 1976 on Tugidak Island in the Gulf of Alaska. Natural disturbances were categorized by the relative intensity of elicited reaction as either "minor" with sources including bird activity, nearby birth of a pup, small clay slides from the nearby cliffs and intraspecific aggression or "major" with sources including eagles landing near the group and major landslides from the cliffs. Minor disturbances involved flight of only a portion of the seals at a haul-out with subsequent rapid return to the same site. Major disturbances, on the other hand, involved flight of all seals from a beach with subsequent haul-out onto a different beach after a prolonged period of milling offshore. During the pupping period, minor disturbances were common, often caused by delivery itself or aggressive defense of the pup or placental membranes from scavenging birds. Such disturbances usually resulting in one to many nearby seals fleeing into the water but they most often hauled back out again within minutes. Occasionally though, eagles attracted to the placental membrane would land and cause a major disruption in which all of the seals would flee into the water, including mothers of neonates. Recently born pups that were not coordinated enough to follow or had not yet acquired the following response, were left onshore. Mothers reportedly occasionally reunited with these pups but many such separations were permanent and thus very likely mortal for the pup. Older pups able to follow the mother into the water were often separated from their mother among the other seals fleeing into the surf. The chances of a successful

[8] The stratum germinativum is the epidermal layer in which the hair follicle first develops during the molt (Ling, 1974 as cited in Boily, 1995)

reunion were reportedly inversely proportional to the severity of the disturbance and the number of seals in the water.

For anthropogenic disturbances, Johnson focused on aircraft operations, noting 42 overflights of hauled out seals from aircraft types including helicopters (n=19), small planes (n=16), large planes (n=4) and jets over the island (n=3). The minimum, maximum and mean altitudes per each category of aircraft are given in Table 2 .

Overflights at altitudes higher than 305 m were often noted to cause desertion of the beach by some, but not all seals aggregated at a haul-out. Overflights at altitudes between 122m and 305 m elicited varied reactions depending on the weather, the frequency of recent disturbance, the type of aircraft and the altitude of the overflight. Stronger reactions were noted on calm days, during periods of frequent disturbance, with helicopter or large plane overflights and with low altitude-overflights. Overflights at altitudes of less than 122 m, especially less than 30 m, usually resulted in desertion of the observed haul-out by most or all of the seals aggregated there, usually with subsequent haul-out in a new location after a prolonged (2+ hour) period in the water (i.e. major disturbance). This agrees with an ecological risk assessment produced by Efroymson & Suter (2001) who suggested that ~95% of hauled out harbor seals would be affected by an overflight with slant distance of ~120-130 m (values estimated from graph presented in the risk assessment).

Aircraft	Number overflights	Min. Altitude (m)	Max. Altitude (m)	Mean Altitude (m)
Helicopter	19	6.1	30.5	16.8
Small Plane	16	15.2	304.8	174
Large Plane	4	76.2	304.8	228.6
Jet over Island	3	Not noted	Not noted	Not noted

Table 2: Number of aircraft overflights of harbor seal haul-outs per category of aircraft with minimum, maximum and mean altitude, Tugidak Island, Gulf of Alaska: May-September 1976. Adapted from Johnson (1977). Note: the altitude of jets flying over the island

Aerial photography of harbor seals hauled out on Tugidak Island conducted from a Gruman Goose could not operate at altitudes less than 152 m without flushing seals from haul-outs whereas aerial surveys flown with a Cessna 180 at altitudes of 61-91 m were successfully conducted (Vania et al., 1968).

Based on an estimated birth rate of 5 pups per hour during peak pupping season, Johnson estimated that an aircraft circling the island at less than 30 m would result in separation and death of 12 newborn pups (born within two hours before to ½ hour after a major disturbance) and an unknown number of older pups. After consideration of hourly pupping rate over the entire pupping season, in addition to the frequency of aircraft overflights, Johnson estimated that such low flying aircraft were likely directly responsible for the death of over 150 newborn pups and up to 300 slightly older pups during the 1976 pupping season.

Andersen et al. (2014) studied the response of VHF and satellite-tagged harbor seals in the Anholt seal reserve (Denmark) to a variety of anthropogenic disturbances (i.e. pedestrians, boats, low-altitude aircraft and grey seals-a known harbor seal predator) during the prebreeding period (25 April-21 May) of 2008. Twenty-six disturbance events were recorded including two involving low-altitude aircraft overflight, although no further details about those overflights (i.e. aircraft type, altitude, slant distance, received sound levels, etc.) were provided in the paper. The behavioral response under investigation in this study was seal flight into the water with subsequent tracking of the duration and distance traveled in water as well as diel pattern of rehauling. Most seals resumed hauling out during the night (between dusk and dawn), the quietest time in the reserve, regardless of whether they had left the haul-out naturally or due to a disturbance (post-disturbance=65%; undisturbed=67%). The mean duration following disturbance from pedestrians (18.5 hrs) varied significantly from that of undisturbed trips (7.1 hrs) while durations from other disturbance sources did not (boat=9.9 hrs, grey seal = 14.3 hrs, airplane=11.4, unknown=9.1). Similarly, pairwise comparisons of trip extent showed that seals disturbed by pedestrians moved significantly farther from the haul-out (12.5 km) than did those disturbed by boats while the difference between trip distances following all other disturbance types were insignificant. The authors noted that, with the exception of trips following disturbance by pedestrians, all other trip parameters (i.e. duration and timing of rehaul, area use) were comparable to those of undisturbed animals and reasoned that these animals likely engaged in foraging after fleeing into the water as opposed to waiting near the haul-out until dusk to rehaul.

Osinga et al. (2012), studied the reactions of harbor seals to various anthropogenic land, air, and water stressors experienced by mostly mother and pup pairs hauled out during the pupping and nursing seasons in the Dutch Wadden Sea. The authors observed two main reactions of harbor seals to anthropogenic disturbance events; alertness and fleeing into water with flight deemed the most serious of the two. The percentage of serious responses did not differ significantly between the three studied categories (i.e. land, air, and water disturbances) with 4% of recorded potentially disturbing air activities (including propeller, rotary wing, and jet aircraft flights) resulting in seals fleeing into the water vs 7.8% and 6.5% flight from potentially disturbing land and sea activities, respectively. Aircraft overflights of the study area were mostly limited by regulation to altitudes of greater than 450m with a limited number of flights allowed at 150 m. Aircraft type and altitude in relation to observed reactions, however, were not reported in this study with the exception of the observations of at least two survey overflights[9] at approximately 300 m, none of which resulted in reactions other than alerting of a limited number of animals. The authors concluded that lower altitude overflights[10] appeared to cause more disturbance of seals and that the effects of flights between 150-300 m needed more study.

Holst et al. (2011), studied the behavioral responses of pinnipeds (harbor seal, northern elephant seal, and California sea lion) to 77 missile launches from San Nicolas Island, California using acoustic recorders and remote video cameras. Of the three pinniped species monitored, harbor seals were found to be the most reactive species with the majority of seals (68%) within ~ 4km of the launch fleeing into the water with subsequent rehaul at the same site several hours later. Despite this, the authors noted that the number of pinnipeds disturbed by the launches was small with minor, short-term and localized effects having no consequences on local pinniped populations as evidenced by stable (harbor seal) or increasing (elephant seals and California sea lions) numbers on SNI despite over 50 years of rocket launches in the area.

Southall et al. (2007) reviewed three studies ((Thorson et al., 1999, 2000b; Berg et al., 2002; as cited in Southall et al., 2007) of behavioral responses of pinnipeds (harbor seals, northern elephant seals,

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[9] It was noted that surveys conducted by the Seal Rehabilitation and Research Centre (Pieterburen, Netherlands) during the summers of 2009 and 2010 were observed in this study but there was no indication of the number or frequency of these surveys (e.g. once per year, once per month, once per week, etc).
[10] While not explicitly stated in the report, "lower altitude" is assumed to mean less than 300 m since the authors note that overflights of small aircraft at 300m did not lead to flight into the water.

Californian sea lions, and northern fur seals) to in-air nonpulse sounds from rocket launches. Based on these few studies, the authors generalized that pinnipeds exposed to rocket launch noise at received levels of ~ 60-70 dB re: 20 μPa tended to ignore the noise altogether while those exposed to levels of ~110-120 dB re: 20 μPa tended to flee into the water with a subsequent rehaul minutes to a few hours later. They also suggested the possibility that the exposed animals may have been habituated to rocket launches, thereby affecting their response.

3.4.2 Behavioral reactions while in water

There are no published studies, that we are aware of, detailing observed reactions from seals in the water, either submerged or with their head out of the water to aircraft overflight. However, reactions to noise from other anthropogenic sources are likely to be fundamentally similar to reactions to noise from an overflight.

Southall et al. (2007) reviewed studies of behavioral responses of pinnipeds to waterborne nonpulse sounds under various conditions and concluded, based on those limited studies, that exposures between 90 dB and 140 dBrms re 1 μPa generally do not appear to induce strong behavioral responses (Kastelein et. al, 2006; Jacobs & Terhune 2002; Costa et al., 2003)

Kastelein et al. (2006) exposed captive harbor seals to narrowband, mid-frequency (12kHz) sounds emulating those proposed for use in an underwater data collection network (ACME) and found that the seals avoided the sound source (i.e. swam away) as opposed to lifting their heads out of the water or hauling out. An acoustic behavioral discomfort threshold, defined as the boundary between the areas that the seals usually occupied during sound transmission and those areas that they did not was determined to be 107 dB RMS re 1 μPa.

Götz and Janik (2010) found that captive seals (harbor and grey) presented with various underwater sounds characterized as aversive[11] initially turned away or fled from the sound (received levels 146 dB re 1 μPa) or were prevented from catching fish presented to them. The seals quickly habituated to the sounds, however, such that these responses were not elicited after the first playback session. Wild grey seals, on the other hand, exhibited temporary displacement (avoidance) from haul-out areas but did not appear to habituate to the noises (received levels 135-144 dB re 1 μPa). The authors noted that the captive seals were presented with fish during noise playback while the wild animals were not and thus reasoned that the captive seals were motivated by the food to approach the feeder (adjacent to the projector) and that the positive reward of food likely overrode the aversiveness of the sound. They further reasoned that food motivation facilitates habituation to aversive noise. Conversely, Yurk & Trites (2000) successfully deterred harbor seal predation on salmon smolt under a bridge in British Columbia for a month using Acoustic Harassment Devices (AHDs) developed to elicit avoidance behavior in pinnipeds. They did, however, acknowledge that such acoustic deterrence was likely to only be effective in the short term due a demonstrated pinniped ability to adapt to sounds (Fraker, 1994). The ability of harbor seals to adapt or habituate to sounds was also suggested by Jacobs and Terhune (2002) who observed no reaction from free-ranging Canadian harbor seals swimming near aquaculture cages upon exposure to noise from AHD's with perceived sound levels estimated 142 dB re: 1 μPa).

Kastelein et al. (2017) tested the behavioral reactions of two captive harbor seals to a suite of 16 sounds (200 Hz-20kHz frequency band) produced by a seal deterrence device, FaunaGuard Seal Module (FG-

11 An aversive sound is one that is unpleasant and elicits avoidance from an animal.

SM). Reactions of the seals to the sounds played at four source levels and two background noise levels included no reaction, increased time with head out of the water, increased haul-out frequency, and increased number of jumps. The behavioral threshold for jumping, considered the most important reaction for evaluating behavioral change since it was rare in baseline behavior, was between 136 and 148 dB re 1μPa. The two seals differed in their response to the noise above certain levels: one seal increased the amount of time with her head out of the water as well as jumped more while the other increased haul-out frequency as well as the number of times it jumped out of the water.

3.4.3 Habituation and increased tolerance for disturbance

The ethological concept of behavioral habituation can be described as a process in which one's response to a repeated stressor is reduced over time (Thorpe, 1963 as cited in Olsen and Acevedo-Gutierrez, 2017).

Burns (2009) generalized that habituation of harbor seals to anthropogenic activities is not uncommon where these activities are regular, continuous, non-threatening and where the seals are not "unduly harassed". For example, Calambokidis et al. (1985b as cited in Hoover, 1988), observed few instances of harbor seal flight into the water over the course of two years as a result of multiple low-flying aircraft overflights (up to 20 per day) and suggested that the seals in this area had become habituated to such low altitude overflights. Similarly, Richardson et al. (1995) noted that harbor seals can habituate to frequent overflights citing an example of harbor seals hauled out next to Vancouver International Airport showing little to no reaction to low aircraft overflights (Johnson et al., 1989).

3.5 Description of Harbor Seal Use of the Activity Area (Eagle Bay, Sixmile Creek and Lower Knik Arm near Port of Anchorage

3.5.1 Eagle Bay and Sixmile Creek: JBER Marine Mammal Observation Program (unpublished data)

Harbor seal data were taken during systematic visual observations (focal group follow protocol) of Cook Inlet beluga but they were taken via Ad Libitum sampling which tends to emphasize rare and significant events (i.e. strong behavioral reactions to disturbance) (Altmann, 1974). As such, more subtle events, such as increased alertness or brief submergence, may be missed. These data are therefore not suited for quantitative descriptions of behavioral budgets but do allow qualitative descriptions.

Small numbers of harbor seals (1-4) are commonly observed in both Eagle Bay and at the mouth of Sixmile Creek (1-2) , with the greatest concentration of observations occurring at or near the mouth of Eagle River. Harbor seals in both Eagle Bay and Sixmile are most consistently observed in August and September, coinciding with the peak of beluga activity and presumably the peak of the salmon run. Observations of small numbers (1-3) of seals in the other open water months- i.e. June, July, October and November have also been made but with much less frequency (see Figure 10 & Figure 11).

Seals apparently undisturbed by anthropogenic activity in Eagle Bay (no known stressors evident other than the consistent human observers at the observation point) are commonly observed traveling along the coast and within Eagle River, swimming at the surface with nostrils exposed, drifting while floating vertically and looking around, sinking from that vertical position and moving underwater to another position, milling, following belugas, pursuing prey, and feeding (fish observed in mouth). They also occasionally haul out, porpoise, swim on their side with foreflipper visible at water surface, and spin. Other observed behavior that has been associated with disturbance in other studies, but which did not appear to be caused by any overt anthropogenic stressor at the time includes, slapping a foreflipper against the water, splashing, diving, and moving away from the mouth of the river. No hypotheses were offered as to what the seals in these cases might have been reacting to, but it is possible that they spotted the human observers on land or there was some unseen interaction with a beluga or other seal subsurface.

Seals observed at the mouth of Sixmile Creek exhibit similar behaviors to those seen in Eagle Bay: traveling, milling, following whales, prey pursuit, feeding (fish in mouth), diving, looking, sinking, and on one occasion, hauling out.

Hauling out is an important behavior in that it is often tied to pupping and molting (Pitcher, 1984). Seals were observed hauled-out in Eagle Bay/River in five out of 79 (6.3%) observations indicating harbor seal presence between 2008 and 2021 (total observation time=4238.5 min over 813 days). Haul out substrate included silt for four of the observations and a drifting ice pan in one. Harbor seals (groups of 1-2) hauled out in Eagle Bay in June (n=1 haul-out), July (n=1), August (n=2) and November (n=1) (Table 3). At Sixmile Creek, 23 harbor seal observation were recorded between 2018 and 2022 (total observation time=620.5 hours over 141 days) with one observed haul-out (4%) of a single harbor seal onto the silt at the mouth of the creek on 14 September 2021. No pups were observed in any of the observations from Eagle Bay or Sixmile Creek.

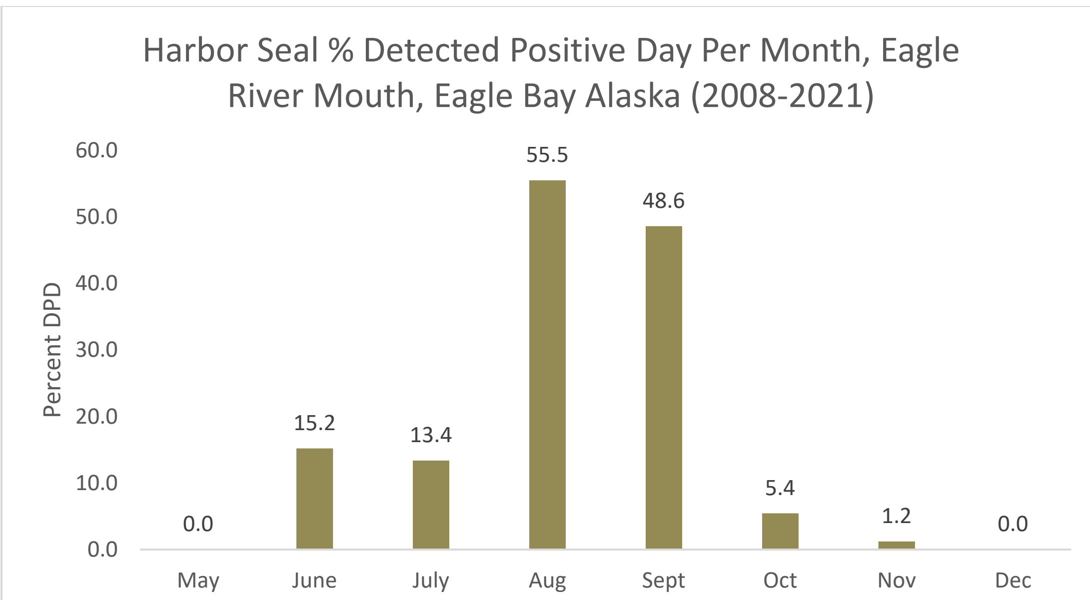

Figure 10. Monthly percent detected positive days (DPD) for harbor seals at the mouth of Eagle River and in Eagle Bay, Knik Arm, Alaska from 2007-2021. A DPD is a day in which a harbor seal is observed and percent DPD is the percentage of days observed in any given month with seal observations

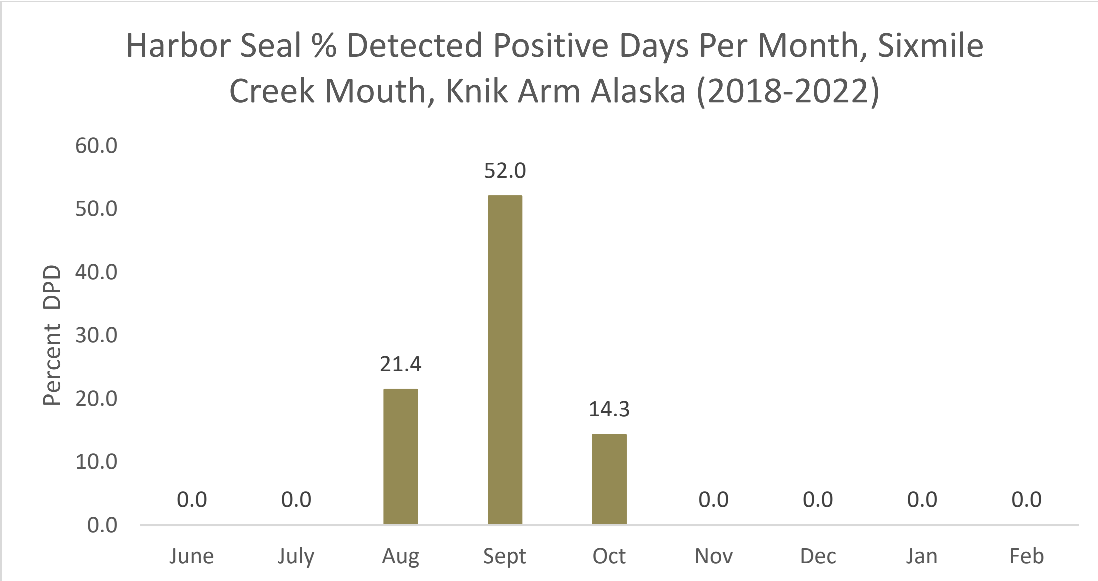

Figure 11 Monthly percent detected positive days (DPD) for harbor seals at the mouth of Sixmile Creek, Knik Arm, Alaska from 2018-2022. A DPD is a day in which a harbor seal is observed and percent DPD is the percentage of days observed in any given month with seal observation

Date	Synopsis of notes
8/24/2009	Two seals hauled out on south bank of Eagle River
8/16/2010	Harbor seal hauled out on shoreline of Eagle Bay
7/26/2011	Harbor seal hauled out on riverbank, resting. Later entered water and was observed in prey pursuit
6/27/2013	Two harbor seals hauled out on bank of Eagle River
11/13/2013	Harbor seal hauled out on ice flow in Eagle Bay for 25 min but left as ice approached shore

Table 3. Observations of harbor seals hauled-out in Eagle Bay/River between 2008-2021. JBER unpublished data.

3.5.2 Lower Knik Arm-Cairn Point: Data from POA 2021, POA 2022

Monitoring of marine mammal location and behavior relative to construction of the Port and Cement Terminal at the Port of Anchorage in lower Knik Arm was conducted in 2020 as required by a NMFS-issued Biological Opinion and Incidental Harassment Authorization (POA, 2021). During the monitoring period, 27 April -24 November, 2020 (1,239 hours of observation over 128 days), observers documented 321 groups of harbor seals (340 individual animals) (POA, 2021) in lower Knik Arm with the highest concentration of sightings occurring near the Ship Creek , Cairn Point and mid-Arm off of Point Woronzof (Figure 12A). Most of sightings were of individual animals with 17 groups of two and one group of three animals. All animals reported were adults with the exception of a single juvenile/pup. Common harbor seal behaviors (primary behavior) in this area of Knik included “looking” (64.5% of primary behaviors), “traveling” (19.6%), “milling” (9.7%) and “sink” (1.6%) with other behaviors occurring less than 1% of the time (“diving”, “feeding observed”, “feeding suspected”, “other” and “resting”). No overt behavioral reactions in response to port construction were noted.

In 2021, observation occurred from 26 April-29 September (735 hours of observation over 74 days), with a total of 203 harbor seal groups (220 individuals) sighted. Most sightings (83.6%) were of single animals with 13 groups of two and two groups of three. Similar to 2020, the highest concentration of sightings were near Ship Creek and Cairn Point (Figure 12B). All seals were adults. Common harbor seal behaviors in 2021 included “looking” (76.4 % of primary behaviors) and “traveling” (17.7% of primary behaviors) with other behaviors occurring 2.0% or less of the time as a primary behavior (“feeding observed”, “milling”, “spyhopping”, and “sink”. Similar to 2020, no overt behavioral reactions in response to port construction were noted. No observations of hauling-out were specifically mentioned in either 2020 or 2021 report, however, in 2020 a single harbor seal was observed hauled out for about an hour on the silt at the mouth of Ship Creek (C. Neumann, personal communication, 9 February 2022). This incident was likely categorized as “other” behavior in the report.

In general , harbor seal usage of lower Knik Arm, near and adjacent to the Port of Anchorage, appears to be low in April, moderate in May, high from June through September and then zero in October and November (Figure 13) The average group size is low, between 1 and just over 1 seal/group, with low numbers of seals/day in April (0.1) and May (2.4), relatively moderate numbers in July (3.6) and relatively high numbers in June (5.1), August (6.0) and September (5.6)[12] (Figure 14).

[12] These seal/day numbers are likely conservative as the observational protocol for the Port of Anchorage marine mammal monitoring required assignment of a new group number to seals that were not observed for 30 minutes or more and thus it is likely that many of the daily sightings are of the same seal or several seals (C. Neumann, personal communication, 9 February 2022)

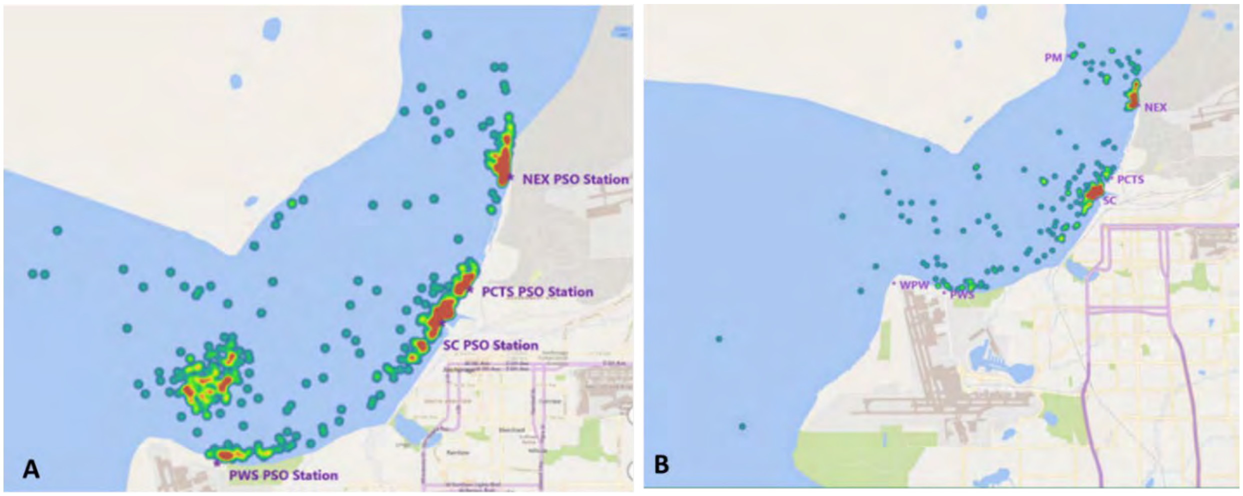

Figure 12 Heat map of harbor seal sightings in 2020 (Panel A) and 2021 (Panel B) recorded from observation stations indicated in purple lettering. Panel A adapted from POA 2021 and panel B adapted from POA 2022.

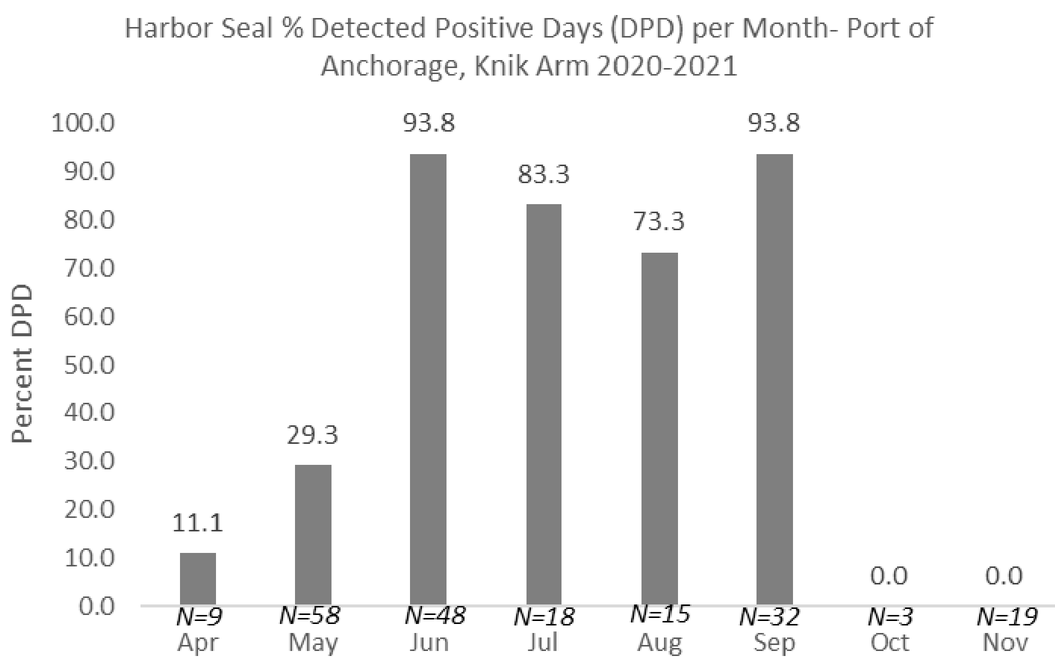

Figure 13. Monthly percent detected positive days (DPD) for harbor seals in lower Knik Arm, Alaska in 2020 and 2021. A DPD is a day in which a harbor seal is observed and percent DPD is the percentage of days observed in any given month with seal observations. The collective number of days per month observed over 2020 and 2021 is indicated above the month. Data from (POA, 2021, 2022)

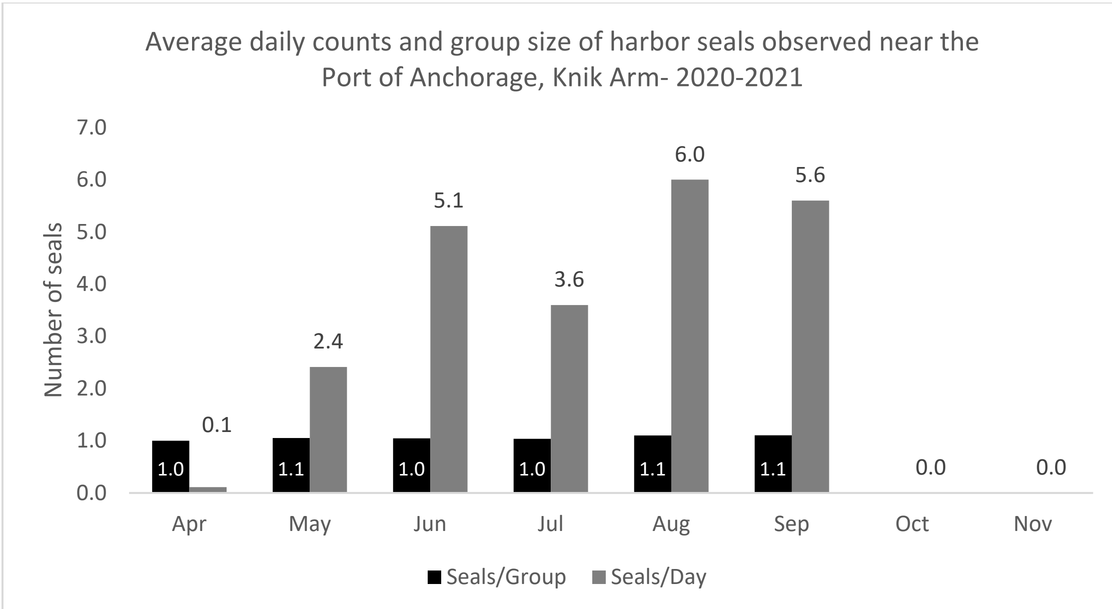

Figure 14. Monthly average number of seals per day (light gray) and seals per group (dark gray) observed in lower Knik Arm, near the Port of Anchorage in 2020 and 2021. Data from POA (2021, 2022)

4.0 OBSERVATIONS OF BEHAVIORAL REACTIONS TO OVERFLIGHTS IN THE ACTION AREA

4.1 Eagle Bay

Overall, data on 15 observations of harbor seals exposed to potential disturbance from overflights of various types of aircraft were taken between 2008-2021 at the mouth of Eagle River. Of those, five were filtered out as they lacked sufficient detail to determine potential reactions. Of the ten remaining observations, seven involved known military aircraft (Blackhawk helicopter, C17, E3 Sentry, F-22) and three involved small civilian or unknown aircraft (Table 4). Two of the ten observations noted an overt behavioral reaction. One involved the low overflight of two harbor seals by a C17 in which one seal did not appear to react while the other seal dove. Both seals remained in the area. The other noted reaction involved the low overflight of a Blackhawk helicopter of a harbor seal in Eagle Bay in which the seal submerged before the aircraft was overhead and then surfaced a minute later. No overt behavioral reactions were noted to overflights by the other aircraft types (F-22, E3 Sentry, commercial jet, small plane, unknown plane). All seals in these ten observations were in the water throughout the duration of their respective observational periods.

Date	Potential Stressor	Harbor seal reaction
8/24/2013	Low overflight, small plane (n=1)	Harbor seal remains in Eagle River mouth after small plane low overflight of Bay.
9/5/2014	Overflight of unknown plane type (n=1)	Harbor seal remains in Eagle River area from 11:09 - 13:46 after overfight of really loud plane (could not hear partner talking) @ 13:30
8/21/2016	Low overflight of C17 (n=1)	Low overflight of C17 over two harbor seals in Eagle Bay elicits no reaction from one seal while the other dives. Both seals remain in area
9/7/2016	Low overflight of Blackhawk helicopter, approaching from N (n=1)	Blackhawk helicopter approaches from N flying low. Harbor seal in Eagel Bay submerges before it passess overhead and resurfaces 1 minute later
8/20/2021	Overflight of C17 and F22 (n=1 each)	Harbor seal milling south of ER mouth with no change in behavior from C17 overflight and no change noted for seal in Eagle River. No behavioral change noted for either seal from F22 overflight- i.e. both continue milling.
8/20/2021	Overflight of E3 Sentry (n=2)	Harbor seal in middle of milling whales remains in Eagle River after overflight of E3 Sentry
8/23/2021	Multiple overflights of C17 (n=2) and F22 (n=7)	Harbor seal following the prey pursuit of a whale in Eagle River mouth at 13:22 with C17 and F22 overflights occurring before (C17=13:06 & 13:17; F22=13:19,13:20) and multiple F22 flights after this following event (F22= 13:23, 13:24, 13:27, 13:30 (2) and 13:31).
8/23/2021	Overflight of E3 Sentry (n=2)	Harbor seal continues milling in Eagle River mouth after E3 sentry overflight.
9/6/2021	Multiple overflights of small plane conducting survey of Eagle River Flats	Harbor seal milling at mouth of Eagle River while small plane conducts survey in flats.
9/17/2021	Overflight of small plane (n=1), unknown aircraft (n=1), commercial jet (n=1) and E3 Sentry (n=1)	Harbor seal remains in ER mouth after overflights of small plane, commercial jet and E3 Sentry.

Table 4. Table of behavioral reactions of harbor seals in Eagle Bay and Eagle River to potential aircraft-related disturbance. JBER unpublished data

4.2 Sixmile Creek

Between 2018 and 2022, only one observation of harbor seals exposed to potential disturbance from aircraft overflights was noted at the mouth of Sixmile Creek. During this observation, which occurred on 14 September, 2021, two seals, one hauled out and one in the water milling and feeding, were exposed to 66 individual aircraft overflights from a variety of aircraft type over the course of a four hour period (F-22, n=56; C12F, n=3; C130, n=1; E-3 Sentry, n=1; Commercial jet, n=2; Blackhawk helicopter, n=3). No overt behavioral reactions were noted from either seal to any of the overflights. The backup alarm from a large truck at the observation point, however, caused the seal that was hauled out to flee into the water and leave the area to the southwest. The seal that was in the water also swam off in the same direction but did so slightly after the first seal and at a slower pace.

Note: As mentioned earlier, for both Eagle Bay and Sixmile Creek observations, harbor seal data were taken during systematic (focal group follow protocol) visual observations of Cook Inlet beluga but they were taken via Ad Libitum sampling which tends to emphasize rare and significant events (i.e. strong behavioral reactions to disturbance) (Altmann, 1974). As such, more subtle events, such as increased alertness or brief submergence, may be missed.

4.3 Port of Anchorage

Aircraft overflights were not noted by Port observers.

5.0 ANALYSIS OF POTENTIAL EFFECTS FROM F-22 OVERFLIGHTS

Potential effects of the proposed action on harbor seals theoretically include 1) injury or mortality to hauled out harbor seal pups as a result of crushing during mass flight, maternal abandonment shortly after birth or permanent mother-pup separation 2) noise-induced effects including auditory injury (permanent threshold shift or PTS), auditory fatigue (temporary threshold shift or TTS), auditory masking and 3) behavioral responses.

5.1 Potential for Pup Injury or Mortality from Crushing, Abandonment, or Permanent Separation as a Result of Disturbance During Haul-out

Harbor seals are wary at haul-outs and often flee into the water from seemingly minor natural disturbances (Johnson, 1977; Bishop, 1967). Anthropogenic disturbances of hauled out harbor seals often result in all animals at a haul-out fleeing and in large, densely packed aggregations, this can lead to injury or mortality of pups or mother-pup separation or abandonment (Johnson, 1977).

5.1.1 Analysis of the potential for pup injury or mortality

Pupping in the Gulf of Alaska reportedly occurs from early May to late June with the height occurring just before the middle of June (Bishop, 1967). Pupping typically occurs on land (Bishop, 1967) in mixed age and sex aggregations, with parturition often occurring on the edge of large groups, in separate nursery areas or in sites removed from the large groups [(Knudtson 1974; Johnson 1976a,b; Calambokidis et at. 1978;as cited in Hoover, 1988), (Hoover 1983;)].

In the upper Cook Inlet, relatively large aggregations of harbor seals are rare in Knik Arm but are consistently observed during pupping season (June) near the McArthur River (max. daily June count=172; avg=21.7), Chickaloon Bay/River (max=207; avg=82.1), Theodore River (max=320, avg =74.1), Lewis River (max=200; avg=38.9) and the Big Susitna River/Delta (max=500; avg=111.5) (Rugh et al., 2005; Shelden et al., 2013; Shelden et al., 2015; Shelden et al., 2017, Shelden et al., 2019). Other than use of the Chickaloon in Turnagain Arm, seal use of the eastern side of Upper Cook inlet appears much lower than use of the western side (Figure 8) as was observed in the lower Cook Inlet as well (Boveng et al., 2012). Boveng et al. (2011) found that areas in lower Cook Inlet with large numbers of seals hauled out in June also generally had high numbers of pups (i.e., pupping areas), a trend that also likely continues in upper Cook Inlet, especially in the areas of consistent use mentioned above.

Observations of pups are exceedingly rare in Knik Arm with only one “juvenile/pup” noted over the course of 6833 observation hours accrued between 2008 and early 2022 (JBER unpublished data; POA, 2021, 2022). Additionally, observations of seals hauled-out is rare in Knik Arm with only seven known incidences documented in the same time span (6833 hours during the span 2008-2022).

Given that the large aggregations of seals in the upper Cook Inlet during the pupping season occur outside of the Knik Arm and that observations of seals hauled-out as well as observations of pups in Knik Arm are rare and exceedingly rare, respectively, it seems highly unlikely that harbor seals pups would be present, much less hauled-out in the action area. Thus, without pupping aggregations to disturb or pups to be crushed, abandoned or separated, the potential for pup injury or mortality as a result of an F-22 overflight seems highly unlikely.

For the reasons outlined above, JBER has determined that the potential for pup injury or mortality from crushing, abandonment or permanent separation as a result of an F-22 overflight of a haul-out in Knik Arm is highly unlikely and therefore, discountable.

5.2 Potential for Auditory Injury (PTS) or Fatigue (TTS)

Auditory fatigue, or temporary threshold shift (TTS) may result from overstimulation of the delicate hair cells and tissues within the auditory system. The result of TTS is a temporary increase in hearing threshold (i.e., decreased hearing sensitivity) which eventually returns to normal. Decreased hearing sensitivity that does not return to normal after a relatively long period of time post-exposure (usually in the order of weeks), is considered auditory injury or permanent threshold shift (PTS) (Southall et al. 2007)

5.2.1 Analysis for TTS and PTS underwater

Prior to 2016, NMFS used generic thresholds in SPL rms to assess the potential for a noise generating activity to cause the onset of PTS or TTS in all submerged marine mammals. In 2016, NMFS released updated criteria which divided marine mammals into hearing groups and changed sound metrics used to assess the onset of PTS and TTS. In 2018, a revised version of this TTS/PTS criteria[13] was released along with a worksheet calculator and associated manual[14] intended to allow calculation of potential TTS/PTS onset in all marine mammal hearing groups using sound data generated prior to the 2016 update. JBER uses this worksheet to assess the potential for F-22 overflights to cause the onset of PTS/TTS for all marine mammal hearing groups. Thresholds used in the worksheet are from NMFS (2018) and are depicted in Table 5.

Functional hearing group	Weighted SEL_{cum} (dB re 1 μPa2·s)	
	PTS threshold	TTS threshold
Low-frequency (LF) cetaceans	199	179
Mid-frequency (MF) cetaceans	198	178
High-frequency (HF) cetaceans	173	153
Phocid pinnipeds in water	201	181
Otariid pinnipeds in water	219	199

Table 5. PTS and TTS onset thresholds (Received level) per marine mammal functional hearing group for submerged marine mammals exposed to non-impulsive noise sources (NMFS, 2018).

5.2.2 Parameters used in the worksheet calculation

Type of noise source: mobile, non-impulsive, continuous per guidance from NMFS (2020)

Weighting Factor Adjustment (kHz): no WFA was applied. This produces the most conservative estimate (M. Castellote, personal communication, 17 December 2021). To do this, JBER manually removed the dB adjustments in the spreadsheet per guidance from NMFS (2020).

Calculation method: For mobile sources, the optional User Spreadsheet tool relies upon the concept of "safe distance" from Sivle et al. (2015). "Safe distance" is defined as "the distance from the source beyond which a threshold for that metric (SPL or SEL) is not exceeded" (Sivle et al. 2015[2]). This method allows one to model a simple moving source and accounts for three main factors for mobile, non-

[13] https://media.fisheries.noaa.gov/dam-migration/tech_memo_acoustic_guidance_(20)_(pdf)_508.pdf

[14] https://media.fisheries.noaa.gov/2020-12/User_Manual%20_DEC_2020_508.pdf

impulsive, continuous noise: unweighted source level (action proponent provided); transit speed or velocity (action proponent provided) and exposure threshold (NMFS provided from Technical Guidance)

This method operates under the following assumptions: source movement is simple (constant velocity and direction) ; receiver does not avoid or move toward the source either vertically or horizontally (no avoidance or attraction to the source); and propagation loss is simple (spherical spreading).

Source level: 136.8 dB_{rms} re: 1 µ Pa. This is not the source level of an F-22 in air but rather the level estimated just below the surface of the water directly under the aircraft (JBER, 2016). This is the highest level of sound estimated to be in the water column and thus acts as the noise source from which sound will propagate out to some distant underwater receiver (marine mammal) (M. Castellote, personal communication, 17 December 2021).

Source velocity: As reported by F-22 pilots during interviews, airspeeds when crossing the Knik Arm range from 180 to 440 knots (~93-226 m/s). The slowest velocity is used as that will generate the most conservative safe distance isopleth.

NOTE: when accessing the worksheet on the NMFS website, only the PTS calculator is available. In order to analyze for the onset of TTS for submerged marine mammals, JBER modified internal calculations within the PTS calculator to include TTS thresholds rather than PTS thresholds.

5.2.3 Results

Given the parameters indicated above, the calculated PTS and TTS safe distance isopleth for all marine mammal hearing groups as a result of overflight by the loudest F-22 flight profile (136.8 dB re: 1µ Pa) is 0 m, meaning that there is no PTS or TTS isopleth for a sound of this level from a source traveling the velocity of an F-22. Given this result, the potential for an F-22 overflight to cause PTS or TTS in any submerged marine mammal within the action area, to include harbor seal, is highly unlikely.

5.2.4 Analysis for TTS and PTS in air

The NMFS has not established in-air PTS or TTS criteria (NMFS, 2022) however Southall et al. (2007) proposed in-air PTS threshold for pinnipeds of 149 dB re: 20 µPa (peak) (unweighted) which was based on the peak pressure known to cause TTS in pinnipeds plus 6 dB. Thus, JBER uses 149 dB re: 20 µPa (peak) (unweighted) and 143 dB re: 20 µPa (peak) (unweighted) to assess the potential for onset of PTS and TTS, respectively.

The noise levels modeled in the BE were given in unweighted root mean square (RMS) SPL. A method for converting sound pressure levels reported in RMS to peak values is not available in the literature. As a rough guide, however, values reported in SPL peak have been converted to RMS values by subtracting 15 dB from the peak level (Laughlin, 2017). Conversely, conversion from RMS to peak would entail addition of 15 dB to the RMS value to obtain a roughly estimated peak value.

The highest estimated SPL in-air from an F-22 overflight under either Alternative A or F is 104.8 dBrms re: 20 µPa (unweighted) (Table 1). Using the 15 dB rule of thumb yields an estimated unweighted peak SPL of 119.8 dBpeak re: 20 µPa, well below either TTS or PTS threshold proposed by Southall et al. (2007).

Given this, the potential for an F-22 overflight to cause either PTS or TTS in-air seems unlikely.

For the reasons outlined above, JBER has determined that the potential for an F-22 overflight to result in the onset of PTS or TTS in a harbor seal, either in-air or underwater, is unlikely and therefore, insignificant

5.3 Potential for Auditory Masking

Auditory masking occurs when the perception of a sound is interfered with by a second sound and the probability of masking increases as the two sounds increase in similarity and the masking sound increases in level. F-22 overflights have the potential to mask male breeding vocalizations and mother attraction calls (MAC) by pups as well as the sounds of an approaching predator.

5.3.1 Noise from jets in the action area

(see “Description of soundscape in the action area: for more detail)

Castellote et al. (2016, 2018) analyzed acoustic recordings from moorings deployed from 2009-2012 in seven locations within lower, mid and upper Cook Inlet including three within or adjacent to the action area for this project (Eagle River mouth, Sixmile, and Cairn Point). Overall, nine anthropogenic noise sources were identified including two general classes of jet aircraft: “commercial or military non-fighter” and “military fighter”.

Most fighter jet events had peak energy between 198-500 Hz (Castellote et al 2016) with third octave band peak energy commonly occurring in the 315 Hz band (Castellote et al. 2018). Jet noise in-air has the most energy in frequency bands below 4 kHz (see Figure 6). The duration of military fighter jet noise events was short with an overall average of 10.4 sec (Castellote et al., 2018).

5.3.2 Harbor seal hearing

The ears of pinnipeds, such as the harbor seal, are amphibious, operating equally well in air and water (Reichmuth et al, 2013). Harbor seals can hear sounds in air from at least 100 Hz to 72 kHz with the most sensitive from about 500 Hz to 14 kHz (Reichmuth et al., 2013)). Underwater, they are sensitive to sound over a wide range of frequencies, from at least 100 Hz to 100 kHz with the most sensitive hearing between 900 Hz and 41 kHz (Reichmuth et al., 2013). This suggests that harbor seals would be able to hear noise from an F-22 overflight both in-air and underwater (See section “Description of soundscape in the action area”)

5.3.3 Analysis of potential for masking of male breeding vocalizations

Male harbor seals throughout their range produce short (2-10 sec), stereotyped, broadband, low-frequency (78 Hz-1300Hz) (Hanggi & Shusterman, 1994;Van Parijs et al., 2000; Matthews et al., 2017) underwater roars during the breeding season both to locate and challenge intruders as well as potentially attract females (Hayes et al., 2004; Hanggi & Shusterman, 1994). The acoustic parameters of these stereotyped calls vary across their range due to genetics but also potentially due to local dialects that may form in specific subpopulations or at specific sites (Van Parijs et al., 2003)

To our knowledge, no studies have been conducted of harbor seal breeding vocalizations in Cook Inlet. Since Cook Inlet harbor seals are genetically distinct from other stocks of harbor seals in Alaska ((Boveng et al., 2012), it seems likely that the roars produced in this region would differ from those of other regions. However, lacking better data, JBER uses the parameters of roars from male harbor seals in Glacier Bay National Park as measured by Matthews et al. (2017) in this analysis. Matthews et al., recorded breeding calls with an average source level of 144 dBrms re 1 µPa at 1 m in the 40-500 Hz frequency band and with an average pulse duration of 3.0s and average total duration of 4.8 sec.

A portion of male roars (198-500 Hz) are within the peak frequency range of F-22 overflights and of a short enough duration that they could be covered entirely by a double ship overflight. Additionally, if the calling male were under or near the direct overflight path, the waterborne SPL just beneath the surface of the water would be loud enough to mask the call even if another seal were very close to the caller.

The result of periodic masking of vocalizations associated with breeding are unknown but may lead to the loss of breeding opportunities for individual males or the need for increased calling with potential additional energetic costs. However, given that the onset of harbor seal breeding coincides roughly with weaning (thus occurring near pupping aggregations) and that a distinguishing characteristic of harbor seals is that they breed in large aggregations, in addition to the fact that large aggregations of seals are rarely observed in Knik Arm and not at all for the last 16 years, it seems highly unlikely that breeding activity, to include male vocalizations, would occur in Knik Arm. The potential for an F-22 overflight to mask breeding vocalizations then, also seems highly unlikely.

5.3.4 Analysis of potential for masking of pup mother attraction calls

Harbor seal pups vocalize nearly continuously while following their mother and it is thought that these calls, which disappear from their vocal repertoire shortly after weaning, may allow the mother to recognize and keep track of her pup, especially while in the water (Renouf, 1985). These calls, dubbed "mother attraction calls" (MAC), are highly individualized, tonal, low frequency (most harmonics below 4 kHz with fundamental frequency between 200-620Hz), short duration (31-1113ms) and are emitted singularly or in series with an inter-call interval as low as 500 ms (Renouf, 1985; Ralls et al., 1985; Perry & Renouf, 1988; Van Parijs & Kovacks 2002; Khan et al., 2006; Sauve, 2014). MAC's propagate both in air and underwater simultaneously and estimates of propagation range vary from as little as a maximum of 8 m[15] Renouf (1980, as cited in Renouf, 1985) up to 128 m and 200m for the amplitude modulation (AM), frequency modulation (FM) and energy spectrum components of both in-air and underwater calls, respectively (Sauve, 2014).

Individual mother attraction calls could be masked by F-22 overflight both in air and underwater. Complete masking of these calls could theoretically lead to separation of the mother and pup, a potentially fatal result for the pup. However, given observations by Renouf, (1985) that harbor seal pups vocalize nearly continuously in the water, it seems unlikely that even multiple-ship overflights would lead to such a catastrophic masking event. Furthermore, given that the large aggregations of seals in the upper Cook Inlet during the pupping season occur outside of the Knik Arm and that observations of seals hauled-out as well as observations of pups in Knik Arm are rare and exceedingly rare, respectively, it seems highly unlikely that mother-pup pairs would even be present in the action area. Thus, the potential for F-22 overflights in the action area to mask pup mother-attraction calls completely seems highly unlikely.

5.3.5 Analysis of potential for masking sounds of predators

Harbor seal predators in Alaska, besides man, include orca (*Orcinus orca*) (Scheffer and Slipp 1944) Steller sea lions (*Eumetopias jubatus*) (Mathews & Adkison (2010), Pacific sleeper sharks (*Somniosus pacificus*) (Hoover, 1988), and likely bald eagles (*Haliaeetus leucocephalus*) are (on pups) (Hayward, 2009).

5.3.6 Masking of hunting transient orca (i.e. marine mammal eating ecotype)

Overall, transient orca tend to be quiet while hunting with infrequent use of vocalizations and echolocations. When they do echolocate (broadband pulses with peak energy between 4 and 18 kHz), they use few clicks in short (often 1-2 clicks per train), irregular trains, a strategy thought to make their echolocation blend in with the background noise (Barrett-Lennard et al., 1996; Deeke, et al., 2005). Similarly, when they do vocalize during a hunt, the AT1 subpopulation of transients use low amplitude

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[15] This assumes the harbor seal critical ration of 25 dB, 70 dB MAC source level, and ambient noise levels of 25 dB spectrum.

pulsed calls below 600 Hz (Saulitis et al., 2005), which is within the underwater hearing range of harbor seals but outside of the most sensitive portion of that range (900Hz-41 kHz)(Reichmuth et al., 2013). These acoustic adaptations likely evolved to minimize detection by potential prey such as harbor seals (Deeke et al., 2005) and suggest that transients may rely on passive listening to orient and find prey Barrett-Lennard et al., 1996).

Two males from the AT1 subpopulation of transients were observed in Knik Arm on 15 September, 2021 near the Port of Anchorage (V. Gill, personal communication 22 September, 2021) during the same time frame that two beluga, one harbor porpoise and one harbor seal were also noted near the Port (POA, 2022). No predation events were observed.

The sounds of a hunting transient orca, both the pulsed calls and the lower echolocation frequency bands, could be masked by F-22 overflight. On the other hand, both orca and seals are thought to use passive listening to help them locate prey and, in the case of harbor seals, predators (Barrett-Lennard et al., 1996; Schustermann et al., 2000). Sounds of movement as well as visual cues at the surface, including breaking the surface of the water to breath and the actual inspiration and expiration itself may be used by seals to detect and localize orca. Pinnipeds have good vision both below the surface (although not in turbid water like Knik Arm) and in the air, with visual acuity similar to that of a cat (Hanke & Dehnhardt, 2013).

Given these considerations, it seems likely that an F-22 overflight would mask both the low amplitude pulsed calls of hunting orca and the low end of their echolocation trains if these acoustic signals were to overlap. However, the higher end of the echolocation clicks, between about 10-18 kHz, are unlikely to be masked and are within the most sensitive hearing range of the harbor seal (Reichmuth et al., 2013). This, with the added sounds and visual component of blows and whales (especially dorsal fins) breaking the surface, increases the odds that a harbor seal would detect an approaching orca, even if some of the echolocation signal or the pulsed calls were masked. Thus, the overflight of an F-22 is unlikely to fully mask the approach of an orca.

In addition, despite the two transients observed in 2021, the presence of orca in the action area is quite rare and thus the chances of having an orca present in Knik at all are unlikely to highly unlikely. Given the rarity of this predator in the action area and the likelihood of a harbor seal detecting a partially masked orca approach via hearing the upper end of their echolocation or detecting blows or whales at the surface, the potential for an F-22 overflight to result in a fatal, for the seal, masking of an approaching orca seems unlikely.

5.3.7 Masking of hunting sea lion

Predation of harbor seals by Steller sea lions in Alaska has been documented multiple times and has been implicated as a potential factor in the decline of harbor seals in Glacier Bay, Alaska (Mathews & Adkison, 2010; Womble & Conlon 2010). Steller sea lions are uncommon to rare in Knik Arm depending on whether the 14 sightings of lone sea lions observed between 2020 and 2021 at the POA were all different animals, the same animal, or some number in between.

Steller sea lions do not echolocate and while they are quite vocal at times, it is unlikely that they vocalize while hunting for harbor seal. Thus, the approach of a Steller sea lion may likely only be detected via visual or aural cues of surface activity (e.g breathing or surfacing). Since they do not echolocate, they would be limited to passive listening and visual cues for the detection of and approach to a harbor seal and thus would likely be equally impaired during F-22 overflights. Given the uncommonness of Steller sea lion observations in the action area, and the fact that the harbor seal would still have the visual component of detection available during an overflight, the potential for an F-22 overflight to result in a fatal, for the seal, masking of an approaching Steller sea lion seems unlikely.

5.3.8 Masking of hunting Pacific sleeper shark.

Pacific sleeper sharks are thought to prey on harbor seals in the Gulf of Alaska (Sigler et al., 2006; Taggart et al., 2005). Sleeper sharks in the Gulf of Alaska make extensive daily vertical movements from below the photic zone where they typically reside during the day to near the surface at night (Hulbert et al., 2006). The temperature range recorded during these vertical movements, 4.4°-11.8° C, (Hulbert et al., 2006) is consistent with temperatures found in Knik Arm during the spring-fall (JBER unpublished data). Pacific sleepers are likely ambush predators that rely on quiet approaches (due to low hydrodynamic noise) from the cover of darkness (or perhaps turbidity) to attack fast-swimming prey (Hulbert 2006) detected through smell, hearing, electrical sense or some other sensory modality. Hearing would thus likely not be an important sensory modality for detection of an approaching Pacific sleeper shark by a harbor seal. The turbid waters of Knik Arm along with the tendency of sharks to stay submerged, at least more than marine mammals who are obligated to break the surface of the water to breath, most likely removes vision, as well, from the senses useful for detection of an approaching shark.

To our knowledge, there are no documented observation of predation of harbor seals by Pacific sleeper sharks in Cook Inlet or documented observation of sleeper sharks within Knik Arm. As such the likelihood of a harbor seal encountering a Pacific sleeper in the action area is unknown. Assuming such an encounter were to occur in the action area, however, given the assumed silent ambush hunting strategy of the sleeper shark, the potential for an F-22 overflight to mask the sounds of this already silent approach is highly unlikely.

5.3.9 Masking of hunting bald eagle

Bald eagles may opportunistically prey on newborn harbor seal pups (Hayward , 2009; Lambourn et al. 2010). To our knowledge, however, predation events of harbor seal pups by bald eagles in Cook Inlet have not been documented.

Observations of pups are exceedingly rare in Knik Arm with only one “juvenile/pup” noted over the course of 6833 observation hours accrued between 2008 and early 2022 (JBER unpublished data; POA, 2021,2022). Additionally, observations of seals hauled-out is rare in Knik Arm with only seven know incidences documented in the same time span (6833 hours during the span 2008-2022). Thus, is seems highly unlikely that bald eagles would encounter harbor seal pups in the action area at all, much less on land where they could access them.

Assuming that a harbor seal mother was to pup on a Knik Arm sandbar, however, the approach of a flying eagle would likely not be heard by the seals even in the absence of any anthropogenic sound. Once on the ground though, the sound and sight of an eagle landing or hopping/walking through the silt would likely be detected by the mother visually and aurally. An F-22 overflight before an approaching eagle has been detected by the female seal could mask a portion, or all of the sound of the approaching bird. It is highly likely though, that the seal would see the approaching eagle and move to intercept it. Given the likelihood of visual detection of an approaching eagle, despite masking of movement sounds, in addition to the rarity of hauled out pups in the action area, the potential for an F-22 overflight to result in a fatal, for the seal, masking of an approaching bald eagle seems unlikely.

For the reasons outlined above, JBER has determined that the potential for an F-22 overflight to mask biologically important sounds like male breeding vocalizations, mother attraction calls and the sound of an approaching predator is unlikely and therefore, insignificant

5.4 Potential for Behavioral Effects from F-22 Overflights

Overflight by military aircraft has the potential to disturb or behaviorally harass marine mammals with amphibious hearing such as harbor seals both in air (e.g., when animals are hauled out or positioned with their head out of the water) and underwater. NMFS often uses generic sound exposure thresholds to assess the potential for behavioral harassment (level B harassment) of marine mammals from noise generating activities (70 FR 1871). The level B behavioral threshold for continuous noise is 120 dB SPLrms re 1 μPa for submerged marine mammals regardless of species and 90 dB SPLrms re 20 μPa (unweighted) for harbor seals exposed to continuous noise in-air.

As detailed in JBER (2016) and corroborated by Castellote et al. (2018) (for waterborne noise) several flight patterns under both the no-action and the preferred alternative could generate waterborne and in-air sound levels exceeding those thresholds (maximum modeled waterborne SPL = 136.8 dBrms re 1 μPa and maximum in-air=104.8 dBrms re 20 μPa). However, in accordance with the amended definition for harassment as a result of military readiness activities (PL 108-136), such exposures would not be considered level B harassment unless they caused or were likely to cause disruption of natural behavioral patterns to the point of significant alteration or abandonment of these natural behaviors ((16 USC 1362 [18][B][i],[ii]).

There are no peer-reviewed studies, that we are aware of, documenting behavioral reactions of harbor seals, either submerged or in air, specifically to overflights of military fighter jet aircraft. There are, however, several peer reviewed studies as well as gray literature that report observations of reactions of harbor seals to other types of aircraft overflights. JBER also has 15 years of unpublished data on harbor seal behavior in Eagle Bay and several years from Sixmile Creek, including observations of reactions to military aircraft overflight of harbor seals.

Given this paucity of published papers detailing harbor seal reactions to military aircraft overflights, JBER will use a bulk-of-evidence argument, pulling in information from related disturbance studies as well as unpublished observations, to analyze the potential for F-22 overflights to cause significant alteration or abandonment of natural behaviors such as would constitute a Level B harassment under the MMPA by a military readiness activity.

5.4.1 Synopsis of observed behavioral reactions to aircraft overflights in the action area (JBER unpublished data)

Overall, data on 15 observations of harbor seals exposed to potential disturbance from overflights of various types of aircraft were documented between 2008-2021 at the mouth of Eagle River. Of those, five were filtered out as they lacked sufficient detail to determine potential reactions. Of the ten remaining observations, seven involved known military aircraft (Blackhawk helicopter, C17, E3 Sentry, F-22) and three involved small civilian or unknown aircraft (Table 4). Two of the ten observations noted an overt behavioral reaction. One involved the low overflight of two seals by a C17 in which one seal did not appear to react while the other seal dove. Both seals remained in the area. The other noted reaction involved the low overflight of a Blackhawk helicopter of a seal in Eagle Bay in which the seal submerged before the aircraft was overhead and then surfaced a minute later. No overt behavioral reactions were noted to overflights by the other aircraft types (F-22, n=8 overflights; E3 Sentry, n=5; commercial jet,n=1; small plane,n=”multiple”; unknown plane, n=2). All seals in these ten observations were in the water throughout the duration of their respective observational periods.

Between 2018 and 2022, only one observation of harbor seals exposed to potential disturbance from aircraft overflights was noted at the mouth of Sixmile Creek. During this observation, which occurred on 14 September, 2021, two seals, one hauled out and one in the water milling and feeding, were exposed to 66 individual aircraft overflights from a variety of aircraft type over the course of a four hour period (F-22, n=56; C12F, n=3; C130, n=1; E-3 Sentry, n=1; Commercial jet, n=2; Blackhawk helicopter, n=3). No overt behavioral reactions were noted from either seal to any of the overflights. The backup alarm from a large truck at the observation point, however, caused the seal that was hauled out to flee into the water and leave the area to the southwest. The seal that was in the water also swam off in the same direction but did so slightly after the first seal and at a slower pace.

Given the lack of observed overt behavioral reactions of harbor seals within Knik Arm to F-22 overflights it seems likely that the seals present in Knik Arm have either habituated to overflights or at least have an increased tolerance for them. Burns (2009) generalized that habituation of harbor seals to anthropogenic activities is not uncommon where these activities are regular, continuous, non-threatening and where the seals are not "unduly harassed". Similarly, Richardson et al. (1995) noted that harbor seals can habituate to frequent overflights citing an example of harbor seals hauled out next to Vancouver International Airport showing little to no reaction to low aircraft overflights (Johnson et al., 1989 as cited in Richardson et al., 1995). Given these assessments, habituation, or at least increased tolerance for overflights seems highly likely given the high estimated daily number of operations of various aircraft type in the Anchorage area (~1266 civilian aircraft operations per day; see "Description of soundscape in the action area" for details). Additionally, both reactions observed in response to low overflights of military aircraft (C17 and Blackhawk helicopter) involved diving beneath the water but with subsequent resurfacing in the same area (i.e. no displacement). Such a reaction would not be considered a significant alteration of normal behavior.

5.4.2 Synopsis of pertinent studies of behavioral reactions of pinnipeds in water to anthropogenic noise

(see section "Harbor seal behavioral reactions to disturbance" for more detail)

Southall et al. (2007) reviewed studies of behavioral responses of pinnipeds to waterborne nonpulse sounds under various conditions and concluded, based on those limited studies, that exposures between 90 dB and 140 dBrms re 1 μPa generally do not appear to induce strong behavioral responses (Kastelein et. al, 2006; Jacobs & Terhune 2002; Costa et al., 2003). Two later studies generally corroborated this conclusion with aversive anthropogenic sound found to cause temporary displacement of wild grey seals at received levels of 135-144 dB re 1 μPa (Götz & Janik, 2010) and increased jumping in captive harbor seals at received levels of 136-148 dB re 1 μPa (Kastelein et al., 2017).

5.4.3 Synopsis of pertinent studies of behavioral reactions of hauled-out pinnipeds to anthropogenic noise

(see section "Harbor seal behavioral reactions to disturbance" for more detail)

Most studies of disturbance to pinnipeds from aircraft overflight focus on flushing of seals from haul-outs and report altitude as a behavioral threshold metric without consideration of received SPL.

Several studies, for instance, found that overflights of harbor seal haul-outs at altitudes of ~300-305 m sometimes caused increased alertness or flushing of some, but not all seals at a haul-out (Osinga et al., 2012; Johnson, 1977) whereas overflights at altitudes between 122 m and 305m produced varied results based on the weather, the frequency of recent disturbance, the type of aircraft and the altitude of the overflight (Vania et al., 1968; Johnson, 1977). Stronger reactions were noted on calm days, during periods of frequent disturbance, with helicopter or large plane overflights and with low altitude-overflights (Johnson, 1977). Overflights at altitudes of less than 122 m, especially less than 30 m, usually resulted in desertion of the observed haul-out by most or all of the seals aggregated there, usually with subsequent haul-out in a new location after a prolonged (2+ hour) period in the water (i.e. major disturbance) (Johnson, 1977).

Similarly, in Glacier Bay, Alaska, severe harbor seal disturbance was caused by 83% and 40% of flights at altitudes of 30 m and 45-61m, respectively. However, overflights at altitudes greater than 76 m only elicited mild responses (increased alertness; a few seals entering water) (Streveler, 1979; Murphy and

Hoover, 1981; both as cited in Hoover, 1988). Vania et al. (1968), likewise, was able to successfully conduct surveys of harbor seal haul-outs (implies low or no flushing of seals) on Tugidak Island and the north side of the Alaska Peninsula, using a Cessna 180 flown at altitude of 61-91 m. Thus, it seems that responses to aircraft overflights may differ regionally, likely as a result of habituation or increased tolerance of seals to overflights.

For instance, Calambokidis et al. (1985b as cited in Hoover, 1988), observed few instances of harbor seal flight into the water over the course of two years in Glacier Bay as a result of multiple low-flying aircraft overflights (up to 20 per day) and suggested that the seals in this area had become habituated to such low altitude overflights.

In contrast to altitude-centric studies of behavioral reaction to aircraft overflights, some studies of pinniped responses to rocket launches focused on received sound pressure levels as a behavioral threshold metric.For instance, Southall et al. (2007) reviewed three studies ((Thorson et al., 1999, 2000b; Berg et al., 2002; as cited in Southall et al., 2007) of behavioral responses of pinnipeds (harbor seals, northern elephant seals, Californian sea lions and northern fur seals) to in-air nonpulse sounds from rocket launches. Based on these few studies, the authors generalized that pinnipeds exposed to rocket launch noise at received levels of ~ 60-70 dB re: 20 µPa tended to ignore the noise altogether while those exposed to levels of ~110-120 dB re: 20 µPa tended to flee into the water with a subsequent rehaul minutes to a few hours later. They also suggested the possibility that the exposed animals may have been habituated to rocket launches, thereby affecting their response.

5.4.4 Analysis of the potential for behavioral effects resulting from F-22 overflights

Potential behavioral reactions to aircraft overflight for hauled-out harbor seals include increased alertness and flight into the water (Bishop, 1967). Potential behavioral reactions to overflight of seals in the water include increased time with head out of water, jumping, porpoising, avoidance behavior (swimming away, submergence, diving, etc.), area displacement, disruption of feeding and increased haul-out frequency (Götz & Janik, 2010; Kastelein et al., 2017; JBER unpublished data)

5.4.5 Analysis based on altitude for hauled-out animals

The lowest over-water altitude proposed in the preferred alternative is 216 m which is within the variable effects range (122 -305 m) noted by Johnson, (1977) on Tugidak Island but above the altitude (76 m) shown to elicit only mild responses from seals in Glacier Bay (Streveler, 1979; Murphy and Hoover, 1981; both as cited in Hoover, 1988) and seals on Tugidak Island/Alaska Peninsula (61-91m) (Vania et al., 1968). It is thus not clear, from the literature, whether or not an F-22 overflight at that altitude would result in seal flight into the water. Based only on the altitude data presented in the literature, the potential for a strong reaction resulting from an overflight of an F-22 at 216 m seems unlikely to somewhat likely. However, in consideration of observations of multiple (64) F-22 overflights of harbors seals within the action area, none of which elicited an overt behavioral reaction, in addition to the high likelihood that Knik Arm seals are either habituated or at least have increased tolerance for aircraft overflights, the overall potential for an F-22 overflight to cause a strong reaction in a hauled-out harbor seal seems unlikely.

This is bolstered by the rarity of observations of seals hauled-out in Knik Arm (seven known incidences documented in ~6833 hours of observation over the span 2008-2022). Furthermore, the flight pattern associated with this minimum over-water altitude (ILS on RW 06) is expected to occur, on average, less than one time per day (0.91) further decreasing the likelihood of a hauled-out seal overflight. The next lowest altitude, 360 m, is above the variable range and would thus be unlikely to cause a strong reaction of a hauled-out seal.

5.4.6 Analysis based on in-air sound pressure level for hauled-out animals

As mentioned above there are few studies that relate behavioral reactions of pinnipeds to received sound levels of aircraft overflight with the exception of studies of rocket launches.

Rocket launches are comprised of several stages including a transonic climb phase (i.e., prior to reaching supersonic speeds and creation of sonic boom) which is broadly similar to subsonic flight of military fighter jets (rapidly moving, aerial, broadband, nonpulse source). Supersonic rocket engines produce three types of noise: broadband shock-associated noise, screech tones and turbulent mixing noise. Turbulent mixing noise is also produced by subsonic jets and consists of broadband noise in low to mid frequencies directed at angles normal (perpendicular) to the jet axis (Lubert, 2017). Rocket launches, in general, produce sound over a broad frequency range, 0.02-10 kHz (NASA, 1996) with the peak energy of transonic flight likely similar to those of subsonic military fighter jets based on the acoustic profile of a transonic rocket flight (LLV1) showing peak energy centered on ~650 Hz (NASA, 1996). Therefore, the use of the above-mentioned pinniped "flight" threshold, 110-120 dB re: 20 μPa (Southall et al., 2007), in this analysis seems reasonable, especially given the dearth of studies measuring SPL in relation to pinniped reactions to overflights.

The maximum in-air sound pressure level predicted from an F-22 overflight under either alternative A or the preferred alternative is 104.8 dB re 20 μPa (JBER, 2016), above the "no reaction" level of 60-70 dB re 20 μPa but below the level at which pinnipeds tended to flee into water during rocket launches. Thus, the potential for strong reaction from a harbor seal to an F-22 overflight at this maximum SPL seems unlikely to somewhat likely. However, in consideration of observations of multiple (64) F-22 overflights of harbors seals within the action area, none of which elicited an overt behavioral reaction, in addition to the high likelihood that Knik Arm seals are either habituated or at least have increased tolerance for aircraft overflights, the overall potential for an F-22 overflight to cause a strong reaction in a hauled-out harbor seal seems unlikely.

5.4.7 Analysis based on waterborne sound pressure level:

The maximum waterborne sound pressure level predicted from an F-22 overflight under the preferred alternative is 136.8 dB re 1 μPa for a few seconds duration at any given point in the water (JBER, 2016). Given that this modeled maximum SPL level falls below the SPL range for nonpulse sounds generally thought to induce strong behavioral responses for submerged pinnipeds, as concluded by Southall et al. (2007) and just reaches the behavioral response thresholds for temporary displacement and jumping (Götz & Janik, 2010; Kastelein et al., 2017) it seems unlikely to somewhat likely that an animal positioned directly underneath the flight path of an F-22 would exhibit a strong reaction. However, in consideration of observations of multiple (64) F-22 overflights of harbors seals within the action area, none of which elicited an overt behavioral reaction, in addition to the high likelihood that Knik Arm seals are either habituated or at least have increased tolerance for aircraft overflights, the overall potential for an F-22 overflight to cause a strong reaction seems unlikely.

Based on the analysis presented above, JBER has determined that the potential for F-22 overflights to cause significant alteration or abandonment of natural behaviors both in air and underwater, such as would constitute a Level B harassment under the MMPA by a military readiness activity is unlikely and therefore insignificant.

6.0 DETERMINATION OF EFFECT

Based on the information and analysis presented in this document, JBER has determined that the potential for F-22 overflights under either Alternative A or F to cause injury or mortality to hauled out harbor seal pups; auditory injury (permanent threshold shift or PTS), auditory fatigue (temporary threshold shift or TTS), auditory masking; or behavioral responses to harbor seals within the action area is unlikely and therefore insignificant.

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Appendix C
Air Quality Impact Assessment

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Air Quality

Introduction

This appendix provides updated air emissions estimates based on the change to the proposed action originally analyzed as part of the 2018 Final Environmental Impact Statement (FEIS) for F-22 Operational Efficiency. This appendix includes a summary of the methods used to estimate air emissions for the Preferred and No Action Alternatives presented in the Supplemental Environmental Assessment (SEA) to the 2018 FEIS. The emissions estimates are presented in tabular format in Attachment 1 of this appendix.

Annual emissions estimates were calculated for the following criteria pollutants: carbon monoxide (CO), particulate matter 10 microns in diameter or less (PM_{10}), particulate matter 2.5 microns in diameter or less ($PM_{2.5}$), oxides of nitrogen (NO_x), volatile organic compounds (VOC), and sulfur dioxide (SO_2). Greenhouse Gas (GHG) emissions, expressed as carbon dioxide equivalent (CO_2e) were estimated as well.

Air Quality Environmental Impact Analysis

An Air Quality (AQ) Environmental Impact Analysis Process (EIAP) was performed since the proposed action has the potential to result in a net, annual emissions increase during both the construction and operational phases. Construction phase emissions are expected to be short-term and would cease once project is complete. The air quality assessment was performed consistent with Air Force Civil Engineer Center (AFCEC) AQ EIAP guidance (AFCEC 2019). Based on AFCEC screening criteria a Level II Quantitative Assessment was performed. The AQ EIAP insignificance indicators for Level II Quantitative Assessments were used to evaluate ambient air quality impacts from the proposed action. Proposed actions are deemed to have a significant impact on ambient air quality if the net annual emissions exceed the AQ EIAP insignificance indicators.

The AQ EIAP insignificance indicators are summarized in Table 1. AQ EIAP insignificance criteria for attainment and nonattainment areas were used since the region of influence being assessed has the potential to impact JBER, which is in attainment for all criteria pollutants and nearby maintenance areas.

Table 1. Air Quality EIAP Insignificance Indicators

Criteria Pollutant	Pollutant(s) of Concern	Area Classification	First-Level Indicators (tons/year)	Second-Level Indicators (tons/year
Ozone	VOC and NO_x	Clearly Attainment	100	None
CO	CO	Nonattainment		None
		Clearly Attainment	100	None
SO_2	SO_2	Clearly Attainment	100	None

NO_x	NO_x	Clearly Attainment	100	250
Particulate Matter				
PM_{10}	PM_{10}	Clearly Attainment	70-100[a]	None
		Nonattainment	100	250
$PM_{2.5}$	$PM_{2.5}$	Clearly Attainment	100	250
Lead	Lead	Clearly Attainment	25	None

a. Range depends on severity of the nonattainment. For the air quality impact assessment, the highest value within the range for PM_{10} was used since Eagle River is classified as maintenance area.

General Conformity

A general conformity evaluation is required as part of the AQ EIAP since the region of influence associated with the proposed action incorporates the nearby Eagle River PM_{10} and Municipality of Anchorage (MOA) CO Maintenance Areas. A Level II Quantitative Assessment for General Conformity was performed. The assessment was performed consistent with AFCEC guidance and the regulatory requirements found in Title 40 of the Code of Federal Regulations Part 93.

The general conformity analysis included the direct and indirect emissions potentially generated from the proposed. action. For the purposes of this analysis direct emissions refer to those emissions of a criteria pollutant or its precursors that are caused or initiated by the proposed action and originate in a nonattainment or maintenance area and occur at the same time and place as the action and are reasonably foreseeable. Indirect emissions means those emissions of a criteria pollutant or its precursors: (1) that are caused or initiated by the proposed action and originate in the same nonattainment or maintenance area, but occur at a different time or place as the action; (2) That are reasonably foreseeable; (3) That the agency can practically control; and (4) For which the agency has continuing program responsibility.

A Level II Quantitative Assessment was performed based on the general conformity de minimis levels. These values are compared to the net annual emissions generated as a result of the proposed action to determine their significance. Criteria used to make this determination are defined in 40 CFR 93. A proposed action is considered to have a significant ambient air quality impact under general conformity if it results in a net annual change in emissions above the de minimis levels as defined in 40 CFR 93.153(b)(1) and (b)(2). The General Conformity de minimis levels are listed in Table 2.

Table 2. General Conformity De Minimis Values for Criteria Pollutants for Maintenance Areas

Criteria Pollutant	**De Minimis Level (tons per year)**
CO	100

PM_{10}	100

Source: 40 CFR 93.153(b)(1) and (2)

Greenhouse Gases

Evaluation criteria for assessing the significance of ambient air quality impacts from GHG have not been established; therefore, CO_2e emissions were not compared against an AQ EIAP insignificance indicator. general conformity de minims threshold.

Prevention of Significant Deterioration and State of Alaska Minor Stationary Source Program

The proposed action would occur within the JBER Flight Line Stationary Source. The JBER Flight Line Stationary Source is classified as a Title V major source since it has the potential to emit (PTE) greater than 100 tons per year of one or more criteria pollutants. JBER currently operates under a Title V Operating Permit issued by ADEC (Permit Number AQ0886TVP03), which is currently undergoing renewal. The JBER Flight Line Stationary Source does not exceed the major source thresholds to be classified as a prevention of significant deterioration (PSD) major source since it has a PTE less than 250 tons per year for all criteria pollutants. The JBER Flight Line Stationary source is a minor source of hazardous air pollutant (HAPs) thresholds based on its PTE since it emits less than 25 tons of total HAPS and less than 10 tons per year of a single HAP.

An evaluation of the potential new source review permitting requirements associated with installing the three, new emergency generators was completed as part of the AQ EIAP. The Alaska Department of Environmental Conservation (ADEC), Division of Air Quality has primary responsibility for implementing new source review in Alaska. The PTE for all three generators was compared to the PSD major modification found in 40 CFR 52.21 and the ADEC minor stationary source permit thresholds found in Title 18 of the Alaska Administrative Code (AAC), Chapter 50 Section 502(c)(3)(A) to determine whether the proposed action would trigger permitting. These thresholds are provided in Table 3 below.

Table 3. PSD Major Modification and Minor Source Permitting Thresholds

Criteria Pollutant	Permitting Thresholds (tons per year)	
	PSD Major Modification	Minor Stationary Source
NO_x	40	10
CO	100	100
PM_{10}	15	10
$PM_{2.5}$	10	10
SO_2	40	10
VOC	40	--
Lead	0.6	--

Construction Phase Activities

The Preferred Alternative would extend RW 16/34 2,900 feet to the north. For the purpose of this air quality impact analysis, the following components were assessed for construction phase of the proposed action: (1) excavate terrain to remove topographic barriers, (2) cut and fill operations to create the runway foundation, (3) construct the runway pavements, (4) construct taxiways on both sides of the proposed extension, (5) construct/relocate support features, such as navigational aids (Navaids), aircraft arrestor systems, signage, and drainage, and (6) relocate the roadway around the north end of the runway extension. The air quality analysis evaluated impact scenarios to extend RW 16/34 by 2,900 feet. The analysis assumed that construction activities would require three years to complete.

The No Action Alternative would not include any facility improvements and therefore would not generate any construction emissions.

Assumed runway extension construction activities would produce emissions from three main sources:

1. Nonroad construction equipment.
2. On-road haul trucks.
3. Fugitive dust generated from the operation of equipment and trucks on unpaved surfaces.

Activity data were developed to estimate equipment and truck usages and associated combustive and fugitive dust emissions for the proposed construction activities. These data were based on (1) the metrics identified in a 100 percent design for a 2,900-foot runway extension, inputs from the project engineers, and from similar types of construction projects. The analysis assumes that construction vehicles would deposit cut materials within, or very near to the disturbed area depicted on SEA Figure 2-1.

Calculations for Nonroad Equipment

Data needed to estimate emissions for nonroad construction equipment include the following:

1. Horsepower (hp) rating.
2. Engine load factor as a fraction of full power.
3. Hours per day, days per year, and total years of operation.
4. Equipment emission factors, in units of grams per hp-hour (gm/hp-hr).

Items 1 through 3 are activity data that were estimated by taking into consideration the types and magnitudes of potential construction activities, production rates of applicable equipment; such as, hourly loading rates of scrapers, and construction scheduling. Factors needed to derive construction equipment source emission rates were obtained from the EPA NONROAD2008a model for an average Anchorage Borough fleet and assuming summer climate conditions (EPA 2009) consistent with the 2018 FEIS. The model outputs these emission factors into ranges of equipment hp categories. The analysis used nonroad emission factors for year 2018 consistent with the 2018 FEIS AQ EIAP. Continued use of the 2018 emission factors represents a conservative approach to estimating air impacts since emission rates are expected to decrease over time as older equipment is replaced with lower emitting units. The analysis estimated total horsepower-hours (hp-hrs) for each piece of equipment and then multiplied these by the applicable emission factor in units of grams per horsepower (gm/hp-hr) to obtain total grams (converted to pounds [lb] and tons) of emissions.

Calculation Methods for On-road Vehicles

Assumed data to estimate emissions for on-road vehicles include the following:

1. Vehicle category, as defined by the EPA MOVES2014 model on-road mobile sourceemissions model (EPA 2014).
2. Trips per day, days per year, and total years of operation of each vehicle type.
3. Miles per round trip of travel.
4. Fraction of total round trip that occurs within speed ranges of 5 miles per hour (mph)increments to match the form of the MOVES2014 emission factors.
5. Vehicle emission factors, in units of grams per mile (gm/mi).

All project haul trucks were evaluated as heavy-heavy duty diesel trucks with a gross vehicle weight (GVW) greater than 33,000 pounds. Vehicle trips were based on the requirements of potential activities, such as concrete and runway base materials volumes.

Haul truck tip lengths were based on the distances between JBER and locations of potential sources of supplies and aggregates needed for construction.

Vehicle emission factors were obtained from the EPA MOVES2014 model and developed for an average Anchorage Borough fleet. Like the analyses of nonroad equipment, on-road emission factors were developed for year 2018. The analysis developed composite emission factors to define the travel conditions expected along the project truck routes. These include travel 40/60 percent of the time at 25/50 mph. The analysis estimated total vehicle miles travelled (VMT) for each type of vehicle and then multiplied these by the applicable emission factor in units of grams per mile (gm/mi) to obtain total grams (converted to lb and tons) of emissions.

Calculation Methods for Fugitive Dust Sources

Data needed to estimate emissions of fugitive dust are based on the assumed acreages where equipment and trucks would operate on exposed soils and the assumed durations of these disturbances for each construction activity. Fugitive dust emission factors were obtained from the WRAP Fugitive Dust Handbook (Table 3-2) for active large-scale earth moving operations (units in lb per acre-day) (Countess Environmental

2006). Factors were reduced by 74 percent from uncontrolled levels to simulate the relatively moist soil conditions that would exist at JBER during summer conditions and water application/use of best management practices for fugitive dust control (Table 3-7 Countess Environmental 2006). The analysis estimated total activity data for each construction activity and then multiplied these by the applicable emission factor to obtain total mass emissions.

Estimation of Peak Annual Construction Emissions

Annual emissions for each year of construction and the peak annual period of emissions were calculated as part of the AQ EIAP. The following activities would occur during the three-year construction period:

1. Year 1 – (a) Vegetation Removal - Cut and Fill Operations and (b) Building Demolition.
2. Years 1 and 2 - (a) excavate terrain/cut and fill operations.
3. Year 2 - (a) Runway Overrun - Remove Existing Asphalt, (b) Paved Road - Remove Existing Asphalt, and (c) Install Gravel for Erosion Control.
4. Years 2 and 3 - (a) Install Gravel and Backfill and (b) Construct/Relocate Requisite Support Features Activities.
5. Year 3 – Asphalt and Resurfacing.

Peak annual emissions would occur between construction years one and two. Peak annual emissions would include (1) half of excavate terrain/cut and fill operations, (2) runway overrun - remove existing asphalt, (3) paved road - remove existing asphalt, (4) install gravel for erosion control, (5) half of install gravel and backfill, and (6) half of construct/relocate requisite support features activities.

Yearly and peak annual construction emissions are not expected to contribute to an exceedance of a National or State of Alaska ambient air quality standard since annual emission contributions from this activity do not exceeds the AQ EIAP insignificance indicators and the general conformity de minimis levels.

F-22 Operations

The typical depth of the atmospheric mixing layer where the release of aircraft emissions would affect ground-level pollutant concentrations is 3,000 feet (914 meters). The analysis of proposed aircraft emissions focuses on operations that would occur within the lowest 3,000 feet (914 meters) of the atmosphere. In general, aircraft emissions released above the mixing layer would not appreciably affect ground-level air quality. The project alternatives include changes in F-22 aircraft departure and arrival patterns that could affect F-22 operations below 3,000 feet above ground level (AGL) and emissions below 3,000 feet are included in the analysis of alternatives. Emission effects of F-22 operations would occur within the immediate airspace surrounding JBER and the JBER-Elmendorf runways. The air quality analysis for proposed F-22 aircraft operations focuses on emission effects within this domain. Generally, emissions of CO and PM_{10} from operations or from potential runway construction would minimally impact the air quality maintenance areas identified in Section 3.4.1 of the 2018 FEIS, due to the low strengths and/or substantial distances associated with the emission sources.

F-22 operations and resulting emissions below 3,000 feet above ground level (AGL) within the Eagle River PM_{10} Maintenance Area would result in a slight reduction in F-22 flight operations below 3,000 feet AGL within the MOA CO Maintenance Area. F-22 flights operations and resulting emissions within the MOA CO Maintenance Area would result in a slight decrease in emissions as compared to baseline operations.

Changes to F-22 operations, runway improvements and installation of new support facilities proposed for the Preferred Alternative would result in a decrease in F-22 aircraft emissions compared to existing conditions at JBER. Changes in the operation of ground support equipment (GSE) and similar mobile sources that operate intermittently within the JBER Flight Line are not expected to change as a result of the proposed action; therefore, emissions for this equipment were not estimated.

Emission impacts from the change in operation of F-22 aircraft from additional engine idling times and approach times were estimated. Factors needed to estimate emissions for the F-22 engine (F119-PW-100) were obtained from the Air Emissions Guide for Air Force Mobile Sources (Air Force Civil Engineer Center August 2020).

F-22 operations are not expected to contribute to an exceedance of a National or State of Alaska ambient air quality standard since annual emission contributions from this activity do not exceeds the AQ EIAP insignificance indicators and the general conformity de minimis levels. F-22 operations would in fact produce less than significant air quality impacts due to a decrease in F-22 flight operations below 3,000 AGL.

New Stationary Source Emissions

The proposed action will occur within the Flight Line Stationary Source. Changes to existing support features and the installation of three new facilities would occur under the Preferred Alternative. Under Preferred Alternative, the aircraft arrestor systems on both ends of the north-south runway will be relocated to align with the extension including the proper overrun areas. Each of the aircraft arrestor systems being relocated has a diesel-fired engine that drives the arrestor cables. A new airfield lighting vault and two new, separate instrument landing system (ILS) support features will installed under the Preferred Alternative. These new ILS include a localizer and a glide slope facility. Diesel-fired emergency generators will be installed at each of the new facilities to ensure uninterruptable power is provided to these facilities since ALFS-1 and ILS localizer and ILS Glide Slope equipment provide an essential service for F-22 flight operations. The emergency generators will operate for maintenance purposes and in the event of a power outage from the local electrical utility. Electrical heating will be installed in each facility to prevent the emergency generators and equipment from freezing during colder temperatures.

There will be no change in emissions associated with relocating the aircraft arrestor systems since the engines associated with these units are existing sources listed in the JBER Flight Line Title V operating permit. Emissions have not been estimated for these facilities for this reason. The three emergency generators that will be installed under the Preferred Alternative will result in an emission increase since they are new stationary sources that are not currently accounted for in JBER Flight Line Stationary Source Title V permit.

The annual emissions increase from these three emergency generators has been estimated based on each unit not operating more than 500 hours per year consistent with United States Environmental Protection Agency guidance (Seitz 1995). The emergency generators are expected to operate no more than one to two hours a month for maintenance and testing purposes and occasionally during power outages. All three generators are affected sources under the Standards of Performance for Stationary Compression Ignition Internal Combustion Engines under 40 CFR 60, Subpart IIII and must be certified to meet emission standards to which they are subject and must combust ultra-low sulfur diesel fuel (ULSD). These emission standards were used as the emission factors for NO_x, CO, PM_{10}, and $PM_{2.5}$. Annual SO_2 emissions were calculated using a mass balance approach and an assumed fuel sulfur content of 15 parts per million, which is the standard for ULSD. The emission factor from USEPA AP-42 was used to estimate VOC emissions. CO_2e emissions were calculated based on emission factors and the calculation methods described in 40 CFR 98.

The engine input ratings for each of the emergency generators used to estimate annual emission rates are based on information provided in the 100 percent design documents, which reflect the best available data.

The nominal net emissions increase from the installation of the three new emergency generators is not expected to contribute to an exceedance of a National or State of Alaska ambient air quality standard since annual emission contributions from this activity do not exceeds the AQ EIAP insignificance indicators and the general conformity de minimis levels. As documented in Table 4, installation of the three emergency generators does not trigger a PSD major modification or require a minor source permit to authorize their operation. JBER will be required to submit a notification to ADEC in accordance with specific permit conditions listed in the JBER Flight Line Title V operating permit.

Table 4. Comparison Between Permit Thresholds and Stationary Source Emissions Increase

Criteria Pollutant	Permitting Thresholds (tons per year)		Net Emissions Increase from 3 New Emergency Generators (tons per year)
	PSD Major Modification	Minor Stationary Source	
NO_x	40	10	2.21

CO	100	100	1.25
PM_{10}	15	10	0.07
$PM_{2.5}$	10	10	0.07
SO_2	40	10	<0.01
VOC	40	--	0.51
Lead	0.6	--	0.00

Organization of Attachment 1 Emissions Tables

Project emissions estimates are presented in tabular format in an attachment to this appendix. Emissions were estimated for potential construction activities, F-22 operations, and the installation of the three new emergency generators. Tables 1 through 12 summarize the input parameters, emission factors, and annual emissions from construction. The input parameters, emission factors and annual emissions from the installation of the three emergency generators are summarized in Tables 13 through 15. Tables 16 through 19 summarize input parameters, emission factors and annual emissions from the F-22 operations. Table 20 summarizes the annual emissions estimated under the preferred alternative during the three year construction phase and the operating phase.

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USEPA. 2009. NONROAD Model (nonroad engines, equipment, and vehicles). Available at http://www.epa.gov/otaq/models/moves

Table 1. Construction Phase Operating Inputs for Year 1

Construction Activity/ Equipment Type	Hp Rating	Avg. Daily Load Factor	Number Active	Hours/ Day	Daily Hp-Hrs	Work Days	Total Hp-Hrs
Vegetation Removal - Cut and Fill Operations							
Bulldozer (D-9)	405	0.43	4	10	6,966	174	1,212,084
Loader	215	0.36	8	12	7,430	174	1,292,890
Construction Activity/Equipment Type	**Number Active**	**Idle Time (minutes)**	**Miles Per Roundtrip**	**Daily Truck Trips**	**Daily Miles**	**Work Days**	**Total Miles**
Haul Truck (20 cubic yard (CY), Vegetation/ Debris)	8	10	3	20	60	174	83,520
Building Demolition							
Construction Activity/ Equipment Type	**Hp Rating**	**Avg. Daily Load Factor**	**Number Active**	**Hours/ Day**	**Daily Hp-Hrs**	**Work Days**	**Total Hp-Hrs**
Backhoe	160	0.55	2	8	1,408	20	28,160
Bulldozer - D-8	310	0.43	2	10	2,666	20	53,320
Crane w/Wrecking Ball	180	0.29	1	10	522	20	10,440
Loader	215	0.36	4	12	3,715	20	74,300
Construction Activity/ Equipment Type	**Number Active**	**Idle Time (minutes)**	**Miles Per Roundtrip**	**Daily Truck Trips**	**Daily Miles**	**Work Days**	**Total Miles**
Haul Truck (20 CY, Debris)	12	10	8	49	384	20	18,816

Assumptions (Vegetation Removal):

Total Volume of Vegetation Removed (CY):	68,745
Total Number of Truckloads Required (20 CY load):	3,437
Total Number of Truckloads per Day:	20
Average Vehicle Speed:	40
Total Minutes per Trip Including Idling Time:	23
Total Number of Trips per Truck per Hour	3

Assumptions (Building Demolitions):

Total Volume of Debris Removed (CY):	19,926
Total Trucks Required:	8
Total Number of Truckloads Required (20 CY load):	996
Total Number of Truckloads per Day:	50
Average Vehicle Speed:	40
Total Minutes per Trip Including Idling Time:	15
Total Number of Trips per Truck per Hour	4
Total Trucks Required:	12

Table 2. Construction Phase Operating Inputs for Years 1 and 2

Construction Activity/ Equipment Type	Hp Rating	Avg. Daily Load Factor	Number Active	Hours/ Day	Daily Hp-Hrs	Work Days	Total Hp-Hrs
Excavate Terrain/Cut and Fill Operations							
Backhoe	160	0.55	2	6	1,056	626	661,478
Bulldozer - D-9	405	0.43	2	10	3,483	626	2,181,751
Grader	180	0.41	2	8	1,181	626	739,653
Loader	430	0.36	4	10	6,192	626	3,878,669
Scraper	550	0.48	8	10	21,120	626	13,229,568
Construction Activity/ Equipment Type	**Number Active**	**Idle Time (minutes)**	**Miles Per Roundtrip**	**Daily Truck Trips**	**Daily Miles**	**Work Days**	**Total Miles**
Haul Truck (20 CY, Soils Off-road)	21	10	3	864	2,592	626	1,623,490
Haul Truck (20 CY, Soils On-road)	2	10	8	96	767	626	480,153
Supply Trucks	2	10	20	2	40	268	10,720
Construction Activity/ Equipment Type			**Acres Disturbed**	**Hours/ Day**		**Work Days**	**Total Acre Days**
Fugitive Dust	NA	NA	5.0	8	NA	626	3,132

Assumptions:	Spoils Off-Road	Spoils On-Road
Total Volume of Spoils Removed (CY):	10,821,012	1,202,335
Total Number of Truckloads Required (20 CY load):	541,051	60,117
Total Number of Truckloads per Day:	864	96
Average Vehicle Speed:	40	40
Total Minutes per Trip Including Idling Time:	23	15
Total Number of Trips per Truck per Hour	3	4
Total Number of Trips per Truck Per Day:	21	32
Total Trucks Required:	42	3
Total Trucks Required per Year:	21	2

Table 3. Construction Phase Operating Inputs for Year 2

Construction Activity/ Equipment Type	Hp Rating	Avg. Daily Load Factor	Number Active	Hours/ Day	Daily Hp-Hrs	Work Days	Total Hp-Hrs
Runway Overrun - Remove Existing Asphalt							
Asphalt Profiler	950	0.5	1	12	5,700	2	10,059
Loader (938G)	160	0.36	2	8	922	2	1,627
Water Truck (5000 Gallons)	175	0.38	1	8	532	2	939
Construction Activity/ Equipment Type	**Number Active**	**Idle Time (minutes)**	**Miles Per Roundtrip**	**Daily Truck Trips**	**Daily Miles**	**Work Days**	**Total Miles**
Haul Truck (20 CY, Debris)	1	10	3	35	105	2	185
Construction Activity/ Equipment Type			**Acres Disturbed**			**Work Days**	**Total Acre Days**
Fugitive Dust	NA	NA	0.2	12	NA	2	4
Paved Road - Remove Existing Asphalt							
Construction Activity/ Equipment Type	**Hp Rating**	**Avg. Daily Load Factor**	**Number Active**	**Hours/ Day**	**Daily Hp-Hrs**	**Work Days**	**Total Hp-Hrs**
Asphalt Profiler	950	0.5	1	12	5,700	12	68,400
Loader (938G)	160	0.36	2	8	922	12	11,059
Water Truck (5000 Gallons)	175	0.38	1	8	532	12	6,384
Construction Activity/ Equipment Type	**Number Active**	**Idle Time (minutes)**	**Miles Per Roundtrip**	**Daily Truck Trips**	**Daily Miles**	**Work Days**	**Total Miles**
Haul Truck (20 CY, Debris)	2	10	3	46	138	12	1,656

Construction Activity/ Equipment Type	Number Active	Idle Time (Minutes)	Acres Disturbed	Daily Truck Trips	Daily Miles	Work Days	Total Acre Days
Fugitive Dust	NA	NA	0.1	12	NA	12	14
Install Gravel for Erosion Control - Runway/Taxiway/Arm Disarm Pad							
Construction Activity/ Equipment Type	**Hp Rating**	**Avg. Daily Load Factor**	**Number Active**	**Hours/ Day**	**Daily Hp-Hrs**	**Work Days**	**Total Hp-Hrs**
Bulldozer (D-8)	310	0.43	2	9	2,399	14	33,352
Grader	180	0.41	2	12	1,771	58	88,560
Loader	215	0.36	2	12	1,858	58	92,880
Construction Activity/ Equipment Type	**Number Active**	**Idle Time (minutes)**	**Miles Per Roundtrip**	**Daily Truck Trips**	**Daily Miles**	**Work Days**	**Total Miles**
Haul Truck (20 CY, Gravel)	1	10	8	23	184	58	10,672

Assumptions:	Runway Overrun	Paved Road	Install Gravel
Total Volume of Overrun / Road Removed (CY):	1,235	11,019	26,859
Total Number of Truckloads Required (20 CY load):	62	551	1,343
Total Number of Truckloads per Day:	35	46	23
Average Vehicle Speed:	25	25	25
Total Minutes per Trip Including Idling Time:	18	18	13
Total Number of Trips per Truck per Hour	3	3	5
Total Number of Trips per Truck Per Day:	26	26	37
Total Trucks Required:	1	2	1

Table 4. Construction Phase Operating Inputs for Years 2 and 3

Construction Activity/ Equipment Type	Hp Rating	Avg. Daily Load Factor	Number Active	Hours/ Day	Daily Hp- Hrs	Work Days	Total Hp-Hrs
Install Gravel and Backfill - Runway/Taxiway/Arm Disarm Pad/Roads/Water Storm Sewer/Misc. Projects							
Backhoe	160	0.55	2	10	1,760	139	244,992
Bulldozer (D-8)	310	0.43	2	8	2,133	70	148,443
Compactive Roller	165	0.38	1	10	627	186	116,371
Grader	180	0.41	2	12	1,771	278	493,102
Loader	215	0.36	2	12	1,858	278	517,267
Construction Activity/ Equipment Type	**Number Active**	**Idle Time (minutes)**	**Miles Per Roundtrip**	**Daily Truck Trips**	**Daily Miles**	**Work Days**	**Total Miles**
Haul Truck (20 CY, Gravel/Sand)	2	10	8	57	456	278	126,950
Construct/Relocate Requisite Support Features							
Construction Activity/ Equipment Type	**Hp Rating**	**Avg. Daily Load Factor**	**Number Active**	**Hours/ Day**	**Daily Hp- Hrs**	**Work Days**	**Total Hp-Hrs**
Air Compressor (100 CFM)	50	0.60	2	8	480	167	80,160
Backhoe	160	0.55	2	8	1,408	139	195,994
Concrete/Industrial Saw	84	0.73	1	4	245	81	19,917
Crane	190	0.29	2	6	661	167	110,420
Forklift	94	0.40	2	6	451	167	75,350
Generator	45	0.60	2	10	540	167	90,180
Construction Activity/ Equipment Type	**Number Active**	**Idle Time (minutes)**	**Miles Per Roundtrip**	**Daily Truck Trips**	**Daily Miles**	**Work Days**	**Total Miles**
Concrete Trucks	2	10	15	2	30	58	1,740
Supply Trucks	2	10	20	5	100	139	13,900

APPENDIX C – ATTACHMENT
CONSTRUCTION PHASE AND OPERATIONAL EMISSION ESTIMATES

Construction Activity/ Equipment Type	Number Active	Idle Time (Minutes)	Acres Disturbed	Hours/ Day	Daily Miles	Work Days	Total Acre Days
Fugitive Dust	NA	NA	3.93	12	NA	167	656.31

Assumptions:	Gravel
Total Volume of Gravel Hauled (CY):	316,310
Total Number of Truckloads Required (20 CY):	15,816
Total Number of Truckloads per Day:	57
Average Vehicle Speed:	25
Total Minutes per Trip Including Idling Time: 13	
Total Number of Trips per Truck per Hour	5
Total Number of Trips per Truck Per Day:	37
Total Trucks Required:	2

Table 5. Construction Phase Operating Inputs for Year 3

Construction Activity/ Equipment Type	Hp Rating	Avg. Daily Load Factor	Number Active	Hours/ Day	Daily Hp-Hrs	Work Days	Total Hp-Hrs
Asphalt and Resurfacing							
Backhoe	160	0.55	2	6	1,056	139.2	146,995
Compactive Roller	165	0.38	2	10	1,254	278.4	349,114
Grader	180	0.41	2	12	1,771	278.4	493,102
Loader	215	0.36	3	12	2,786	278.4	775,734
Paving Machine	200	0.42	2	12	2,016	278.4	561,254
Water Truck (5,000 Gallons)	175	0.38	2	8	1,064	255.2	271,533
Construction Activity/ Equipment Type	**Number Active**	**Idle Time (minutes)**	**Miles Per Roundtrip**	**Daily Truck Trips**	**Daily Miles**	**Work Days**	**Total Miles**
Haul Truck (20 Ton, Asphalt)	2	10	8	54	432	278.4	120,269
Supply Trucks	2	10	15	2	30	185.6	5,568
Construction Activity/ Equipment Type			**Acres Disturbed**			**Work Days**	**Total Acre Days**
Fugitive Dust	NA	NA	3		NA	278.4	835.2

Assumptions:

Total Volume of Asphalt Delivered (Tons):	299,012
Total Number of Truckloads Required (20 Ton):	14,951
Total Number of Truckloads per Day:	54
Average Vehicle Speed:	25
Total Minutes per Trip Including Idling Time:	17
Total Number of Trips per Truck per Hour	4
Total Number of Trips per Truck Per Day:	29
Total Trucks Required:	2

Table 6. Emission Factors Used for Calculating Construction Phase Emissions

Project Year/Source Type	Emission Factors (Grams/Horsepower-Hour)								Reference
	VOC	**CO**	**NOx**	**SO2**	**PM_{10}**	**$PM_{2.5}$**	**Pb**	**CO_2e**	
Nonroad Equipment - 41 - 50 Hp	0.25	0.99	3.60	0.00	0.15	0.15	N/A	614.00	1
Nonroad Equipment - 51 - 75 Hp	0.32	2.10	3.72	0.00	0.27	0.26	N/A	609.00	1
Nonroad Equipment - 76 - 100 Hp	0.32	2.23	2.47	0.00	0.31	0.30	N/A	609.00	1
Nonroad Equipment - 101 - 175 Hp	0.25	0.89	2.09	0.00	0.19	0.18	N/A	547.00	1
Nonroad Equipment - 176 - 300 Hp	0.19	0.53	1.70	0.00	0.10	0.10	N/A	539.00	1
Nonroad Equipment - 301 - 600 Hp	0.18	0.85	2.27	0.00	0.12	0.12	N/A	535.00	1
Nonroad Equipment - 601 - 750 Hp	0.17	1.11	2.26	0.00	0.12	0.12	N/A	535.00	1
Nonroad Equipment - 751 - 1000 Hp	0.24	0.97	3.63	0.00	0.13	0.13	N/A	534.00	1
HDDV - 25 mph	0.39	2.00	7.41	0.02	0.36	0.33	N/A	2110.00	3
HDDV - 50 mph	0.24	1.36	5.67	0.01	0.20	0.18	N/A	1601.00	3
HDDV - Composite	0.30	1.61	6.37	0.02	0.26	0.24	N/A	1805.00	3
Project Year/Source Type	**Emission Factors (Grams/Hour)**								**Reference**
	VOC	**CO**	**NOx**	**SO2**	**PM_{10}**	**$PM_{2.5}$**	**Pb**	**CO_2e**	
Heavy Duty Diesel Vehicles - Idle	38.84	88.07	222.19	0.08	2.22	2.04	N/A	9,024	2
						Emission Factor (lb/hp-hr)			
Project Year/Source Type	**Emission Factors (lb/acre-day)**								
						PM_{10}	**$PM_{2.5}$**		**Reference**
					Disturbed Ground - Fugitive Dust	9.93	0.99		4

References:
1. EPA NONROAD2008a model for Anchorage Borough, AK, summer climate conditions. Composite emission factors calculated for each Hp category by averaging all equipment types within the same Hp category.
2. EPA MOVES2014 model using default parameters for Anchorage Borough, AK. Assumes each truck would idle 5 minutes onsite.
3. Vehicle speeds assumed to be 40% at 25 mph and 60% at 50 mph.
4. All trucks except water trucks assumed to idle 10 minutes per trip.
5. Emission factors for lead (Pb) are not available for construction equipment.
6. Table 3-2 for active large-scale earth moving operations (Countess Environmental 2006). Emissions reduced by 74% from uncontrolled levels to simulate relatively moist soil conditions and water application/use of best management practices for fugitive dust control (Table 3-7 Countess Environmental 2006). Converted to units of lbs/acre-day of disturbance assuming 22 work days/month. PM_{10} Emission Factor (0.42 tons/acre-month) x 2,000 lbs/ton x 1 month/ 22 days x (1-0.74) = 9.93 lb/acre-days. $PM_{2.5}$ Emission Factor assumed to be 10% of PM-10

Table 7. Construction Phase Emissions Year 1

Construction Activity/ Equipment Type	Hp	Tons							
		VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$	Pb	CO_2e
Vegetation Removal - Cut and Fill Operations									
Bulldozer (D9)	405	0.12	0.57	1.52	0.00	0.08	0.08	0.00	357.41
Loader	215	0.14	0.38	1.21	0.00	0.07	0.07	0.00	384.08
Haul Truck - 20 CY - Vegetation/Debris (Idle)	NA	0.20	0.45	1.14	0.00	0.01	0.01	0.00	46.16
Haul Truck - 20 CY - Vegetation/Debris	NA	0.03	0.15	0.59	0.00	0.02	0.02	0.00	166.18
Subtotal		**0.48**	**1.54**	**4.45**	**0.00**	**0.19**	**0.18**	**0.00**	**953.82**
Building Demolition									
Backhoe	160	0.01	0.03	0.06	0.00	0.01	0.01	0.00	16.98
Bulldozer (D8)	310	0.01	0.03	0.07	0.00	0.00	0.00	0.00	16.61
Crane w/Wrecking Ball	180	0.00	0.01	0.02	0.00	0.00	0.00	0.00	6.20
Loader	215	0.02	0.04	0.14	0.00	0.01	0.01	0.00	44.15
Haul Truck (20 CY, Building Debris) (Idle)	NA	0.01	0.02	0.04	0.00	0.00	0.00	0.00	1.62
Haul Truck (20 CY, Building Debris)	NA	0.01	0.03	0.13	0.00	0.01	0.00	0.00	37.44
Subtotal		**0.05**	**0.15**	**0.47**	**0.00**	**0.02**	**0.02**	**0.00**	**123.00**

Table 8. Construction Phase Emissions Years 1 and 2

Construction Activity/ Equipment Type	Hp	Tons							
		VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$	Pb	CO_2e
Excavate Terrain/Cut and Fill Operations									
Backhoe	160	0.18	0.65	1.52	0.00	0.14	0.13	0.00	399
Bulldozer (D-9)	405	0.43	2.04	5.46	0.00	0.29	0.29	0.00	1,287
Grader	180	0.15	0.43	1.39	0.00	0.08	0.08	0.00	439
Loader	430	0.77	3.63	9.71	0.00	0.51	0.51	0.00	2,287
Scraper	550	2.62	12.40	33.10	0.00	1.75	1.75	0.00	7,802
Haul Truck - 20 CY - Soils Off-road (Idle)	NA	3.86	8.76	22.09	0.01	0.22	0.20	0.00	897.26
Haul Truck - 20 CY - Soils Off-road	NA	0.54	2.88	11.40	0.04	0.47	0.43	0.00	3,230
Haul Truck - 20 CY - Soils On-road (Idle)	NA	0.43	0.97	2.45	0.00	0.02	0.02	0.00	99.70
Haul Truck - 20 CY - Soils On-road	NA	0.16	0.85	3.37	0.01	0.14	0.13	0.00	955
Supply Trucks, Idle	NA	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.89
Supply Trucks	NA	0.00	0.02	0.08	0.00	0.00	0.00	0.00	21.33
Fugitive Dust	NA					15.55	1.55		
Subtotal		**9.16**	**32.65**	**90.59**	**0.06**	**19.17**	**5.10**	**0.00**	**17,419.05**

Table 9. Construction Phase Emissions Year 2

Construction Activity/ Equipment Type	Hp	Tons							
		VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$	Pb	CO_2e
Runway Overrun - Remove Existing Asphalt									
Asphalt Profiler	950	0.00	0.01	0.04	0.00	0.00	0.00	0.00	5.92
Loader (938G)	160	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.98
Water Truck (5,000 Gallons)	175	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.57
Haul Truck (20 CY - Debris) (Idle)	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
Haul Truck (20 CY - Debris)	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37
Fugitive Dust	NA					0.02	0.00		
Subtotal		**0.02**	**0.01**	**0.05**	**0.00**	**0.02**	**0.00**	**0.00**	**7.94**
Paved Road - Remove Existing Asphalt									
Asphalt Profiler	950	0.02	0.07	0.27	0.00	0.01	0.01	0.00	40.26
Loader (938G)	160	0.00	0.01	0.03	0.00	0.00	0.00	0.00	6.67
Water Truck (5,000 Gallons)	175	0.00	0.01	0.01	0.00	0.00	0.00	0.00	3.85
Haul Truck (20 CY - Debris)(Idle)	NA	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.92
Haul Truck (20 CY - Debris)	NA	0.00	0.00	0.01	0.00	0.00	0.00	0.00	3.29
Fugitive Dust	NA					0.07	0.01	0.00	
Subtotal		**0.03**	**0.10**	**0.35**	**0.00**	**0.09**	**0.02**	**0.00**	**54.99**
Install Gravel for Erosion Control - Runway/Taxiway/ Arm Disarm Pad									
Bulldozer (D8)	310	0.01	0.03	0.08	0.00	0.00	0.00	0.00	19.67
Grader	180	0.02	0.05	0.17	0.00	0.01	0.01	0.00	52.62
Loader	215	0.02	0.05	0.17	0.00	0.01	0.01	0.00	55.18
Haul Truck (20 CY - Gravel) (Idle)	NA	0.01	0.02	0.05	0.00	0.00	0.00	0.00	2.21
Haul Truck - 20 CY - Gravel	NA	0.00	0.02	0.07	0.00	0.00	0.00	0.00	21.23
Subtotal		**0.05**	**0.16**	**0.48**	**0.00**	**0.02**	**0.02**	**0.00**	**129.68**

Table 10. Construction Phase Emissions Years 2 and 3

Construction Activity/Equipment Type	Hp	Tons							
		VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$	Pb	CO_2e
Install Gravel and Backfill - Runway/Taxiway/Arm Disarm Pad/Roads/Water Storm Sewer/Misc. Projects									
Backhoe	160	0.07	0.24	0.56	0.00	0.05	0.05	0.00	147.72
Bulldozer (D8)	310	0.03	0.14	0.37	0.00	0.02	0.02	0.00	87.54
Compactive Roller	165	0.02	0.07	0.22	0.00	0.01	0.01	0.00	69.14
Grader	180	0.10	0.29	0.92	0.00	0.05	0.05	0.00	292.97
Loader	215	0.11	0.30	0.97	0.00	0.06	0.06	0.00	307.33
Haul Truck (20 CY - Gravel/Sand) (Idle)	NA	0.11	0.26	0.65	0.00	0.01	0.01	0.00	26.31
Haul Truck (20 CY - Gravel/Sand)	NA	0.04	0.23	0.89	0.00	0.04	0.03	0.00	252.59
Subtotal		**0.45**	**1.29**	**3.70**	**0.00**	**0.20**	**0.20**	**0.00**	**931.02**
Construct/Relocate Requisite Support Features									
Air Compressor (100 CFM)	50	0.02	0.09	0.32	0.00	0.01	0.01	0.00	54.25
Backhoe	160	0.05	0.19	0.45	0.00	0.04	0.04	0.00	118.18
Concrete/Industrial Saw	84	0.01	0.05	0.08	0.00	0.01	0.01	0.00	13.37
Crane	190	0.02	0.06	0.21	0.00	0.01	0.01	0.00	65.61
Forklift	94	0.03	0.19	0.21	0.00	0.03	0.02	0.00	50.58
Generator	45	0.02	0.10	0.36	0.00	0.01	0.01	0.00	61.04
Concrete Trucks (Idle)	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19
Concrete Trucks	NA	0.00	0.00	0.01	0.00	0.00	0.00	0.00	3.46
Supply Trucks (Idle)	NA	0.00	0.01	0.03	0.00	0.00	0.00	0.00	1.15
Supply Trucks	NA	0.00	0.02	0.10	0.00	0.00	0.00	0.00	27.66
Fugitive Dust	NA					3.26	0.32		
Subtotal		**0.17**	**0.71**	**1.76**	**0.00**	**3.38**	**0.44**	**0.00**	**395.49**

Table 11. Construction Phase Emissions Year 3

Construction Activity/ Equipment Type	Hp	Tons							
		VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$	Pb	CO_2e
Asphalt and Resurfacing									
Backhoe	160	0.04	0.14	0.34	0.00	0.03	0.03	0.00	88.63
Compactive Roller	165	0.10	0.34	0.80	0.00	0.07	0.07	0.00	210.50
Grader	180	0.10	0.29	0.92	0.00	0.05	0.05	0.00	292.97
Loader	215	0.16	0.45	1.45	0.00	0.09	0.09	0.00	460.90
Paving Machine	200	0.12	0.33	1.05	0.00	0.06	0.06	0.00	333.47
Water Truck (5,000 Gallons)	175	0.07	0.27	0.63	0.00	0.06	0.05	0.00	163.72
Haul Truck (20 CY - Asphalt) (Idle)	NA	0.11	0.24	0.61	0.00	0.01	0.01	0.00	24.92
Haul Truck (20 CY - Asphalt) (Idle)	NA	0.04	0.21	0.84	0.00	0.03	0.03	0.00	239.30
Supply Trucks (Idle)	NA	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.62
Supply Trucks	NA	0.00	0.01	0.04	0.00	0.00	0.00	0.00	11.08
Fugitive Dust	NA					4.15	0.41		
Subtotal		**0.75**	**2.29**	**6.71**	**0.00**	**4.55**	**0.81**	**0.00**	**1,826.11**

Table 12. Summary of Construction Phase Emissions by Year and Peak Emissions

Year/Construction Activity	Tons							
	VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$	Pb	CO_2e
Year 1								
Vegetation Removal - Cut and Fill Operations	0.48	1.54	4.45	0.00	0.19	0.18	0.00	953.82
Building Demolition	0.05	0.15	0.47	0.00	0.02	0.02	0.00	123.00
Excavate Terrain/Cut and Fill Operations[1]	4.58	16.32	45.30	0.03	9.59	2.55	0.00	8,709.53
Year 1 Total:	**5.11**	**18.02**	**50.21**	**0.03**	**9.80**	**2.76**	**0.00**	**9,786.34**
Year 2								
Excavate Terrain/Cut and Fill Operations[1]	4.58	16.32	45.30	0.03	9.59	2.55	0.00	8,709.53
Runway Overrun - Remove Existing Asphalt	0.00	0.01	0.05	0.00	0.02	0.00	0.00	7.94
Paved Road - Remove Existing Asphalt	0.03	0.10	0.35	0.00	0.09	0.02	0.00	54.99
Install Gravel for Erosion Control	0.05	0.16	0.48	0.00	0.02	0.02	0.00	129.68
Install Gravel and Backfill[2]	0.22	0.65	1.85	0.00	0.10	0.10	0.00	465.51
Construct/Relocate Requisite Support Features[2]	0.08	0.36	0.88	0.00	1.69	0.22	0.00	197.74
Year 2 Total Emissions	**4.97**	**17.60**	**48.90**	**0.03**	**11.51**	**2.92**	**0.00**	**9,565.39**
Year 3								
Install Gravel and Backfill[2]	0.22	0.65	1.85	0.00	0.10	0.10	0.00	465.51
Construct/Relocate Requisite Support Features[2]	0.08	0.36	0.88	0.00	1.69	0.22	0.00	197.74
Asphalt and Resurfacing	0.75	2.29	6.71	0.00	4.55	0.81	0.00	1,826.11
Year 3 Total Emissions	**1.05**	**3.30**	**9.44**	**0.01**	**6.34**	**1.13**	0.00	**2,489.37**
Peak Annual Emissions	**1.05**	**3.30**	**9.44**	**0.01**	**6.34**	**1.13**	0.00	**2,489.37**

1. Equals half of the total emissions for a given activity occurring in Years 1 and 2
2. Equals half of the total emissions for a given activity occurring in Years 2 and 3

Table 13. Emergency Generators Input Parameters Used for Emission Calculations

Facility Description	Generator Parameters		Fuel Consumption Rate (gallons/ hour)	Heat Input Rating (MMBtu/hr)
	Generator (kWe)	Engine (bHp)		
Airfield Lighting Vault Emergency Generator	450	755	5.29	5.29
ILS Localizer Emergency Generator	20	34	1.9	0.24
ILS Glide Slope Emergency Generator	20	34	1.9	0.24

Table 14. Emission Factors for New Emergency Generators

Emission Unit Description	Emission Factors							
	Pb	VOC (lb/hp-hr)	CO (g/kw-hr)	NOx (g/kw-hr)	SO_2 (lb/gal)	PM_{10} (g/kw-hr)	$PM_{2.5}$ (g/kW-hr)	CO_2e (kg/MMBtu)
Airfield Lighting Vault	N/A	2.47×10^{3}	4.38	8.00	2.12×10^{4}	0.20	0.20	74.21
ILS Localizer and Glide Slope	N/A	2.47×10^{3}	6.88	9.38	2.12×10^{4}	0.38	0.38	74.21

Notes:
1. Airfield Lighting Vault emission factors for CO, NO_x, PM_{10} and $PM_{2.5}$ from 40 CFR 1039, Appendix I, Table 2.
2. ILS Localizer and Glide Slope emission factors for CO, NO_x, PM_{10} and $PM_{2.5}$ from 40 CFR 1039, Appendix I, Table 2.
3. Emission factors for CO, NO_x, PM_{10} and $PM_{2.5}$ increased by 25 percent in accordance with 40 CFR 1039.101(e).
4. VOC emissions for the Airfield Lighting Vault, ILS Localizer, and ILS Glide Slope from USEPA AP-42, Table 3.3-1.
5. SO_2 emissions for the Airfield Lighting Vault, ILS Localizer, and ILS Glide Slope based on mass balance using ultra-low diesel fuel, which has a fuel sulfur content of 15 parts per million.
6. CO_2 emissions for the Airfield Lighting Vault, ILS Localizer, and ILS Glide Slope from 40 CFR 98, Table C-1.
7. Lead (Pb) emission factors are not available for stationary, diesel-fired emergency generator engines.

Table 15. Annual Emission from New Stationary, Emergency Generators

Emission Unit Description	Annual Emissions (tons/yr)							
	VOC	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$	Pb	CO_2e
Airfield Lighting Vault Emergency Generator	0.47	1.10	2.01	<0.01	0.06	0.06	0.00	176.15
ILS Localizer Emergency Generator	0.02	0.08	0.10	<0.01	<0.01	<0.01	0.00	9.73
ILS Glide Slope Emergency Generator	0.02	0.08	0.10	<0.01	<0.01	<0.01	0.00	9.73
Total	**0.51**	**1.25**	**2.21**	**<0.01**	**0.07**	**0.07**	**0.00**	**195.61**
Permitting Thresholds								
PSD Major Modification	40	100	40	40	15	10	0.6	--
Minor Stationary Source[1]	--	100	10	10	10	10	--	--

1. Proposed action occurs within the JBER Flight Line Title V Stationary Source; therefore, the minor stationary source thresholds in 18 AAC 50.(3)(A) apply.
2. CO2e emissions are in metric tons/ yr.

Table 16. F-22 Emission Factors Used to Calculating Emissions

Engine Mode	Fuel Flow Rate (lb fuel/hr)	Number of Engines	Mode Specific Emission Factors (lb/10^3 lb fuel[1])							
			NO_X	CO	PM_{10}	$PM_{2.5}$	VOC	SO_2	Pb	CO_2e
Idle	1,377	2.0	3.01	48.15	2.49	1.76	6.83	1.91	N/A	3,214.59
Approach	2,742	2.0	6.59	7.92	2.00	1.73	0.34	1.91	N/A	3,214.59

Notes:

1. Fuel flow rates and emission factors for F-22 (F119-PW-100) engines from the Air Emissions Guide for Air Force Mobile Sources, June 2020. F-22 fighter jets have engines.
2. Sulfur emission factor for F-22 engines based on Table 2-2 of the Air Emissions Guide for Air Force Mobile Sources, June 2020.
3. Emission for lead (Pb) not available

Table 17. Annual Emissions from F-22 Operations Under No Action Alternative

Engine Mode	Estimated Emissions (Tons)							
	NO_X	CO	PM_{10}	$PM_{2.5}$	VOC	SO_2	Pb	CO_2e
Idle	0.03	0.49	0.03	0.02	0.07	0.02	0.00	32.48
Approach	0.52	0.63	0.16	0.14	0.03	0.15	0.00	255.02
Total	**0.55**	**1.12**	**0.19**	**0.16**	**0.10**	**0.17**	**0.00**	**287.50**

Table 18. Annual Emissions from F-22 Operations Under Preferred Alternative

Engine Mode	Estimated Emissions (Tons)							
	NO_X	CO	PM_{10}	$PM_{2.5}$	VOC	SO_2	Pb	CO_2e
Idle	0.01	0.16	0.01	0.01	0.02	0.01	0.00	10.52
Approach	0.17	0.20	0.05	0.04	0.01	0.05	0.00	82.61
Total	**0.18**	**0.36**	**0.06**	**0.1**	**0.03**	**0.06**	**0.00**	**93.13**

Table 19. Net Change in Emissions from F-22 Operations Under Preferred Alternative

Alternative	Annual Sorties	TIM/S (Hr)	TAD (Hr)	Annual Emissions (Tons)							
				NO_x	CO	PM_{10}	$PM_{2.5}$	VOC	SO_2	Pb	CO_2e
No Action (Baseline)	355	0.10	36	0.55	1.11	0.18	0.16	0.10	0.17	0.00	287.50
Preferred Alternative	115	0.10	12	0.18	0.36	0.06	0.05	0.03	0.06	0.00	93.13
Net Change in Emissions (Tons/Year)				**-0.37**	**-0.75**	**-0.12**	**-0.11**	**-0.07**	**-0.11**	**0.00**	**-194.37**

1. TIM/S refers to time in mode per sortie
2. TAD refers to total annual duration

Table 20. Annual Emissions by Phase Under Preferred Alternative

Phase	Annual Emissions (tons)							
	NO_X	CO	PM_{10}	$PM_{2.5}$	VOC	SO_2	Pb	CO_2e
Construction Phase								
Year 1	5.11	18.02	50.21	0.03	9.80	2.76	0.00	9,786.34
Year 2	4.97	17.60	48.90	0.03	11.51	2.92	0.00	9,565.39
Year 3	1.05	3.30	9.44	0.00	6.34	1.13	0.00	2,489.37
Operating Phase								
Emergency Generators	0.51	1.25	2.21	<0.01	0.07	0.07	0.00	195.61
F-22 Sorties	0.18	0.36	0.06	0.05	0.03	0.06	0.00	93.13