



Right-of-Way Permit M-349-MR

IRIS/USArray/Earthscope Temporary Seismometer Stations Multiple Wildlife Refuges in Alaska

THE SECRETARY OF THE INTERIOR, through her authorized representative, the Chief, Division of Realty and Conservation Planning, Region 7, U.S. Fish and Wildlife Service, hereinafter referred to as the "Service", in accordance with 16 U.S.C. § 668dd (d), 50 C.F.R. § 29.21 16 U.S.C. §§ 3161-3173, and 43 C.F.R. § 36, does hereby grant a permit to the Incorporated Research Institutions for Seismology (IRIS)/USArray, hereinafter referred to as "Permittee", to use and occupy certain lands located within the Alaska Peninsula, Arctic, Innoko, Nowitna, Togiak, and Yukon Flats National Wildlife Refuges¹ in Alaska, hereinafter referred to collectively as "the Refuges" or by specific refuge name, for the purpose of establishing temporary seismograph stations as part of the Earthscope Transportable Array (USArray).

PREAMBLE

The USArray is one segment of EarthScope, an extensive earth science research project funded by the National Science Foundation and operated by IRIS, a nonprofit 503 corporation comprised of a consortium of over 100 US universities dedicated to the operation of science facilities seismological data. The USArray is a temporary seismic monitoring network that collects and analyzes seismic data for use in improving the understanding of active tectonics, and geologic history of the North American continent. The data will provide new insight into earthquake processes and improve earthquake and tsunami warning systems for hazard mitigation. The array images the deep structure of the earth and records earthquakes. The resulting data is made immediately available to Federal agencies and researchers worldwide. The USArray has installed over 1,700 seismometer stations across the continental US and Canada and is a dense array with approximately 42 mile grid spacing. The temporary installations in Alaska follow the completion of installations in the lower 48 states. The seismometers in Alaska will remain in place for up to 5 years at which time the equipment will be recovered and the sites restored to their original state. Within AK, over 100 sites are planned for installation on lands other than refuge lands.

RIGHT-OF-WAY AUTHORIZATION

The right-of-way permit authorizes the Permittee to install, operate, maintain, and remove seismic monitoring stations and related equipment/facilities, hereinafter referred to as the "Project". Upon

¹ Note: Installations on the Yukon Delta National Wildlife Refuge are planned for 2017 and authorization will be via an amendment to this ROW permit.

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removal, each site will be rehabilitated to its original state. The sites will occupy a footprint not to exceed 20 x 20 feet.

Each site is comprised of a continuously operating seismic station consisting of a seismic sensor, electronics, radio antenna and a surface mount communication module all housed in an above ground-insulated hut like, 5'x5'7'H fiberglass enclosure that can be painted to blend in with the surrounding landscape. The equipment does not produce noise or motion. Solar panels are mounted directly to the hut. The hut will house rechargeable lithium ion and lead-acid AGM batteries charged by solar panels. The batteries will power a data-logger connected to the seismometer, which will reside in an augured or drilled hole. A standard atmospheric sensor package containing a barometer and microbarograph will be installed. Weather station sensors will be mounted on top of the hut. Power and data cables from the seismometer to the enclosure will be run through conduit placed either in trenches (that are subsequently back-filled) or anchored to rock surface. Data will be transmitted to the internet via cell modem, radio links or satellite link. Installation will require access to each site for approximately 2 days. Construction will take approximately 4-6 hours and will be undertaken by two to three field staff. Fuel will not be stored at the installation sites. All refueling will occur at the airport. Maintenance will be performed remotely. On rare occasions maintenance trips may be necessary to correct a problem. Removal of the stations would occur in 1 day. See attached "Exhibit A: POD" for additional information about the installations. The mode of transportation of each site is reflected in the recon reports for each site attached hereto as Exhibit "B".

PROJECT SITE LOCATIONS

The Project sites authorized by this permit are located within the following National Wildlife Refuges in Alaska and are described as follows:

Alaska Peninsula/Becharof National Wildlife Refuge (AK Pen NWR) at the following site:

| Site ID | Latitude | Longitude | Legal Description |
|---------|----------|------------|-------------------------|
| R17K-2 | 57.63981 | -156.38708 | Sec. 35, T29S, R44W, SM |

NOTE: the US owns the surface estate, which is managed by FWS. The subsurface estate is owned by Koniag Corp., who has provided approval/non-objection as to the use of their subsurface.

Arctic National Wildlife Refuge (Arctic NWR) at the following sites:

| Site ID | Latitude | Longitude | Legal Description |
|---------|----------|------------|-----------------------|
| F26K-2 | 67.69624 | -144.13603 | Sec. 9, T33N R16E FM |
| E27K-1 | 68.1862 | -141.59575 | Sec. 31, T14S R46E UM |
| C27K-1 | 69.62636 | -143.71142 | Sec. 11, T3N R34E UM |
| C26K-1 | 69.91748 | -144.91224 | Sec. 33, T7N R29E UM |

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Innoko National Wildlife Refuge (Innoko NWR) at the following site:

| Site ID | Latitude | Longitude | Legal Description |
|---------|----------|------------|----------------------|
| J17K-1 | 63.39661 | -159.07765 | Sec. 21, T24S R2W KM |

Nowitna National Wildlife Refuge (Nowitna NWR) at the following site:

| Site ID | Latitude | Longitude | Legal Description |
|---------|----------|-----------|----------------------|
| I20K-2 | 64.79643 | -154.4779 | Sec. 18, T8S R22E KM |

Togiak National Wildlife Refuge (Togiak NWR) at the following site:

| Site ID | Latitude | Longitude | Legal Description |
|---------|----------|------------|-----------------------|
| O15K-1 | 59.17672 | -159.82437 | Sec. 36, T11S R63W SM |

Yukon Flats National Wildlife Refuge (Yukon Flats NWR) at the following sites:

| Site ID | Latitude | Longitude | Legal Description |
|---------|----------|------------|-----------------------|
| G26K-2 | 66.94923 | -143.78672 | Sec. 33, T25N R18E FM |
| G25K-2 | 66.76534 | -146.10143 | Sec. 6, T22N R8E FM |
| G24K-2 | 66.70098 | -147.47464 | Sec. 26, T22N R1E FM |

Maps reflecting the location of the authorized installation sites are attached hereto as Exhibit "C".

DEFINITIONS

Meanings of certain terms used herein:

The term "Authorized Officer" means the Refuge Manager and Deputy Refuge Manager of the applicable National Wildlife Refuge in Alaska, or designated representative in charge of the land under administration by the U.S. Fish and Wildlife Service. The Authorized Officer will monitor compliance with Permit terms, conditions and stipulations.

- The terms "Wildlife Resource" and Wildlife Resources" includes all fish, animals and birds and all vegetation including trees, plants, shrubs, grass, muskeg and marsh within, on, under or over the Permit area; and all lands, waters and all beds of waters within the Permit area and all appurtenances to lands and waters and beds of waters within the Permit area, whether natural or constructed.
- The term Permittee includes the Permittee, its employees, agents, contractors, employees of the contractors or any persons visiting the permitted sites in connection with this authorization.

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TERM AND RENT:

1. The term for this permit is for five (5) years or while it is used for the purpose granted, whichever period is shorter.
2. The Permittee is required by applicable regulations and statute to make a rental payment in advance for use and occupancy of lands. The annual rental amount, as established by the U.S. Fish and Wildlife Service Annual Fee Schedule (Fee Schedule) as of the date of issuance is \$1,800.00
3. Payment(s) by check must be payable to the U.S. Fish and Wildlife Service and forwarded to the attention of the Chief, Division of Realty and Conservation Planning, 1011 East Tudor Road, MS 211, Anchorage, Alaska 99503. Payment can also be made by credit card by contacting the Division of Realty and Conservation Planning R7 Collections Officer at (907) 786-3566.
4. Rental rates may be reviewed and adjusted by the Service at any time not less than five (5) years after the grant of the permit or the last revision of charges. Should the Fee Schedule be adjusted, then the rental rate would be adjusted accordingly. The Service will furnish a notice in writing to the Permittee of intent to impose new charges commencing with the ensuing charge year. The revised charges will be effective unless the Permittee files an appeal according to 50 C.F.R. 29.22.

Insurance

5. Prior to commencement of a phase of activities, the Permittee shall provide to the Service, (attention Chief, Division of Realty and Conservation Planning, at the address above) the following:
 - (a) A binder or Certificate of Insurance demonstrating that the policy or policies are in place and effective, as required below.
 - (b) Permittee shall maintain in effect throughout the term of this Permit general liability insurance or its equivalent with a limit of \$1,000,000 per occurrence. Such insurance shall name the United States as an additional insured and shall contain a "no waiver of subrogation" provision.

GENERAL TERMS AND CONDITIONS (Applies to all Project/Refuge Sites)

6. This permit is granted subject to outstanding rights, if any, in third parties.
7. The Permittee, by accepting this permit, agrees to the terms and conditions contained herein.
8. By accepting this Permit, the Permittee agrees to reimburse the United States for certain costs incurred by the Service in processing the Permit application.
9. Permittee agrees to comply with State and Federal laws applicable to the project within which the easement or permit is granted, and to the lands which are included in the right-of-way, and lawful existing regulations thereunder.
10. This permit authorizes use only on the lands and waters of the National Wildlife Refuges subject to this permit. Use of land owned by a Native corporation, individual or State of Alaska, but located within the refuge boundaries is not authorized by this permit.
11. Permittee agrees to clear and keep clear the lands within the easement or permit area to the extent and in the manner directed by the Authorized Officer; and to dispose of all vegetative and other material cut, uprooted, or otherwise accumulated during the construction, maintenance and restoration of the project in such a manner as to decrease the fire hazard and also in accordance with such instructions as the Authorized Officer may specify.
12. The construction or clearing of landing strips or pads is prohibited. Incidental hand removal of rocks and other minor obstructions is allowed.
13. Permittee agrees to prevent the disturbance or removal of any public land survey monument or project boundary monument unless and until the applicant has requested and received from the Chief, Division of Realty and Conservation Planning approval of measures the applicant will take to perpetuate the location of aforesaid monument.
14. The Permittee shall comply with the provisions of the Archeological Resources Protection Act (16 U.S.C. 470). The disturbance of archeological, cultural or historical sites and the removal of artifacts from Federal land are prohibited. The term disturbance includes excavation, removal, damage or otherwise to alter or deface, or attempt to excavate, remove, damage, or attempt to alter or deface. In the event that any of these sites are found during the project, a localized work halt shall be initiated. This will be followed immediately by telephone contact to the Refuge Manager, and concurrent contact with the State Historic Preservation Officer, to evaluate the significance of any findings and establish any protective measures that may be necessary, including the possibility of moving an installation or to determine whether an exemption may be applicable. No person may sell, purchase, exchange, transport, receive, or offer to sell, purchase,

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or exchange any archaeological resource if such resource was excavated or removed from Federal lands.

15. Permittee agrees to take such soil and resource conservation and protection measures, including weed control on the land covered by the easement or permit as the Authorized Officer in charge may request. Permittee agrees to do everything reasonably within his power, both independently and on request of any duly authorized representative of the United States, to prevent and suppress fires on or near, lands to be occupied under the easement or permit area, including making available such construction and maintenance forces as may be reasonably obtainable for the suppression of such fires.
16. Permittee agrees to pay the United States the full value for all damages to the lands or other property of the United States caused by him or by his employees, contractors, or employees of the contractors, and to indemnify the United States against any liability for damages to life, person or property arising from the occupancy or use of the lands under the easement or permit, except where the easement or permit is granted hereunder to a State or other governmental agency which has no legal power to assume such a liability with respect to damages caused by it to lands or property, such agency in lieu thereof agrees to repair all such damages. Where the easement or permit involves lands which are under the exclusive jurisdiction of the United States, the holder or his employees, contractors, or agents of the contractors, shall be liable to third parties for injuries incurred in connection with the easement or permit area. Grants of easements or permits involving special hazards will impose liability without fault for injury and damage to the land and property of the United States up to a specified maximum limit commensurate with the foreseeable risks or hazards presented. The amount of no-fault liability for each occurrence is hereby limited to no more than \$1,000,000.
17. Permittee agrees that all or any part of the easement or permit granted may be terminated by the Chief, Division of Realty and Conservation Planning, for failure to comply with any or all of the terms or conditions of the grant, or for abandonment. A rebuttable presumption of abandonment is raised by deliberate failure of the holder to use for any continuous 2-year period the easement or permit for the purpose for which it was granted or renewed. In the event of noncompliance or abandonment, the Chief, Division of Realty and Conservation Planning will notify in writing the holder of the easement or permit of his intention to suspend or terminate such grant 60 days from the date of the notice, stating the reasons therefor, unless prior to that time the holder completes such corrective actions as are specified in the notice. The Chief, Division of Realty and Conservation Planning may grant an extension of time within which to complete corrective actions when, in his judgment, extenuating circumstances not within the holder's control such as adverse weather conditions, disturbance to wildlife during breeding periods or periods of peak concentration, or other compelling reasons warrant. Failure to take corrective action within the

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60-day period will result in a determination by the Chief, Division of Realty and Conservation Planning to suspend or terminate the easement or permit. No administrative proceeding shall be required where the easement or permit terminates under its terms.

18. If the Authorized Officer determines that an immediate temporary suspension of activities within a right-of-way or Permit area is necessary to protect public health and safety, cultural resources or the environment, including adverse impacts to fish and wildlife resources or for seasonal constraints and weather, including high fire danger, flooding, unusual resource problems or other significant problems or emergencies, the Authorized Officer may issue an emergency suspension order to abate such activities without an administrative hearing.
19. Permittee agrees to keep the Chief, Division of Realty and Conservation Planning and the Authorized Officer informed at all times of his address, and, in case of corporations, of the address of its principal place of business and the names and addresses of its principal officers.
20. Permittee agrees that in the construction, operation, and maintenance of the project, he shall not discriminate against any employee or applicant for employment because of race, creed, color, or national origin and shall require an identical provision to be included in all subcontracts.
21. Permittee agrees that the grant of the easement or permit shall be subject to the express condition that the exercise thereof will not unduly interfere with the management, administration, or disposal by the United States of the land affected thereby. The applicant agrees and consents to the occupancy and use by the United States, its grantees, permittees, or lessees of any part of the easement or permit area not actually occupied for the purpose of the granted rights to the extent that it does not interfere with the full and safe utilization thereof by the holder. The holder of an easement or permit also agrees that authorized representatives of the United States shall have the right of access to the easement or permit area for the purpose of making inspections and monitoring the construction, operation and maintenance of facilities.
22. The permittee shall take no action that interferes with subsistence activities of rural users or restricts the reasonable access of subsistence users to Refuge lands. This may include but is not limited to disturbance of wildlife and their movements near subsistence hunters, and damage to cabins, trails, traditional campsites or caches used by subsistence users.
23. Permittee understands and agrees that the easement or permit herein granted shall be subject to the express covenant that any facility constructed thereon will be modified or adapted, if such is found by the Chief, Division of Realty and Conservation Planning to be necessary, without liability or expense to the United States, so that such facility will not conflict with the use and occupancy of the land for any authorized works which may hereafter be constructed thereon under the authority of the United States. Any such modification will be planned and scheduled so

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as not to interfere unduly with or to have minimal effect upon continuity of energy and delivery requirements.

24. Permittee agrees that the easement or permit herein granted shall be for the specific use described and may not be construed to include the further right to authorize any other use within the easement or permit area unless approved in writing by the Chief, Division of Realty and Conservation Planning.
25. The Permittee and permittee's employees, coworkers, or contractors do not have the exclusive use of the site(s) or lands covered by this permit.
26. Permittee agrees that the Chief, Division of Realty and Conservation Planning reserves the right to grant additional rights-of-way or permits for compatible uses on or adjacent to rights-of-way or permit areas granted under this permit after giving notice to the Permittee and an opportunity to comment.

Construction/Installation

27. Permittee agrees that if construction is not commenced within two (2) years after date of right-of-way grant, the right-of-way may be canceled by the Chief, Division of Realty and Conservation Planning at his/her discretion.
28. Proof of construction/installation: Within two (2) weeks of completion of equipment installation, the Permittee shall provide to the Authorized Officer and the Chief, Division of Realty and Conservation Planning the following:
 - (a) verification of as-built coordinates of each site authorized by this permit; and,
 - (b) Photos of each site taken after completion of the installations.
29. The permittee is required to camouflage all installations so as to blend into the natural summer surroundings of the area, if requested by the Authorized Officer.
30. At all times, any bore holes and casings shall be covered to prohibit entry by wildlife.
31. The Permittee is responsible for obtaining all necessary State, Federal and/or Borough permits prior to the start of construction.

Disposal, transfer or termination of interest.

32. Change in jurisdiction over and disposal of lands. The final disposal by the United States of any tract of land traversed by a right-of-way shall not be construed to be a revocation of the right-of-

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way in whole or in part, but such final disposition shall be deemed and taken to be subject to such right-of-way unless it has been specifically canceled.

33. Transfer of easement or permit. Any proposed transfer, by assignment, lease, operating agreement or otherwise, of an easement or permit must be filed in triplicate with the Chief, Division of Realty and Conservation Planning and must be supported by a stipulation that the transferee agrees to comply with and be bound by the terms and conditions of the original grant. A \$25 nonreturnable service fee must accompany the proposal. No transfer will be recognized unless and until approved in writing by the Chief, Division of Realty and Conservation Planning.
34. Disposal of property on termination of right-of-way. In the absence of any agreement to the contrary, the holder of the right-of-way will be allowed 6 months after termination to remove all property or improvements other than a road and useable improvements to a road, placed thereon by him; otherwise, all such property and improvements shall become the property of the United States. Extensions of time may be granted at the discretion of the Chief, Division of Realty and Conservation Planning.

Invasive Species

35. Permittee shall be responsible at all times for preventing the introduction and spread of invasive species/non-native plants on the Refuges and any treatments required, should invasive species be discovered within or directly adjacent to the Permit area. The following preventative measures are required:
 - (a) The permittee shall be responsible for cleaning all conveyance, hand tools and power equipment for digging prior to transport to the permit area, and before leaving the permit area. Tools and power equipment which require cleaning include, but are not limited to, drill rigs and bits, shovels, augers, helicopters; all tools are included.
 - (b) Cleaning shall consist of removal of all soil and plant material from the tools and equipment. These actions are necessary to control the spread of non-native plants that may be spread by seed or other bits of their vegetation from site to site.
36. The permittee is responsible for ensuring that all employees, party members, aircraft pilots and other persons working for the permittee and conducting activities allowed by this permit are familiar with and adhere to the conditions of this permit.
37. All information, reports, photos, data, collections, and observations obtained as a result of this permit must be accessible from the permittee at any time upon request by the Service at no cost, unless specific arrangements are made to the contrary. The Service recognizes the proprietary nature of scientific data and will respect the researchers' privileged position regarding first publication. These data may be used in resource management decisions by the Service before

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their publication, however. Proprietary data of commercial value will be treated confidentially upon request, but may also be used in management decisions.

Helicopter Use/Notifications

38. The use of helicopters is authorized provided that:
- (a) Landing is prohibited except for the direct support of the activity covered by this permit and emergencies.
 - (b) No recreational use of helicopters is permitted.
 - (c) Clearing of vegetation for landing/takeoff is prohibited. Incidental hand removal of rocks and other minor obstructions may be permitted.
 - (d) Personnel transported are restricted to only those necessary to conduct the permitted research activities.
 - (e) Low level slinging of gear from site to site is prohibited.
39. **At least 3 business days prior** to beginning activities/scheduled trip(s) allowed by this permit, the Permittee shall provide notice by telephone or in person (during refuge working hours), to the Authorized Officers with the following information: (1) the name and method of contact for the field party chief/supervisor; (2) date(s) of site visit(s); (3) the aircraft and other vehicle types to be used, including identification information; (4) names of pilots; (5) names of all persons making the site visit(s); and (6) any changes to information provided in the original permit application.
40. Permittee shall provide advance notification to the Authorized Officer of any and all occurrences that require or necessitate emergency repairs/maintenance to the Project.
41. The Permittee's employees, contractors, subcontractors and any other individuals authorized to access the Project by the Permittee, are prohibited from utilizing the area for hunting, trapping and/or fishing except under the terms and conditions that apply to the general public for access for those activities. This permit does not authorize guiding-outfitting for fishing, bear, moose, caribou or other game species within the refuges.
42. Any action by a permittee or the permittee's employees that unduly interferes with or harasses refuge visitors or impedes access to any site is strictly prohibited. Examples of prohibited acts include, but are not limited to: a) parking aircraft or placing other objects (rocks, tents, etc.) on any area so as to restrict use by other aircraft; b) otherwise intentionally interfering in the activity of other refuge users; c) low flights over camps or persons at less than 500 feet (unless taking-off

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or landing); and d) engaging in activity that is contrary to state and federal laws. Ghost camps - unoccupied tents indicating the false use of an area - are prohibited.

43. The operation of aircraft resulting in herding, harassment, hazing, or driving of wildlife is prohibited. It is recommended that all aircraft, except for take-off and landing, and as necessary for safety, shall maintain a minimum altitude of 2000 feet above ground level (AGL).
44. When helicopters are used, a report shall contain a detailed summary of helicopter activities for inclusion in the Refuge helicopter landing database. The summary shall contain the following data:
 - Aircraft model
 - Operator company and/or ownership
 - Date and time of flights
 - Number of hours flown
 - Landing locations (GPS coordinates in decimal degrees)
 - Date and time of each landing
45. The Permittee shall not use any water source within the Project area without advance approval or use equipment under conditions and in manner that will, in the opinion of the Authorized Officer, damage lakes, streams, or fish and wildlife resources.

Wildlife

46. Wildlife shall not be harassed or intentionally approached closely enough to disrupt the animal's activity or to endanger human life. Permittee shall avoid harassing or interfering with non-game wildlife, including land animals, marine mammals, waterfowl, seabirds, and other migratory birds. There shall be no taking of any animal except in the case of defense of life and property. Any problems with wildlife, including human-wildlife interactions of the Permittee, and persons working under the authority of this permit, that have resulted in animals obtaining food; destroying property; or posing a threat to human safety shall be reported to the applicable Authorized Officer immediately or as soon as communication becomes available. A written report is required and must be submitted within 30 days to the Authorized Officer for all interactions with grizzly bears that have resulted in bears obtaining food; destroying property; posing a threat to human safety; or the death of a grizzly bear, so that this data can be used to help prevent future human-bear conflicts. You may use the Bear Incident Report form, which is attached hereto and designated Exhibit "D". Animals taken in defense of life or property shall be reported to the Refuge Manager immediately, and to the Alaska State Troopers at (907) 451-5350, and salvaged in accordance with State regulations.

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47. In the event that any previously undiscovered endangered, threatened, candidate species, or raptor nests are encountered at any point in time prior to or during the implementation of this project, the applicable Authorized Officer is to be consulted and appropriate conservation and/or mitigation measures implemented.
48. All food wastes will be stored in animal-proof containers and disposed of each time Permittee leaves the Project sites.

Violations

49. Should violation(s) of any general or special conditions of this Permit occur, or should operations result in adverse impacts to fish and wildlife resources and/or their habitat, cultural resources, and/or public safety, the Refuge Manager has stop work authority, and may revoke or revise this Permit at any time.

Fuel

50. **The storage of fuel on any of the Project Sites is prohibited.**
51. All activities will be conducted with due regard to the protection of all Wildlife Resources, in accordance with the directions and instructions of the Authorized Officer, and conduct all operations in such a manner as to prevent the erosion of the land, pollution of the water resources, and damage to the watershed. The Permittee will do everything necessary to prevent or reduce to the fullest extent reasonably possible the scarring of the land for the lifetime of this Permit.
52. All activities in connection with this Permit must not violate State and Federal laws applicable to air and water quality standards.

Hazardous Wastes

53. All hazardous wastes (as defined by the Resource Conservation and Recovery Act of 1976, as amended) will be stored, transported, and disposed in accordance with regulation requirements.
54. Burning of trash, solid waste or any other substances or materials is prohibited. All trash and non-petroleum solid waste imported to or generated on the Project will be hauled off the Refuge and disposed in accordance with 18 AAC 60 (Solid Waste Regulations) and with 18 AAC 62 (Hazardous Waste Regulations).
55. No discharge of petroleum products or toxic materials shall be made within the refuges. All hazardous substances utilized and/or generated by permitted activity shall be contained, controlled and cleaned up. Such measures shall take precedence over all other matters except human safety.

56. All spills or leakage of petroleum products or toxic materials, fires, fatalities, and any other conditions which threaten the refuges' resources, the environment, or human safety, shall be reported by the permittee to the Authorized Officer immediately or as soon as communication can be established.
57. The Service and Permittee jointly recognize and acknowledge that the site locations of the Project are undeveloped and undisturbed land free of any and all petroleum, metals and hazardous wastes. As such, soil tests for petroleum, non-naturally occurring metals and hazardous wastes prior to construction are not required to establish baseline values. Permittee is not relieved of any future responsibility or liability for the remediation, cleanup and or disposal of any petroleum, metal or hazardous waste contamination identified or discovered at any time during the life of this Permit.

Rehabilitation

58. Permittee agrees to restore the land to its natural, original, physical condition that existed prior to the disturbance, to the satisfaction of the Authorized Officer, so far as it is reasonably possible to do so upon revocation and/or termination of the easement or permit, unless this requirement is waived in writing by the Authorized Officer. Termination also includes permits or easements that terminate under the terms of the grant. Required restoration includes, but is not limited to:
 - (a) The removal from the sites of all devices/materials and manmade surface materials.
 - (b) The micro-topography is to be recontoured to look as natural as possible. For example, the cable trench will be filled in and displaced rocks and soil along the trench will be scattered instead of left in a linear ridge.
 - (c) When the station is decommissioned, all casings shall be cut to below grade, a permanent physical cap installed, and the cap covered to surrounding grade with native materials.
59. Consistent with 50 C.F.R. 25.21(h), the Authorized Officer may require Permit modifications at any future time to ensure compatibility with the use and occupancy of the land. Additional Permit conditions and stipulations may be added over the life of the Permit based on new information, technologies, or concerns.

Special Stipulations for Each Refuge (In addition to General Stipulations)

Each refuge has special site/refuge specific stipulations In addition to the special stipulations; Permittee must also comply with the General Stipulations listed above, which apply to all the refuges.

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AK Peninsula/Becharof National Wildlife Refuge:

60. **Helicopter flights will not be allowed during bear hunting season. Bear hunting season occurs in 2016 from May 10, 2016 to May 21, 2016.** Note: the dates for bear hunting season may vary from year to year. Permittee is responsible for checking on these dates prior to planning a site visit.
61. Should an eagle nest be found in the area of the installation, the applicant will be responsible to apply for a disturbance permit prior to continuing project activities (50 CFR 1 C).
62. Duration of the disturbances (flights/presence of humans) should **not exceed six days** over the five (5) years of this permit term.

Arctic National Wildlife Refuge:

63. **Installations shall not occur from mid-August through September,** due to high potential for conflict with subsistence users and hunters.
64. Installations shall be placed as far away as possible from airstrips and other known visitor access points. The installations should not be visible from traveled river corridors, airstrips, or other access points.
65. The operation of aircraft resulting in herding, harassment, hazing, or driving of wildlife is prohibited. It is recommended that all aircraft, except for take-off and landing, and as necessary for safety, shall maintain a minimum altitude of 2000 feet above ground level. During the specified time of year that installation is planned, caribou form large aggregations. Researchers and crew should take every possible attempt to avoid disturbing these aggregations.
66. Landings and installations will not occur when aggregations of caribou are present at or near an installation site. This is particularly important at site C27K1. If caribou are present when installation or maintenance is planned, care must be taken not to disturb, herd, harass, haze, or drive them, and landing and installation/maintenance must be delayed until caribou are no longer congregating at the site.
67. Permittees shall maintain their use areas in a neat and sanitary condition. Food, garbage, and other materials shall be stored to minimize attraction to bears and other wildlife. All evidence of your camp shall be obliterated prior to your departure from the site. Equipment and other property, including garbage, shall be removed from the Refuge upon completion of the season's permitted activities.

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68. Human waste shall not be left less than 150 feet from springs, lakes, and streams. Bury waste under soil (or under snow at the ground level during periods when the ground is frozen). Paper toilet tissue, if used, shall be packed out or burned completely to ash. Moist towelettes or sanitary products shall be removed as trash. In high use areas, especially the Kongakut and Hulahula river corridors and extended base-camps, we encourage packing-out of human waste.
69. Legal take and harassment of polar bears is limited to defense of life. Any killing or harassment of a polar bear in defense of life shall be reported to the Refuge Manager and to the US Fish and Wildlife Service Office of Law Enforcement at (907) 456-2335 immediately, as soon as communication becomes available. You are also required to submit a report to the Refuge Manager for all interactions with polar bears that have resulted in bears obtaining food; destroying property; posing a threat to human safety; or the death of a polar bear, so that this data can be used to help prevent future human-bear conflicts.
70. For activities occurring within 25 miles of the coast, the permittee shall read the Polar Bear Interaction Guidelines (Interaction Guidelines) attached to this permit as Exhibit "F". The Guidelines shall also be distributed to all employees and clients of the permittee before engaging in any activities on the Refuge. In addition, the following conditions shall be met:
- (a) When operating in springtime, protection of den sites and minimizing disturbance to sows with small cubs is of critical importance. Guides operating under this permit shall become knowledgeable of the signs and behaviors indicating the presence of a den and avoid those areas.
 - (b) No person shall approach, or remain, within 1 mile of a polar bear den, or of a sow with small cubs. If at any time the permittee becomes aware of signs indicating their close proximity to a polar bear den, or encounters a sow with small cubs, all members of the guided party shall immediately retreat to a distance of at least one mile. If, at any time, the location of a den becomes known to the permittee, no approach shall be made closer than one mile.
71. When operating within 25 miles of the Beaufort Sea coastline, the permittee will store attractants (human food, dog food, garbage, etc.) in "bear-resistant" containers to minimize attracting polar bears and avoid conditioning bears to human food. Containers shall be approved as "bear-resistant." Information about certified "bear resistant" containers can be found at <http://www.igbconline.org/html/container.html>.

Koyukuk-Nowitna-Innoko National Wildlife Refuge Complex

72. The Refuge assumes no responsibility for maintenance or upkeep of the monitoring sites.
73. The Refuge is not obligated to attempt to save installations from wildfire.

RMB

The Secretary of the Interior, acting by and through her authorized representative has executed this permit, known as M-349-AM, for the United States of America on this 26th day of

May, 2016.



U.S. Fish and Wildlife Service
for Chief, Division of Realty and
Conservation Planning

ACKNOWLEDGMENT

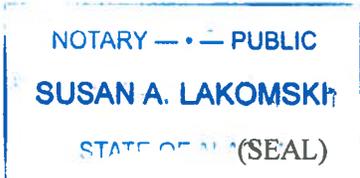
STATE OF ALASKA)

) ss:

THIRD JUDICIAL DISTRICT)

THIS IS TO CERTIFY that on the 26th day of MAY, 2016, before me, a Notary Public in and for the State of Alaska, duly commissioned and sworn as such, personally appeared Diana Biesanz, known to me to be the ^{Acting} Chief, Division of Realty and Conservation Planning, Region 7, U.S. Fish and Wildlife Service, who executed the within instrument and who acknowledged to me that the same was signed freely and voluntarily for the uses and purposes therein stated.

WITNESS my hand and notarial seal the day and year first above written in this certificate.





Notary Public in and for Alaska

My commission expires:



Attachment A: PoD

General Project Summary

From 2003 to 2013 the EarthScope: Transportable Array (USArray) installed over 1,700 seismometer stations across the continental United States and southern Canada in a dense semi-permanent array at a 70 km (42 mile) grid spacing. The USArray is one segment of EarthScope, an extensive earth science research project funded by the National Science Foundation. The USArray is operated by the Incorporated Research Institutions for Seismology (IRIS), a nonprofit 503C founded in 1984 that is a consortium of over 100 US universities dedicated to the operation of science facilities for the acquisition, management, and distribution of seismological data.

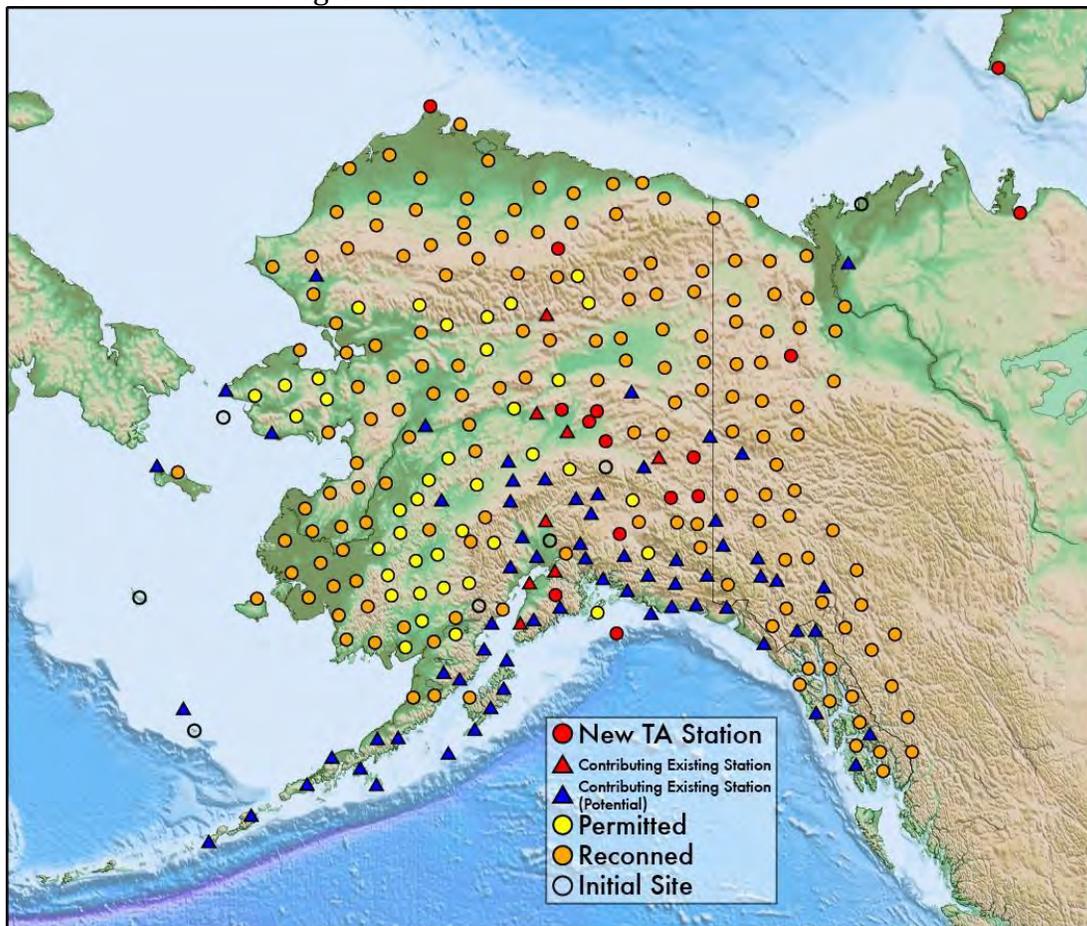


Figure 1: Proposed sites for the EarthScope: Transportable Array in Alaska, based on 2013 and 2014 reconnaissance efforts. Note that actual station locations are subject to permit approval.

Following the completion of the seismic installations in the lower 48 states, the EarthScope: Transportable Array project is beginning work in Alaska. This project consists of a large deployment (approximately 294) of ground motion sensors (seismometers) throughout Alaska and western Canada at a nominal spacing of 85 km (51 miles) over the next 4 years. See www.usarray.org/alaska and Figure 1. Stations will remain in place for up to 5 years,

at which time the equipment will be recovered and sites will be restored to their original state. Rolling station removals are expected to start in 2018.

USArray is seeking participation from private landowners (~20 sites), state (DNR ~50 sites) and federal agencies (BLM ~20, NPRA ~15, FWS ~20, and NPS ~5 sites), Tribal Governments/Councils, First Nations, and Native Corporations (~30 sites) to help accomplish this unprecedented research and public education project. USArray has been in communication with these groups since 2011.

Purpose and Need

One of the main objectives of the project is to improve our understanding of the active tectonics and geologic history of the North American continent. EarthScope: Transportable Array will create images of the deep structure of the earth, from depths of about 5 km to the core of the earth. The instruments are spread too far apart to provide detailed imaging commonly used for exploration for oil and gas (whose drills go less than 4 km deep).

Further science objectives and rationale for the deployment of this large array are explained in a 63--page report found at:

http://www.iris.edu/hq/Alaska_Workshop_2011/report.phph

The seismometers record earthquakes that occur locally, regionally, and throughout the world. The unique value of data produced from this array is due to the large area covered, and to the dense, regular spacing of hundreds of high---quality seismometers. Data from these stations are open and freely available and are forwarded immediately to USGS National Earthquake Information Center in Golden CO, Alaska Earthquake Center at UAF, the Canadian Hazard Information Service in Ottawa, the Alaska Volcano Observatory, and NOAA's Tsunami Warning Center and distributed to hundreds of researchers worldwide. The data help scientists gain new insights into earthquake processes and source characteristics, expand our understanding of earthquakes and lower crustal processes, and improve earthquake and tsunami warning systems for hazard mitigation.

The locations proposed in Alaska will supplement or enhance existing seismic stations currently operated by the Alaska Earthquake Center (AEC), Alaska Volcano Observatory (AVO), and the Tsunami Warning Center (TWC). About a dozen seismic stations will be co---located with existing GPS stations constructed by the EarthScope: Plate Boundary Observatory (PBO). As the stations become operational, some of the partnering networks may seek to retain certain stations. These stations would be left in place, becoming a part of Alaska's permanent seismic monitoring network. It is difficult to predict the number and locations of these selections or the funding levels of the partnering networks, but USArray will work with agencies to adapt permits where possible and to accommodate the enhanced observational capability the seismic network.

A) Type of System or Facility

A continuously operating seismic station that will consists of a seismic sensor, electronics, radio antenna, and a surface mount communication module. The general design and construction of the USArray stations will be uniform for all site locations across the state.

Slight variations may be required for individual sites based on local and environmental conditions.

Sites were selected based on a number of criteria:

- Maintaining a grid spacing of approximately 85 km between stations.
- Selecting geologic conditions that would maximize the quality of the signal recorded, e.g. bedrock and/or permafrost.
- Avoiding conditions that would degrade the signal quality (e.g. generators, towers, trees) or reduce solar panel effectiveness.
- Wherever possible pre-disturbed locations were favored.
- Radio Line-of-sight, strong signal strength of satellite communications, or direct access to wireless, radio, broadband, or satellite hookups.

B) Related Structures and Facilities

The typical USArray station will occupy a footprint not to exceed 20 x 20 feet (6 x 6 meters), with a low physical profile. The equipment does not produce any noise or motion. To protect the sensor and reduce interference from surface noise, the seismometer will be placed in a PVC or steel cased hole 3 to 15 feet (1 to 5 meters) below the surface of the ground. The PVC or steel casing is secured in place by grout. The hole will either be augured or drilled via a helicopter sling/transportable drill, will be 6 inches (15 cm) in diameter, and extend only 6 inches above grade. Ground conditions at the site will dictate hole depth and creation technique. Additionally, a soil temperature string probe will be installed roughly 3 feet from the seismometer, within a ~1" diameter hole, at a depth of 3 to 15 feet. The hole will be created with the same drill machine or with air driven hand tools. This collaborative science activity is contingent on funding and approvals from NASA.



Figure 2: Left Image: Typical station configuration, with the borehole sensor within PVC casing (prior to trimming) in the foreground and grey hut enclosure in the background. Right Image: Alternate station configuration, with box enclosures and anchoring/mounting frame.

At most USArray stations, the electronics and power system will be housed in an above ground---insulated enclosure. The most common enclosure is a grey hut, measuring approximately 5'x5'x7'H, and made of fiberglass that can be painted to blend in with the form, line, and color of the surrounding landscape (Figure 2). Solar panels are mounted directly to the hut. The alternate station configuration consists of boxes/containers, which are secured to a frame, and anchored to the ground; this frame will also serve as the mount for the solar panel. Additionally, weatherproof informational signage will be placed on enclosures (Figure 3).



Figure 3: Example of informational signage to be placed on hut enclosure.

The enclosure will house a power system comprising 1400AH of rechargeable lithium ion and lead---acid AGM batteries charged by solar panels*. The solar panels will be mounted on the outside of the hut or on a vertical bracket attached to the base frame. The batteries inside the enclosure will power a [Quanterra Q330](#) datalogger connected to a three---component broadband seismometer (STS---4B, STS---5A, T120PH, or CMG---3T) residing in the augured or drilled hole. Ground motion data is recorded continuously at up to 40 samples per second. Average power of the entire system is about 7 watts.

A standard USArray atmospheric sensor package containing a MEMS barometer, a Hyperion IFS---4232 infrasound sensor ([hyperiontg.com](#)), and a [Setra 278](#) microbarograph ([setra.com](#)) will be included at each station. When present, weather station sensors will be mounted on top of the hut or on the enclosure support frame. Additional sensors that could be deployed at some stations as part of collaborative projects include a strong--- motion accelerometer, and/or soil temperature profiler. Weather and pressure data is recorded at 1 sample every second, with infrasound also recorded at 40 samples per second. The UTC accuracy of time labels, which is required for seismology, is unusual in weather monitoring.

* Fuel cells are NOT being considered at any of these stations/sites.



Figure 4: Station I23K: Inside hut enclosure: Battery system, sensors, data cables, etc.

Power and data cables from the seismometer to the enclosure will be run through conduit and either placed in trenches or anchored to rock surface. The trenches will be backfilled after all cables have been secured and tested (Figure 5).



Figure 5: Typical trenching (left image: at soft sediment location) or anchoring (right image: at hard rock location) of sensor cable conduit

Data from the stations will be transmitted to the Internet via cell modem, radio links or through a satellite link and received at the USArray Network Facility at UC San Diego Super Computing Center for processing, and archived at the IRIS Data Management Center in Seattle, Washington. All data are freely available to the public and to scientific researchers (<http://usarray.seis.sc.edu/index.html>). Data will not be transmitted within the licensed frequency spectrum.

C) Physical Specifications

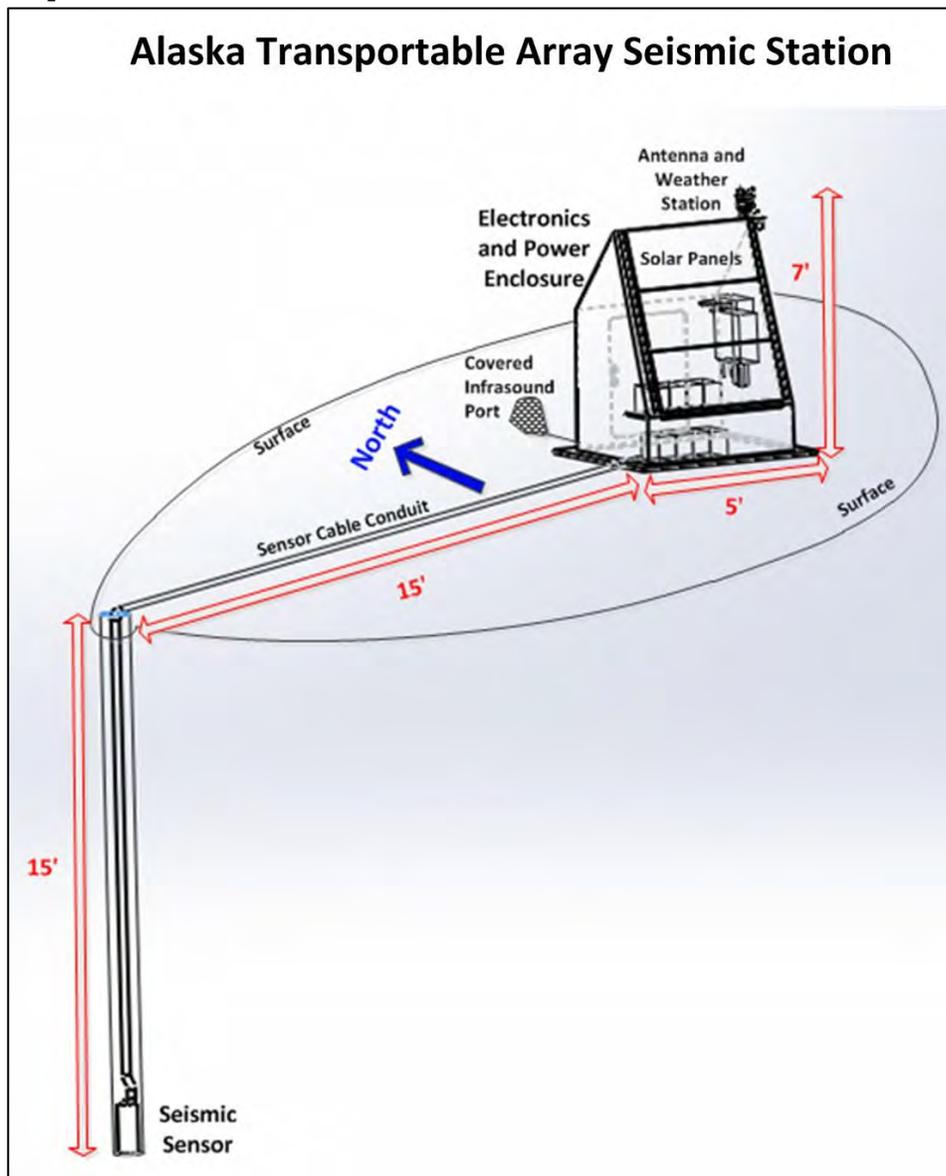


Figure 6: Specification of a USArray seismic station with borehole sensor connected to hut enclosure via sensor cable conduit.

D) Term of Years Needed

In 2011, roughly 294 initial sites were identified within predetermined 20km areas. 2013 and 2014 field reconnaissance efforts refined these locations to within a few meters of the actual site location, and in some cases provided several alternate locations. With the actual sites located, efforts have moved to permitting and install logistics. As of fall 2014, 25 stations have been installed and/or incorporated into the array. The general proposed schedule for all future station installations over the next few years is depicted in Figure 7. For specific station installation schedules refer to "Attachment B".

Stations will be installed between mid--May and mid--October, as weather permits. Once a station has been installed it will operate continuously for ~5 years. After this time period

stations will be decommissioned/removed. As mentioned, there is a possibility that partnering networks would seek the take over a few of these stations.

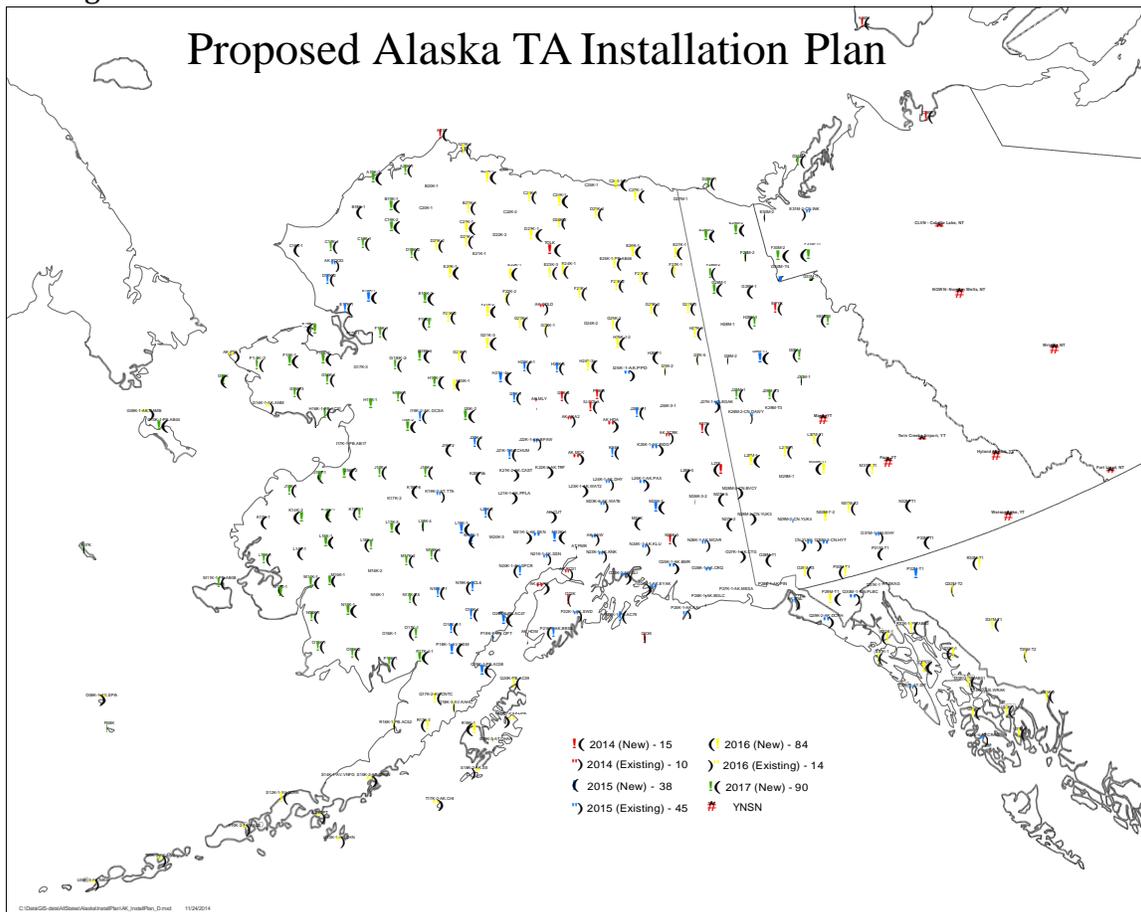


Figure 7: Location of sites based on 2013 and 2014 field reconnaissance work. Sites in red are installed seismic stations. Sites with square symbols are existing seismic stations that we anticipate being incorporated into the array. All other sites follow the installation plan. Note: Install plan has not been finalized.

E) Time of Year of Use or Operation

As mentioned above, stations will be installed between mid--May and mid--October, as weather permits. Once a station has been installed it will operate continuously until 2018--2019. Although, stations run continuously, the equipment does not produce any noise or motion.

F) Volume or Amount of Product to be Transported

| Installation Equipment | Description and Purpose |
|---------------------------|--|
| Helicopter Portable Drill | ---Lightweight multipurpose (V1), or single purpose (V2) drill --Uses auger or downhole hammer drill bits --Creates 6 inch wide, 3 to 15 feet deep borehole ---Weight = 1050 lbs machine, 250 lbs casing, tools, grout Or 1300lbs total (480kg+110kg supplies) |

| Equipment | Description and Purpose |
|---------------------------------------|--|
| Air Compressor | <ul style="list-style-type: none"> ---Lightweight, helicopter portable, required for downhole hammer drilling with the V1 drill --Compressor included with the V2 drill --Weight = 600 lbs (270 Kg) |
| Electronics Enclosure | <ul style="list-style-type: none"> ---4' L x 5' W x 7' H enclosure hut with 3, 90w solar panels installed for battery charging ---May include external mast that will extend 2---3' beyond the roofline of the hut for data telemetry antennas and/or meteorological instrumentation |
| AGM Batteries | <ul style="list-style-type: none"> ---Each site will have ~4, 100ah non---hazardous AGM batteries for augmenting station power. --Weight = 70 lbs each (30 Kg) |
| Lithium Iron Phosphate Batteries | <ul style="list-style-type: none"> ---Each site will have 6 or 8, 180ah Lithium Iron Phosphate batteries for powering station electronics. --Weight = 60 lbs each (26 Kg) |
| Broadband Seismometer | <ul style="list-style-type: none"> ---Each site will have a single 6" diameter broadband seismometer installed downhole. |
| Other miscellaneous station equipment | <ul style="list-style-type: none"> --2" diameter liquidite conduit. ---Sensor cable will be installed in steel lined liquidite conduit to protect it from environmental damage. ---Collaboratory science soil temperature probe is contingent on their funding |

Table 1: List of installation equipment: Note: See section "B) Related Structures and Facilities" for the description, purpose, and amount/volume related to the station equipment.

G) Duration and Timing of Construction

Installation: As mentioned above, stations will be installed between mid---May and mid---October, as weather permits. The installation team will require access to each site for ~2 days which may not be contiguous due to weather. A lightweight auger/drilling machine with the ability to both auger and drill holes will be transported via fixed wing or helicopter to sites that cannot be accessed by road. The mode of transportation to each proposed site can be found in "Attachment B", while Table 2 describes the rough details, average number of trips, and average fuel requirement for a single station installation, and Figure 8 depicts a typical station installation scenario. Two to three field staff will create the hole (~6 inch diameter and 3---15 feet deep) and install 6" PVC or steel casing. Water required for grout will be transported to remote sites by aircraft, or by truck to sites near a road. Care will be taken to minimize ground disturbance at the site. Construction of a station will take ~4---6 hours. Installation of the electronics may proceed immediately, but is often performed on a separate day within a week of construction and subject to weather conditions.



Figure 8: Typical station installation. Left Image: Drill rig with downhole drill attachment. Right Image: Securing of PVC pipe casing and lowering of borehole sensor.

Maintenance: The seismometer and other equipment will operate continuously. Routine maintenance will be performed remotely. If the equipment malfunctions, the problem can be identified at the data processing center. On rare occasion maintenance trips may be necessary to correct the problem and in such cases the landowner/agency would be contacted. Most often maintenance issues are related to power (blocked panels or dead batteries) or radio antennas.

Removal: Removal of stations would occur in 1 day, and involves the removal of the hut enclosure (and contents), sensor cable conduit, and borehole seismic sensor. The PVC or steel casing would be left in place, but cut about ~1 foot below the surface and buried/covered with local sediments/native materials. It is common practice for USArray to provide the landowner/agency with a Station Removal Report.

General Information:

Installation, maintenance, and removal of a station require 30 feet of workspace in all directions around the borehole and hut enclosure assemblies.

*Note: Fuel WILL NOT be stored on the sites located within Alaska National Wildlife Refuges

EarthScope: Transportable Array recognizes their responsibility to respect the property and privacy of landowners, the obligation to operate all stations safely and securely, while assuming full liability if the equipment is damaged or stolen. The landowner/agency will be held harmless for any loss or injury involved with the EarthScope project. Additionally, EarthScope will adhere to all site-specific stipulations issued by the landowner/agency concerning the construction and timeframe related to the installation, maintenance, and removal of stations.

H) Temporary Work Areas Needed for Construction

Field Camps: The establishment of field camps is not expected at this time. Field crews will be staying overnight in local communities.

Staging Areas/Hubs: Wherever possible staging areas/hubs will be established in local communities and are tentatively denoted in Attachment B.

Flight Paths: Flights will be planned to conform to all local flight restrictions and will be as direct as possible (between hubs and site locations), without compromising safety. When taking off and climbing out of airports or site locations, climbing to cruise will be completed as quickly as possible to minimize disturbance in the surrounding areas. In general, and when possible, cross country flights will be made at high cruise altitudes to minimize disturbance to areas below the flight path.

Fire Safety SOP: These procedures cover fire prevention and response for USArray employees completing site installations for the EarthScope: Transportable Array project.

- Sites located in the vicinity of active wildfires will not be completed until the Field Operations Manager has evaluated the site area for the safety of the crews and equipment. Excessive smoke, low visibility, or the potential for active wildfire will cause the site installation to be postponed.
- Prior to welding, grinding, or other "hot work" activities, the site must be cleared of all flammable material, including vegetation. If clearing is not possible, station equipment will be returned to a hub community or other safe location for "hot work" before being returned to the installation site.
- A fire extinguisher will be stored in each helicopter supporting field operations, and a fire extinguisher and shovel will be stored in the drill rig tool kit.
- On discovery of fire at the installation site, the site will be immediately evaluated for personnel safety. If possible, the fire should be safely extinguished using the on-site fire fighting equipment.
- If the fire cannot be safely extinguished using on-site equipment, crews must vacate the area and inform the Field Operations Manager via radio or sat phone immediately.
- Wildfires and potential wildfires will be immediately reported to Alaska Fire Service at the Alaska Interagency Coordination Center at 1-800-237-3633.

- *Any release of a hazardous substance must be reported* as soon as the person has knowledge of the discharge.
- OIL/PETROLEUM RELEASES:
 - TO WATER: Any release of oil to water must be reported as soon as the person has knowledge of the discharge.
 - TO LAND: Any release of oil in excess of 55 gallons must be reported as soon as the person has knowledge of the discharge. Any release of oil in excess of 10 gallons but less than 55 gallons must be reported within 48 hours after the person has knowledge of the discharge. A person in charge of a facility or operation shall maintain, and provide to the Department on a monthly basis, a written record of any discharge of oil from 1 to 10 gallons.
 - TO IMPERMEABLE SECONDARY CONTAINMENT AREAS: Any release of oil in excess of 55 gallons must be reported within 48 hours after the person has knowledge of the discharge.

Waste Disposal SOP: In the event that public facilities are available for the disposal of any waste mentioned herein, e.g. waste transfer stations, recycling centers, sewer/septic systems, gray water systems, etc., USArray crew members will adhere to local laws regarding disposal of waste. In the event that public facilities are not available at or near the work site, disposal will be conducted as described in this SOP.

- Human Waste – Human waste will be disposed of in typical backcountry "catholes" dug at least 6 inches deep and at least 200 feet away from any body of water.
- Food Scraps – Food scraps will be limited at the work site, but any waste of this type will be collected in plastic bags or containers at the work site. These waste items may be stored at an active work site in bear---proof containers and will be removed to a public waste transfer station at the earliest opportunity.
- Non---Hazardous Waste – All trash, construction debris, and other non---hazardous solid waste will be collected in plastic bags or containers at the work site. These waste items may be stored at an active work site and will be removed to a public waste transfer station at the earliest opportunity.
- Universal Hazardous Waste – Batteries or lamps/bulbs considered to be hazardous will be collected as individual units or in plastic bags or containers, depending on size, at the work site. These waste items will be removed to processing facilities in Anchorage or Fairbanks at the earliest opportunity.
- Oily Waste – Fuel, oil, or related waste items will be collected in designated oily waste bags at the work site. These waste items may be stored at an active work site in bear---proof containers and will be removed to processing facilities in Anchorage or Fairbanks at the earliest opportunity.
- No waste items of any type will be stored at any inactive or completed work site.

Emergency Response Plan SOP: See Attachment C

Additional Attachments:

- *Attachment B:* Site list with coordinates, legal descriptions, install information, notes and correlating site map
- *Attachment C:* Emergency Response Plan
- *Attachment D:* NEPA considerations
- *Attachment E:* List of previous ROW applications related to project
- *Attachment F:* Individual site recon reports and maps

Information and Outreach:

A significant portion of the funding for this project is dedicated to public outreach. EarthScope and its partners have developed activities, lesson plans, map tools, visualizations --- and much more --- to help students and teachers work with EarthScope data and scientific results. EarthScope materials include teachable moments, research summaries, links to research projects, and interactions with EarthScope scientists and staff. For more information on the EarthScope project, please review the links below:

<http://www.usarray.org/researchers/obs/transportable>

<http://www.nature.com/news/us-seismic-array-eyes-its-final-frontier-1.14099>

www.popsoci.com/science/gallery/2011-07/big-science-universes-ten-most-epic-projects?image=9

www.earthscope.org

<http://www.earthscope.org/science/observatories>

<http://www.earthscope.org/resources>

www.nature.nps.gov/geology/earthscope



Alaska Transportable Array Field Notes for Recon Report

GENERAL

SITE: R17K-2

DATE: 2014/05/29

TIME: 1016

PERSONNEL: Isaac Rowland, PE

MEANS OF ACCESS: Helicopter

WEATHER: 50F, rain, wind S 30 mph

LOCATION

LANDMARK: Ugashik Creek

COORDS (WGS84): N 57.63981⁰ W 156.38708⁰

ELEV (FT): 955

SITE DESCRIPTION

LAND OWNER/MANAGER: Native - Regional

CLASSIFICATION: Primary

GENERAL DESCRIPTION:

Top of rock hill below larger mountain. Located just inside Koniag land.

VEGETATION (TYPE & COVERAGE):

None

TERRAIN FEATURES:

Bare hilltop

SLOPE AND ASPECT:

10* N

SOIL TYPE PERMAFROST DEPTH AND/OR BEDROCK DEPTH:

Highly weathered sandstone bedrock

OTHER:**WATER TABLE (EST):**

N/A

ACCESS

ACCESS TYPE: Helicopter

FIXED WING ACCESS FOR SERVICE: N/A

NEAREST HUB:

King Salmon

AIRSTRIPE CODE:**LZ CLEARING REQUIRED:**

None

STATION CLEARING REQUIRED:

None

POSSIBLE ACCESS RESTRICTIONS (TRAVEL ON FROZEN TUNDRA, BIRD NESTING, CARIBOU MIGRATION):



Alaska Transportable Array Field Notes for Recon Report



| SENSOR EMPLACEMENT | |
|--|------------------------------|
| INSTALLATION METHOD: Down Hole Hammer | |
| WATER SOURCE FOR DRILLING: None | |
| ANCHOR SYSTEM: | EXPECTED DEPTH: 3m |

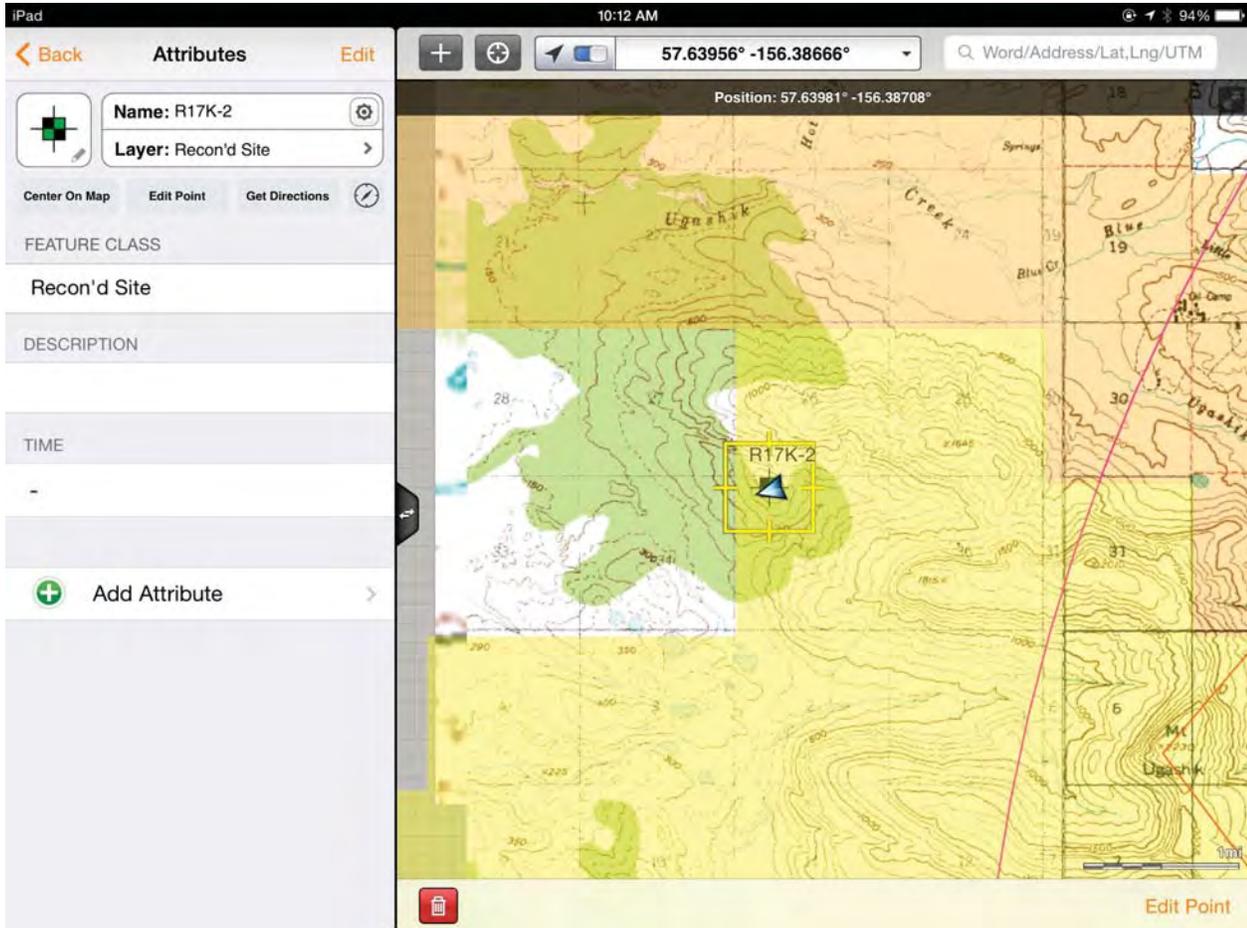
| ANTICIPATED STATION PLAN | |
|---|--|
| EQUIPMENT LOCATION OPTIONS: Stand alone enclosure | POWER SUPPLY: Stand alone power supply |
| EST WINTER SNOW DEPTH: | NOISE OR WILDLIFE FACTORS: Brown bears |

| ANTICIPATED DATA COMMUNICATION | |
|--------------------------------------|------------------------------------|
| METHODS AVAILABLE: BGAN | RADIO LINE OF SIGHT: N/A |
| CONTACTS OR PROVIDERS: N/A | |

Alaska Transportable Array Field Notes for Recon Report

| | | | | | |
|--------------------|---------------------------|--------------------------|---------------------------|--------------------------|-----------------------|
| CAMERA TIME: 1012 | | START INDEX: 0559 | | END INDEX: 0567 | |
| GPS 0559 | LOOK NORTH 0560 | LOOK EAST 0561 | LOOK SOUTH 0562 | LOOK WEST 0563 | AERIAL 0567 |

VICINITY/GPS



The screenshot shows a mobile application interface for a GIS project. On the left, there is a sidebar with the following elements:

- Attributes** (with an **Edit** button)
- A green crosshair icon
- Name:** R17K-2
- Layer:** Recon'd Site
- Buttons: **Center On Map**, **Edit Point**, **Get Directions**
- FEATURE CLASS:** Recon'd Site
- DESCRIPTION:** (empty field)
- TIME:** -
- Add Attribute** button

The main map area displays a topographic map with contour lines. A point labeled **R17K-2** is highlighted with a yellow square and a blue arrow. The map includes labels for **Ugnashik Creek**, **Blue 19**, and **Ugnashik**. At the top of the map area, the coordinates **57.63956° -156.38666°** are shown, along with a search bar containing **Word/Address/Lat,Lng/UTM**. The position **57.63981° -156.38708°** is also displayed. At the bottom right of the map, there is an **Edit Point** button.

Alaska Transportable Array Field Notes for Recon Report

NORTH

Date & Time: Thu May 29 10:13:25 AKDT 2014
Position: +057.63952° / -156.38663°
Altitude: 937ft
Azimuth/Bearing: 354° N06W 6293mils (True)
Elevation Angle: -16.5°
Horizon Angle: +03.9°
Zoom: 1X



NOTES:

EAST

Date & Time: Thu May 29 10:13:44 AKDT 2014
Position: +057.63962° / -156.38672°
Altitude: 932ft
Azimuth/Bearing: 097° S83E 1724mils (True)
Elevation Angle: -05.1°
Horizon Angle: +02.4°
Zoom: 1X



NOTES:

SOUTH

Date & Time: Thu May 29 10:14:01 AKDT 2014
Position: +057.63966° / -156.38657°
Altitude: 926ft
Azimuth/Bearing: 180° S00W 3200mils (True)
Elevation Angle: -02.2°
Horizon Angle: +00.5°
Zoom: 1X



NOTES:

Alaska Transportable Array Field Notes for Recon Report

WEST

Date & Time: Thu May 29 10:14:20 AKDT 2014
Position: +057.63957° / -156.38647°
Altitude: 926ft
Azimuth/Bearing: 273° N87W 4853mils (True)
Elevation Angle: -04.5°
Horizon Angle: +03.6°
Zoom: 1X



NOTES:

AIR

Date & Time: Thu May 29 10:31:42 AKDT 2014
Position: +057.63799° / -156.39183°
Altitude: 1034ft
Azimuth/Bearing: 063° N63E 1120mils (True)
Elevation Angle: -11.0°
Horizon Angle: +02.3°
Zoom: 1X



NOTES:

#

ADDITIONAL PHOTOS**NOTES:**

ROCK AT SURFACE

Photo 0564

#

ADDITIONAL PHOTOS



NOTES:

Rock typical of site
Photo 0565



Alaska Transportable Array Field Notes for Recon Report

| GENERAL | | |
|---|--|------------------------------------|
| SITE: C27K-1 | DATE: 140705 | TIME: 1345 |
| PERSONNEL: Steve Rowland, PE | | MEANS OF ACCESS: Helicopter |
| WEATHER: overcast, some fog | | |
| LOCATION | | |
| LANDMARK: Jago River | COORDS (WGS84): N 69.62636 ⁰ W 143.71142 ⁰ | ELEV (FT): 1234 |
| SITE DESCRIPTION | | |
| LAND OWNER/MANAGER: FWS | | CLASSIFICATION: Primary |
| GENERAL DESCRIPTION: AERIAL RECON ONLY - No landing due to critical habitat area restrictions! Site on south side of east-west trending ridge (Bitty Mtn). Jago River 1 mi to East. Arctic National Wildlife Refuge - near/within FWS-designated critical habitat area. 4 mi from Mollie Beattie Wilderness border. | | |
| VEGETATION (TYPE & COVERAGE): Sparse lichen and moss | TERRAIN FEATURES: East-west ridge slopes down to south, rolling hills to north | |
| SLOPE AND ASPECT: | SOIL TYPE PERMAFROST DEPTH AND/OR BEDROCK DEPTH: | |
| OTHER: | WATER TABLE (EST): N/A | |
| ACCESS | | |
| ACCESS TYPE: Helicopter | | |
| FIXED WING ACCESS FOR SERVICE: N/A | | |
| NEAREST HUB: Kaktovik 35 mi to north | AIRSTRIP CODE: | |
| LZ CLEARING REQUIRED: None | STATION CLEARING REQUIRED: None | |
| POSSIBLE ACCESS RESTRICTIONS (TRAVEL ON FROZEN TUNDRA, BIRD NESTING, CARIBOU MIGRATION): ANWR critical habitat | | |



Alaska Transportable Array Field Notes for Recon Report



| SENSOR EMPLACEMENT | |
|--|------------------------|
| INSTALLATION METHOD: Down Hole Hammer | |
| WATER SOURCE FOR DRILLING: None | |
| ANCHOR SYSTEM: Rock bolts | EXPECTED DEPTH: |

| ANTICIPATED STATION PLAN | |
|---|--|
| EQUIPMENT LOCATION OPTIONS: Stand alone enclosure | POWER SUPPLY: Stand alone power supply |
| EST WINTER SNOW DEPTH: | NOISE OR WILDLIFE FACTORS: None |

| ANTICIPATED DATA COMMUNICATION | |
|--|------------------------------------|
| METHODS AVAILABLE: BGAN not verified | RADIO LINE OF SIGHT: N/A |
| CONTACTS OR PROVIDERS: N/A | |

Alaska Transportable Array Field Notes for Recon Report

| | | | | | |
|--------------------------|---------------------------|--------------------------|--------------------------|-------------------------|----------------------------|
| CAMERA TIME: 1343 | | START INDEX: 1067 | | END INDEX: 1070 | |
| GPS GPS_C27K-1 | LOOK NORTH 1070 | LOOK EAST n/a | LOOK SOUTH n/a | LOOK WEST n/a | AERIAL 1067-1070 |

VICINITY/GPS

NORTH

Date & Time: Sat Jul 5 13:44:34 AKDT 2014
Position: 069.62354°N / 143.68796°W
Altitude: 1225ft
Azimuth/Bearing: 350° N10W 6222mils (True)
Elevation Angle: -05.2°
Horizon Angle: +03.1°
Zoom: 1X
Jago

C27K-1



NOTES:

AERIAL VIEW TO NORTH
Photo 1070

Alaska Transportable Array Field Notes for Recon Report

Date & Time: Sat Jul 5 13:44:14 AKDT 2014
Position: 069.62632°N / 143.68308°W
Altitude: 1205ft
Azimuth/Bearing: 229° S49W 4071mils (True)
Elevation Angle: -14.0°
Horizon Angle: +00.4°
Zoom: 1X
Jago

C27K-1

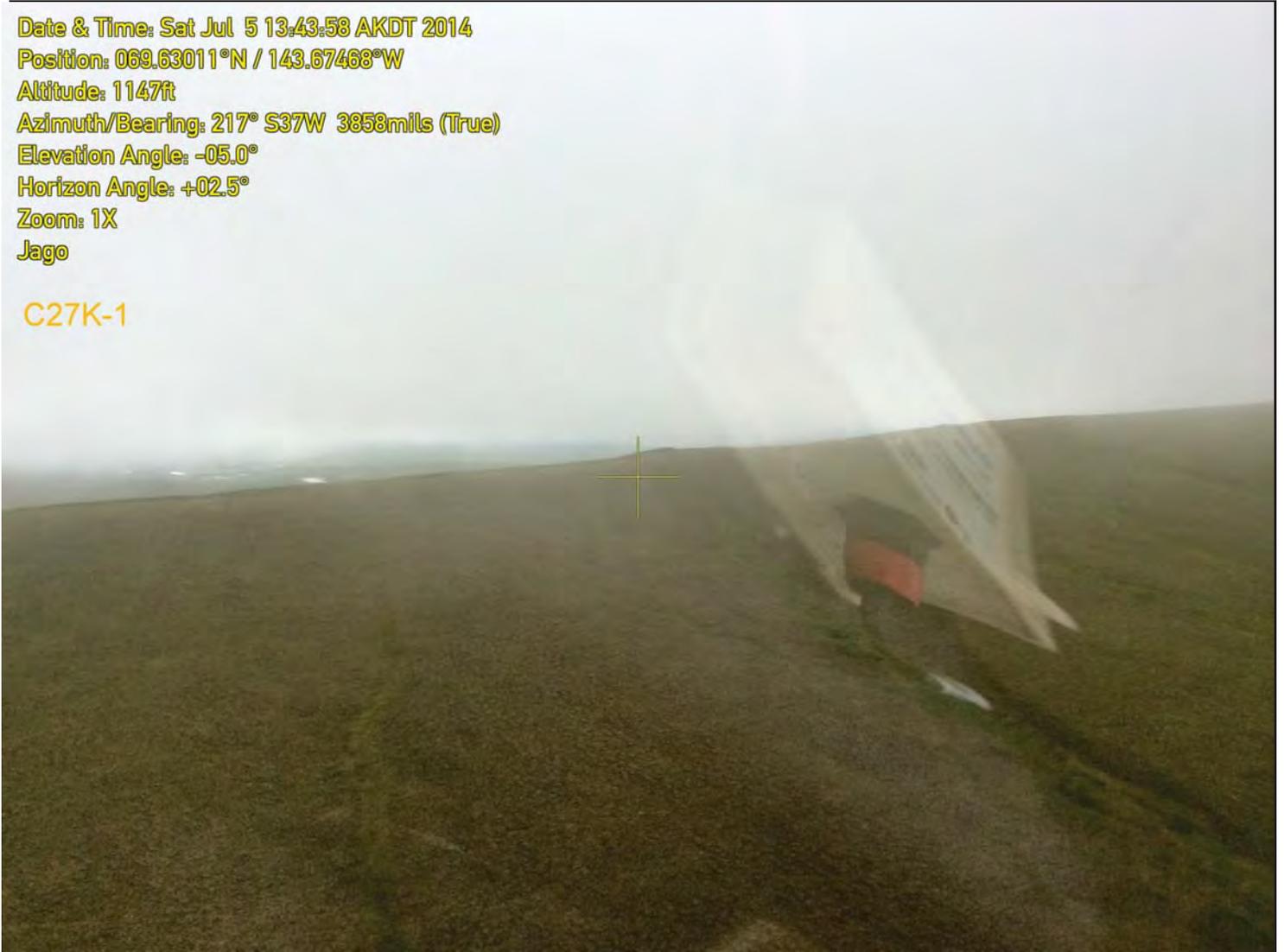


NOTES:

AERIAL VIEW
Photo 1069

Date & Time: Sat Jul 5 13:43:58 AKDT 2014
Position: 069.63011°N / 143.67468°W
Altitude: 1147ft
Azimuth/Bearing: 217° S37W 3858mils (True)
Elevation Angle: -05.0°
Horizon Angle: +02.5°
Zoom: 1X
Jago

C27K-1



NOTES:

AERIAL VIEW
Photo 1068

Date & Time: Sat Jul 5 13:43:49 AKDT 2014
Position: 069.63314°N / 143.66939°W
Altitude: 1131ft
Azimuth/Bearing: 194° S14W 3449mils (True)
Elevation Angle: -11.0°
Horizon Angle: +00.2°
Zoom: 1X
Jago

C27K-1



NOTES:

AERIAL VIEW
Photo 1067



Alaska Transportable Array Field Notes for Recon Report



| GENERAL | | |
|---|--|------------------------------------|
| SITE: E27K-1 | DATE: 140613 | TIME: 1250 |
| PERSONNEL: Steve Rowland, PE | | MEANS OF ACCESS: Helicopter |
| WEATHER: Clear, light wind, NE 50 | | |
| LOCATION | | |
| LANDMARK: Bilwaddy Creek | COORDS (WGS84): N 68.18620 ⁰ W 141.59575 ⁰ | ELEV (FT): 2100 |
| SITE DESCRIPTION | | |
| LAND OWNER/MANAGER: FWS | | CLASSIFICATION: Primary |
| GENERAL DESCRIPTION: FLY BY RECON ONLY! No landing due to ANWR access conditions. Site is on nose of barren south trending ridge. Suitable area for drill and hut setup. Helipad adjacent to site. Rock outcrops in vicinity and at site. Good site with limited shelter from wind. Good south exposure. 2 mi SW west of Bilwaddy Creek. Excellent drainage and good footing. Arctic NWR. | | |
| VEGETATION (TYPE & COVERAGE): Sparse lichen and moss with outcrop in area. Sparse spruce and light brush below ridge crest. | TERRAIN FEATURES: Range of low broad hills between major drainages. Site on nose of south trending ridge.. | |
| SLOPE AND ASPECT: Slope with line of ridge appears <10 deg | SOIL TYPE PERMAFROST DEPTH AND/OR BEDROCK DEPTH: Rock type not verified. Appears broken and blocky | |
| OTHER: | WATER TABLE (EST): N/A | |
| ACCESS | | |
| ACCESS TYPE: Helicopter | | |
| FIXED WING ACCESS FOR SERVICE: None | | |
| NEAREST HUB: Arctic Village 82 nm west | AIRSTRIIP CODE: | |
| LZ CLEARING REQUIRED: None | STATION CLEARING REQUIRED: None | |
| POSSIBLE ACCESS RESTRICTIONS (TRAVEL ON FROZEN TUNDRA, BIRD NESTING, CARIBOU MIGRATION): None. | | |

Alaska Transportable Array Field Notes for Recon Report

| SENSOR EMPLACEMENT | |
|--|--------------------------------|
| INSTALLATION METHOD: Down Hole Hammer | |
| WATER SOURCE FOR DRILLING: None | |
| ANCHOR SYSTEM: Rock bolt | EXPECTED DEPTH: 2.5m |

| ANTICIPATED STATION PLAN | |
|---|--|
| EQUIPMENT LOCATION OPTIONS: Stand alone enclosure | POWER SUPPLY: Stand alone power supply |
| EST WINTER SNOW DEPTH: 2m | NOISE OR WILDLIFE FACTORS: None |

| ANTICIPATED DATA COMMUNICATION | |
|---|------------------------------------|
| METHODS AVAILABLE: Not verified, but should be good signal from the east. | RADIO LINE OF SIGHT: N/A |
| CONTACTS OR PROVIDERS: N/A | |

Alaska Transportable Array Field Notes for Recon Report

| | | | | | |
|---------------------|---------------------------|--------------------------|---------------------------|--------------------------|-----------------------|
| CAMERA TIME: | | START INDEX: 0460 | | END INDEX: 0466 | |
| GPS 0466 | LOOK NORTH 0461 | LOOK EAST none | LOOK SOUTH 0464 | LOOK WEST 0463 | AERIAL 0460 |

VICINITY/GPS

Attributes

Name: E27K-DT1
Layer: Recon'd
Custom Class #106

OID *
160

INITIAL_SITE_ID *
<Null>

SITE_ID *
E27K-DT1

MAP_ID *
E27K-DT1

SITE_ID_STATUS *
Desktop Recon

LATITUDE *
68.209775

Position: 68.18620° -141.59575°

12:51 PM

68.18618° -141.59561°

Word/Address/Lat,Lng/UTM

16%

Edit Point

Alaska Transportable Array Field Notes for Recon Report

NORTH

Date & Time: Fri Jun 13 12:49:04 AKDT 2014
Position: 068.18461°N / 141.59433°W
Altitude: 2234ft
Azimuth/Bearing: 349° N11W 6204mils (True)
Elevation Angle: -09.5°
Horizon Angle: -00.5°
Zoom: 1X
E27K-DT1



NOTES:



Alaska Transportable Array Field Notes for Recon Report



EAST

NONE

NOTES:

SOUTH

Date & Time: Fri Jun 13 12:49:47 AKDT 2014
Position: 068.18646°N / 141.59654°W
Altitude: 2182ft
Azimuth/Bearing: 348° N12W 6187mils (True)
Elevation Angle: -11.9°
Horizon Angle: +10.3°
Zoom: 1X
E27K-DT1



NOTES:

WEST

Date & Time: Fri Jun 13 12:49:23 AKDT 2014
Position: 068.18674°N / 141.59275°W
Altitude: 2229ft
Azimuth/Bearing: 292° N68W 5191mils (True)
Elevation Angle: -06.7°
Horizon Angle: +00.1°
Zoom: 1X
E27K-DT1



NOTES:

AIR

Date & Time: Fri Jun 13 12:48:40 AKDT 2014
Position: 068.18814°N / 141.60918°W
Altitude: 2325ft
Azimuth/Bearing: 114° S66E 2027mils (True)
Elevation Angle: -09.1°
Horizon Angle: +01.8°
Zoom: 1X
E27K-DT1



NOTES:

ADDITIONAL PHOTOS

Date & Time: Fri Jun 13 12:50:44 AKDT 2014
Position: 068.18625°N / 141.59584°W
Altitude: 2127ft
Azimuth/Bearing: 295° N65W 5244mils (True)
Elevation Angle: -17.4°
Horizon Angle: +01.0°
Zoom: 1X
E27K-DT1



NOTES:

Additional aerial view
Photo 0465



Alaska Transportable Array Field Notes for Recon Report



| GENERAL | | |
|---|---|------------------------------------|
| SITE: F26K-2 | DATE: 140613 | TIME: 1340 |
| PERSONNEL: Steve Rowland, PE | | MEANS OF ACCESS: Helicopter |
| WEATHER: Clear, light wind, NE 50 | | |
| LOCATION | | |
| LANDMARK: Sheenjek | COORDS (WGS84): N 67.69624 ⁰ W 144.13603 ⁰ | ELEV (FT): 2100 |
| SITE DESCRIPTION | | |
| LAND OWNER/MANAGER: FWS | | CLASSIFICATION: Primary |
| GENERAL DESCRIPTION: FLY BY RECON ONLY! No landing due to ANWR access conditions. Site is on mostly barren southeast trending ridge. Suitable area for drill and hut setup. Helipad adjacent to site. Rock outcrops in vicinity and at site. Good site with limited shelter from wind. Good south exposure. 3 mi. SSE of Helmet Mt. and 2 mi NW of Sheenjek River. Excellent drainage and good footing. Arctic NWR. | | |
| VEGETATION (TYPE & COVERAGE): Sparse lichen and moss with outcrop in area. Sparse spruce and light brush below ridge crest. | TERRAIN FEATURES: Range of low hills between major drainages. Site on nose of south trending ridge. | |
| SLOPE AND ASPECT: Slope with line of ridge appears 2-10 deg | SOIL TYPE PERMAFROST DEPTH AND/OR BEDROCK DEPTH: Rock type not verified. Appears broken and blocky | |
| OTHER: | WATER TABLE (EST): N/A | |
| ACCESS | | |
| ACCESS TYPE: Helicopter | | |
| FIXED WING ACCESS FOR SERVICE: None | | |
| NEAREST HUB: Fort Yukon 72 nm SSW | AIRSTRIIP CODE: | |
| LZ CLEARING REQUIRED: None | STATION CLEARING REQUIRED: None | |
| POSSIBLE ACCESS RESTRICTIONS (TRAVEL ON FROZEN TUNDRA, BIRD NESTING, CARIBOU MIGRATION): None. | | |



Alaska Transportable Array Field Notes for Recon Report



| SENSOR EMPLACEMENT | |
|--|--------------------------------|
| INSTALLATION METHOD: Down Hole Hammer | |
| WATER SOURCE FOR DRILLING: None | |
| ANCHOR SYSTEM: Rock bolt | EXPECTED DEPTH: 2.5m |

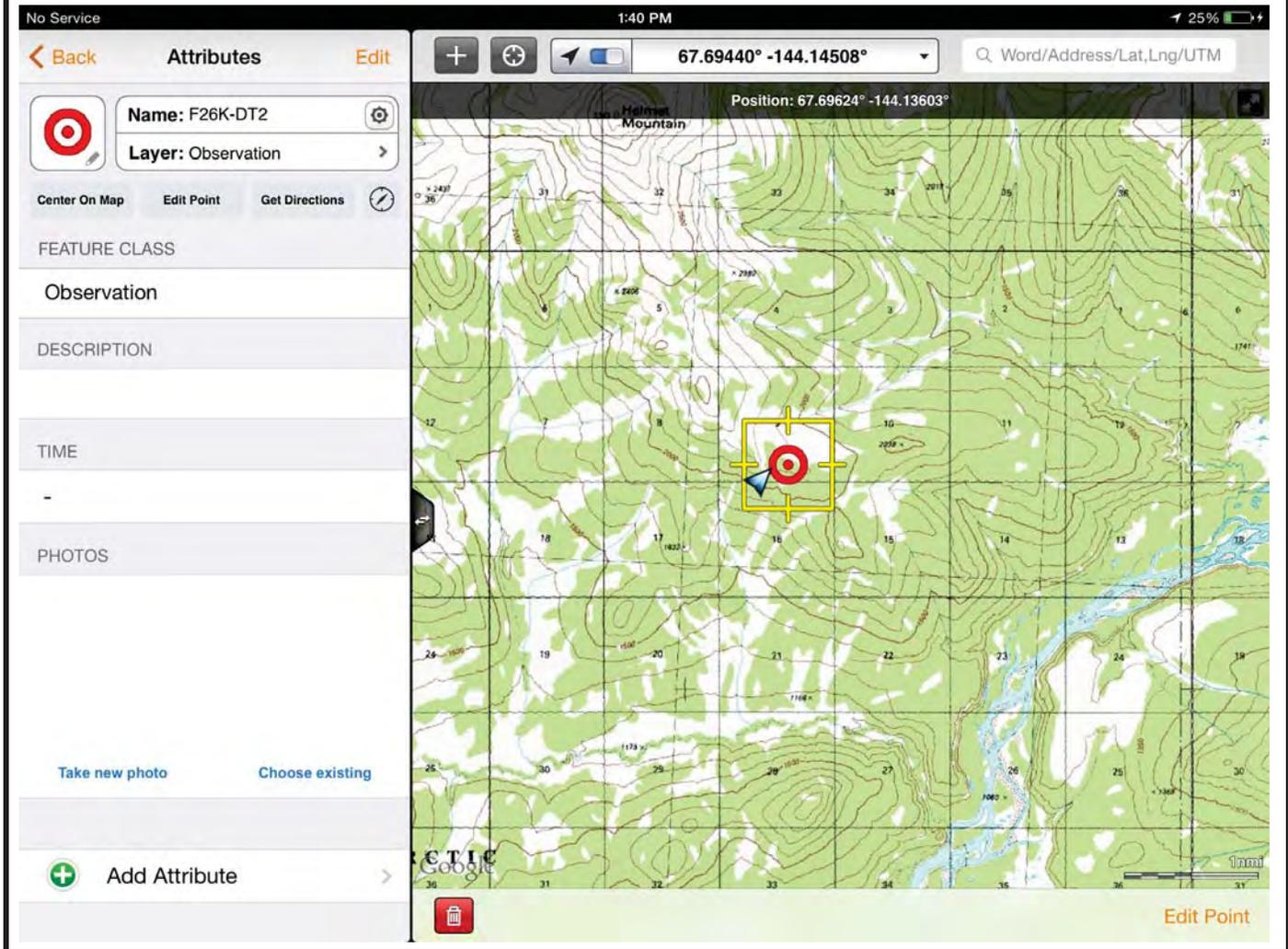
| ANTICIPATED STATION PLAN | |
|---|--|
| EQUIPMENT LOCATION OPTIONS: Stand alone enclosure | POWER SUPPLY: Stand alone power supply |
| EST WINTER SNOW DEPTH: 2m | NOISE OR WILDLIFE FACTORS: None |

| ANTICIPATED DATA COMMUNICATION | |
|--|------------------------------------|
| METHODS AVAILABLE: BGAN not verified, but should be good signal from east. | RADIO LINE OF SIGHT: N/A |
| CONTACTS OR PROVIDERS: N/A | |

Alaska Transportable Array Field Notes for Recon Report

| | | | | | |
|-------------------|--------------------|-------------------|------------------|-------------------|----------------|
| CAMERA TIME: 1337 | | START INDEX: 0476 | | END INDEX: 0482 | |
| GPS 0482 | LOOK NORTH 0479 | LOOK EAST 0477 | LOOK SOUTH NA | LOOK WEST 0480 | AERIAL 0478 |

VICINITY/GPS



The screenshot shows a mobile application interface for field data collection. The top status bar indicates 'No Service', '1:40 PM', and '25%' battery. The main map area displays a topographic map with a grid and a red target icon centered on a yellow square. The position is shown as 67.69440° -144.14508°. The sidebar on the left contains the following elements:

- Attributes:** Name: F26K-DT2, Layer: Observation
- Actions:** Center On Map, Edit Point, Get Directions
- FEATURE CLASS:** Observation
- DESCRIPTION:** (Empty field)
- TIME:** -
- PHOTOS:** (Empty field)
- Buttons:** Take new photo, Choose existing, Add Attribute

NORTH

Date & Time: Fri Jun 13 13:38:11 AKDT 2014

Position: 067.69349°N / 144.14449°W

Altitude: 2347ft

Azimuth/Bearing: 002° N02E 0036mils (True)

Elevation Angle: +00.1°

Horizon Angle: -02.3°

Zoom: 1X

F26K-DT2

**NOTES:**

EAST

Date & Time: Fri Jun 13 13:37:57 AKDT 2014
Position: 067.69436°N / 144.14868°W
Altitude: 2368ft
Azimuth/Bearing: 073° N73E 1298mils (True)
Elevation Angle: -11.0°
Horizon Angle: -03.8°
Zoom: 1X
F26K-DT2



NOTES:



Alaska Transportable Array Field Notes for Recon Report



SOUTH

VIEW NOT AVAILABLE

NOTES:

WEST

Date & Time: Fri Jun 13 13:38:54 AKDT 2014

Position: 067.69467°N / 144.14502°W

Altitude: 2317ft

Azimuth/Bearing: 212° S32W 3769mils (True)

Elevation Angle: -20.4°

Horizon Angle: +00.2°

Zoom: 1X

F26K-DT2



NOTES:

AIR

Date & Time: Fri Jun 13 13:38:03 AKDT 2014

Position: 067.69372°N / 144.14710°W

Altitude: 2365ft

Azimuth/Bearing: 035° N35E 0622mils (True)

Elevation Angle: -17.1°

Horizon Angle: -00.9°

Zoom: 1X

F26K-DT2



NOTES:

ADDITIONAL PHOTOS



NOTES:

Photo 0481

Exhibit B Nowitna to ROW Permit M-349-MR



**Alaska Transportable Array
Field Notes for Recon Report**



| GENERAL | | |
|---|--|----------------|
| SITE: I20K-2 | DATE: 2014/05/21 | TIME: 1047 |
| PERSONNEL: Isaac Rowland, PE | MEANS OF ACCESS: Helicopter | |
| WEATHER: 55F, clear, light breeze from W | | |
| LOCATION | | |
| LANDMARK: Grass Lake to W | COORDS (WGS84): N 64.79643 ° W 154.47790 ° | ELEV (FT): 225 |
| SITE DESCRIPTION | | |
| LAND OWNER/MANAGER: FWS | CLASSIFICATION: Primary | |
| GENERAL DESCRIPTION: Site located on eastern edge of large swamp in Nowitna flats. LZ located 200 ft to SE | | |
| VEGETATION (TYPE & COVERAGE): Scattered black spruce, tundra tussocks. | TERRAIN FEATURES: Ancient floodplain flats | |
| SLOPE AND ASPECT: Flat | SOIL TYPE PERMAFROST DEPTH AND/OR BEDROCK DEPTH: Expected fine grain permafrost soils | |
| OTHER: 200 ft from grassy swamp | WATER TABLE (EST): Shallow | |
| ACCESS | | |
| ACCESS TYPE: Helicopter | | |
| FIXED WING ACCESS FOR SERVICE: Ski landing possible in winter | | |
| NEAREST HUB: Galena | AIRSTRIPE CODE: | |
| LZ CLEARING REQUIRED: None | STATION CLEARING REQUIRED: None | |
| POSSIBLE ACCESS RESTRICTIONS (TRAVEL ON FROZEN TUNDRA, BIRD NESTING, CARIBOU MIGRATION): | | |



**Alaska Transportable Array
Field Notes for Recon Report**



| SENSOR EMPLACEMENT | |
|---------------------------------------|-----------------------|
| INSTALLATION METHOD: Permafrost auger | |
| WATER SOURCE FOR DRILLING: None | |
| ANCHOR SYSTEM: Soil anchors | EXPECTED DEPTH: 4m |

| ANTICIPATED STATION PLAN | |
|--|------------------------------------|
| EQUIPMENT LOCATION OPTIONS: Stand Alone | POWER SUPPLY: Stand Alone |
| EST WINTER SNOW DEPTH: 1.5m | NOISE OR WILDLIFE FACTORS: None |

| ANTICIPATED DATA COMMUNICATION | |
|--------------------------------|-----------------------------|
| METHODS AVAILABLE: BGAN | RADIO LINE OF SIGHT: N/A |
| CONTACTS OR PROVIDERS: N/A | |



Alaska Transportable Array Field Notes for Recon Report



| | | | | | |
|-------------------|--------------------|-------------------|--------------------|-------------------|----------------|
| CAMERA TIME: 1045 | | START INDEX: 0207 | | END INDEX: 0213 | |
| GPS 0207 | LOOK NORTH 0208 | LOOK EAST 0209 | LOOK SOUTH 0210 | LOOK WEST 0211 | AERIAL 0213 |

VICINITY/GPS

Attributes: Name: 120K-2, Layer: Recon'd Site

FEATURE CLASS: Recon'd Site

DESCRIPTION:

TIME:

+ Add Attribute



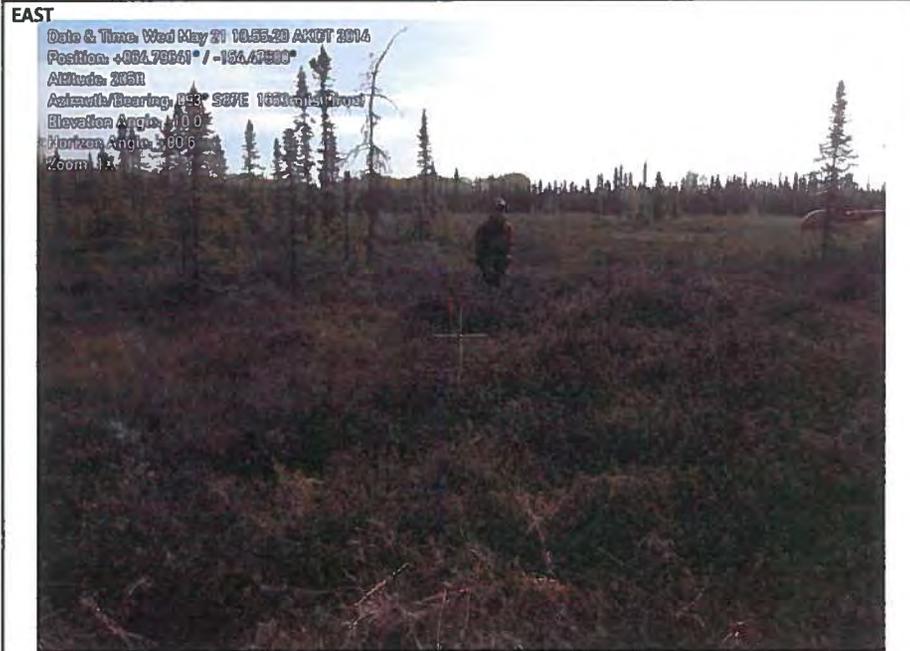
Alaska Transportable Array Field Notes for Recon Report



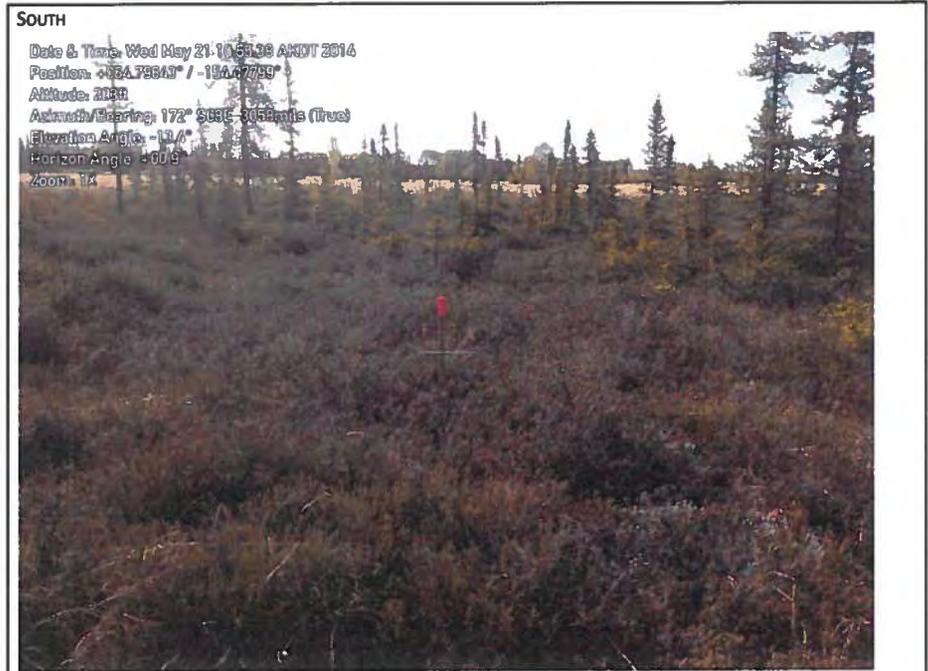
NORTH

Date & Time: Wed May 20 10:54:58 AM DT 2014
 Position: 64.70844° -154.47780°
 Altitude: 217ft
 Azimuth Bearing: 355° (07W) 6276mils True
 Elevation Angle: -13.8°
 Horizon Angle: -05.0°
 Zoom: 1x

Notes:
Looking back into trees



NOTES:
LZ located 200 ft to SE



NOTES:
Grassy swap to S

WEST



NOTES:

AIR



NOTES:

ADDITIONAL PHOTOS



NOTES:

Typical ground at site
Photo 0212

Potential TA Site - I20K-2

64.79643, -154.4779

64 808° N

64 792° N

64 783° N

64 775° N

- | | | | |
|--|---------------------------|--|------------------------|
| | Forest Service | | Native Selected |
| | National Park Service | | Metlakatla Indian Res. |
| | Fish and Wildlife Service | | State Patent or TA |
| | Bureau of Land Management | | State Selected |
| | Military | | Private |
| | Native Patent or IC | | Village Lands |
| | | | Regional Corp. Lands |

I20K-2

18 Fish and Wildlife Service





Alaska Transportable Array Field Notes for Recon Report

| GENERAL | | | |
|---|---|---|------------------------|
| SITE: O15K-1 | DATE: 2014/05/28 | TIME: 1018 | |
| PERSONNEL: Isaac Rowland, PE | | MEANS OF ACCESS: Helicopter | |
| WEATHER: 50F, fog, wind E 10 mph | | | |
| LOCATION | | | |
| LANDMARK: Ungalikthiuk River | COORDS (WGS84): N 59.17672 ⁰ W 159.82437 ⁰ | | ELEV (FT): 1000 |
| SITE DESCRIPTION | | | |
| LAND OWNER/MANAGER: FWS | | CLASSIFICATION: Alternate | |
| GENERAL DESCRIPTION: Small bench on SE trending ridge on right side of river. Located Togiak NWR. | | | |
| VEGETATION (TYPE & COVERAGE): Low tundra | | TERRAIN FEATURES: Small bench near SE end of ridge | |
| SLOPE AND ASPECT: 10*SE | | SOIL TYPE PERMAFROST DEPTH AND/OR BEDROCK DEPTH: Weathered bedrock at surface. Outcrop 15 ft to SE. | |
| OTHER: | | WATER TABLE (EST): N/A | |
| ACCESS | | | |
| ACCESS TYPE: Helicopter | | | |
| FIXED WING ACCESS FOR SERVICE: N/A | | | |
| NEAREST HUB: Dillingham | | AIRSTRIP CODE: | |
| LZ CLEARING REQUIRED: None | | STATION CLEARING REQUIRED: None | |
| POSSIBLE ACCESS RESTRICTIONS (TRAVEL ON FROZEN TUNDRA, BIRD NESTING, CARIBOU MIGRATION): | | | |



Alaska Transportable Array Field Notes for Recon Report



| SENSOR EMPLACEMENT | |
|---------------------------------------|------------------------------|
| INSTALLATION METHOD: Rock Core | |
| WATER SOURCE FOR DRILLING: | |
| ANCHOR SYSTEM: | EXPECTED DEPTH: 2m |

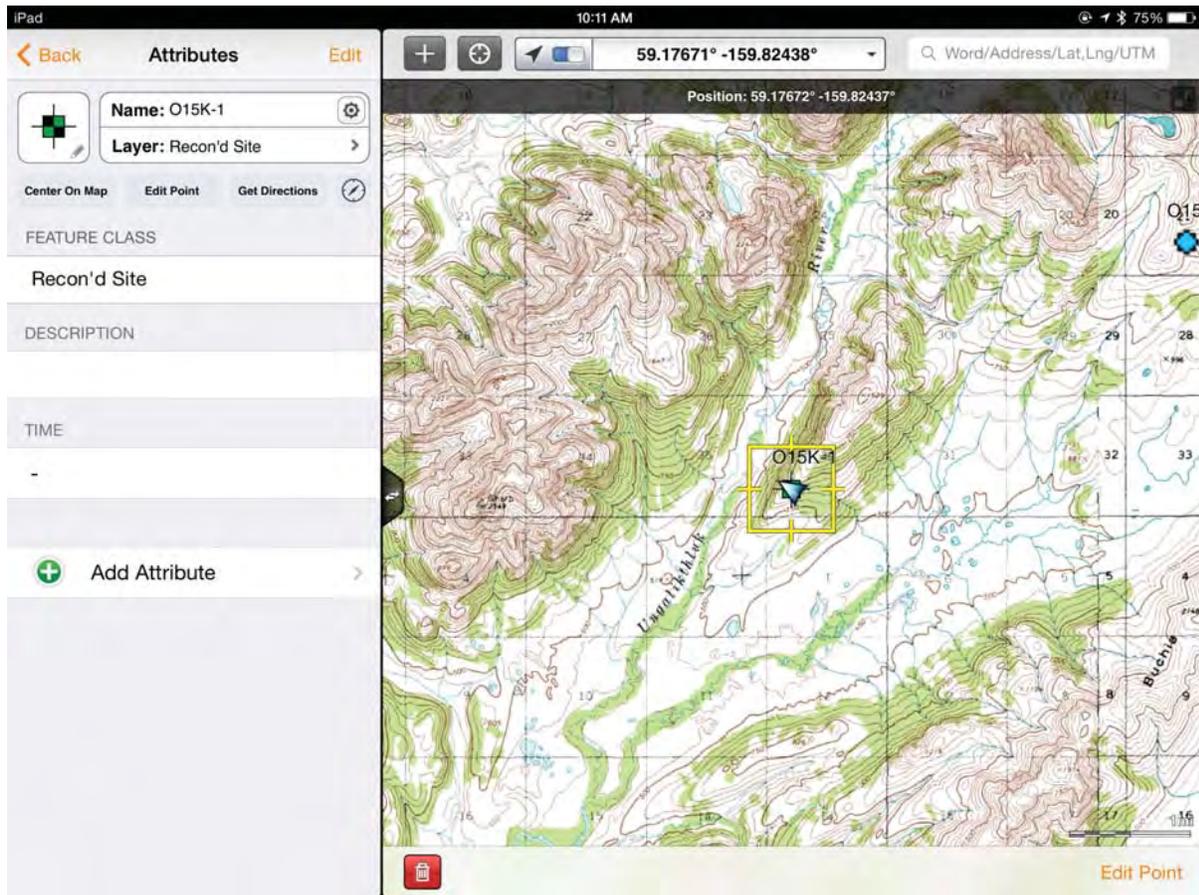
| ANTICIPATED STATION PLAN | |
|---|--|
| EQUIPMENT LOCATION OPTIONS: Stand alone enclosure | POWER SUPPLY: Stand alone power supply |
| EST WINTER SNOW DEPTH: 1m | NOISE OR WILDLIFE FACTORS: |

| ANTICIPATED DATA COMMUNICATION | |
|--------------------------------------|------------------------------------|
| METHODS AVAILABLE: BGAN | RADIO LINE OF SIGHT: N/A |
| CONTACTS OR PROVIDERS: N/A | |

Alaska Transportable Array Field Notes for Recon Report

| | | | | | |
|-------------------|--------------------|-------------------|--------------------|-------------------|----------------|
| CAMERA TIME: 1011 | | START INDEX: 0499 | | END INDEX: 0506 | |
| GPS 0499 | LOOK NORTH 0500 | LOOK EAST 0501 | LOOK SOUTH 0502 | LOOK WEST 0503 | AERIAL 0506 |

VICINITY/GPS



Alaska Transportable Array Field Notes for Recon Report

NORTH

Date & Time: Wed May 28 10:12:15 AKDT 2014
Position: +059.17671° / -159.82438°
Altitude: 1029ft
Azimuth/Bearing: 001° N01E 0018mils (True)
Elevation Angle: -09.2°
Horizon Angle: +00.5°
Zoom: 1X



NOTES:

EAST

Date & Time: Wed May 28 10:12:35 AKDT 2014
Position: +059.17685° / -159.82463°
Altitude: 1003ft
Azimuth/Bearing: 091° S89E 1618mils (True)
Elevation Angle: -04.5°
Horizon Angle: -02.6°
Zoom: 1X



NOTES:

SOUTH

Date & Time: Wed May 28 10:13:03 AKDT 2014
Position: +059.17685° / -159.82463°
Altitude: 1003ft
Azimuth/Bearing: 183° S03W 3253mils (True)
Elevation Angle: -08.6°
Horizon Angle: -00.4°
Zoom: 1X



NOTES:

Alaska Transportable Array Field Notes for Recon Report

WEST

Date & Time: Wed May 28 10:13:20 AKDT 2014
Position: +059.17685° / -159.82463°
Altitude: 1003ft
Azimuth/Bearing: 270° S90W 4800mils (True)
Elevation Angle: -09.3°
Horizon Angle: -00.1°
Zoom: 1X



NOTES:

AIR

Date & Time: Wed May 28 10:41:12 AKDT 2014
Position: +059.17539° / -159.82446°
Altitude: 1020ft
Azimuth/Bearing: 356° N04W 6329mils (True)
Elevation Angle: -00.9°
Horizon Angle: -01.9°
Zoom: 1X



NOTES:

#

ADDITIONAL PHOTOS**NOTES:**

ROCK AT SURFACE

Photo 0504

#

#

ADDITIONAL PHOTOS



NOTES:

ROCK AT SURFACE

Photo 0505

#



Alaska Transportable Array Field Notes for Recon Report

| GENERAL | | |
|---|--|------------------------------------|
| SITE: J17K-1 | DATE: 2014/05/22 | TIME: 1123 |
| PERSONNEL: Isaac Rowland, PE | | MEANS OF ACCESS: Helicopter |
| WEATHER: 50F, clear, breeze | | |
| LOCATION | | |
| LANDMARK: VABM Dome | COORDS (WGS84): N 63.39661 ⁰ W 159.07765 ⁰ | ELEV (FT): 1020 |
| SITE DESCRIPTION | | |
| LAND OWNER/MANAGER: FWS | | CLASSIFICATION: Primary |
| GENERAL DESCRIPTION: Innoko NWR. Located on top of highest dome in area. | | |
| VEGETATION (TYPE & COVERAGE): Alder , small spruce | TERRAIN FEATURES: Rounded dome | |
| SLOPE AND ASPECT: Flat | SOIL TYPE PERMAFROST DEPTH AND/OR BEDROCK DEPTH: Unknown soil type | |
| OTHER: LZ located 150' to north | WATER TABLE (EST): N/A | |
| ACCESS | | |
| ACCESS TYPE: Helicopter | | |
| FIXED WING ACCESS FOR SERVICE: N/A | | |
| NEAREST HUB: Unalakleet | AIRSTRIP CODE: | |
| LZ CLEARING REQUIRED: Minor Clearing | STATION CLEARING REQUIRED: Minor Clearing | |
| POSSIBLE ACCESS RESTRICTIONS (TRAVEL ON FROZEN TUNDRA, BIRD NESTING, CARIBOU MIGRATION): | | |



Alaska Transportable Array Field Notes for Recon Report



| SENSOR EMPLACEMENT | |
|--|--------------------------------|
| INSTALLATION METHOD: Auger or DHH | |
| WATER SOURCE FOR DRILLING: None | |
| ANCHOR SYSTEM: Soil anchors | EXPECTED DEPTH: 3+ m |

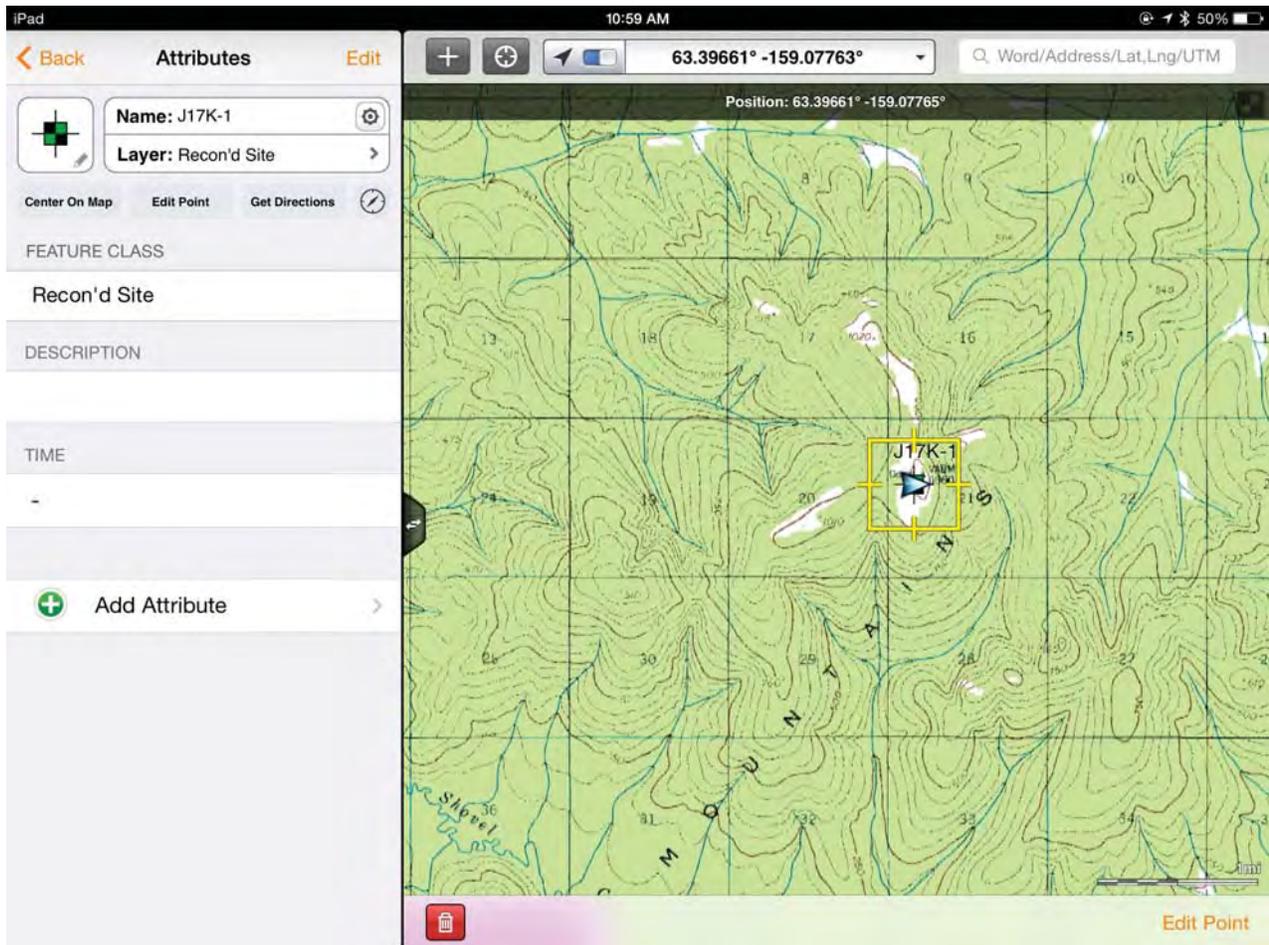
| ANTICIPATED STATION PLAN | |
|---|--|
| EQUIPMENT LOCATION OPTIONS: Stand alone | POWER SUPPLY: Stand alone |
| EST WINTER SNOW DEPTH: 1m | NOISE OR WILDLIFE FACTORS: Bears |

| ANTICIPATED DATA COMMUNICATION | |
|--------------------------------------|------------------------------------|
| METHODS AVAILABLE: BGAN | RADIO LINE OF SIGHT: N/A |
| CONTACTS OR PROVIDERS: N/A | |

Alaska Transportable Array Field Notes for Recon Report

| | | | | | |
|-------------------|-------------------|-------------------|-------------------|------------------|---------------|
| CAMERA TIME: 1059 | | START INDEX: 0273 | | END INDEX: 0278 | |
| GPS | LOOK NORTH | LOOK EAST | LOOK SOUTH | LOOK WEST | AERIAL |
| 0273 | 0274 | 0275 | 0276 | 0277 | 0278 |

VICINITY/GPS



NORTH

Date & Time: Thu May 22 11:00:33 AKDT 2014
Position: +063.39652° / -159.07764°
Altitude: 1009ft
Azimuth/Bearing: 359° N01W 6382mils (True)
Elevation Angle: -09.8°
Horizon Angle: -00.7°
Zoom: 1X



NOTES:

LZ in background

Alaska Transportable Array Field Notes for Recon Report

EAST

Date & Time: Thu May 22 11:00:59 AKDT 2014
Position: +063.39652° / -159.07764°
Altitude: 1009ft
Azimuth/Bearing: 092° S88E 1636mils (True)
Elevation Angle: -20.3°
Horizon Angle: -01.6°
Zoom: 1X



NOTES.

SOUTH

Date & Time: Thu May 22 11:01:22 AKDT 2014
Position: +063.39654° / -159.07750°
Altitude: 1098ft
Azimuth/Bearing: 182° S02W 3236mils (True)
Elevation Angle: -14.0°
Horizon Angle: -00.8°
Zoom: 1X



NOTES:

Alaska Transportable Array Field Notes for Recon Report

WEST

Date & Time: Thu May 22 11:01:43 AKDT 2014
Position: +063.39636° / -159.07741°
Altitude: 1090ft
Azimuth/Bearing: 270° N90W 4800mils (True)
Elevation Angle: -13.9°
Horizon Angle: +02.7°
Zoom: 1X



NOTES:

AIR

Date & Time: Thu May 22 11:19:28 AKDT 2014
Position: +063.39638° / -159.07636°
Altitude: 1107ft
Azimuth/Bearing: 287° N73W 5102mils (True)
Elevation Angle: -17.3°
Horizon Angle: +06.3°
Zoom: 1X



NOTES:



Alaska Transportable Array Field Notes for Recon Report

| GENERAL | | | |
|---|---|--|-----------------------|
| SITE: G25K-2 | DATE: 140612 | TIME: 1500 | |
| PERSONNEL: Steve Rowland, PE | | MEANS OF ACCESS: Helicopter | |
| WEATHER: Partly cloudy, windy SE, 50 | | | |
| LOCATION | | | |
| LANDMARK: Bearman Lake | COORDS (WGS84): N 66.76534 ⁰ W 146.10143 ⁰ | | ELEV (FT): 450 |
| SITE DESCRIPTION | | | |
| LAND OWNER/MANAGER: FWS | | CLASSIFICATION: Primary | |
| GENERAL DESCRIPTION: Site on prominent knoll above flats. 1.2 mi west of Chandalar River and 1/4 mi north of Bearman Lake. Lake suitable for floatplane with short easy hike to site. Good LZ and excellent site area with good drainage and footing. Recommend clearing LZ on knoll as meadow may seasonally flood. Good options for installation. Yukon Flats NWR. | | | |
| VEGETATION (TYPE & COVERAGE): Low shrubs and grasses in open area with small spruce and aspen forest over most of knoll. | | TERRAIN FEATURES: 50' high Knoll above surrounding flats. | |
| SLOPE AND ASPECT: Nearly flat top knoll sloping 5-20 deg to surrounding terrain | | SOIL TYPE PERMAFROST DEPTH AND/OR BEDROCK DEPTH: 1-2 ft of loess over fine sandy gravel. May be thawed to terminal depth | |
| OTHER: | | WATER TABLE (EST): N/A | |
| ACCESS | | | |
| ACCESS TYPE: Helicopter | | | |
| FIXED WING ACCESS FOR SERVICE: None | | | |
| NEAREST HUB: Fort Yukon 23 nm ESE | | AIRSTRIIP CODE: | |
| LZ CLEARING REQUIRED: Minor Clearing | | STATION CLEARING REQUIRED: Minor Clearing | |
| POSSIBLE ACCESS RESTRICTIONS (TRAVEL ON FROZEN TUNDRA, BIRD NESTING, CARIBOU MIGRATION): Bird nesting | | | |



Alaska Transportable Array Field Notes for Recon Report



| SENSOR EMPLACEMENT | |
|--|------------------------------|
| INSTALLATION METHOD: Auger | |
| WATER SOURCE FOR DRILLING: None | |
| ANCHOR SYSTEM: Duckbill | EXPECTED DEPTH: 5m |

| ANTICIPATED STATION PLAN | |
|---|--|
| EQUIPMENT LOCATION OPTIONS: Stand alone enclosure | POWER SUPPLY: Stand alone power supply |
| EST WINTER SNOW DEPTH: 1.5 | NOISE OR WILDLIFE FACTORS: None |

| ANTICIPATED DATA COMMUNICATION | |
|---|------------------------------------|
| METHODS AVAILABLE: BGAN signal good @ 100 deg. Az. 10 deg V BGAN signal good @ 230 deg. Az. 10 deg V | RADIO LINE OF SIGHT: N/A |
| CONTACTS OR PROVIDERS: N/A | |

Alaska Transportable Array Field Notes for Recon Report

| | | | | | |
|-------------------|--------------------|-------------------|--------------------|-------------------|----------------|
| CAMERA TIME: 1449 | | START INDEX: 0387 | | END INDEX: 0398 | |
| GPS 0390 | LOOK NORTH 0392 | LOOK EAST 0393 | LOOK SOUTH 0394 | LOOK WEST 0395 | AERIAL 0398 |

VICINITY/GPS

No Service 2:59 PM 47%

[Back](#) **Attributes** [Edit](#)

Name: G25K-DT2

Layer: Recon'd

Center On Map Edit Point Get Directions

FEATURE CLASS

Observation

DESCRIPTION

TIME

Jun 12, 2014, 2:59 PM

PHOTOS

[Take new photo](#) [Choose existing](#)

[Add Attribute](#)

Position: 66.76534° -146.10143°

[Edit Point](#)

NORTH

Date & Time: Thu Jun 12 15:02:02 AKDT 2014
Position: 066.76523°N / 146.10146°W
Altitude: 487ft
Azimuth/Bearing: 360° N00W 6400mils (True)
Elevation Angle: -02.6°
Horizon Angle: -00.2°
Zoom: 1X
G25K-DT2 N



NOTES:

EAST

Date & Time: Thu Jun 12 15:02:38 AKDT 2014
Position: 066.76531°N / 146.10164°W
Altitude: 490ft
Azimuth/Bearing: 090° S90E 1600mils (True)
Elevation Angle: -02.2°
Horizon Angle: +00.0°
Zoom: 1X
G25K-DT2 E



NOTES:

SOUTH

Date & Time: Thu Jun 12 15:03:11 AKDT 2014
Position: 066.76535°N / 146.10141°W
Altitude: 477ft
Azimuth/Bearing: 185° S05W 3289mils (True)
Elevation Angle: -12.8°
Horizon Angle: -00.5°
Zoom: 1X
G25K-DT2 S

**NOTES:**

WEST

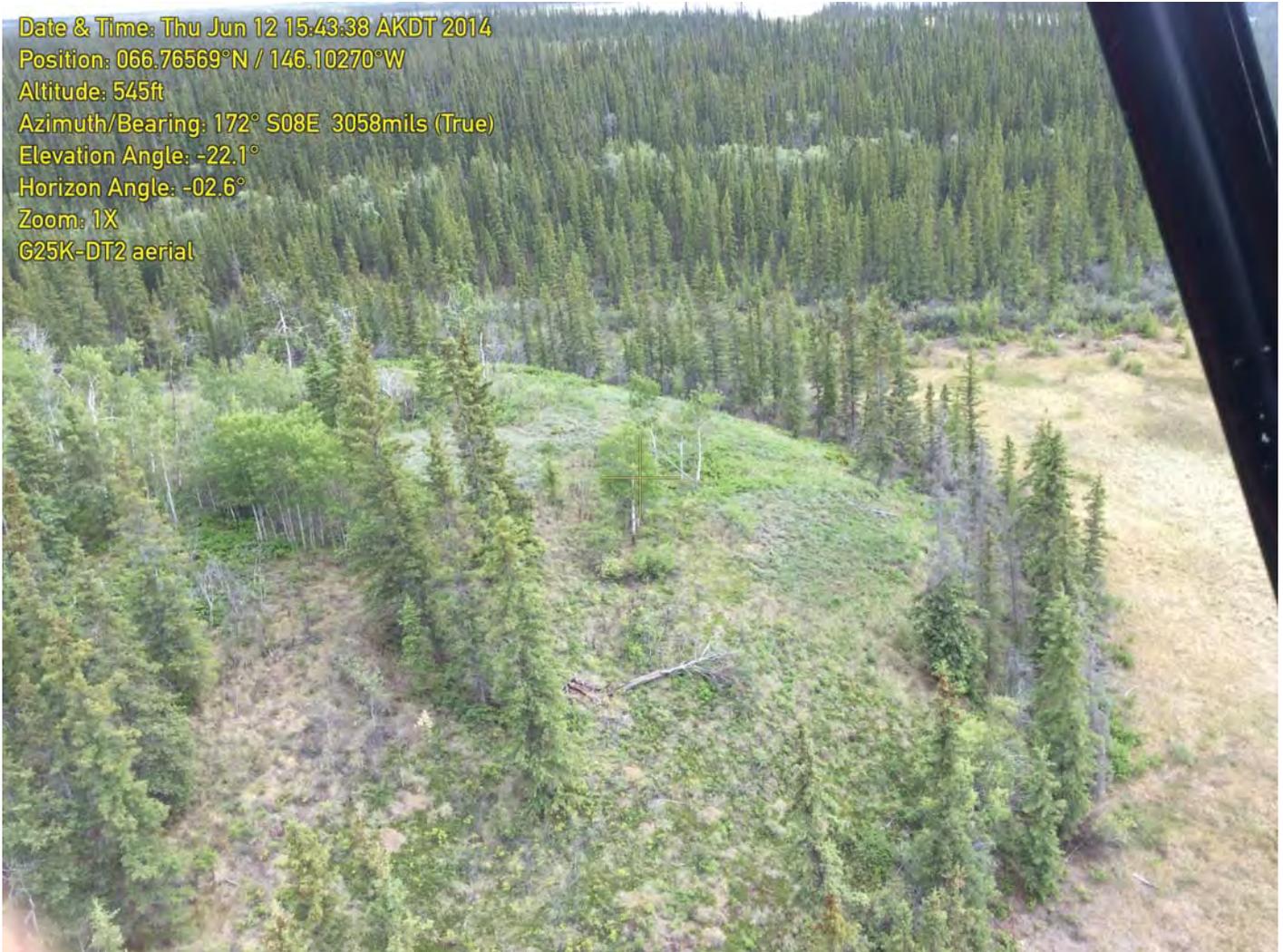
Date & Time: Thu Jun 12 15:03:44 AKDT 2014
Position: 066.76529°N / 146.10124°W
Altitude: 455ft
Azimuth/Bearing: 271° N89W 4818mils (True)
Elevation Angle: -13.5°
Horizon Angle: +01.4°
Zoom: 1X
G25K-DT2 W



NOTES:

AIR

Date & Time: Thu Jun 12 15:43:38 AKDT 2014
Position: 066.76569°N / 146.10270°W
Altitude: 545ft
Azimuth/Bearing: 172° S08E 3058mils (True)
Elevation Angle: -22.1°
Horizon Angle: -02.6°
Zoom: 1X
G25K-DT2 aerial

**NOTES:**

ADDITIONAL PHOTOS

Date & Time: Thu Jun 12 15:00:55 AKDT 2014
Position: 066.76526°N / 146.10145°W
Altitude: 471ft
Azimuth/Bearing: 288° N72W 5120mils (True)
Elevation Angle: -38.3°
Horizon Angle: -00.6°
Zoom: 1X
G25K-DT2.grnd



NOTES:

Ground
Photo 0391

ADDITIONAL PHOTOS

Date & Time: Thu Jun 12 14:52:06 AKDT 2014
Position: 066.76484°N / 146.10418°W
Altitude: 442ft
Azimuth/Bearing: 076° N76E 1351mils (True)
Elevation Angle: +00.4°
Horizon Angle: -00.8°
Zoom: 1X
G25K-DT2 area



NOTES:

Site on hill and LZ
Photo 0388



Alaska Transportable Array Field Notes for Recon Report



| GENERAL | | |
|---|--|------------------------------------|
| SITE: G26K-2 | DATE: 140614 | TIME: 1400 |
| PERSONNEL: Steve Rowland, PE | | MEANS OF ACCESS: Helicopter |
| WEATHER: Clear, moderate winds NE, 58 | | |
| LOCATION | | |
| LANDMARK: Shyman | COORDS (WGS84): N 66.94923 ⁰ W 143.78672 ⁰ | ELEV (FT): 600 |
| SITE DESCRIPTION | | |
| LAND OWNER/MANAGER: FWS | | CLASSIFICATION: Primary |
| GENERAL DESCRIPTION: Site on slightly elevate surface within a broad flat. Opening available due to intense wildfire removing all trees. Good LZ and adequate site area Site drainage drainage and footing are good. Lots of charred remains of trees. Yukon Flats NWR. | | |
| VEGETATION (TYPE & COVERAGE): Recent burned off forest. Weeds and aspen starting. Area will need brush removal in a couple years | TERRAIN FEATURES: Flat north of Porcupine River | |
| SLOPE AND ASPECT: Nearly level | SOIL TYPE PERMAFROST DEPTH AND/OR BEDROCK DEPTH: Loess over fine gravel and sand | |
| OTHER: | WATER TABLE (EST): N/A | |
| ACCESS | | |
| ACCESS TYPE: Helicopter | | |
| FIXED WING ACCESS FOR SERVICE: None | | |
| NEAREST HUB: Fort Yukon 40 nm WSW | AIRSTRIIP CODE: | |
| LZ CLEARING REQUIRED: None | STATION CLEARING REQUIRED: Minor Clearing | |
| POSSIBLE ACCESS RESTRICTIONS (TRAVEL ON FROZEN TUNDRA, BIRD NESTING, CARIBOU MIGRATION): | | |



Alaska Transportable Array Field Notes for Recon Report



| SENSOR EMPLACEMENT | |
|--|-------------------------------|
| INSTALLATION METHOD: Auger | |
| WATER SOURCE FOR DRILLING: None | |
| ANCHOR SYSTEM: Duckbill | EXPECTED DEPTH: 5 m |

| ANTICIPATED STATION PLAN | |
|---|--|
| EQUIPMENT LOCATION OPTIONS: Stand alone enclosure | POWER SUPPLY: Stand alone power supply |
| EST WINTER SNOW DEPTH: 1.5 | NOISE OR WILDLIFE FACTORS: None |

| ANTICIPATED DATA COMMUNICATION | |
|--|------------------------------------|
| METHODS AVAILABLE: BGAN signal good @ 100 Az. , V 10 deg | RADIO LINE OF SIGHT: N/A |
| CONTACTS OR PROVIDERS: N/A | |

Alaska Transportable Array Field Notes for Recon Report

| | | | | | |
|-------------------|--------------------|-------------------|--------------------|-------------------|----------------|
| CAMERA TIME: 1356 | | START INDEX: 0555 | | END INDEX: 0567 | |
| GPS 0555 | LOOK NORTH 0558 | LOOK EAST 0559 | LOOK SOUTH 0560 | LOOK WEST 0561 | AERIAL 0567 |

VICINITY/GPS

No Service
1:55 PM
55%

← Back
Attributes
Edit

Name: G26K-DT2

Layer: Recon'd

Position: 66.94923° -143.78672°

66.94934° -143.78672°

Q Word/Address/Lat,Lng/UTM

Center On Map Edit Point Get Directions

FEATURE CLASS

Custom Class #106

OID *

35

INITIAL_SITE_ID *

<Null>

SITE_ID *

G26K-DT2

MAP_ID *

G26K-DT2

SITE_ID_STATUS *

Desktop Recon

LATITUDE *

66.943532

YUKON FLATS
Edit Point

Alaska Transportable Array Field Notes for Recon Report

NORTH

Date & Time: Sat Jun 14 13:58:36 AKDT 2014
Position: 066.94918°N / 143.78673°W
Altitude: 685ft
Azimuth/Bearing: 000° N00E 0000mils (True)
Elevation Angle: -09.5°
Horizon Angle: -00.6°
Zoom: 1X
G26K-DT2 N



NOTES:

EAST

Date & Time: Sat Jun 14 13:59:18 AKDT 2014
Position: 066.94929°N / 143.78707°W
Altitude: 689ft
Azimuth/Bearing: 087° N87E 1547mils (True)
Elevation Angle: -07.0°
Horizon Angle: -00.3°
Zoom: 1X
G26K-DT2 E



NOTES:

SOUTH

Date & Time: Sat Jun 14 14:00:00 AKDT 2014
Position: 066.94949°N / 143.78677°W
Altitude: 691ft
Azimuth/Bearing: 178° S02E 3164mils (True)
Elevation Angle: -07.5°
Horizon Angle: -00.2°
Zoom: 1X
G26K-DT2 S



NOTES:

WEST

Date & Time: Sat Jun 14 14:00:43 AKDT 2014
Position: 066.94930°N / 143.78642°W
Altitude: 661ft
Azimuth/Bearing: 271° N89W 4818mils (True)
Elevation Angle: -05.1°
Horizon Angle: -00.5°
Zoom: 1X
G26K-DT2 W

**NOTES:**

AIR

Date & Time: Sat Jun 14 14:30:15 AKDT 2014
Position: 066.94878°N / 143.78673°W
Altitude: 645ft
Azimuth/Bearing: 340° N20W 6044mils (True)
Elevation Angle: -09.8°
Horizon Angle: -02.1°
Zoom: 1X
G26K-DT2 aerial



NOTES:

ADDITIONAL PHOTOS

Date & Time: Sat Jun 14 13:56:01 AKDT 2014

Position: 066.94929°N / 143.78678°W

Altitude: 706ft

Azimuth/Bearing: 014° N14E 0249mils (True)

Elevation Angle: -20.8°

Horizon Angle: -00.9°

Zoom: 1X

©26K-DT2 ground



NOTES:

Ground
Photo 0556

ADDITIONAL PHOTOS

Date & Time: Sat Jun 14 13:57:32 AKDT 2014
Position: 066.94939°N / 143.78624°W
Altitude: 648ft
Azimuth/Bearing: 251° S71W 4462mils (True)
Elevation Angle: -07.2°
Horizon Angle: +00.9°
Zoom: 1X
G26K-DT2 area



NOTES:

Area & LZ
Photo 0557

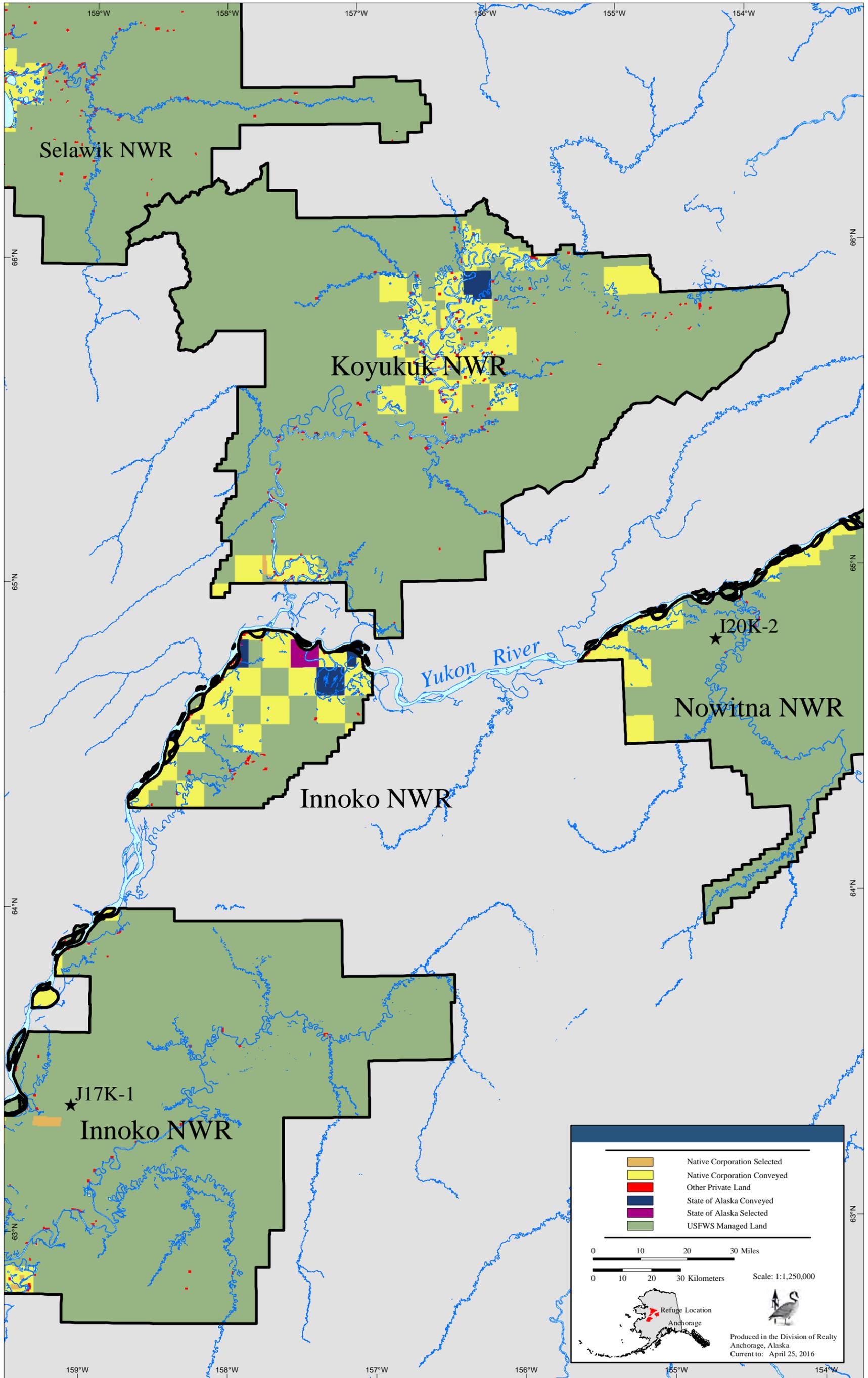


U.S. Fish & Wildlife Service

EarthScope Sites Accepted for Permitting

Koyukuk / Innoko / Nowitna National Wildlife Refuge
Alaska

Exh C to ROW Permit M-349-MR



99-0336 JGB

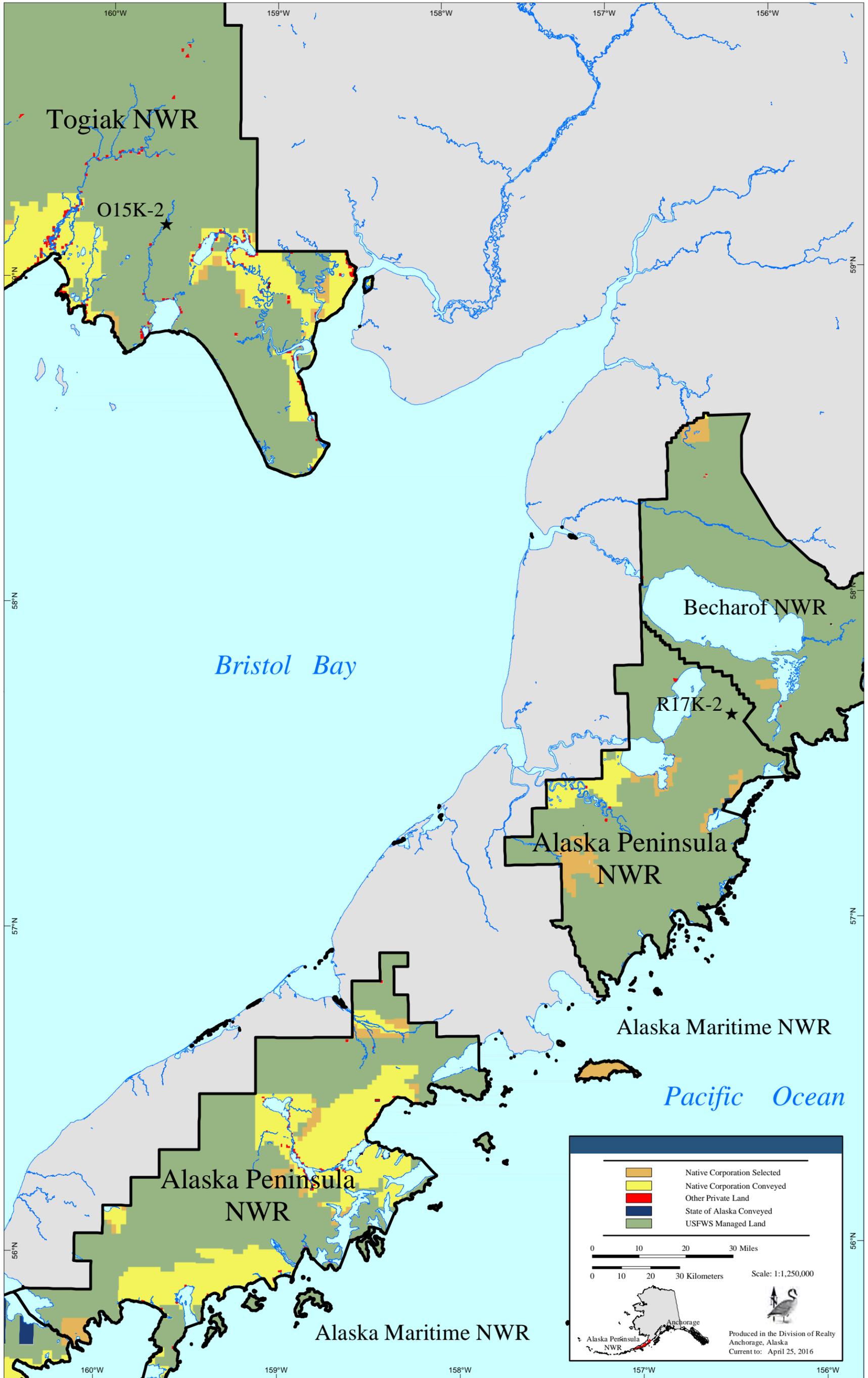


U.S. Fish & Wildlife Service

EarthScope Sites Accepted for Permitting

Alaska Peninsula / Togiak National Wildlife Refuge
Alaska

Exh C to ROW Permit M-349-MR



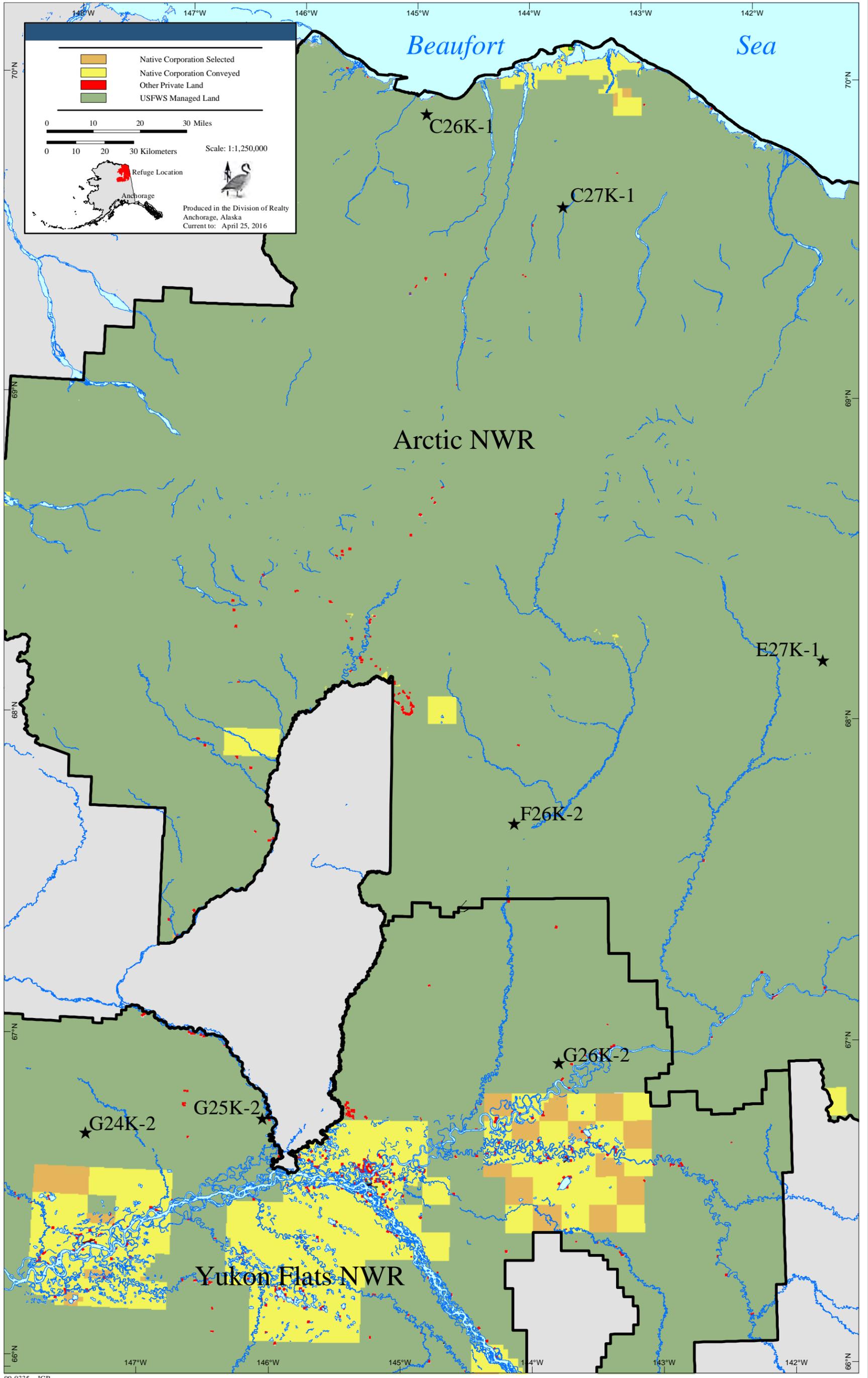
99-0337 JGB



U.S. Fish & Wildlife Service

EarthScope Sites Accepted for Permitting

Arctic / Yukon Flats National Wildlife Refuge Alaska



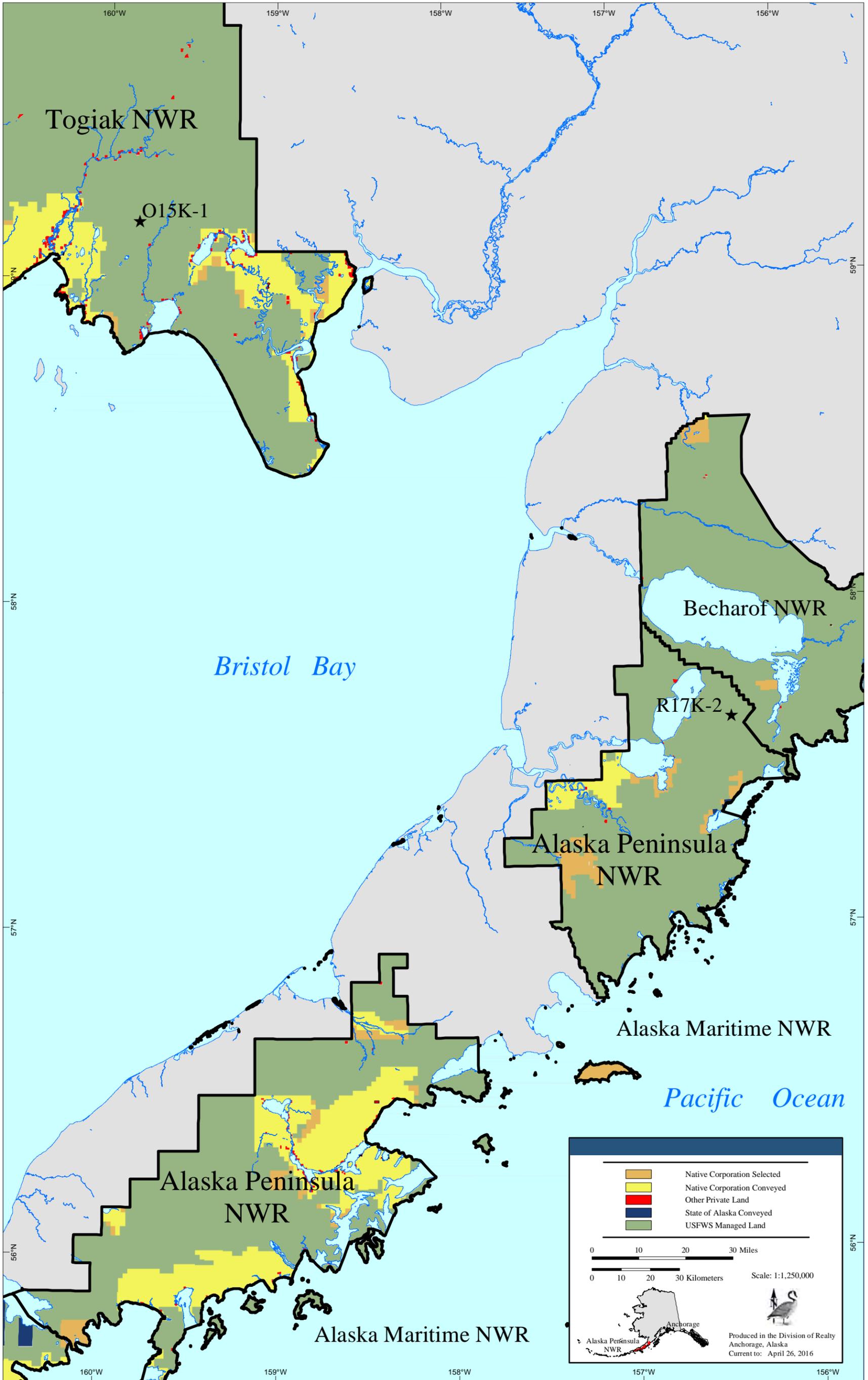
99-0335 JGB



U.S. Fish & Wildlife Service

EarthScope Sites Accepted for Permitting

Alaska Peninsula / Togiak National Wildlife Refuge
Alaska



| | |
|--|-----------------------------|
| | Native Corporation Selected |
| | Native Corporation Conveyed |
| | Other Private Land |
| | State of Alaska Conveyed |
| | USFWS Managed Land |

0 10 20 30 Miles
0 10 20 30 Kilometers Scale: 1:1,250,000

Produced in the Division of Realty
Anchorage, Alaska
Current to: April 26, 2016

99-0337 JGB

Human-Bear Incident Report

Goal: To use field experiences to learn how to create working conditions or modify human incidents with bears that will result in fewer incidents where either bears, people, or equipment are injured or damaged.

Objective: To analyze bear incidents for trends and avoidance strategies.

Bear Incident: Taking or attempting to take a bear in defense of life or property; use of less-lethal deterrents, use of non-lethal deterrents; human injury or death; or damage to camp or equipment by bear(s).

1. Name and duty station of person reporting incident: _____

2. Names of others involved in or present during incident: _____

3. Incident location (please be as specific as possible): _____

4. Date of incident: _____

5. Time of incident: _____

6. Duration of the incident: _____

7. Species involved:
 Black Bear Brown/Grizzly Bear Polar Bear Unidentified

8. Number and age category of bears (if known):
____ Adult Male ____ Adult Female ____ Adult – sex unknown ____ Subadult
____ Female with cubs of the year ____ Female with older offspring

Please describe any identifying features of the bear(s) involved: _____

9. When this incident occurred, what was your primary reason for being there?

10. What were you doing at the time you first became aware of the bear(s)? _____

11. What was the distance to the bear(s) when first observed (specify units)? _____

12. What was the closest distance that the bear(s) approached (specify units)? _____

13. What was the bear doing at the time you first became aware of it? _____

14. What were you doing immediately before you first became aware of the bear(s)?

15. Describe any avoidance measures taken when the bear(s) was first encountered:

16. How did the bear(s) react to avoidance measures? _____

17. What was the total number of people in your group? _____

18. What was the group size throughout the incident? _____

19. Did the bear(s) ever charge? Yes No Not Applicable
If yes, from what distance did it charge (specify units)? _____
How many times did the bear(s) charge? _____

20. What do you feel was the probable cause of the incident? _____

21. Number and types of firearms in the group
Available _____
Used _____
Bullet type and weight _____
Number of shots fired _____
Number of hits _____
Number of shots required to stop bear _____
Number of shots required to kill bear _____

22. Non-lethal deterrents:

Available Air horn Whistle Flare Screamer Banger
 Cracker Rubber Bullet Bean bag Bear pepper spray

other _____

Used Air horn Whistle Flare Screamer Banger
 Cracker Rubber Bullet Bean bag Bear pepper spray

other _____

Distance(s) deterrent(s) used: _____

Effect(s): _____

23. Were you making noise or doing something to let the bear(s) know of your presence prior to the incident? Yes No Not Applicable

If so, describe: _____

24. Were any of the following present at the incident location?

| Camp with | Transportation |
|--------------------------------------|--|
| <input type="checkbox"/> Cabin | <input type="checkbox"/> Metal Boat |
| <input type="checkbox"/> Weatherport | <input type="checkbox"/> Inflatable Boat |
| <input type="checkbox"/> Tent | <input type="checkbox"/> Canoe |
| | <input type="checkbox"/> Kayak |
| | <input type="checkbox"/> Aircraft |
| | <input type="checkbox"/> Other: _____ |

25. Was fuel recently spilled at the incident location?

Yes No Unknown/Not Applicable

If Yes, what type of fuel? _____

26. Was human food present? Yes No Unknown/Not Applicable

If present, how was food stored?

Metal Drum BRFC Cooler Plastic Bag Open

Other _____

If present, where was food stored?

Cabin Weatherport Tent Pack Ground Cache Boat Aircraft

Other _____

27. Was garbage present? Yes No Unknown/Not Applicable

If present, how was garbage stored?

Metal Drum BFRC Cooler Plastic Bag Open

Other _____

If present, where was garbage stored?

Cabin Weatherport Tent Pack Ground Cache Boat Aircraft

Other _____

28. Did incident occur at a camp? Yes No

If yes, what was distance between food storage site and (specify units)

Cooking Area _____ Sleeping Area _____

Camp deterrent systems in use and active at the time of incident

None Electric Fence Perimeter Alarm

Other _____

29. Did bear(s) receive a food reward? Yes No Unknown/Not Applicable

30. Was natural food present? Yes No Unknown/Not Applicable

If yes, please describe

Carrion Spawning Fish Berries

Other _____

Distance to known food source(s) (specify units)? _____

31. Describe the incident environment

| Terrain | Vegetation | Visibility | Weather |
|---|--|-------------------------------------|---|
| <input type="checkbox"/> Flat | <input type="checkbox"/> Tundra | <input type="checkbox"/> <5 m | <input type="checkbox"/> Fog |
| <input type="checkbox"/> Hills/Dunes | <input type="checkbox"/> Grass | <input type="checkbox"/> 5 – 10 m | <input type="checkbox"/> Rain / Snow |
| <input type="checkbox"/> Mountains | <input type="checkbox"/> Brush | <input type="checkbox"/> 10 – 25 m | <input type="checkbox"/> Clear |
| <input type="checkbox"/> Beach/Lake Shore | <input type="checkbox"/> Closed Forest | <input type="checkbox"/> 25 – 50 m | <input type="checkbox"/> Partly Cloudy |
| <input type="checkbox"/> River/Stream | <input type="checkbox"/> Open Forest | <input type="checkbox"/> 50 – 100 m | <input type="checkbox"/> Overcast |
| <input type="checkbox"/> Other | <input type="checkbox"/> Riparian | <input type="checkbox"/> >100 m | <input type="checkbox"/> Wind Speed |
| | <input type="checkbox"/> Other | | <input type="checkbox"/> Wind Direction |

32. Was property damaged? Yes No

If yes, describe: _____

Estimated value: _____

Human-Bear Incident Report Form Instructions

Complete this form if: you took a bear in defense of life of property; a person or bear was injured or died; non-lethal deterrents were used; you had an incident with a bear showing aggressive behavior(s); or if damage to a camp or equipment was caused by bears.

Forward a copy of the completed report to your station bear awareness instructor and the Regional Safety Manager as soon as possible (U.S. Fish and Wildlife Service, Safety Office, 1011 E. Tudor Road, Anchorage, Alaska 99503). In the case of polar bears, also provide a copy to the Marine Mammals Management Office (U.S. Fish and Wildlife Service, Marine Mammals Management, 1011 E. Tudor Road, Anchorage, Alaska 99503; 1-800-362-5148).

If a bear was killed or wounded under Defense of Life and Property provisions, completion of this form **does not** satisfy the requirement to complete a Defense of life and Property report to Alaska Department of Fish and Game. Attach a copy of the Defense of Life and Property Report to this report.

1. Self-explanatory.
2. Provide full names only.
3. Be as specific as possible when describing the location; provide GPS coordinates (including the datum of the GPS). Attach a map with the incident location if possible.
4. Self-explanatory. Complete a separate form for each incident even if you believe the same bear was involved (e.g., an incident at camp at 2200 hrs and then another at 0400 hrs the next day would be 2 separate incidents that would need separate reports).
5. Use military time.
6. Provide your best estimate.
7. Check the appropriate box.
8. Indicate the number of bears in the appropriate category; for example, a 3 in *Female with cubs of the year* would indicate a female with 2 cubs.
Provide any identifying features of the bear in order to help determine repeat instances or patterns.
9. Describe the activity that took you to the incident location (e.g., operating fish weir, salmon escapement survey, waterfowl brood survey, moose browse survey, recreation).
10. Describe your activities, or the activities of the group (e.g., "We had just completed securing the raft on the gravel bar when ...").
11. Provide your best estimate on distance. Be sure to indicate units.
12. Provide your best estimate on distance. Be sure to indicate units.
13. Describe the bear(s) activities and sequence of behaviors, if any.
14. Describe your activities, or the activities of the group, immediately prior to becoming aware of the presence of the bear(s) (e.g., "We were rafting down a quite stretch of the Winding River talking in normal voices.").
15. Describe your actions, or the actions of the group, in the sequence that they occurred. Use additional space if necessary.
16. Describe how the bear(s) responded to your actions. Use additional space if necessary.

17. Indicate the total number of people in the group, not just those directly involved with the bear incident. (This information is being gathered and analyzed by others looking at the influence of other people near the incident site, but not directly involved in the incident.)
18. Indicate the number of people visible to the bear at the beginning of the incident. If the number of people changed during the incident, then indicate the changed number(s) as well (e.g., 2 at beginning, joined by 2 more, then the last member of party).
19. Check the appropriate box.
Provide your best estimate on distance for each charge; be sure to include units (e.g., 30 m, 25 m, and 20 m).
Be sure to indicate the total number of charges.
20. Provide your best estimate on the cause or causes that contributed to the incident occurring (e.g., surprise encounter, stumbled onto food cache, ambient noise covering human sounds, etc.). When analyzing information, it is important to understand your perceptions on contributing factors.
21. Indicate the number and types of firearms available in the incident group and which, if any, were actually used. Use can include non-lethal devices.
If lethal rounds were used: indicate the bullet type and weight; the total number of rounds fired; total number of hits (if this is an estimate then please indicate that the number is an estimate); the number of shots (or hits if known) that were required to stop the bear; and the number of shots (or hits if known) that were required to kill the bear.
22. Check or describe all non-lethal deterrents available in the incident group and those used. If no non-lethal deterrents were used, please indicate this on the Other line.
Provide your best estimate on the distance between the incident group and the bear(s) for each deterrent used (be sure to include distance units). Indicate each distance for each deterrent used if more than 1 deterrent was used or if the same deterrent was used multiple times.
Describe the action/reaction of the bear(s) to each deterrent action. Use additional space if needed.
23. Describe noises, if any, that the incident group was making prior to the incident.
24. Check all applicable boxes.
25. Check appropriate box. Recently means up to 5 days prior to the incident.
Please identify the type of fuel spilled, if known (e.g., unleaded gas, AvGas, Jet A, White Gas, Propane, etc.).
26. Check all applicable boxes and describe as appropriate.
27. Check all applicable boxes and describe as appropriate.
28. Check appropriate box.
Provide best estimated distances; be sure to include distance units.
Check or describe any camp deterrent system in place and active during the incident.
29. Check appropriate box.
30. Check appropriate box.
If present, check and describe food source(s) and indicate distance(s) between food source(s) and incident location; be sure to include distance units.
31. Check all appropriate boxes and provide description if needed to properly describe the incident environment. Be sure to identify primary vegetation present.

32. Check appropriate box. Identify the equipment damaged and describe the damage. Provide your best estimate on repair or replacement cost.
33. Check appropriate box. Provide brief description of types of injuries and locations of injuries (e.g., bites on left leg, cuts on back). Indicate if hospitalization was required to treat injuries.
34. Provide a detailed narrative of the incident in the sequence that it occurred. Include a discussion of those factors, controllable or not, such as poor visibility, campsite location, etc., that may have contributed to this incident. Describe what additional (if any) precautions could have been used to prevent or minimize this incident. Also, please provide any information you feel would be useful in learning from this incident, how to prevent or avoid future bear incidents, or increase employee safety while working in bear country. Attach photos of damaged equipment or facilities.



U.S. Fish & Wildlife Service

Land Clearing Timing Guidance for Alaska

Plan Ahead to Protect Nesting Birds

General Information:

Under the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703) (see <http://www.fws.gov/migratorybirds/CCMB2.htm>), it is illegal for anyone to "take" migratory birds, their eggs, feathers or nests. "Take" includes by any means or in any manner, any attempt at hunting, pursuing, wounding, killing, possessing or transporting any migratory bird, nest, egg, or part thereof. Take and possession under MBTA can be authorized through regulations, such as hunting regulations, or permits, e.g., salvage, research, depredation, or falconry. The MBTA does not distinguish between intentional and unintentional take. In Alaska, all native birds except grouse and ptarmigan (protected by the State of Alaska) are protected under the MBTA.

Destruction of active bird nests, eggs, or nestlings that can result from spring and summer vegetation clearing, grubbing, and other site preparation and construction activities would violate the MBTA. The following timing guidelines are not regulations, but are intended as recommendations to help you comply with the MBTA. Some species and their nests have additional protections under other federal laws, including those listed under the Threatened and Endangered Species Act (ESA), and bald and golden eagles (protected under the Bald and Golden Eagle Protection Act or BGEPA). Please contact the U.S. Fish and Wildlife Service to ensure compliance with ESA and BGEPA if these species may be present in your project area.

Directions:

1. Apply timing window guidelines to your project planning, unless project-specific review results in unique guidelines from the USFWS for your project.
2. If you encounter an active nest *at any time*, including before or after the local timing window, leave it in place and protected until young hatch and depart. "Active" is indicated by intact eggs, live chicks, or presence of adult on nest. Timing guidelines should considerably reduce the risk of inadvertent nest destruction, but final compliance with the law is your responsibility: do not destroy eggs, chicks, or adults of wild bird species.
3. If you have any questions regarding the MBTA and the timing guidelines, including projects that may occur in "boundary areas" between regions described on the matrix, contact your local Fish and Wildlife Field Office for assistance:

Anchorage (907) 271-2888
Fairbanks (907) 456-0203



Recommended Time Periods to Avoid Vegetation Clearing

| HABITAT TYPE → | Forest or woodland ¹ <i>(i.e., trees present)</i> | Shrub or Open <i>(i.e., shrub cover or marsh, pond, tundra, gravel, or other treeless/shrubless ground habitat)</i> | Seabird colonies <i>(including cliff and burrow colonies)</i> | Raptor and raven cliffs |
|---|---|--|--|-------------------------|
| REGION ↓ | | | | |
| Southeast | April 15 – July 15 | May 1 – July 15 ² | May 1 – September 15 ³ | April 10 – August 10 |
| Kodiak Archipelago | | | April 15 – September 7 ³ | |
| Southcentral <i>(Lake Iliamna to Copper River Delta; north to Talkeetna)</i> | May 1 – July 15 ² | | | |
| Bristol Bay/AK Peninsula <i>(north to Lake Iliamna)</i> | April 10 – July 15 | May 1 – July 15 ^{2, 4} | May 10 – September 15 | |
| Interior <i>(north of Talkeetna to south slope Brooks Range; west to treeline)</i> | May 1 – July 15 ² | | May 1 – July 20 ⁵ | April 15 – August 1 |
| Aleutian Islands | | April 25 – July 15 | May 1 – September 15 ³ | April 1 – August 1 |
| Yukon-Kuskokwim Delta <i>(east to treeline)</i> | | May 5 – July 25 ^{2, 4} | May 20 – September 15 | April 15 – August 15 |
| Seward Peninsula | | May 20 – July 20 ⁴ | | |
| Northern <i>(includes northern foothills of Brooks Range)</i> | | June 1 – July 31 ⁴ | | |
| Pribilof and Bering Sea Islands | | June 1 – July 15 | May 25 – September 1 | |
| | | | | |

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¹ Owl species may begin to nest two or more months earlier than other forest birds, and are fairly common breeders in forested areas of Alaska. You may wish to survey for nesting owls (or other early spring tree-cavity nesters) prior to tree-cutting. It is your responsibility to protect active nests from destruction.

² Canada geese and swan habitat: begin April 20

³ Storm petrel burrow habitat: April 1 – October 15

⁴ Black scoter habitat: through August 10

⁵ Seabird colonies in Interior refer to terns and gulls



Polar Bears and Humans

Safety Guidelines

Polar bear density in Alaska is highest during fall months when polar bears aggregate along the coastline. Due to changing ice conditions the U.S. Fish and Wildlife Service (FWS) anticipates that polar bear use of the coast will increase during open-water seasons (June through October). During this time many villagers engage in subsistence activities, and more people are engaging in polar bear viewing opportunities. Increasing numbers of visitors to Barrow and Kaktovik to view polar bears increase potential interactions between humans and polar bears. Polar bears are naturally curious and predatory which are factors that increase risk to humans.

The purpose of these guidelines is to minimize polar bear-human interactions and maximize the safety of both humans and polar bears, so each can continue to live safely in the Arctic environment.

FEDERAL LAW REGARDING POLAR BEAR-HUMAN INTERACTIONS

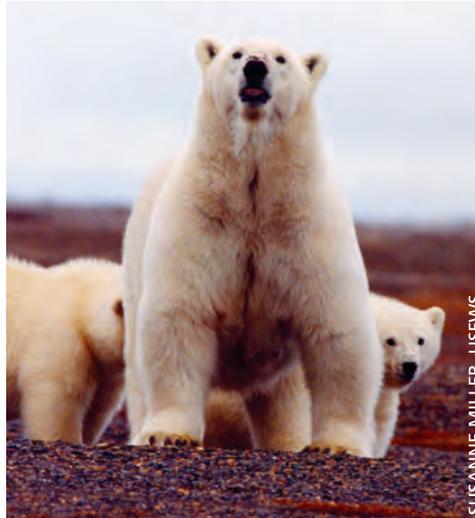
Polar bears are protected under the Marine Mammal Protection Act (MMPA) which prohibits take of any marine mammal.

Take is defined under the MMPA as: “to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal.” This includes feeding or attempting to feed a marine mammal in the wild.

Level A Harassment is: any act of pursuit, torment, or annoyance which has the potential to injure a polar bear.

Level B Harassment is defined as: any act of pursuit, torment, or annoyance which has the potential to disturb a polar bear by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering.

This means that any change in a polar bear’s natural behavior that is a result of your presence in proximity to the animal can be considered level B harassment, and is unlawful.



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A mother protecting her cubs may display defensive behavior by huffing or snapping her jaws.

Some exceptions are:

- Take for subsistence purposes, as long as take is not wasteful. The hunter is required to have the hide and skull tagged within 30 days. Harvest taggers are located in coastal villages to help.
- Authorized harassment of bears (deterrence) by government officials (i.e. North Slope Borough Polar Bear Patrol) is permissible as long as it is done in a humane manner and is for the welfare of the bear, the public, or non-lethal removal of nuisance animals that pose a risk to public safety.
- Defense of life take is only permissible if such taking is imminently necessary in self defense or to save the life of a person in immediate danger, and such taking is reported to FWS within 48 hours. Public officials have the authority to use lethal methods to protect the public from polar bears, and may do so when all reasonable steps to avoid killing the bear(s) have been taken.
- Scientific research such as polar bear population surveys, ecology studies etc. can be authorized.

- Photographing polar bears in the wild is permissible if no take occurs. If such activity is for educational or commercial purposes and could result in Level B harassment (disturbance), a permit is required.

Polar bears are also listed as a “threatened” species under the Endangered Species Act. This designation does not alter the definitions or exceptions of take outlined above under the MMPA.

GUIDELINES FOR LIVING IN POLAR BEAR COUNTRY

Most polar bears avoid people and have historically inflicted few human injuries and fatalities. However, the combination of curious and occasional sudden aggressive behavior creates the potential for human injury. In addition, polar bears spending extended periods of time on land without an adequate food source may be nutritionally stressed animals and potentially more dangerous.

In general, polar bears will react to humans by avoiding them, exhibiting curious behavior, treating them as other bears, or attempting to prey on them. The closer that humans are to polar bears, the more dangerous the situation because of the increased likelihood that the polar bear(s) will feel threatened. This could result in an attack. Unprovoked predatory attacks on humans are rare but do occur. The following guidelines may help reduce the risk associated with living in polar bear country.

Remain undetected

The best way to avoid detection by a polar bear is to be alert and detect the animal before it detects you. Be particularly alert in areas where bears are likely to occur: near open water leads, at whale or other marine mammal carcass sites, along coastal and river bluffs, or in the vicinity of fresh tracks.

- Avoid traveling alone;



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Sub-adults may display curious behavior: moving head around to catch scents, ears forward, stopping frequently.

- When in coastal areas, remain vigilant and be aware of your surroundings;
- Stay down-wind from known polar bear aggregation sites to avoid detection.

Avoid close interactions

Viewing animals should be accomplished without the animal's awareness of your presence. Little information is available regarding what constitutes a safe viewing distance. Polar bears are individualistic and react differently to both noise and human presence. A general rule of thumb is that the closer you are to the animal, the more likely you are to disturb it.

- Use binoculars and high powered scopes to avoid approaching too closely;
- Be aware that when on land bears typically rest during day and become more active during dusk, night, or dawn hours.

Avoid pursuing polar bears

Harassment or pursuit of polar bears is prohibited by law.

- Never attempt to herd, chase, or separate groups of polar bears;
- Using motorized vehicles, including boats, to view bears should be avoided if it results in unnatural behavior by bears.

Minimize attractants

Polar bears will investigate anything out of the ordinary as a possible food item. The presence of attractants are likely to increase the chances of having close bear-human interactions. If a bear learns to associate food with humans, it is likely to attempt obtaining food from humans in the future. A polar bear that receives a food reward is very likely to return.

- Do not let bears associate food with humans;
- Maintain a clean camp or residence; remove attractants such as food, garbage, animal carcasses, sewage, gray water, anti-freeze, or petroleum products;
- Store food or attractants in bear-resistant containers or locations;
- Avoid carrying food or items with strong odors when traveling in bear country.

Be Aware of Bear Behavior

Ensure that your actions do not cause a change in behavior of a polar bear. Since individual animal's reactions will vary, carefully observe all animals and leave the vicinity if you see signs of disturbance. Polar bears that stop what they are doing to turn their head or sniff the air in your direction may have become aware of your presence. These animals may exhibit curious, threatened, or predatory behavior.

- Curious polar bears typically move slowly, stopping frequently to sniff the air, moving their heads around

to catch a scent, or hold their heads high with ears forward.

- A threatened or agitated polar bear may huff, snap its jaws together, stare at you (or object of threat) and lower its head to below shoulder level, pressing its ears back and swaying from side to side. These are signals for immediate withdrawal. If ignored, the polar bear may charge. Threatened animals may also retreat, withdraw, or run away.
- Predatory behavior may involve a polar bear that is sneaking or crawling up on an object it considers prey. Another form of predatory behavior is a bear that is approaching in a straight line at a constant speed without exhibiting curious or threatened behavior. This behavior is indicative of a bear about to attack.

WHAT TO DO IF YOU HAVE A CLOSE ENCOUNTER WITH A POLAR BEAR

If a polar bear detects and approaches you, get out of the way if you are in the bear's path, or between a mother and her cubs. If the animal continues to approach and you are in a vehicle, leave the area. If no vehicle is available, slowly move to a safe shelter. If no safe shelter is available, do not run; stand your ground. Gather people together in a group and/or hold a jacket over your head to look bigger. If the bear continues to approach, shout or make noise to deter the bear.

If a polar bear attacks in a predatory manner and no safe shelter is available, defend yourself. If the attack is by a female defending her cubs, remove yourself as a threat to the cubs; fight back if the attack turns predatory.

The future of polar bears is uncertain due to the combination of climate change effects and human-caused mortality. We encourage everyone to seek non-lethal methods of avoiding bear-human conflicts. This may help ensure polar bears are here in the future.