Federal Aviation Administration
Air Traffic Airspace Branch, ASW-520
2601 Meacham Blvd.
Fort Worth, TX 76137-0520

**Aeronautical Study No.**
**2004-AAL-104-OE**

Issued Date: 03/20/2008

Steve Gilbert
Chugach Electric Association, Inc
5601 Minnesota Drive
Anchorage, AK 99519-6300

**** PUBLIC NOTICE ****

The Federal Aviation Administration is conducting an aeronautical study concerning the following:

Structure: Fire Island Wind Turbine Project
Location: Anchorage, AK
Latitude: 61-09-32.51N NAD 83
Longitude: 150-13-36.00W
Heights: 351 feet above ground level (AGL), 600 feet above mean sea level (AMSL)

In the study, consideration will be given to all facts relevant to the effect of the structure on existing and planned airspace use, air navigation facilities, airports, aircraft operations, procedures and minimum flight altitudes, and the air traffic control system.

Interested persons are invited to participate in the aeronautical study by submitting comments to the above FAA address or through the electronic notification system, http://oeaaa.faa.gov, aeronautical study number 2004-AAL-104-OE. Responses may be sent directly to Robert van Haastert, email: Robert.van.Haastert@faa.gov, fax: (907) 271-5863.

To be eligible for consideration, comments must be relevant to the effect the structure would have on aviation, must provide sufficient detail to permit a clear understanding, must contain the aeronautical study number printed in the upper right hand corner of this notice, and must be received on or before **04/26/2008.**

This notice may be reproduced and circulated by any interested person. Airport managers are encouraged to post this notice.

If we can be of further assistance, please contact our office at (907) 271-5863. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2004-AAL-104-OE.

**Signature Control No: 379686-101869997**

(CIR)

Robert van Haastert
Specialist
Attachment(s)

**NARRATIVE AERONAUTICAL STUDY NO. 2004-AAL-104-OE**

**Abbreviations**

AGL – above ground level
MSL – mean sea level
IFR – instrument flight rules
VFR – visual flight rules
RWY – runway
EMI – electromagnetic interference
Part 77 – Title 14 Code of Federal Regulations (CFR) Part 77, Objects Affecting Navigable Airspace

**1. LOCATION OF PROPOSED CONSTRUCTION**

The proposed wind turbine locations are contained on Fire Island, within nine (9) nautical miles west of the Airport Traffic Control Tower (ATCT) at Ted Stevens Anchorage International Airport (ANC). The Fire Island wind turbine original proposal included 33 wind turbines incorporating the Vestas V90-3.0MW generator in a nacelle mounted on 262 foot steel poles, roughly 20 miles of transmission power lines, and an electrical substation to transfer wind generated power to the Anchorage area electric grid. Each wind turbine generator evaluated had a rated electrical output of 3,000 kilowatts and the wind turbine blades had a 90 meter (295 feet) diameter span. A table detailing the 33 wind turbine locations is located in the Determination of Presumed Hazard (DPH) dated September 2, 2005, at end of this narrative.

**2. OBSTRUCTION STANDARDS EXCEEDED**

FAA Order 7400.2F, Procedures for Handling Airspace Matters, Section 3. Identifying/Evaluating Aeronautical Effect, paragraph 6-3-2 Scope, states Part 77 establishes standards for determining obstructions to air navigation. A structure that exceeds one or more of these standards is presumed to be a hazard to air navigation unless the obstruction evaluation study determines otherwise. An obstruction evaluation study shall identify:

a. The effect the proposal would have:
   1) On existing and proposed public-use and military airports and/or aeronautical facilities.
   2) On existing and proposed VFR/IFR aeronautical departure, arrival, and en route operations, procedures, and minimum flight altitudes.
   3) Regarding physical, electromagnetic, or line-of-sight interference on existing or proposed air navigation, communications, radar, and control system facilities.
   4) On airport capacity, as well as the cumulative impact resulting from the structure when combined with the impact of other existing or proposed structures.
b. Where marking and/or lighting is necessary.

The wind turbine structures that exceed 600 MSL, 22 of the original 33, are identified as Part 77 obstructions, Section 77.23(a)(3) – A height that increases a minimum instrument flight altitude within a terminal area of an airport. Any structure height exceeding 600 MSL would adversely effect the ANC Category (CAT) III instrument landing system (ILS) procedure. ANC is one of only two airports in Alaska with a CAT III ILS.

The FAA found two significant EMI impacts, which are detailed in the 2005 DPH, included at the end of this narrative. The ANC conventional Very High Frequency Omnidirectional Range (VOR) navigational facility and the ANC ASR-8 radar were found to have significant adverse impacts. The wind turbine proposal included wind turbine blades with a 90-meter (295 feet) diameter span and an operational rotation specification, 9-19 revolutions per minute. Wind turbine blade speed at 19 rpm, at the outer tip, would be in excess of 200 miles per hour.

**ANC VOR MITIGATION**
The FAA Technical Center conducted further analysis simulating replacing the conventional VOR with a new-generation, Doppler VOR (DVOR) on the Fire Island wind turbine proposal. Three studies were conducted and the final study used a maximum wind turbine mast height of 250 feet MSL.

The DVOR study identified 12 wind turbines that would significantly impact the DVOR and must be removed from the project. Five (5) other wind turbines locations would have to significantly reduce their mast heights below the technical specifications submitted in the original proposal. Additionally, three (3) new wind turbine locations could be added to the proposal at the southern tip of Fire Island that would not cause DVOR interference.
For VOR EMI mitigation, the conventional VOR would have to be replaced by a proponent-funded DVOR and the Fire Island wind turbine project would be modified from the original proposed 33 wind turbines to a revised number of 24. Five of the remaining 24 shall have reduced mast heights.

Additionally, replacing the ANC conventional VOR with a new DVOR will impact each ANC standard instrument approach procedure (SIAP), Departure Procedure (DP), & Standard Arrival Route (STAR) which may require extensive Terminal Instrument Procedures (TERPS) design work, an aircraft flight check for validation of facility performance, and air traffic controller training. Revising any air traffic routes below 3,000 feet MSL will initiate National Environmental Policy Act (NEPA) requirements leading to an Environmental Assessment and/or an Environmental Impact Statement. Each VOR Federal Airway and Jet Route involved with this change will require TERPS design work, an aircraft flight check for validation, along with extensive rulemaking procedures detailed in Title 14 Code of Federal Regulation part 71.

**ANC RADAR MITIGATION**
Spinning wind turbine blades created significant radar processing problems that the older ASR-8 could not mitigate. The FAA is currently in the process of replacing the ASR-8 with a newer, Raytheon-designed, ASR-11 radar, which incorporates digital processing techniques that could be modified to mitigate the wind turbine EMI. The FAA along with the Fire Island wind turbine project consortium, (Municipal Power & Light, Chugach Electric Association, Golden Valley Electric Association, Homer Electric Association, Cook Inlet Region Incorporated, and Wind Energy Alaska) have been funding ASR-11 radar/software modifications over the past several years. ASR-11 radar modeling on the revised 24 wind turbine project has shown potential that the recent radar/software modifications could mitigate the spinning blade EMI and meet basic airport surveillance requirements. The ASR-11 is currently under operational evaluation trials and a commissioning decision is expected.

ASR-11 acceptance and commissioning shall be required for ANC radar EMI mitigation.

**3. EFFECT ON AERONAUTICAL OPERATIONS**
a. The impact on arrival, departure, and en route procedures for aircraft operating under VFR follows: An existing departure procedure, Fire Island Route, allows pilots departing Campbell Lake to stay low-level and fly around the Anchorage Class C controlled airspace to the west and depart to points north. Pilots on the Fire Island Route may fly this procedure without the requirement to contact air traffic controllers nor have a transponder-equipped aircraft. The Anchorage Class C airspace was designed with this specific 600 foot exclusion area for operations to/from Campbell Lake. The 600-foot altitude limit for the route is an upper limit that provides pilots flying it at least 1,000 feet of vertical separation from any heavy jet aircraft that might be on final to ANC Runway 7R or 7L. Changing the minimum altitudes for this departure procedure with the construction of the proposed wind turbines would place

small aircraft in unsafe proximity to heavy jet aircraft wake turbulence. Wind turbulence was not part of the scope of this aeronautical study. Wind turbine obstruction marking and lighting would be white paint on the structures along with synchronized flashing red lights as outlined in chapters 4, 12, and 13, of Advisory Circular AC 70/7460-1K. The advisory circular is available online at https://oeaaa.faa.gov/oeaaa/external/content/AC70_7460_1K.pdf. It is also free of charge, from the Department of Transportation, Subsequent Distribution Section, M-494.3, 400 7th Street, SW, Washington, DC 20590.

b. The impact on arrival, departure, and en route procedures for aircraft operating under IFR follows: The absolute maximum height of any structures on Fire Island is 600 MSL. Any structure height exceeding 600 MSL would adversely effect the ANC Category (CAT) III instrument landing system (ILS). ANC is one of only two airports in Alaska with a CAT III ILS. Additionally, maintaining two operational radars (ASR-8 and ASR-11) would create a mosaic radar situation that would adversely impact the ANC efficiency and capacity by requiring additional aircraft separation. Impacts to aircraft radar altimeter systems were not part of the scope of this aeronautical study.

c. The impact on all-existing public-use airports and aeronautical facilities follows: under investigation. There are no impacts to the Long Range surveillance radars.

d. The impact on all planned public-use airports and aeronautical facilities follow: under investigation.

e. The cumulative impact resulting from the proposed construction or alteration of a structure when combined with the impact of other existing or proposed structures follows: under investigation.

**4. CIRCULARIZATION**

Reponses to this public notice may be filed electronically at http://oeaaa.faa.gov, circularization notice number 2004-AAL-104-OE. All proposed Fire Island wind turbine structures will be included under this one 2004-AAL-104-OE aeronautical study. Responses may also be sent directly to Robert van Haastert, email: Robert.van.Haastert@faa.gov, phone: 907-271-5863, or fax: 907-271-2850.

This public notice was initiated before final ASR-11 commissioning action as an effort to identify any other issues or concerns not identified to the FAA and possibly commit funding allotted by Denali Commission and the State of Alaska.

## September 2, 2005 DPH Narrative

The Federal Aviation Administration (FAA) has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77 concerning the proposed Fire Island wind turbines. Details on each wind turbine structure are listed in a table below.

The initial findings of these studies indicated that the structures as described above would exceed obstruction standards and/or would have an adverse physical or electromagnetic interference effect upon navigable airspace or air navigation facilities. Therefore, pending resolution of the issues described below, it is hereby determined that the structures are presumed to be a hazard to air navigation.

The studies revealed that the potential for electromagnetic interference exists. See the attachment for further information.

A copy of this determination will be forwarded to the Federal Communications Commission if the structures are subject to their licensing authority.

NOTE: Pending resolution of the issues described above, the structures are presumed to be a hazard to air navigation. This determination does not authorize construction of the structures even at a reduced height. Any resolution of the issues described above must be communicated to the FAA so that a favorable determination can be subsequently issued.

If more than 60 days from the date of this letter has elapsed without attempted resolution, it will be necessary for you to reactive the studies by filing a new FAA form 7460-1, Notice of Proposed Construction or Alteration.

If we can be of further assistance, please contact our office at (907) 271-5863. On any future correspondence concerning this matter, please refer to the Aeronautical Study Numbers listed above.

***Signature Control No: 379718-402177***

Robert van Haastert
Specialist, Obstacle Evaluation Service

**DPH Attachment**
Aeronautical Study Numbers 2004-AAL-104-OE through 2004-AAL-136-OE

*** * * Determination of Presumed Hazard * * ***

| | | NAD 83 | NAD 83 | Site Elevation | AGL | AMSL |
|---|---|---|---|---|---|---|
| **No.** | **Aeronautical Study** | **Latitude** | **Longitude** | **feet** | **feet** | **feet** |
| 1 | 2004-AAL-104-OE | 61° 9' 32.51" | 150° 13' 36" | 249.3 | 413 | 662.3 |
| 2 | 2004-AAL-105-OE | 61° 9' 26.01" | 150° 13' 40" | 229.7 | 413 | 642.7 |
| 3 | 2004-AAL-106-OE | 61° 9' 20.51" | 150° 13' 46" | 246.1 | 413 | 659.1 |
| 4 | 2004-AAL-107-OE | 61° 9' 08.02" | 150° 13' 52" | 213.3 | 413 | 626.3 |
| 5 | 2004-AAL-108-OE | 61° 9' 00.02" | 150° 13' 57" | 259.2 | 413 | 672.2 |
| 6 | 2004-AAL-109-OE | 61° 8' 54.02" | 150° 13' 50" | 246.1 | 413 | 659.1 |
| 7 | 2004-AAL-110-OE | 61° 8' 49.02" | 150° 14' 04" | 196.9 | 413 | 609.9 |
| 8 | 2004-AAL-111-OE | 61° 7' 49.52" | 150° 14' 52" | 242.8 | 413 | 655.8 |
| 9 | 2004-AAL-112-OE | 61° 7' 45.02" | 150° 15' 00.5" | 196.9 | 413 | 609.9 |
| 10 | 2004-AAL-113-OE | 61° 7' 42.02" | 150° 15' 6.5" | 213.3 | 413 | 626.3 |
| 11 | 2004-AAL-114-OE | 61° 7' 38" | 150° 15' 15" | 213.3 | 413 | 626.3 |
| 12 | 2004-AAL-115-OE | 61° 7' 34.5" | 150° 15' 25" | 164.0 | 413 | 577.0 |
| 13 | 2004-AAL-116-OE | 61° 7' 31" | 150° 15' 38" | 98.4 | 413 | 511.4 |
| 14 | 2004-AAL-117-OE | 61° 7' 29.5" | 150° 15' 51.01" | 49.2 | 413 | 462.2 |
| 15 | 2004-AAL-118-OE | 61° 8' 36.01" | 150° 11' 25.99" | 196.9 | 413 | 609.9 |
| 16 | 2004-AAL-119-OE | 61° 8' 31.51" | 150° 11' 32.99 " | 196.9 | 413 | 609.9 |
| 17 | 2004-AAL-120-OE | 61° 8' 28.01" | 150° 11' 39.99" | 232.9 | 413 | 645.9 |
| 18 | 2004-AAL-121-OE | 61° 8' 23.01" | 150° 11' 50.99" | 229.7 | 413 | 642.7 |
| 19 | 2004-AAL-122-OE | 61° 8' 19.01" | 150° 12' 00" | 164.0 | 413 | 577.0 |
| 20 | 2004-AAL-123-OE | 61° 8' 15.01" | 150° 12' 39.5" | 147.6 | 413 | 560.6 |
| 21 | 2004-AAL-124-OE | 61° 8' 11.01" | 150° 12' 48" | 164.0 | 413 | 577.0 |
| 22 | 2004-AAL-125-OE | 61° 8' 07.01" | 150° 12' 54" | 147.6 | 413 | 560.6 |
| 23 | 2004-AAL-126-OE | 61° 8' 03.51" | 150° 13' 03" | 131.2 | 413 | 544.2 |
| 24 | 2004-AAL-127-OE | 61° 8' 01" | 150° 13' 10" | 114.8 | 413 | 527.8 |
| 25 | 2004-AAL-128-OE | 61° 7' 58.5" | 150° 13' 09" | 164.0 | 413 | 577.0 |
| 26 | 2004-AAL-129-OE | 61° 7' 53.01" | 150° 13' 24" | 147.6 | 413 | 560.6 |
| 27 | 2004-AAL-130-OE | 61° 7' 52" | 150° 13' 23.5" | 229.7 | 413 | 642.7 |
| 28 | 2004-AAL-131-OE | 61° 7' 47.02" | 150° 13' 38" | 246.1 | 413 | 659.1 |
| 29 | 2004-AAL-132-OE | 61° 7' 43.52" | 150° 13' 46" | 229.7 | 413 | 642.7 |
| 30 | 2004-AAL-133-OE | 61° 7' 40.02" | 150° 13' 52.5" | 246.1 | 413 | 659.1 |
| 31 | 2004-AAL-134-OE | 61° 7' 37.02" | 150° 13' 59" | 278.9 | 413 | 691.9 |
| 32 | 2004-AAL-135-OE | 61° 7' 33.02" | 150° 14' 07" | 262.5 | 413 | 675.5 |
| 33 | 2004-AAL-136-OE | 61° 7' 30.02" | 150° 14' 15" | 246.1 | 413 | 659.1 |

The Chugach Electric Association's Fire Island Wind Turbine Project consists of 33 wind turbines incorporating the Vestas V90-3.0MW generator in a nacelle mounted on 262 foot steel poles, roughly 20 miles of transmission power lines, and an electrical substation to transfer wind generated power to the Anchorage area electric grid. Each wind turbine generator has a rated electrical output of 3,000 kilowatts and the wind turbine blades have a 90 meter (295 feet) diameter span. The wind turbine blades will rotate in an operational 9-19 revolutions per minute (rpm) range. Wind turbine blade speed at 19 rpm, at the outer tip, would be 200 miles per hour.

The proposed wind turbine locations are contained on Fire Island, within nine (9) nautical miles of the Airport Traffic Control Tower (ATCT) at Ted Stevens Anchorage International Airport (ANC). ANC is one of only two airports in Alaska with a Category III instrument landing system (ILS).

ANC Tower Operations

| | Itinerant | | | | Local | | |
|---|---|---|---|---|---|---|---|
| **Year** | Air Carrier | Air Taxi | General Aviation | Military | General Aviation | Military | **Total** |
| 2002 | 121,384 | 85,743 | 89,227 | 5,637 | 7,179 | 55 | 309,225 |
| 2003 | 120,003 | 76,601 | 85,070 | 5,045 | 6,055 | 24 | 292,798 |
| 2004 | 127,595 | 84,458 | 84,525 | 5,934 | 6,946 | 2 | 309,460 |

The FAA evaluated the proposed wind turbine operational effects on four FAA facilities: the Anchorage Very High Frequency Omni-directional radio range (VOR)/Distance Measuring Equipment (DME), Airport Surveillance Radar (ASR)-8 and ASR-11, and the co-located Airport Traffic Control Tower (ATCT) and TRACON operations. This extensive evaluation took 17 months to complete.

The Anchorage VOR/DME, is located at N61º 09' 03" W150º 12' 23" (NAD 83) with a site elevation of 279 ft. MSL and antenna height of 296 ft. MSL. The proposed wind turbine locations varies from 4,000 to 13,700 feet in distance from the Anchorage VOR/DME which is located 5.2 nautical miles from the landing threshold of ANC Runway (RWY) 7R.

The Anchorage VOR/DME provides azimuth and course guidance to eight (8) VOR Federal Airways: V-319, V-320, V-334, V-438, V-440, V-441, V-456, & V-462 and eight (8) Jet Routes J-111, J-115, J-124, J-125, J-133, J-501, J-511, J-804R The Anchorage VOR/DME is a component of six (6) standard instrument approach procedures (SIAP) into ANC: ANC ILS RWY 7L, ANC ILS RWY 7R, ANC ILS RWY 14, ANC ILS RWY 7R (CAT II), ANC ILS RWY 7R (CAT III), and ANC VOR RWY 7R; three (3) ANC departure procedures (DPs): Anchorage THREE, KNIK SIX, & TURNAGAIN TWO; and five (5) Standard Terminal Arrival (STAR) procedures: AMOTT FIVE, DENALI ONE, ELLAM TWO, TAGER THREE & YESKA TWO. Additionally, Take-off Minimums and (Obstacle) Departure Procedures require the use of Anchorage VOR/DME facility.

The VOR/DME siting criteria are contained in FAA Order 6820.10, *VOR, VOR/DME, and VORTAC Siting Criteria*, and reiterated in FAA Advisory Circular (AC) 150/5300-13, *Airport Design*. Specifically, FAA Order 6820.10, paragraph 17 (e) titled "Structures" states "All structures that are partly or entirely metallic shall subtend vertical angles of 1.2 degrees or less, measured from ground elevation at the antenna site." AC 150/5300-13, paragraph 604 (b) Clearances states "Terminal VOR signals are susceptible to distortion caused by reflections. Structures should be at least 1,000 feet (300 meters) from the antenna. Metal structures beyond 1,000 feet (300 meters) should not penetrate a 1.2 degree angle measured from the antenna base."

The FAA William J. Hughes Technical Center conducted a Math Modeling study using the Ohio University VPPM version 3.06 to model the turbine masts. Model results indicate a near-total loss of the Anchorage VOR service volume if the wind turbines are installed as planned. The primary reason for this is that most of the wind turbines exceed the elevation criteria of 1.2 degrees as stated in the FAA Order 6820.10. Also, the sheer number of turbines to be installed is a factor. The effects of the blades are harder to predict, because their effects are transient. Modeling suggests that there could be many multipath interferences caused by the blades, but the location of their effects is dependent on wind direction. Because of the relatively low speed of the blades, the cyclical bearing errors observed will be dependent on receiver filtering.

| Wind Turbine Bearing & Distance to Anchorage VOR/DME | | | | |
|---|---|---|---|---|
| **ID** | **Wind Turbine** | **True Bearing** | **Distance in feet** | **Angle Degrees from VOR base** |
| 1 | 2004-AAL-104 | 313.23 | 4,377.20 | **5.024** |
| 2 | 2004-AAL-105 | 304.63 | 4,114.51 | **5.071** |
| 3 | 2004-AAL-106 | 295.81 | 4,087.88 | **5.335** |
| 4 | 2004-AAL-107 | 277.32 | 4,007.59 | **4.971** |
| 5 | 2004-AAL-108 | 265.91 | 4,231.39 | **5.332** |
| 6 | 2004-AAL-109 | 258.22 | 4,462.08 | **4.886** |
| 7 | 2004-AAL-110 | 252.73 | 4,780.01 | **3.969** |
| 8 | 2004-AAL-111 | 222.87 | 10,178.16 | **2.121** |
| 9 | 2004-AAL-112 | 222.84 | 10,797.07 | **1.756** |
| 10 | 2004-AAL-113 | 222.89 | 11,220.82 | **1.773** |
| 11 | 2004-AAL-114 | 223.03 | 11,802.56 | **1.686** |
| 12 | 2004-AAL-115 | 223.57 | 12,397.99 | **1.377** |
| 13 | 2004-AAL-116 | 224.53 | 13,097.25 | 1.017 |
| 14 | 2004-AAL-117 | 225.99 | 13,657.77 | 0.769 |
| 15 | 2004-AAL-118 | 130.65 | 4,205.34 | **4.512** |
| 16 | 2004-AAL-119 | 138.31 | 4,280.67 | **4.433** |
| 17 | 2004-AAL-120 | 144.82 | 4,345.69 | **4.844** |
| 18 | 2004-AAL-121 | 154.19 | 4,509.87 | **4.625** |
| 19 | 2004-AAL-122 | 161.18 | 4,718.36 | **3.622** |
| 20 | 2004-AAL-123 | 184.90 | 4,890.31 | **3.302** |
| 21 | 2004-AAL-124 | 188.99 | 5,344.24 | **3.197** |
| 22 | 2004-AAL-125 | 191.24 | 5,795.92 | **2.785** |
| 23 | 2004-AAL-126 | 194.58 | 6,241.24 | **2.436** |
| 24 | 2004-AAL-127 | 196.67 | 6,676.15 | **2.136** |
| 25 | 2004-AAL-128 | 198.50 | 7,118.83 | **2.399** |
| 26 | 2004-AAL-129 | 200.11 | 7,567.93 | **2.133** |
| 27 | 2004-AAL-130 | 201.85 | 7,984.24 | **2.611** |
| 28 | 2004-AAL-131 | 203.10 | 8,387.74 | **2.597** |
| 29 | 2004-AAL-132 | 204.53 | 8,871.51 | **2.349** |
| 30 | 2004-AAL-133 | 205.41 | 9,328.45 | **2.335** |
| 31 | 2004-AAL-134 | 206.34 | 9,741.83 | **2.429** |
| 32 | 2004-AAL-135 | 207.30 | 10,281.56 | **2.210** |
| 32 | 2004-AAL-136 | 208.42 | 10,734.44 | **2.029** |

The proposed wind turbine locations are in areas where there are no VOR/DME performance restrictions, however, model results indicate a significant air navigation hazard via an electromagnetic effect would occur if the wind turbines were constructed. Likewise, any proposed location within the siting criteria would present an adverse effect and an air navigation hazard.

For a substantial adverse effect situation to be present, the situation must need both an adverse effect, i.e., electromagnetic interference to the operation of an air navigation facility, Anchorage VOR/DME, or the signal used by aircraft, and have a impact on a significant volume of aeronautical operations. The reported ANC Tower Operations indicate regular and continuing activity, which is considered a

significant volume. Thus, the Chugach Electric Fire Island Wind Turbine Project will have a substantial adverse effect on air operation into Ted Stevens Anchorage International Airport.

It is important to note that any relocation of the Anchorage VOR/DME involves more than the physical movement. Each SIAP, DP, & STAR will have to have extensive Terminal Instrument Procedures (TERPS) design work, an aircraft flight check and validation of facility performance, and air traffic controller training. Revising air traffic routes below 3,000 feet MSL will initiate National Environmental Policy Act (NEPA) requirements leading to an Environmental Assessment and/or an Environmental Impact Statement. Each VOR Federal Airway and Jet Route involved with a change will require TERPS design work, an aircraft flight check and validation, along with extensive rulemaking procedures detailed in Title 14 Code of Federal Regulation Part 71.

The Minimum Vectoring Altitude (MVA) in the vicinity of Fire Island is currently 1,600 feet MSL. Eleven of the turbines will be higher than 649 feet MSL (sites identified as 1, 3, 5, 6, 8, 14, 28, 30, 31, 32, & 33) which will raise the MVA to 1,700 feet within three miles of these turbines. This will add to the complexity of the facility MVA chart and create potential problems for air traffic controllers. The instrument approach procedure final approach fix will be at a lower altitude than the facility MVA, not a normal situation.

An existing departure procedure, Fire Island Route, allows pilots departing Campbell Lake to stay low-level and fly around the Anchorage Class C controlled airspace to the west and depart to points north. Pilots on the Fire Island Route may fly this procedure without the requirement to contact air traffic controllers nor have a transponder-equipped aircraft. The Anchorage Class C airspace was designed with this specific 600 foot exclusion area for operations to/from Campbell Lake. The 600-foot altitude limit for the route is an upper limit that provides pilots flying it at least 1,000 feet of vertical separation from any heavy jet aircraft that might be on final to ANC Runway 7R or 7L. Changing the minimum altitudes for this departure procedure with the construction of the proposed wind turbines would place small aircraft in unsafe proximity to heavy jet aircraft wake turbulence.

Currently, the ASR-8 radar is used to separate and radar vector air traffic to the Anchorage area airports: ANC, Merrill Field, Lake Hood, Lake Hood Seaplane Base, & Elmendorf Air Force Base. It is located at N61º 10' 43.47" W150º 00' 50.85" (NAD 27) with an antenna height of 314 feet MSL.

The ASR-8 is a two-dimensional, 60 nautical mile range, S-Band, radar using two klystron amplifiers. The ASR-8 is planned to be replaced by the Digital ASR-11, currently in test, optimization, & validation checks. The ASR-11 is located at N61º 09' 04.98" W150º 12' 23" (NAD 27) with an antenna height of 375 ft. MSL. It is currently not used for air traffic control.

An FAA study was conducted with the following conclusions:
1. Wind turbines would likely cause primary clutter (false target presentation and permanent echos) on controller radar displays in their immediate vicinity. They would likely cause interference with primary radar returns from aircraft flying directly over them, especially small, general aviation type aircraft. This interference may cause short duration loss of target identification.
2. Wind turbines would cause beacon (transponder) false targets, when aircraft are lower than 1,000 feet MSL and close to the turbines (<.23nm for the ASR-8/<.59 nm for ASR-11).
3. Wind turbines could cause both primary and beacon shadowing (dead zone/loss of targets) behind the turbines (1300 feet for ASR-8/1500 feet for ASR-11).
4. Beam distortion should not be a problem for either radar.

The study mentioned that some of the negative impacts may be mitigated via software modifications to the ASR-8 and ASR-11. However, the turbine blades will result in primary radar returns that cannot be subtracted by Moving Target Indicator (MTI) circuitry. Permanent radar display clutter in these areas is not acceptable.

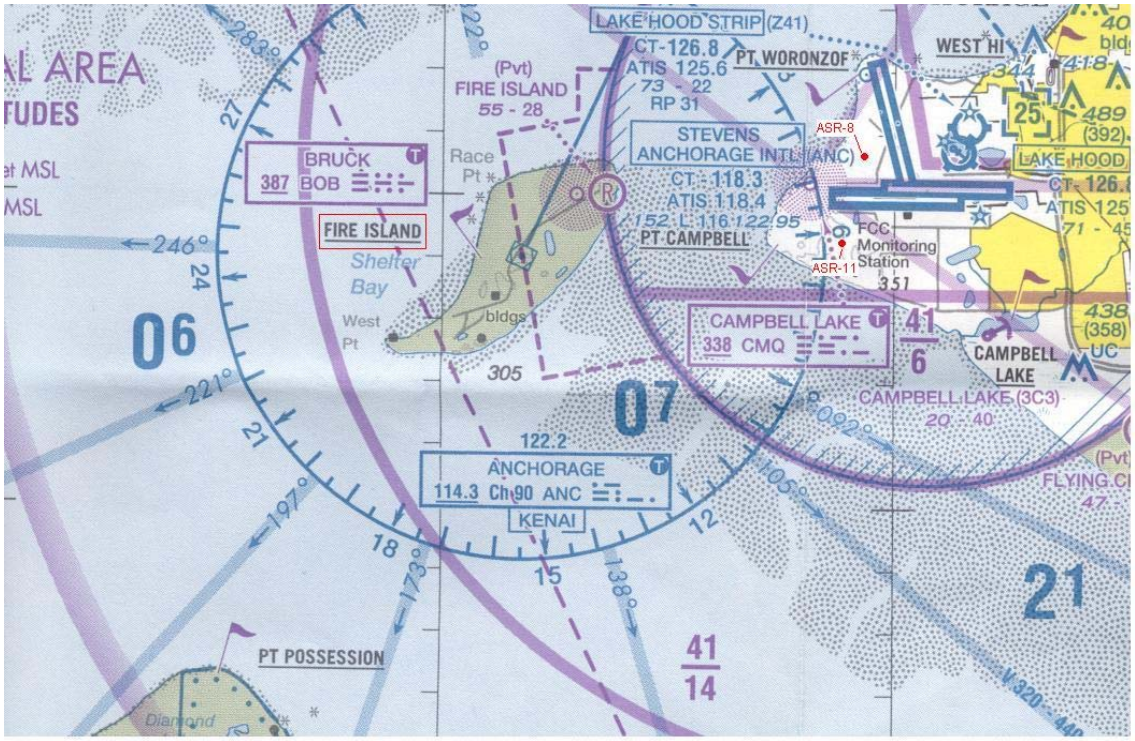
The proposed wind turbine locations are within what is considered to be a critical operations area, an area extending from the runway out to a 10 mile final including five (5) miles either side of the final approach course. This 50 square mile area is where the last opportunity for approach sequencing and spacing for arriving aircraft to the final approach course occurs. The potential radar clutter interference in this area is a major concern to Air Traffic personnel as it directly impacts the efficiency and capacity at Anchorage Ted Stevens International Airport.

Primary radar is the chief means of separating aircraft, while secondary radar provides the ability of computer-assisted tracking. The possible loss of primary radar returns in these maneuvering areas would limit the controller's ability to provide merging target procedures for aircraft on approach relative to any aircraft that might be flying on the Fire Island route. The Anchorage Airport Traffic Control management is opposed to any degradation of their primary radar capabilities.

There are additional impacts in the radar controlled environment when secondary radar is used for separation of transponder-equipped aircraft in lieu of primary radar. Instead of separating from the centers of the radar targets as with primary radar, a controller must separate targets from the ends of the beacon slashes. This can lead to adding up to two miles of required separation between aircraft, thereby reducing the number of aircraft on final; resulting in lower arrival rates and potential delays.

The potential for an adverse effect to the capacity and efficiency of air traffic flow to/from Anchorage Ted Stevens International Airport exists.

-- last line –




Orange triangles are proposed wind turbine locations