EXECUTIVE SUMMARY

The Master Plan prepared for Juneau International Airport (referred to as "the Airport" or "JNU," the 3-letter Airport code) by the City and Borough of Juneau in 1999 made a number of recommendations intended to enhance land use compatibility, resolve design and capacity deficiencies, accommodate existing and future air traffic, and reconstruct or rehabilitate Airport facilities (USKH 1999). The Federal Aviation Administration (FAA) accepted this Master Plan in 2000 and determined that some of the improvements identified in the Master Plan were needed to comply with the Federal Aviation Act and federal regulations on design standards for runways (40 CFR §139.309(a)(2); FAA 1989a). Any actions recommended in the Master Plan that would require federal action (e.g., partial or total federal funding, federal agency approval, or federal permit issuance) are subject to environmental review and analysis under the National Environmental Policy Act of 1969, as amended (NEPA) before being implemented.

To disclose the environmental consequences associated with proposed development activities at the Airport, as is required by NEPA, a Draft Environmental Impact Statement (Draft EIS or DEIS) was prepared according to NEPA regulations and guidelines. FAA considered comments to the Draft EIS submitted by the public and interested agencies, and in response prepared a Final EIS (FEIS) with additional information, analysis, and alternatives to be considered for implementation. The Council on Environmental Quality (CEQ) regulations implementing NEPA require that "each EIS contain a summary which adequately and accurately summarizes the [EIS]" (40 CFR §1502.12). According to the regulations, the summary (referred to in this EIS as the "Executive Summary") is to include:

- the major conclusions of the EIS,
- areas of controversy including highly controversial issues, and
- the issues to be resolved, such as the choice among alternatives.

FAA guidance for considering environmental impacts further requires that the Executive Summary also discuss:

- the Sponsor's proposed action and rationale supporting the proposal,
- a summary of the scoping process,
- major environmental considerations and how these have been addressed while other issues identified during scoping have been dismissed from analysis,
- the analysis of alternatives,
- FAA's preferred alternatives and rationale for these selections, and
- proposed mitigation measures to avoid or minimize impacts, or as compensation for unavoidable impacts, and conditions of project approval such as grant conditions or monitoring requirements.

The Executive Summary also should identify coordinating agencies and other interested agencies; list permits, licenses, and other approvals that must be obtained; and reflect compliance with other applicable environmental laws, regulations, and Executive Orders.

This Executive Summary is designed to provide members of the public and other interested parties a concise and factual accounting of the issues, analyses, and conclusions documented in the Final EIS for Juneau International Airport. However, readers are encouraged to review the Final EIS for a complete accounting of the process and analysis, as well as for access to the numerous figures that illustrate locations of and plans for the Proposed Actions and alternatives.

After careful and thorough consideration of the facts contained herein, and following consideration of the views of those Federal agencies having jurisdiction by law or special expertise on environmental impacts described, the undersigned finds that the proposed Federal action is consistent with existing national environmental policies and objectives as set forth in Section 101(a) of the National Environmental Policy Act of 1969.

for Bob Roth

Byron K. Huffman
Manager, Airports Division
Federal Aviation Administration

ES.1.0 INTRODUCTION

The FAA, cooperating state and federal agencies, and a third-party consultant team have evaluated the Proposed Actions and alternatives. Environmental issues and concerns expressed by the public and other agencies during scoping for this EIS have been considered and incorporated into the analysis. The Final EIS has been prepared in accordance with the statutory requirements of NEPA (42 U.S.C. §4321), the CEQ regulations implementing NEPA (40 CFR §1500 *et seq.*), and other applicable federal laws and regulations. Requirements and guidance specific to FAA were also used in development of the Final EIS, including FAA Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions* (2006) and FAA Order 1050.1E, *Policies and Procedures for Considering Environmental Impacts* (2004a).

ES.1.1 PROJECT LOCATION

Juneau, Alaska's state capital, is located in the panhandle of Southeast Alaska and within the Inside Passage alongside Gastineau Channel, approximately 950 air miles northwest of Seattle and 570 air miles southeast of Anchorage. The Airport plays an important role in serving the capital of Alaska by providing direct, non-stop service to Anchorage and other Alaskan cities. JNU is the primary commercial service airport for southeast Alaska and, other than ferry service, provides the only access to areas outside the Juneau area. The Airport is located within the City and Borough of Juneau (CBJ), approximately 9 miles northwest of downtown Juneau (Figure ES-1). Airport property encompasses approximately 662 acres of land.

The Airport is situated in a mountainous region that places limits on flight operations (e.g., weight limitations placed on some aircraft to ensure that these aircraft clear obstructions when departing). An example of how terrain restricts operations at JNU is the offset approach to Runway 08. The rising terrain west of the Airport (i.e., Pederson Hill) negatively impacts or elevates the existing straight-in landing minimums to Runway 08, while the higher mountains on Douglas Island constrain the existing missed approach procedure to this runway. The Coastal Range and other terrain in the vicinity of Juneau limit and define both approach and departure procedures at JNU. The Airport can at times experience changing weather and winds, further complicating aviation operations.

ES.1.2 CURRENT AIRPORT FACILITIES

JNU has a number of existing facilities for a variety of tenants, ranging from private aircraft parking and storage to commercial aviation services and military operations. A summary description follows of those facilities for which an action has been proposed and evaluated in this EIS. Figure ES-2 identifies some of the main Airport features, with emphasis on those facilities that could be affected by actions considered in the EIS.

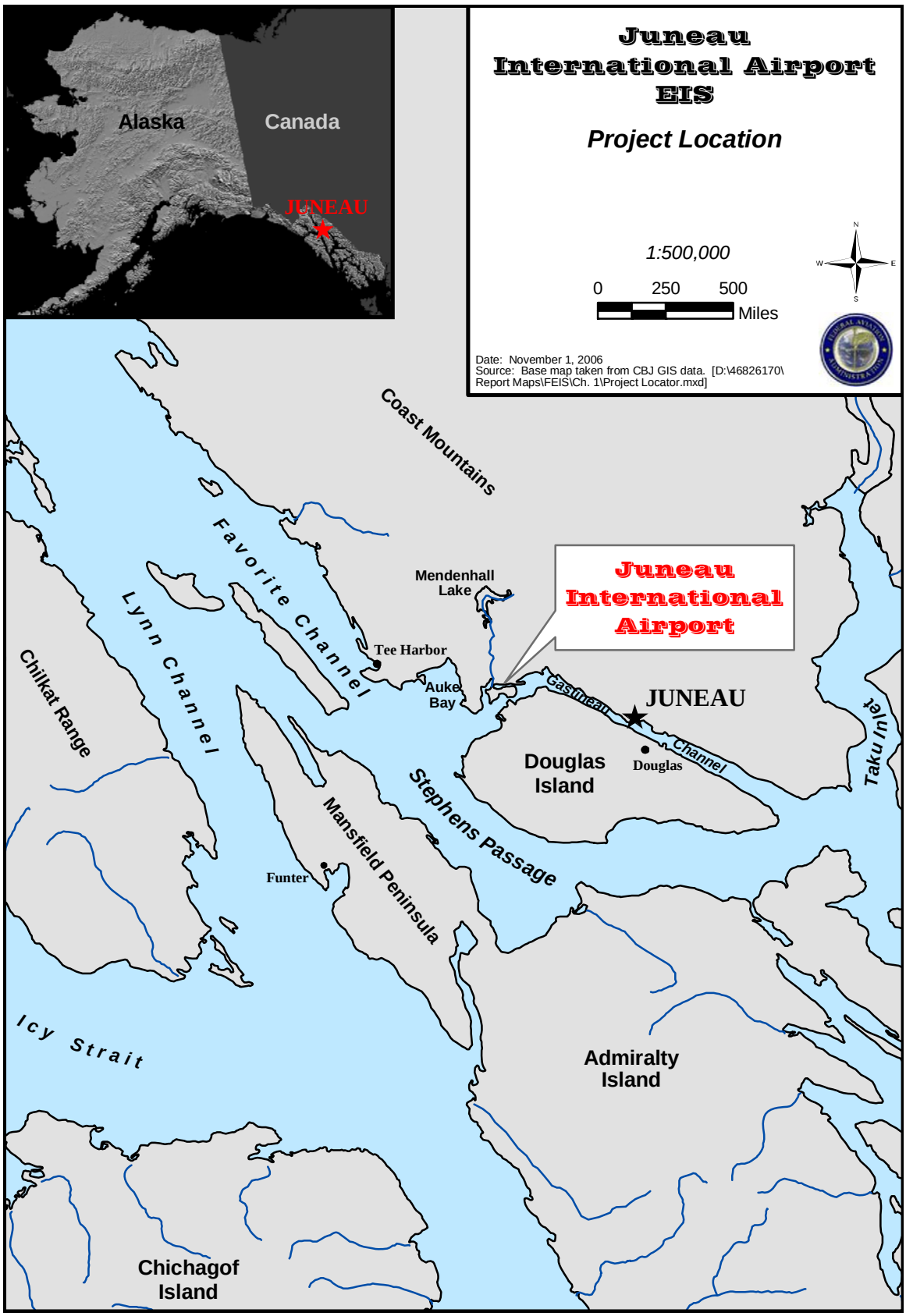

Figure ES-1. Project area locator map.

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ES.1.2.1 RUNWAY SAFETY AREA (RSA)

For wheeled aircraft, JNU has a single runway aligned in an almost east-west direction that is 150 feet wide and 8,456 feet long, constructed of grooved asphalt; the runway's gross weight-bearing capacity depends on the main landing gear configuration. Takeoffs to the west and landings from the east use Runway 26, while takeoffs to the east and landings from the west use Runway 08. The Float Plane Pond also serves as a runway for water takeoffs and landings. It has the same alignment as the hard surface runway and is 4,800 feet long and 450 feet wide. Surrounding the main runway is a runway safety area (RSA), which is defined by the FAA as:

> "A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of undershoot, overshoot, or excursion from the runway" [1999:*definitions, page 3*]

The RSA at the Airport extends approximately 250 feet beyond the end of Runway 08 (at a width of approximately 232 feet), and approximately 289 feet beyond the end of Runway 26 (at a width of approximately 228 feet). The width of the RSA also varies along the lateral extent of the runway. It is approximately 362 feet wide for approximately 3,500 feet of runway length and is 500 feet wide for the remainder of the runway.

ES.1.2.2 SNOW REMOVAL EQUIPMENT AND MAINTENANCE BUILDING

The existing airport snow removal equipment and maintenance building, located immediately north of the commercial aircraft apron and northwest of the terminal building, covers approximately 5,200 square feet. It has received only minor repairs since it was originally built. The main building was designed to accommodate three pieces of airfield snow removal equipment: a grader, loader, and a plow truck. Since the early 1950s, the building has also served as a storage facility for some of the snow removal equipment, although currently, because of the space limitations, many pieces of equipment are stored outside. Another hangar, built in the 1940s and across the terminal from the building, serves as storage for sand, pavement de-icing/anti-icing compounds, and other materials and supplies.

ES.1.2.3 FUEL FARM

There are presently two fuel storage facilities located on the Airport. The primary facility, which serves as the bulk storage fuel farm for the Airport, is located northwest of the snow removal equipment and maintenance building. The tanks at this facility contain Jet A fuel and different formulations of AvGas. The second fuel storage facility is smaller and is located just west of Taxiway C-1 and north of Taxiway A. Access to and from the two facilities is not direct, and refueling tanker trucks are required to travel outside of the secure Airport environs, on Alex Holden Way, to reach the terminal aviation ramp.

ES.1.2.4 AVIATION FACILITIES

Approximately 35 acres are being used at JNU to accommodate rotary wing (helicopter) and fixed wing aircraft: this area includes hangars and aircraft parking. Table ES-1 summarizes the existing aviation facilities, including current demands for new facilities, and also illustrates the number of facilities needed through the year 2015.

Table ES-1. Existing and Projected Future Aviation Facility Requirements

Facility/Aircraft	Number Existing and Approved	Additional Demand	EIS Forecast (year 2015)	Projected Number Increase
T-Hangars/Executive Hangars	80	16	116	36
Other Hangars (Large Private/Commercial) [4]	9	1	16	7
Transient Aircraft Tiedowns	128	vary[5]	153	25
Based Aircraft Tiedowns	196	vary[5]	194	-2
Helicopter FBO [6]	5	2	6[7]	2[8]
Based and Transient Helicopter Parking Sites	32	7	46[7]	14

[1] Total number in use as of June 2004, as well as those in construction or already authorized but not yet in use.
[2] Only shows additional demand over and above value in previous column. Based on February 2004 Wait Lists.
[3] Demand in year 2015 vs. number existing and approved.
[4] Number of aircraft stored can vary by size and need, particularly for commercial hangars. For example, 5 Wings hangar is approximately 20,000 square feet.
[5] Current tiedown needs vary according to available hangar space, seasonal operations, etc.
[6] FBO = Fixed Base Operator; typically includes hangar, building, access road, aircraft parking, vehicle parking, and operational area.
[7] Helicopter forecasts are based on Master Plan because FAA's Terminal Area Forecast does not track or project helicopter operations.
[8] Demand already exceeds Master Plan forecast.

The space at the Airport is insufficient to almost all operators and carrier types presently based at JNU. The lengthy waiting list for additional leases illustrates the existing need for new hangars to store based aircraft. The forecasts indicate that the space needed for T-hangars and executive/corporate hangars will increase by almost 50% (from that currently available) through the planning horizon (2015). Currently, aircraft are parked in obscure places or with insufficient space that is cramped, which continually results in unnecessary aircraft movement and a lack of separation between aircraft and operational surfaces which, in turn, result in potential safety concerns. JNU has also received relatively recent requests for accommodations for additional large aircraft and commercial operations. Development of new commercial hangars and parking spaces for larger aircraft would allow more prominent operators to expand their cargo services and operations at JNU. Furthermore, there are existing conflicts between rotary wing and fixed wing operators in places where they are stored in close proximity.

This EIS considered the spatial requirements to provide for all of the current and forecasted needs. Based on the existing demand for facilities and projected growth in demand for aviation services, the EIS study team estimates that approximately 9.1 additional acres would be needed, not including area required for supporting infrastructure.

ES.1.2.5 WILDLIFE HAZARD MANAGEMENT

Airports that accommodate commercial service air carriers are required to maintain an operating certificate in accord with FAR Part 139, to demonstrate that the Airport is adequately equipped and able to conduct safe operations, pursuant to the Federal Aviation Act of 1958. In accordance with 14 CFR Part 139.337(d), JNU is responsible for development of a Wildlife Hazard Management Plan (WHMP) and its implementation, which includes taking immediate action to alleviate wildlife hazards whenever they are detected.

JNU has a WHMP under which it operates in compliance with FAA requirements. After completing an updated Wildlife Hazard Assessment (WHA) in 2001, the Airport submitted a revised WHMP in April 2002. Because some actions proposed in the WHMP were determined by FAA to potentially significantly affect the environment, FAA decided to include an analysis of those actions and alternatives in this EIS.

ES.1.3 CURRENT AND FUTURE AVIATION ACTIVITY

For more than a decade (from 1990 through 2003), aviation activity at JNU has been relatively stable, but with an overall trend of increased operations. The peak year of aircraft operations was 1995, with 156,987 annual aircraft operations. The peak year for passenger activity was 1996, with 326,947 boarding (enplaning) passengers.[1] Total operations at JNU began a decreasing trend in 1999 which continued through 2003. However, air carrier operations in particular appear to be increasing and numbers of enplaned passengers are also on an upward trend. Data compiled on a monthly and annual basis by the Airport indicate that overall enplanements for Alaska Airlines in 2005 were up approximately 3% over 2004. Alaska Airlines has steadily increased operations for the past four years and is now operating at greater levels than in 2002, their previous peak year for operations at JNU.

The growth projections detailed in the Airport Master Plan used aviation activity data from the mid 1990s and relied on a seasonal forecast methodology to estimate aviation demand through the year 2015. This method was applicable to JNU because of the large seasonal variation in aviation activity, primarily due to summer tourism. During preparation of this EIS, however, it was found that the Master Plan inaccurately forecasted *continuous* growth in passenger traffic and aircraft operations. This discrepancy is not unexpected for airports the size of JNU, since aviation activity often fluctuates, particularly in a seasonal market heavily influenced by tourism. Aviation forecasts are often prepared to reflect *average* annual growth rates and, therefore, rarely match actual

1. Data identified by FAA in the 2004 TAF (showing historical activity levels).

activity levels. To assess whether the Master Plan's forecasts were based on acceptable assumptions and reflect appropriate long-term trends at JNU, this EIS attempted to corroborate the Master Plan's forecasts with another forecast tool: the FAA's Terminal Area Forecast (TAF).

The 2003 TAF for JNU operations is approximately 20%, 16%, and 13% less than the Master Plan's forecast of operations in years 2005, 2010 and 2015, respectively. The passenger forecasts differ by approximately 36% in those same years. However, upon close review, it was determined that the TAF for operations was deficient in forecasting seasonal and recreational aircraft—the forecasts for which the Master Plan was determined to be relatively sufficient. (This is probably because the TAF is based on assumptions reflecting conditions at the national level, and JNU's seasonal aviation operations are not typical of most airports.) As a result, the FAA agreed that the Master Plan forecasts could be incorporated into the EIS planning and analysis for limited uses considered very specific to JNU, such as float plane and helicopter facilities. The TAF forecasts were to be used to project other facility needs considered in this EIS, such as hangar and tiedown spaces.

The EIS also evaluated the Master Plan analysis of critical aircraft, fleet use, and airline projections for the future fleet mix at JNU. Based on more recent trends and information from the primary air carrier (Alaska Airlines), both the B737-400 and the B737-900 are used as the critical aircraft for analysis of JNU runway length and RSA needs. The B737-900 is anticipated to be the future critical aircraft for landing operations at JNU, while the B737-400 is the current and future critical aircraft for takeoff considerations.

ES.1.4 Purpose and Need

The CEQ regulations implementing NEPA require that an EIS specify the underlying Purpose and Need to which an agency is responding in proposing actions and alternatives (40 CFR §1502.13). The following sections summarize the Need to improve Airport facilities and the stated Purpose for actions proposed by the Airport and FAA. More information documenting the Needs may be found in Section 1.4 of the Final EIS. Actions proposed to satisfy the Needs are described in Section 1.5.

ES.1.4.1 Runway Safety Area (RSA)

The RSA dimension for Runway 08/26 is defined as a 500-foot-wide rectangular area centered upon the runway and extending lengthwise 1,000 feet beyond each runway end. These dimensions are based on the type of design aircraft using the Airport, specifically the wingspan and approach speed of the design aircraft.[2] Shortly after publication of the Draft EIS, FAA issued new guidance for RSA undershoot protection, reducing the required RSA length from 1,000 feet to 600 feet beyond each runway end (FAA 2004b). Overshoot protection remained unchanged at 1,000 feet beyond each runway end.

2. All of the B737-series aircraft using or projected to use JNU fall within the wingspan category of Group III and approach category of C, thereby defining the 1,000 feet x 500 feet RSA dimensions.

Under dry conditions, the RSA should be capable of supporting occasional aircraft that could overrun, underrun, or veer off the runway without causing structural damage to the aircraft, as well as supporting aircraft firefighting and rescue equipment. The runway at JNU was originally built to meet then-current runway design standards, but in the mid 1980s, the RSA dimension standards were changed nationwide. In order to meet federal special grant conditions associated with a runway rehabilitation conducted in 1997, the RSA must be brought into compliance with FAR Part 139 (Public Law 109-115). Relative to Juneau P.L. 109-115 requires that the Airport comply with FAA RSA standards by the year 2015. Specifically, this law states:

> "That not later than December 31, 2015, the owner or operator of an airport certificated under 49 U.S.C. 44706 shall improve the airport's runway safety areas to comply with the Federal Aviation Administration design standards required by 14 CFRR Part 139: *Provided further*, that the Federal Aviation Administration shall report to the Congress on the agency's progress toward improving the runway safety areas at 49 U.S.C. 44706 airports."

The deficiencies associated with the runways at JNU include:

- insufficient lateral RSA along approximately 3,500 feet on the south side of the east portion of the runway,
- a relatively small amount of insufficient lateral RSA on the north side of the runway, and
- runway-end RSAs that are too narrow and more than 700 feet too short.

The deficiencies described above illustrate the Need to bring the Airport into compliance with FAA's standards for RSA. In doing so, the Airport shall not be required to reduce the length of the runway or declare the length of the runway to be less than the actual pavement length in order to meet the FAA requirements for RSAs. Improvement of the RSA will meet FAA's statutory responsibility to ensure that the safe operation of the Airport and runway system is the highest aviation priority (49 U.S.C. §47101(a)(1)).

ES.1.4.2 IMPROVE NAVIGATIONAL ALIGNMENT

Flight operations into and out of JNU are complicated by mountainous terrain, inclement weather including strong winds, precipitation, and fog with limited visibility, and sometimes slippery runway conditions caused by ice and snow. When the Airport is below ceiling or visibility minimums, some aircraft are not capable of landing or taking off, creating delays and, in some cases, flight cancellations. As a result, flight schedule reliability, particularly for commercial traffic, is reduced, which has clear economic and social impacts.

Additional approach lighting is needed to improve pilot alignment and create safer landing conditions for all aircraft during the transition to visual references used in landing at night and during poor weather conditions. This project would help to fulfill FAA's statutory responsibility to ensure that the safe operation of the Airport and runway system is the highest aviation priority.

ES.1.4.3 Improve and Increase Aviation Facilities

The Purpose of improving and adding additional aviation facilities is to efficiently meet current and reasonably foreseeable Needs for snow removal resources, access to the fuel farm, and aircraft parking for commercial and general aviation users. All of these actions support FAA's statutory responsibility to ensure that the safe operation of the Airport and runway system is the highest aviation priority.

ES.1.4.3.1 Snow Removal Equipment and Maintenance Facility (SREF)

The current snow removal equipment building does not meet current building codes or worker safety codes. Because of insufficient storage space inside the building, much of the equipment is stored outside, which reduces equipment life expectancy and increases maintenance costs. Equipment status is a major reason for delays to airfield operations and other time-critical activities, such as keeping the runway surface cleared to a condition suitable for landing and takeoff in wet snow. The sand storage hangar, located across the terminal from the current snow removal equipment and maintenance building, is also in a state of disrepair. This facility was not designed as a storage area for efficient loading and unloading of sand, nor was it constructed to hold airfield chemicals, such as de-icing compounds.

JNU has a Need for a larger SREF that is designed to shelter equipment and reduce mobilization time for snow removal operations, and a new sand storage building designed for such use. Co-location of snow removal equipment and maintenance and the sand shed would also increase operational efficiency.

ES.1.4.3.2 Fuel Farm Access

A new access route between the bulk fuel farm and the general aviation ramp has been proposed by JNU to keep fuel supply trucks off public thoroughfares, thereby creating safer traffic conditions. A new fuel farm access road would also increase airfield efficiency because of the shorter distance trucks would travel to reach the aviation ramp. The new road would provide better security for the Airport and fuel supply trucks, as all fuel loading and transport would take place on Airport property.

ES.1.4.3.3 Aircraft Parking and Storage

At the present time, aircraft at JNU are parked in obscure places or with insufficient space, resulting in unnecessary aircraft movement and inadequate separation between aircraft and operational surfaces. Additional facilities and apron space are needed to satisfy existing private and commercial aviation demands and to accommodate the projected growth in aviation needs, thereby satisfying other Airport objectives such as separating general aviation aircraft from commercial operations and relieving facility and parking congestion.

These developments would reflect FAA's responsibility to undertake airport construction and improvement projects that increase the capacity of facilities to accommodate passenger and cargo traffic to the maximum feasible extent, so that safety and efficiency increase and delays decrease (49 U.S.C. §47101(a)(7)).

ES.1.4.4 Wildlife Hazard Management Plan (WHMP)

There have been a number of wildlife strikes to aircraft approaching or departing JNU. FAA's strike database includes 44 documented strike reports for JNU during the years 1990 through 2005 (Cleary 2006). Except for one reported bat strike, all of the strikes involve birds, including a variety of species such as herons, owls, sandpipers, sparrows, ducks, ravens, and geese. One recent major event occurred on August 17, 2004. An Alaska Airlines B-737-400 was struck on departure from Runway 26 by a medium-sized bird at an elevation of approximately 1,000 feet. According to the Wildlife Strike Report, the bird was ingested into one of the engines. No passenger or crew injuries were reported, but the aircraft was out of service for inspection and repair for approximately 24 hours.

JNU published a revised WHMP (CBJ 2002) and identified species and problem areas presenting a hazard to aviation. In accordance with FAR Part 139, an updated WHMP is needed to implement habitat modifications and management actions that will reduce potential for aircraft collisions with wildlife.

ES.1.5 Summary of Proposed Actions

The following sections briefly summarize the actions proposed by JNU to meet the Purpose and Need identified in Section 1.4. Each of these actions is described in detail in Chapter 2 of the EIS.

ES.1.5.1 Increase Runway Safety Area (RSA)

To bring the Airport into compliance with FAA standards for RSA, the current runway would be modified and new RSA would be added to runway ends and sides. The Runway 08 landing threshold would be displaced 120 feet to the east, and another 230 feet of RSA would be added to the west end, resulting in a safety area that meets FAA standards of 1,000 feet in length and 500 feet in width. Additional fill and disturbance would be required for about 96 more linear feet west of the RSA to accommodate relocation of the Float Plane Pond access road and Dike Trail/EVAR.

The Runway 26 threshold would be extended 520 feet to the east, so that approximately 850 linear feet would need to be filled on the east end of the runway for the threshold relocation and RSA construction. The parallel taxiway (Taxiway A) would also be extended approximately 520 feet east with a connector to the runway at the east end, so that aircraft can taxi to and from the new Runway 26 threshold.

In addition, the lateral RSA along approximately 3,500 feet of the south side of the runway would be extended out an additional 132 feet to meet FAA's 500-foot width requirements for RSA. Finally, RSA would be extended out over Jordan Creek on the north side of the runway, between the runway and Taxiway A. This action, the Airport's Proposed Action, is Alternative RSA-5E.

ES.1.5.2 INSTALL MALSR ON RUNWAY 26 APPROACH

To improve navigational alignment with Runway 26, FAA has proposed to install a medium-intensity approach lighting system with runway alignment indicator lights (MALSR). The MALSR would consist of up to 14 light support towers spaced at 200-foot intervals, extending 2,400 feet east of the threshold. Access to and maintenance and repair of the MALSR would be accomplished with a permanent, at-grade road. This action, the Airport's Proposed Action, is NAV-2B.

ES.1.5.3 DEVELOP AIRPORT FACILITIES

Section ES.1.4.3 of this Executive Summary describes the Need to improve some facilities at JNU to improve operational efficiency, increase airfield capacity, and accommodate future growth in aviation activity. The following subsections describe the actions proposed by the Airport to satisfy those Needs.

ES.1.5.3.1 SNOW REMOVAL EQUIPMENT AND MAINTENANCE FACILITY (SREF)

JNU has proposed to construct a new, approximately 44,000-square-foot SREF to be co-located with a new, approximately 12,100-square-foot sand and chemical storage building on 6.7 acres of Airport property in the Northeast Development Area. The facility would include parking, room for equipment turnaround and changeovers, outside loading and unloading, and snow storage. This action, the Airport's Proposed Action, is SREF-3B1.

ES.1.5.3.2 FUEL FARM ACCESS ROAD

JNU has proposed to construct a new road that leads directly south from the fuel farm to the main Airport facilities. This roadway would directly link the bulk fuel storage facility with the aircraft operating area. The proposed roadway alignment would require installation of a bottomless arch or bottomless box culvert in Duck Creek. This action, the Airport's Proposed Action, is FF-1.

ES.1.5.3.3 AIRCRAFT PARKING AND STORAGE NEEDS

Recognizing the current facility deficiencies at the Airport and relying on aviation demand estimates generated for this EIS, JNU has proposed to develop additional transient and based aircraft parking and tiedowns in the Northeast and Northwest Development Areas, 38 new T-hangars and executive hangars, primarily in the Northwest Development Area, and 2 new, fixed-base helicopter operations and hangars in the Northeast Development Area. Commercial operations in the

Northeast Development Area would be expanded with the addition of 7 new commercial or corporate hangars and/or fixed base operations. This action, the Airport's Proposed Action, is FW/RW-2.

ES.1.5.4 Implement a Revised Wildlife Hazard Management Plan (WHMP)

The Airport has proposed a number of wildlife habitat modifications and hazard management actions that represent a subset of activities from the alternatives described in Section 2.9 of the EIS. They include:

- Filling and grading the wetlands located near the mouth of Duck Creek, on and off Airport property west of Runway 08.
- Relocating the mouth of Duck Creek to the northern Airport boundary.
- Removing swales and areas that pond water along the edges of the runway and parallel taxiway by filling, leveling, and grading the areas.
- Altering vegetation management techniques and increased hazing in the infield areas.
- Removing vegetation from the Float Plane Pond by dredging all waters south of the Float Plane Pond and the main portion of the pond (where vegetation exists) to a depth of at least ten feet.
- Removing the dam at the mouth of Jordan Creek.
- Implementing an adaptive hazard management approach to the Float Plane Pond woodlands. Initial habitat modifications would include:
    - Installation of a deer fence along the north side of the dike, from the existing fence on the west end to the existing fence on the east end.
    - Removal of corvid nests, as needed, to prevent re-establishment of crow rookeries in the woodlands.

ES.1.6 Lead, Cooperating, and Interested Agencies

The FAA is the lead federal agency responsible for preparation of this Final EIS, and for issuing a final Record of Decision (ROD) concerning the proposed airport development actions and alternatives. FAA will consider the proposed actions and alternatives presented in this EIS and issue a single Record of Decision that includes a decision for each of the identified needs.

Four other agencies with permitting authority and/or resource management responsibilities are cooperating with the FAA in the development of this EIS, pursuant to the CEQ regulations implementing NEPA (40 CFR §1501.6). The Cooperating Agencies are the U.S. Army Corps of Engineers (Corps), the U.S. Fish and Wildlife Service (FWS), the National Marine Fisheries Service (NMFS), and the Alaska Department of Fish and Game (ADF&G).

Other state, federal, and local agencies have been involved via their consultation responsibility and/or permitting authority for actions being considered in this EIS. These interested, consulting agencies include the U.S. Environmental Protection Agency (EPA), Alaska State Historic Preservation Office (SHPO), Alaska Department of Environmental Conservation (ADEC), a number of offices within Alaska Department of Natural Resources (ADNR), including Office of Habitat Management and Permitting, Office of Project Management and Permitting, and Division of Mining, Land, and Water, U.S. Department of Agriculture Wildlife Services, and various departments of CBJ. The Airport, an entity within CBJ government, is the project Sponsor.

ES.1.7 Permits, Licenses, and Approvals

A number of permits, approvals, and regulatory consultations would have to be approved or completed before the Proposed Actions or alternatives to those actions could be implemented. Table ES-2 lists the regulatory steps that JNU and/or FAA would have to fulfill and the state, local, or federal agency with primary regulatory responsibility.

ES.1.8 Public Review and Comment on Draft EIS

The CEQ regulations implementing NEPA direct the lead agency to solicit comments concerning the actions, alternatives and analysis within a Draft EIS from the public, government agencies, the project sponsor, and other interested parties (40 CFR 1503). The FAA prepared a Draft EIS for the Airport actions that was released to the public on April 29, 2005, initiating a comment period that lasted until June 30, 2005. The FAA's Notice of Availability (of the Draft EIS) appeared in the Federal Register on April 13, 2005. The FAA held public hearings on the Draft EIS in Juneau on June 1 and 2, 2005 including opportunities for the public to discuss the Draft EIS with the EIS preparation team. The FAA also held meetings at this time with public officials and cooperating and consulting agencies.

The FAA received comments by e-mail and letter, and through oral testimony at the public hearings. All substantive comments have been included in Appendix M of the Final EIS. Not every comment resulted in a change to the alternatives or analysis, but some resulted in clarifications, factual corrections or modifications and improvements to the analysis. In any case, FAA has carefully considered all of the Draft EIS comments and provided a response to each one. Responses to the comments are also shown in Appendix M of the Final EIS.

ES.2.0 Alternatives Including the Proposed Actions

In accordance with the federal guidelines implementing NEPA, a range of reasonable alternatives were identified that could accomplish the objectives of the Proposed Actions. Those alternatives that did not meet the Purpose and Need, as well as those that were not technically, operationally, or economically prudent and feasible, were eliminated from detailed consideration in the EIS. Two alternatives for runway safety area, RSA-6A and RSA-6B, were considered both prudent and feasible at the time the Draft EIS was prepared but were subsequently determined by the FAA to not be prudent based on cost since these alternatives are approximately 2.5 times the cost of tradi-

tional fill RSA alternatives and exceed FAA's $30 million financial feasibility threshold for runway safety area at JNU. However, FAA retained Alternatives RSA-6A and RSA-6B for analysis the Final EIS for the purpose of full disclosure of potential impacts and costing information.

The first half of Chapter 2 contains the eliminated alternatives and the rationales for their elimination. Those alternatives still available after the screening process were then described in sufficient detail to allow an evaluation of impacts upon the human environment. The following sections briefly describe the alternatives retained for detailed environmental analysis.

ES.2.1 RUNWAY SAFETY AREA (RSA)

Important considerations in the screening of runway-end RSA alternatives were how each alternative would affect runway characteristics, and how those changes could in turn affect aviation operations at the Airport. Numerous possible RSA configurations were evaluated for these and other factors, including technical feasibility, relative cost, and ability to meet Purpose and Need. The Draft EIS identified five alternatives plus the No Action Alternative that satisfied the screening criteria for runway-end RSA. These alternatives were subjected to a detailed environmental analysis. Since publication of the Draft EIS, other alternatives have been considered as a result of design refinements developed by FAA and CBJ, but also reflecting new RSA criteria for the design aircraft. Previously, the FAA's RSA criteria for aircraft such as the B-737-900 or -400, classified as Airplane Design Group III, incorporated a 1,000-foot safety area for both undershoots and overshoots. FAA still requires a 1,000-foot overshoot protection but the minimum undershoot protection has been reduced to 600 feet (FAA 2004b). This change has provided opportunities to modify alternatives that can reduce the RSA footprint through the use of declared distances (as explained in Section 2.2.2.2 of the EIS). The operational characteristics of alternatives developed during the DEIS were presented using full 1,000-foot undershoot and overshoot protection. Modifications of alternatives evaluated in the DEIS, based on the FAA's new RSA criteria, are included in the FEIS.

Three alternatives have been added to the FEIS, each representing a modification of alternatives evaluated in the DEIS. They include:

RSA-5D, an alternative based on RSA-5C and developed by JNU to use areas west of the Airport to the maximum extent possible for runway safety area,

RSA-5E, developed by FAA and CBJ/JNU in consultation with the Cooperating Agencies to avoid fill into the Mendenhall River resulting from some alternatives evaluated in the DEIS, such as RSAs-1, -6B and -6C, as well as RSA-5D, and

RSA-6D, developed by FAA based on the DEIS Alternatives RSA-6A and -6B, that could be used with traditional safety areas or modified to incorporate EMAS and thereby increase runway length.

RSA-5C, the alternative evaluated in the DEIS as JNU's Proposed Action, has also been modified to reduce impacts east of the runway but with a larger disturbance footprint west of the Airport.

Table ES-2. Coordinating and Consulting Agencies and Actions

Agency	Action	Authority and Basis of Action
FAA	Record of Decision	42 U.S.C. §4321 et seq. and 40 CFR §1500 et seq. The Record of Decision will document authorization for actions approved.
	Certifications	Federal Aviation Regulation Part 139 FAA approval of the Airport's Certification Manual. 49 U.S.C. §44502(b). A certification that the proposed facility is reasonably necessary for use in air commerce or from the national defense.
	Approval	49 U.S.C. §40103; 49 U.S.C. §44502; and 49 U.S.C. §47105. FAA must approve Airport Layout Plan revisions and make a determination of no adverse affect to safe, efficient use of airspace.
	Approval and Funding	49 U.S.C. §47104 et seq. and 49 U.S.C. §470117. FAA will determine how much financial support can be provided for the proposed development projects.
	Approval	49 U.S.C. §44502(a)(1). FAA must approve relocation or upgrade of existing navigational aids.
	Determinations	14 CFR Part 77. Concerning possible obstructions to navigable airspace. 14 CFR Part 157. Whether FAA objects to JNU's development proposal from airspace perspective. 49 U.S.C. Subtitle I, Section 303, Department of Transportation Act, Section 4(f). Concerning impacts to public parks, recreation area, or wildlife and waterfowl refuge of national, state or local significance.
	Consultation	Section 307 of the Coastal Zone Management Act (16 U.S.C. §1458(c)). Requires that the applicant certify that the project is in compliance with an approved State Coastal Zone Management Program and that the State concurs with the applicant's certification prior to FAA approval of the project and Airport Layout Plan.
Corps	Permit	Section 10 of the Rivers and Harbors Act (33 U.S.C. §403). Approval required for any structures to be placed in navigable waters of the U.S., or for work in or affecting navigable waters of the U.S.
	Permit	Section 404 of the Clean Water Act (33 U.S.C. §1344). Approval required for the discharge of dredged and/or fill material into waters of the U.S., including wetlands.
	Permit	Section 103 of the Marine Protection, Research, and Sanctuaries Act (33 U.S.C. §1413). Approval required for the transport of dredged material for the purpose of dumping it into ocean waters.
	Consultation	Section 307 of the Coastal Zone Management Act (16 U.S.C. §1458(c)). Applicant must certify that the project complies with an approved State Coastal Zone Management Program and that the State concurs.

Table ES-2. Coordinating and Consulting Agencies and Actions, continued

Agency	Action	Authority and Basis of Action
NMFS	Consultation And Opinion	Section 7 of Endangered Species Act. NMFS will issue Biological Opinion concerning potential effects of the Airport actions on endangered or threatened species.
	Consultation and Recommendation	Magnuson-Stevens Act (16 U.S.C. §1855(b)). NMFS will provide a conservation recommendation to the FAA and the agency must provide a detailed response in writing documenting measures for avoiding, mitigating, or offsetting the impacts on essential fish habitat.
	Consultation	Marine Mammal Protection Act (16 U.S.C. §1361-1421; Pub. L. 92-522). Service will determine whether the actions being considered have the potential to constitute a "taking" of marine mammals.
	Consultation	Fish and Wildlife Coordination Act (16 U.S.C. §661-667e). Requires consultation with NMFS (and FWS and ADF&G) when waters are proposed or authorized or permitted to be controlled or modified, so that loss of and damage to wildlife resources can be prevented. Pursuant to authority of this Act, NMFS (and FWS) also provide comment and recommendations to the Corps concerning Clean Water Act Section 404 Permits and Section 10 Permits issued under authority of the Rivers and Harbors Act.
FWS	Permit	Migratory Bird Treaty Act (regulations at 50 CFR Part 21.43). A federal depredation permit is required for the destruction of birds to control wildlife hazards at airports.
	Permit	Bald and Golden Eagle Protection Act (regulations at 50 CFR Part 22.23). An eagle depredation permit which allows the harassment of bald eagles but prohibits the killing, injuring, or capturing of eagles may be issued by the FWS for the alleviation of hazards to aircraft safety.
	Consultation	Fish and Wildlife Coordination Act (16 U.S.C. §661-667e). See above, as described for NMFS.
EPA	Consultation	Section 309 of Clean Air Act. This Act provides the EPA with authority to review and comment on federal actions conducted under NEPA.
	Permit	Section 401 and 402 of the Federal Water Pollution Control Act. Certification that the projects would meet discharge requirements of the Clean Water Act is required under Section 401.
ADF&G	Special Area Permit	5 AAC §95.420. A special area permit is required for any habitat-altering work, including any construction activity in a designated state refuge, critical habitat area, or sanctuary.
	Public Safety Permit	Permit for Scientific, Educational, Propagative, or Public Safety Purposes (5 AAC §92.033). A public safety permit for the taking of game species at JNU is necessary for all direct wildlife control operations.

Table ES-2. Coordinating and Consulting Agencies and Actions, continued

Agency	Action	Authority and Basis of Action
Alaska SHPO	Consultation and Concurrence	Section 106 of National Historic Preservation Act. Written statement from SHPO acknowledging appropriate consultation was undertaken and concurring with the findings of the field inventories should be received as evidence of compliance with the governing legislation.
Alaska DEC	Certification	Section 401 of the Clean Water Act (33 U.S.C. §1344). Certification would be required that the Airport actions will meet state water quality standards before federal permits are approved, with ADEC maintaining certification authority for the NPDES program (EPA has permitting authority).
ADNR Division of Lands	Approval	Disposal of Refuge property through a sale or lease to the Airport (to accommodate one or more of the actions) would require a finding that the action is in the best interest of the State of Alaska.
	Permit	Leasing and Permitting of State-owned Tidelands (11 AAC §58/11 AAC §62.690-730). In some instances, the State will provide a lease or permit for use of State-owned tidelands. Actions considered could involve lease, easement on, or purchase of State-owned lands.
ADNR, OHMP	Permit	Anadromous Fish Act (AS §41.14.870). Requires that an individual or governmental agency notify and obtain approval from ADNR for all activities within or across a specified anadromous water body and all instream activities affecting a specified anadromous water body.
	Permit	Fishway Act (AS §41.14.840). Requires that an individual or governmental agency notify and obtain authorization from the ADNR for activities within or across a stream used by fish if the ADNR determines that such uses or activities could represent an impediment to the efficient passage of fish.
	Consistency Determination	Alaska Coastal Management Program (6 AAC 80). The ACMP establishes standards against which the Airport actions may be evaluated, including requirements for management of coastal habitat and protection and preservation of land, air, and water quality. The Coastal Management Program manages the Consistency Review that ensures consideration of and compliance with all applicable requirements.
CBJ	Review and Approval	Juneau Coastal Management Plan (Section 49.70.950f). This policy, applied to development activities as part of the Juneau Coastal Management Plan and Consistency Review process, establishes a 50-foot setback from streams or lakes for all structures and foundations. Work within a 50-foot setback would have to receive CBJ approval through a variance process. CBJ Ordinance 49.70.400 requires receipt of FEMA permit for development in a flood hazard area.

Table ES-2. Coordinating and Consulting Agencies and Actions, continued

Agency	Action	Authority and Basis of Action
	Review and Approval, Permit	Juneau Wetland Management Plan CBJ Land Use Code 49.70.1065-1075). Any elements of the project involving fill of wetlands and impacts to habitat in general would require evaluation for consistency with the Juneau Coastal Management Plan and the ACMP, with possible issuance of conditional use permit.
	Permit	New buildings, modifications to existing buildings, and preparation for structures and surface would require building and grading permits from CBJ. Wetlands permit required for development in Class C and D (minor) wetlands under the jurisdiction of CBJ.

The JNU Airport Board voted unanimously on February 14, 2007 to designate Alternative RSA-5E as the new Proposed Action.

Five alternatives for lateral RSA, including the No Action, were initially considered and evaluated for technical feasibility, relative cost, ability to meet the Purpose and Need, and other factors. Based upon this evaluation, the only prudent and feasible alternative for achieving RSA compliance along the lateral length of the runway was clearing, filling, and grading along the eastern portion of the east runway.

As described in following sections, each of the alternatives for achieving RSA compliance with FAA standards at runway ends assumes lateral RSA development as a component of the action. All of the RSA alternatives would result in relocation of Duck Creek to enter the Mendenhall River north of its current discharge point. The emergency vehicle access road (EVAR)/Dike Trail, Float Plane Pond access road, and Airport perimeter fence would also be relocated west under all RSA alternatives, but the extent of relocation is dependent on the degree to which each alternative would require fill west of the existing Runway 08 threshold.

ES.2.1.1 RSA-1: Construct Traditional Graded Areas Surrounding the Runway

The most straightforward means of meeting RSA standards is through filling and grading the existing runway ends. The intent of this alternative would be to develop a traditional and standard, 1,000-foot RSA with no change in runway thresholds or operational procedures. To achieve the RSA compliance in this manner, JNU would have to purchase or otherwise gain access to Mendenhall Wetlands Stage Game Refuge (Refuge) lands owned by the State of Alaska. To meet RSA standards, over 700 additional feet of 500-foot-wide RSA would be created at each runway end. On the east, Runway 26 end, the RSA would extend out to approximately the Airport/Refuge boundary, approximately 711 feet beyond the end of the existing RSA. On the west, Runway 08, end the RSA would require approximately 750 additional feet of fill plus that required to relocate the EVAR/Dike Trail and boundary fence. This alternative would require acquisition, transfer, or lease of approximately 9.8 acres of Refuge land west of the Airport and 0.01 acre of Refuge land east of the Airport and relocation of the Mendenhall River around the end of the Runway 08 RSA. An additional 4.5 acres of Refuge land east of the Airport would be disturbed for the construction of the East Runway Slough channel. A substantial portion of Duck Creek would have to be relocated north due to the fill footprint. The estimated cost to construct this alternative is $16.9 million. Approximately 603,125 cubic yards of fill would be needed to complete the RSA on both runway ends and along runway edges, within a disturbance footprint of approximately 37.2 acres.

ES.2.1.2 RSA-5C: Displace Runway 08 Threshold and Construct Additional 26 Runway and Safety Area

This alternative, formerly JNU's Proposed Action, is a refinement of the Alternative RSA-5C identified in the Draft EIS. The location of the Runway 08 landing threshold would be displaced 446 feet to the east to achieve RSA standards through the implementation of declared distances criteria. The Runway 08 MALSR leading to the west end approach would also have to be relo-

cated east approximately 446 feet because of the threshold shift to the east. Departures on Runway 08 would begin takeoff roll at the existing threshold location. To meet RSA standards on the Runway 26 end, the Runway 26 threshold would be relocated 446 feet to the east. To enable aircraft to taxi to and from the new Runway 26 threshold, the parallel taxiway would also be extended an equivalent length to the relocated threshold.

Approximately 1,157 feet of fill would be necessary on the east (Runway 26) end for the threshold relocation and construction of the RSA, and 304 feet of new disturbance would be added to the west (Runway 08) end to complete the RSA. Approximately 5.8 acres of Refuge land east of the Airport and 3.2 acres of Refuge land west of the Airport would have to be acquired, transferred, or leased to JNU for implementation of this alternative. An additional 2.1 acres of Refuge land east of the Airport would be used for construction of a slough channel connecting the area northeast of the runway with Sunny Slough to reduce hydrologic impacts from construction of the RSA. A substantial portion of Duck Creek would have to be relocated north due to the fill footprint.

A total of approximately 39.3 acres would be disturbed to complete the runway end and lateral RSAs, and 595,204 cubic yards of fill would be needed to construct this alternative, at an estimated cost of $14.7 million.

ES.2.1.3 RSA-5D: Relocate Runway 26 Threshold and Construct Additional Runway and Safety Areas

This alternative was developed by JNU in response to FAA's efforts to identify a "compromise" alternative that would meet FAA's standards and meet the Sponsor's concerns about other alternatives. It also reflects recent changes to FAA's requirements for runway safety area, and uses the minimum RSA undershoot protection of 600 feet, while maintaining 1,000-foot overrun protection, to lessen impacts to wetlands and the Refuge east of the Airport. Alternative RSA-5D retains the existing Runway 08 threshold but includes relocation of the Runway 26 threshold by 400 feet to the east. The Runway 26 changes and RSA additions east of the runway would extend approximately 18 feet beyond the Airport boundary with the Refuge. The parallel taxiway would be extended 400 feet east so that aircraft would be able to taxi directly to the new Runway 26 threshold. Approximately 750 feet of fill would be necessary on the east end of the runway for the threshold relocation and construction of the RSA, extending 711 feet, plus an additional 39 feet for the 4:1 fill slope to support the RSA embankment. The RSA west of the Runway 08 threshold would be extended 350 feet. Additional fill and disturbance would be required for about 125 more linear feet west of the RSA to accommodate the steep RSA embankment slope, and relocation of the Airport perimeter fence, Float Plane Pond access road and Dike Trail/EVAR. A substantial portion of Duck Creek would have to be relocated north due to the fill footprint and relocated facilities.

This alternative was designed to minimize direct impacts to the Refuge east of the Airport and also to take advantage of other work west of the runway, specifically, fill of wetlands to reduce wildlife hazards (see WH-1b). As a result, however, the area disturbed to support new RSA, relocate the Float Plane Pond access road, and maintain recreational access to the Refuge south of

the Airport via the Dike Trail would extend into the east side of the Mendenhall River, directly west and southwest of the runway. To compensate for the possible hydrologic changes stemming from this work an approximately equal amount of dredging would be conducted on the west riverbank.

Approximately 8.1 acres of Refuge land west of the Airport and 0.01 acre east of the Airport would have to be acquired, transferred, or leased by JNU for implementation of this alternative. An additional 4.5 acres of Refuge land east of the Airport would be disturbed for the construction of the East Runway Slough channel to maintain the hydrologic connection between the sloughs north and south of Runway 26 and minimize impacts to wetlands and essential fish habitat. A total of about 35.6 acres would be disturbed by the RSA and relocation of facilities, and 511,677 cubic yards of fill would be needed. The estimated construction cost is $15.1 million.

ES.2.1.4 RSA-5E: Displace Runway 08 Threshold 120 Feet and Construct Additional 26 Runway and Safety Area (Proposed Action)

This alternative was developed by FAA and CBJ, in consultation with the Cooperating Agencies, in recognition that some alternatives evaluated in the DEIS incorporated expansions of the west runway end safety area that would encroach into the Mendenhall River west of the Airport. FAA, CBJ, and resources agencies have all expressed some concern over the predicted impacts to the Mendenhall from those alternatives and the uncertainties associated with the impact analysis, particularly hydraulic modelling.

Alternative RSA-5E varies from other alternatives using standard safety area only in the extent of change to the two runway thresholds. The location of the Runway 08 landing threshold would be displaced 120 feet east, although departures from that runway would begin at their current brake-release point. Runway 26 would be extended 520 feet to the east to preserve existing runway length. Each runway would have 600-foot undershoot protection and 1,000-foot RSA for overruns. The parallel taxiway would be extended 520 feet to the east to provide taxiway access to the extended runway. The lights comprising the Runway 08 MALSR would have to be shifted to match the eastward threshold displacement, while the EVAR/Dike Trail and Float Plane Pond access road would have to be relocated to the west of the RSA embankment slope. Duck Creek would be relocated north of the new RSA and away from other facilities.

Approximately 850 feet of fill would be necessary on the east end of the runway for the threshold relocation and construction of the RSA, including a 4:1 fill slope, and 230 feet of new disturbance would be added to the west runway end to complete the RSA. Additional fill and disturbance would be required for about 96 more linear feet west of the RSA to accommodate relocation of the Float Plane Pond access road and Dike Trail/EVAR. Approximately 4.2 acres of Refuge would have to be acquired, transferred, or leased by JNU for implementation of this alternative. An additional 4.9 acres of Refuge land east of the Airport would be disturbed for the construction of the East Runway Slough channel. About 35.3 acres would be disturbed and 484,365 cubic yards of fill needed to construct the RSA and associated facilities, at an estimated cost of $13.2 million.

ES.2.1.5 RSA-6A: EMAS TECHNOLOGY WITH DECLARED DISTANCES/RUNWAY 26 EXTENSION

EMAS is an acronym for Engineered Materials Arresting System, a technology developed by FAA and Engineered Arresting Systems Corporation for airports where standard RSAs cannot feasibly be developed on runway ends. EMAS consists of a number of pre-cast, cellular cement blocks installed beyond the end of the runway on available RSA. As an aircraft traverses the first row of "lead-in" blocks in the EMAS, they begin to crush. The interface between the aircraft tires and arresting material becomes resistant to the load, causing a deceleration, or slowing down, of the aircraft.

FAA has developed new guidance concerning EMAS and its potential application in lieu of standard RSA (FAA Order 5200.9). After years of testing and analysis, FAA has determined that EMAS can provide a level of safety generally equivalent to a standard RSA for overruns. However, for protection on runways with vertical guidance (such as instrument approach or visual guidance lighting), an EMAS system still needs an additional amount of RSA between the EMAS and the threshold, so as to provide no less than 600 feet of undershoot protection.

The overall design objective for JNU would be to arrest the design aircraft entering the EMAS at up to 70 knots and prevent the aircraft from exiting the far end of EMAS. Alternative RSA-6A uses EMAS to avoid direct disturbance to the Refuge east of the runway and minimize disturbance to the Refuge on the west runway end. An EMAS bed approximately 337 feet long would provide overrun protection equivalent to standard RSA. The EMAS bed plus additional RSA between the threshold and the beginning of the EMAS would create a 600-foot undershoot margin, considered by FAA to be an acceptable level of protection. On the east (Runway 26) end, approximately 323 feet of new disturbance would be needed to build the additional RSA and EMAS. The Runway 26 departure threshold would be located 188 feet east of its current location, while the Runway 26 landing threshold would remain at its current location. The net effect is that the new Runway 26 arrival threshold would be at the existing Runway 26 threshold. On the west (Runway 08) end, the EMAS would extend to just beyond the Airport/Refuge boundary after the addition of approximately 175 additional feet of fill. The Runway 08 landing threshold would be displaced 188 feet east, but takeoffs would begin from the current departure threshold. The Runway 08 MALSR leading to the west end approach would also have to be relocated east approximately 188 feet because of the threshold shift.

Approximately 1.9 acres of Refuge land on the west runway end would need to be acquired, transferred, or leased by JNU for implementation of this alternative. An additional 0.2 acres of Refuge land east of the Airport would be disturbed for the construction of the East Runway Slough channel. Duck Creek would be relocated to a discharge site in the Mendenhall River north of the runway. Approximately 25 acres of disturbance would result from this action, including the 12.2 acres of lateral RSA, requiring the use of approximately 317,412 cubic yards of fill. The estimated cost to construct this alternative is $23.1 million.

ES.2.1.6 RSA-6B: EMAS TECHNOLOGY WITH DECLARED DISTANCES/RUNWAY 08 EXTENSION

This EMAS alternative was designed to minimize disturbance to wetlands and habitat east of the Runway. It includes a 337-foot-long EMAS bed on each runway end, and additional standard RSA to create 600-foot undershoot margins for each runway. The Runway 26 landing threshold would be displaced 188 feet west, while takeoffs would begin from the current departure threshold. Approximately 135 feet of additional disturbance would be needed to build the remaining RSA and EMAS on the east runway end. However, the reduced footprint east of the runway would necessitate a greater disturbance area west of the runway. The Runway 08 departure threshold would be relocated 188 feet west of its current location, but the landing threshold would remain at the current location. The EMAS and additional RSA would extend the disturbance footprint another 350 feet and approximately 200 feet into the Refuge on the west runway end. The Runway 08 MALSR would be unaffected by this alternative.

Approximately 8.1 acres of Refuge land on the west runway end would be acquired, transferred, or leased by JNU for implementation of this alternative. An additional 0.2 acres of Refuge land east of the Airport would be disturbed for the construction of the East Runway Slough channel. Duck Creek would be relocated to a discharge site in the Mendenhall River north of the runway. Approximately 27.2 acres of disturbance would result from this action, including the 11.6 acres of lateral RSA, requiring the use of approximately 371,244 cubic yards of fill. The estimated cost to construct this alternative is $25.8 million.

ES.2.1.7 RSA-6C: EMAS TECHNOLOGY COMBINED WITH RUNWAY SAFETY AREA

This alternative was developed as a means of combining positive features of both standard (1,000-foot-long) RSA and EMAS technology. An EMAS system, with a 337-foot-long bed and an additional 263-foot-long RSA, would be installed on the Runway 08 end. The EMAS and additional RSA would extend the disturbance footprint an additional 350 feet and approximately 175 feet into the Refuge on the west runway end, exactly as described for Alternative RSA-6B. On the east runway end, approximately 711 feet of new disturbance would be needed to construct a full, 1000-foot-long RSA with the same dimensions and footprint as the Runway 26 RSA described for Alternative RSA-1. There would be no change in runway thresholds. The Runway 08 approach MALSR would be unaffected by this alternative.

Approximately 8.1 acres of Refuge land on the west runway end and 0.01 acre on the east runway end would be acquired, transferred, or leased by JNU for implementation of this alternative. An additional 4.5 acres of Refuge land east of the Airport would be disturbed for the construction of the East Runway Slough channel. Approximately 33.7 acres of disturbance would result from this action, including the 12.2 acres of lateral RSA, requiring the use of approximately 490,288 cubic yards of fill. The estimated cost to construct this alternative is $20.3 million.

ES.2.1.8 RSA-6D: THRESHOLD DISPLACEMENT USING DECLARED DISTANCE CRITERIA WITH OPTION FOR EMAS

This alternative was developed by FAA after publication of the Draft EIS and in consideration of comment expressed by JNU, CBJ, and others concerning EMAS alternatives. Alternative RSA-6D is a modification of EMAS Alternatives RSA-6A and -6B that could be implemented without the use of EMAS yet still have lower cost and less environmental impact than other traditional-RSA alternatives (such as RSA-1, RSA-5C or RSA-5D). RSA-6D has a greater amount of threshold displacement on each runway end than either RSA-6A or RSA-6B, but with the same fill footprints as RSA-6B on the west end and RSA-6A on the east end. The entire RSA on both runway ends would be constructed at full pavement strength so as to meet design standards for runway use, allowing greater runway length for departures. The operational drawback with this alternative is the landing distance available without EMAS would be reduced to 8,056 feet for each runway, about 400 feet less than existing conditions. With EMAS installed the landing distance for each runway would increase to approximately 8,644 feet.

The configuration of this alternative on the west runway end would be similar to that described for Alternatives RSA-5D, RSA-6B, and RSA-6C. The RSA west of the Runway 08 threshold would be extended 350 feet. Additional fill and disturbance would be required for about 125 more linear feet west of the RSA to accommodate the steepened RSA embankment slope and relocation of the Airport perimeter fence, Float Plane Pond access road and Dike Trail/EVAR. A substantial portion of Duck Creek would have to be relocated north due to the fill footprint and relocated facilities. The fill footprint would extend into the Mendenhall River, and some channel-side excavation would be conducted on the west bank to maintain hydraulic functions. An additional 311 feet of runway safety area would be added to the east runway approach.

This alternative does not include extension of the parallel taxiway for departures from either runway. Instead, aircraft that want or need to use the entire available takeoff pavement would be required to enter the runway at either Taxiway B, for Runway 08, or Taxiway G, for Runway 26 and backtaxi to the end of the full-strength pavement, and turn 180 degrees to begin takeoff roll.

Approximately 8.1 acres of Refuge west of the Airport would have to be acquired, transferred, or leased by JNU for implementation of this alternative. An additional 0.2 acres of Refuge land east of the Airport would be disturbed for the construction of the East Runway Slough channel. Approximately 29.2 acres of disturbance would be caused for the RSA and embankment construction, including the 12.2 acres of lateral RSA. Approximately 401,842 cubic yards of fill would be needed for this work, at an estimated construction cost of $11.9 million.

As noted earlier, this alternative as constructed without EMAS would actually reduce the landing distance available. Technically, this alternative does not meet the statutory requirements to retain full runway length if JNU would not agree to its implementation, even though coordination with Alaska Airlines suggests that the reduction would have only minimal effect on Alaska Airlines operations. However, this alternative was designed for possible future use with EMAS, and the runway configuration with arresting systems on both ends would restore the "lost" landing length. In addition, this alternative would have a lower construction cost than all other alternatives carried forward, and cause less environmental impact than most.

ES.2.1.9 RSA-8: NO ACTION ALTERNATIVE

CEQ regulations require the consideration of a No Action Alternative. While FAA standards for RSA essentially render a No Action Alternative not practicable, in the NEPA process, consideration must be given to an alternative that essentially maintains existing conditions. In this case, the runway thresholds would be maintained in their present location, and a runway length of 8,456 feet would be retained. This alternative would result in RSAs that are deficient by 750 feet or more at each end and too narrow for more than 40% of the runway length.

ES.2.1.10 PUBLIC LAW 109-443

Late in 2006, after publication of the Draft EIS and while revisions were being completed for this Final EIS, Congress passed and the President signed Public Law 109-443 to the National Transportation Safety Bill. Portions of this law address the proposed runway safety area improvements at JNU, and provide explicit direction to FAA concerning which alternative is preferred for implementation. Specifically, P.L. 109-443 states that "…the Secretary of Transportation may only select as the preferred alternative the least expensive runway safety area alternative that meets the standards of the Federal Aviation Administration and that maintains the length of the runway as of the date of enactment of this Act." In determining the least expensive runway safety area alternative "…the Secretary shall consider, at a minimum, the initial development costs and life-cycle costs of the project."

Revisions for the FEIS included substantial review and update to many of the cost analyses (see Appendix A in the EIS). Some alternatives incorporating EMAS were shown to have substantially greater construction and life-cycle costs than those alternatives using standard safety area construction. FAA considered eliminating the higher-cost EMAS alternatives from the full environmental analysis, since they clearly would not satisfy the statute's requirement to select the least expensive alternative. However, FAA also noted two other relevant factors. First, considerable effort had been expended responding to public and agency comments to develop alternatives that would reduce environmental impacts to the Refuge and nearby wetlands and wildlife habitat. While the EMAS alternatives may be precluded from selection as the preferred alternative, FAA believes it is important to complete the administrative record documenting all efforts to reduce and minimize adverse environmental effect. Second, some agencies have suggested they would not be bound by a statute pertaining to the Department of Transportation when there are other, possibly contradictory statutes applicable. For example, the Clean Water Act requires the Corps of Engineers to select the least environmentally damaging, practicable alternative with somewhat different direction from FAA's approach to project cost estimation. For these reasons, FAA has retained some EMAS alternatives for complete environmental analysis in the EIS.

ES.2.2 NAVIGATIONAL ALIGNMENT

Until recently, when the special procedures were established, few approaches to Runway 26 occurred during poor weather, due to existing terrain and vegetation in the vicinity of the Airport. Alaska Airlines now uses a RNAV special approach to Runway 26 when visibility is as low as 1 mile and the ceiling is as low as 337 feet. Although the RNAV approach to Runway 26 allows

lower minimums, there are no sophisticated approach lights to Runway 26 to provide visual guidance during use of special approach procedures or at night. By contrast, Runway 08 is served by a medium intensity approach lighting system with runway alignment indicator lights (MALSR), the most sophisticated approach lighting system available for that runway.

This EIS initially considered two general categories of navigational systems that could improve pilot alignment with the runway at night and during poor weather. One category was on-the-ground visual landing aids, typically consisting of enhanced lighting systems that assist the pilot with runway alignment on approach. Examples of these aids include:

- approach lighting with sequential flashers (ALSF), consisting of high-intensity lights that are required to support Category II and III precision approaches;[3]
- medium intensity approach light system (MALS), consisting of medium-intensity lights extending a distance of 1,400 feet from the runway end that enhance non-precision and night-time visual approaches;
- the MALSR, which consists of medium-intensity lights that extend 2,400 feet away from the approach end of the runway and supports Category I precision approaches;[4] and
- omni-directional approach lighting system (ODALS), which is typically installed on a runway with a non-precision approach or on a runway that is difficult to identify due to an excessive number of other lights in the area.

The other category of navigational system considered was in-the-cockpit navigational aids, which include procedures and technology available to the pilot to enable alignment of the aircraft on approach to a runway, but without use of additional lighting. Examples of these aids include:

- microwave landing system (MLS), an instrument and approach landing system that operates on microwave frequencies; and
- global positioning system (GPS) and/or flight management system (FMS), consisting of instrumentation in the cockpit that uses satellite communication technology to ensure the precise position of the aircraft on approach or departure.

Based on this review of available and applicable technologies, a number of possible alternatives were considered to meet the Need for improved navigational alignment. Only one action alternative, the Proposed Action, was found to meet Purpose and Need, and to be both prudent and feasible.

3. The weather designated capability of the landing system that provides acceptable guidance information to the pilot capable of supporting a landing minimum of 100 feet decision height and 1,200 feet runway visual range, the length down the runway visible to the pilot.
4. Supporting landing minima of 200 feet decision height and 1,800 feet runway visual range.

ES.2.2.1 NAV-2B: Medium Intensity Approach Light System with Runway Alignment Indicator Lights (MALSR)

A MALSR would improve operating parameters at JNU by enabling visual alignment with Runway 26 for all aircraft at night and during poor weather. The MALSR would provide a 1/4-mile lighting credit for the Runway 26 precision approach, allowing Alaska Airlines minimums to be reduced to 3/4 mile from the current 1-mile minimum. This would result in an estimated 17.5 additional hours of access per year that is otherwise precluded by weather conditions, thus reducing flight delays. The MALSR would also result in much easier alignment for all aircraft approaching JNU from the east at night. The cost of a MALSR is approximately $1.5 million, including equipment, installation, and construction of an at-grade access road for equipment operation and maintenance.

ES.2.2.2 NAV-3: No Action Alternative

This alternative would leave the current runway alignment systems unchanged. As a result, no operational improvements would be available or implemented to assist in nighttime/poor weather approaches (with or without instruments) to Runway 26. As a result, the frequency of flight delays at JNU would continue unchanged. However, in accordance with CEQ regulations, this alternative is carried forward for detailed analysis.

ES.2.3 Airport Facilities Development

Section 1.4.3 describes the current and reasonably foreseeable future Needs for snow removal resources, aircraft parking and storage, and access to and from the fuel farm. The following sections identify the alternatives selected to address each of those Needs.

ES.2.3.1 Snow Removal Resource Alternatives

The possible alternatives for construction of a new SREF and maintenance facility were evaluated for technical feasibility, particularly in consideration of other needed Airport developments, relative cost, possible environmental benefits or drawbacks, and ability to meet Purpose and Need. Other important considerations for this action were impacts on snow-removal response and capability and whether a given site would impede efficient development of other facilities. Ten different sites, including one off-Airport property, were initially considered. Only two of these sites were considered not feasible, either because of the presence of other Airport buildings within the needed development footprint, or a lack of development space without significant operational impacts on other Airport tenants and facilities. Other alternatives were considered not prudent due to a number of factors, including remote location, degradation of snow removal operations, and possible conflicts with aviation operations.

To reduce the number of alternatives to a reasonable range for detailed evaluation in the EIS, the FAA focused on those sites that would have the least impact on existing or planned aviation developments while still providing adequate access to the airfield with little potential for conflict

with aircraft movements. As a result, two alternatives were selected for detailed evaluation of environmental impacts: SREF-1B, West End of Airport and East of a Relocated Duck Creek, and the Proposed Action—SREF-3B1, South of Yandukin Drive. Each alternative was assessed using essentially the same layout and design features. Each alternative is estimated to cost $15.6 million to construct.

ES.2.3.1.1 SREF-1B: WEST END OF AIRPORT, EAST OF RELOCATED DUCK CREEK

To enable the relocation of Duck Creek, potentially needed for aviation facility development and/or to reduce wildlife hazards, a site on the east and south bank of the relocated creek was identified. This site is a few hundred feet east of the SREF-1A location, described in Chapter 2. Sufficient land exists to accommodate the facility. The estimated cost to develop this site could be greater than for other comparable areas, since a road may have to be cleared from the apron to the new building, if the SREF were approved without other airfield development in this area. Although locating the SREF here would allow development of other facilities in the immediate area, ironically, it would also somewhat limit that development as well. The site would have to be sufficiently distant from the north Airport boundary to allow relocation of the creek and accommodate the required stream setbacks. These buffers, combined with the parking and turnaround requirements for large snow removal equipment, would limit the number of hangars or other facilities constructed in the Northwest Development Area. Approximately 45,000 cubic yards of fill would be imported from the Float Plane Pond to construct the parking area and SREF and sand shed.

ES.2.3.1.2 SREF-3B1: SOUTH OF YANDUKIN DRIVE

This alternative is the Proposed Action. SREF-3B1 would be located immediately south of Yandukin Drive at the TEMSCO access road (Maplesden Way). This site would not affect any planned Airport development. A parking area for employees, vendors and buses could be located on the east side of the relocated TEMSCO access road. While minor operational conflicts could arise between snow vehicles and rotary wing aircraft, the helicopters operating in this area are typically less active during winter when snow removal operations are conducted. Conflicts between snow removal equipment and aircraft would be minimized by developing separate service roads from the taxiway system. Approximately 40,000 cubic yards of fill would be required for site preparation. According to CBJ, this site provides the best compromise among Airport development, cost, environmental factors, and other factors.

ES.2.3.1.3 SREF-5: NO ACTION ALTERNATIVE

This alternative would require retaining the current snow removal equipment and maintenance building at its present site, in its present condition. Some snow removal equipment and maintenance operations would remain outside. Without the added space to accommodate existing and future equipment, CBJ would continue to experience increased maintenance costs and decreased life expectancy of the snow removal equipment. As a result, delays in responding to snow and ice conditions would continue and would likely increase. Under this alternative, FAA's participation in future equipment acquisition may be jeopardized. Nonetheless, as required by NEPA, this alternative is carried forward for detailed environmental analysis.

ES.2.3.2 AVIATION FACILITIES

Based on the airfield facility development objectives and the demonstrated existing aviation needs, combined with the forecast needs through the year 2015, a number of possible initial alternatives were developed for new aviation facilities. The possible locations for development of new aviation facilities were evaluated for technical feasibility, relative cost, relative environmental impacts, and ability to meet Purpose and Need. It was determined through the planning and forecast validation efforts that neither of the two main, undeveloped lands on the Airport (known as the Northeast Development Area and Northwest Development Area) could provide sufficient space to accommodate forecast demand on its own. Only two alternatives, each making use of *both* large undeveloped areas, would meet the existing and forecast demands for space and aviation facilities. These alternatives would also meet the facility development objectives. FW/RW-1 and FW/RW-2 are carried forward for detailed environmental analysis, as is the No Action Alternative, FW/RW-3.

Both alternatives would require relocation of the emergency vehicle access road/Dike Trail and trail parking access. Conceptual layouts for the two development alternatives were prepared in accordance with the FAA criteria specified in Advisory Circular 150/5300-13 Airport Design, Advisory Circular 150/5390-2B Heliport Design, and Federal Aviation Regulation (FAR) Part 77 Objects Affecting Navigable Airspace. The overall layout and placement of facilities was driven by the design standards presented in these documents.

ES.2.3.2.1 FW/RW-1: FULL DEVELOPMENT OF NORTHEAST AND NORTHWEST DEVELOPMENT AREAS WITHOUT DUCK CREEK RELOCATION

This alternative includes aviation facility development in both the Northeast and Northwest Development Areas of the Airport. It would meet all of the planning/development objectives identified, such as separation of aircraft types, fixed base and commercial operations in one area, and consolidation of private aircraft in another.

Because a substantial portion of fixed wing aircraft uses occur on the west portion of the Airport, the Master Plan recommended that additional fixed wing aircraft parking for based aircraft occur on the Northwest Development Area along with new T-hangars and executive hangars. Fixed-base operators and other commercial tenants (such as TEMSCO, Wings, National Guard, Coastal, etc.) would, to the extent practicable, be concentrated in the Northeast Development Area. Tables ES-3 and ES-4 compare the numbers of facilities provided in the Northeast and Northwest Development Areas, respectively, against the forecast Need for the facilities.

The future buildout within the Northeast Development Area would necessitate relocation of the Remote Communications Outlet (RCO), Automated Surface Observation System (ASOS), and other FAA equipment. Most of the equipment from these facilities would be relocated to the Engineer's Cut or to a site just east of the TEMSCO parking lot. A few items, including the air traffic information service radio facility and the very high frequency (VHF) omni-directional range test transmitter, would need to remain in close proximity to the runway.

Table ES-3. Northeast Development Area Facilities

Facility Type	Number Provided	Projected Need
Based and Transient Tiedowns	12[1]	23[1]
Large Hangars	7	7
Helicopter FBO	2	2
Helicopter Tiedown Spaces	15	14

[1] Insufficient space is allocated for tiedowns in either the NE or NW Development Areas. The number provided (12) should be combined with that shown in Tables ES-4 or ES-5 to determine relationship to the projected Need of 23 combined based and transient tiedowns. Area for tiedowns can vary depending on the size and types of aircraft to be accommodated.

Table ES-4. Northwest Development Area Facilities, Alternative FW/RW-1

Facility Type	Number Provided	Projected Need
Executive/T-Hangers	37	36
Based and Transient Tiedowns	15[1]	23[1]

[1] Insufficient space is allocated for tiedowns in either the NE or NW Development Areas. The number provided (17) should be combined with that shown in Table ES-3 (12) to determine relationship to the projected Need of 23 combined based and transient tiedowns. Area for tiedowns can vary depending on the size and types of aircraft to be accommodated.

Approximately 24.8 acres would be disturbed by the proposed development in the Northeast Development Area, including approximately 19.8 acres of wetlands.[5] Some of this has already been disturbed for facilities, including the RCO and the access road to TEMSCO. However, other portions of the area consist of estuarine wetland habitat. It is estimated that 133,500 cubic yards of fill would be needed to raise the elevation above tidal influence, to approximately the level of the Delta One ramp, and provide a suitable support base for the facilities. The culvert providing a hydraulic connection between this area and the extreme east portion of the Airport would be removed or used as part of the storm-water drainage system.

Approximately 17 acres would be disturbed by the proposed development in the Northwest Development Area, most of which is currently undeveloped. The habitat to be disturbed includes approximately 5.0 acres of wetlands. It is estimated that 67,240 cubic yards of fill would be needed to raise the elevation above tidal influence and provide a suitable support base for the facilities. This alternative is estimated to cost $18 million to construct.

5. These numbers do not include the area set aside for a SREF, as shown on the Figure 2-34 of the EIS. Total disturbance including the SREF in the NE Development Area would be approximately 31.5 acres, requiring 173,680 cubic yards of fill.

Most of Duck Creek would remain in its existing location, but bridges would be needed for aircraft and vehicles to access and exit the aviation facilities. The SREF could be incorporated into this design in the Northeast Development Area, but if sited in the Northwest Development Area, it would limit space for aviation facilities and disrupt efficient operational flow of aircraft by transecting the apron that connects hangars to taxiways.

ES.2.3.2.2 FW/RW-2: FULL DEVELOPMENT OF NORTHEAST AND NORTHWEST DEVELOPMENT AREAS WITH MAJOR DUCK CREEK RELOCATION

This alternative represents the Proposed Action. This alternative would also result in buildout of the Northeast and Northwest Development Areas, and meet the planning objectives for existing and future demand and aircraft/facility separation. The planning concept applied to this alternative would be similar to that described in FW/RW-1. Transient aircraft parking, fixed-based operators and other commercial tenants would be concentrated in the Northeast Development Area, exactly as described for Alternative FW/RW-1. New, fixed wing aircraft parking would be located in the Northwest Development Area along with new T-hangars and executive hangars. However, this alternative would include relocation of Duck Creek to a northern airport corridor, extending from about Cessna Drive and, trending west, to discharge into the Mendenhall River. As a result, the configuration of facilities in the Northwest Development Area would be different than conceptualized for Alternative FW/RW-1, with some changes to the numbers of facilities provided, as shown in Table ES-5.

Table ES-5. Northwest Development Area Facilities, Alternative FW/RW-2

Facility Type	Number Provided	Projected Need (Table 1-2)
Executive/T-Hangers	38	36
Based and Transient Tiedowns	11[1]	23[1]

[1] Insufficient space is allocated for tiedowns in either the NE or NW Development Areas. The number provided (11) should be combined with that shown in Table ES-3 (12) to determine relationship to the projected Need of 23 combined based and transient tiedowns. Area for tiedowns can vary depending on the size and types of aircraft to be accommodated.

As with the previous alternative, approximately 17 acres would be disturbed in the Northwest Development Area. However, due to relocation of Duck Creek, the net gain in wetlands in the Northwest Development Area is estimated at 3.6 acres. The proposed development would be at an elevation of approximately 19 feet msl; an estimated 87,000 cubic yards of fill would be needed to raise and level the surface to that elevation. A pedestrian footbridge would span the creek where the Dike Trail crosses, near the Airport's western boundary. The existing pipe culvert at Radcliffe Road would be removed. This alternative is estimated to cost $18.6 million to construct.

The relocation of Duck Creek would benefit the Airport layout and would also provide an opportunity to improve certain stream characteristics and aquatic functions. The most valuable fish function of the lowermost portion of Duck Creek is as a migration corridor for anadromous and

resident salmonids. Currently, this function is impaired due to low flows, periodic creek dewatering, and lack of habitat diversity. Conditions for migration would be improved in a relocation of Duck Creek, and conditions for other functions would be maintained.

This alternative would also accommodate either SREF alternative (i.e., sited in the Northeast or Northwest Development Areas). However, placement of the SREF in the Northwest Development Area would be less efficient, since Duck Creek relocation would reduce available space in that area, and the SREF activity would also disrupt aircraft and vehicle traffic.

ES.2.3.2.3 FW/RW-3: No Action Alternative

In accordance with federal regulations implementing NEPA, the No Action Alternative is carried forward for detailed environmental analysis. This alternative would not satisfy existing and future aviation needs. As aircraft operations increased over time, parking would become increasingly congested, until JNU and FAA determined that there were unsafe conditions. Additional effort would be expended by Airport staff and tenants to move aircraft as needed, but it would become increasingly difficult to operate either safely or efficiently. Under this alternative, it would also become impossible with further growth to meet Airport Design standards, established to provide adequate aircraft clearance from other aircraft and ground support equipment.

ES.2.3.3 Fuel Farm Access

The possible alternatives for fuel farm access were evaluated for technical feasibility, relative cost, relative environmental impacts, and ability to meet Purpose and Need. Other important considerations for this action included maintenance of airfield security, protection of public safety, and more efficient refueling operations. Nonetheless, there were limited options to improve access for trucks to the fuel farm, and it is not feasible to re-locate the fuel farm (due to space limitations on the Airport, and siting safety constraints for petroleum storage tanks). After all these factors were considered, few alternatives remained that could address the needs associated with vehicles heavier than the allowable road capacity, Airport security and public safety concerns, and efficiency of refueling operations. Two alternatives, one for a new fuel farm road, and one for a fuel pipeline with service station, underwent detailed environmental analysis, along with the No Action Alternative.

ES.2.3.3.1 FF-1: Develop New Access Road to Fuel Farm

This alternative represents the Proposed Action. A new access road would be constructed to exit the south side of the fuel farm site. The route would parallel the Airport fenceline, cross Duck Creek, and connect to the aircraft apron in the vicinity of Taxilane W-2. Using this route, the fuel farm could be reached without having to travel on public roads or exit from the secure Airport perimeter. The estimated cost to develop the new access road is $302,998.

The road would consist of two lanes, each 12 feet wide, with an adjacent 2-foot shoulder on each side. The road would be paved with asphalt and underlain by select graded gravels and a base of borrow material, to meet CBJ construction standards and to be suitable for the vehicle types and weights to be transported. A bottomless arch culvert or bottomless box culvert would be installed

at the Duck Creek crossing. To reduce the culvert length, and therefore reduce impacts to the riparian corridor and aquatic life, the road width at this point would be narrowed to a 16-foot, single-lane crossing for approximately 30 feet. The culvert diameter would be sized according to the width of stream channel crossed. The new road would extend approximately 565 feet from the fuel farm to an unnamed Airport service road. Approximately 0.23 acres would be disturbed, including some palustrine scrub-shrub wetlands. Approximately 2,000 cubic yards of fill would be required for road construction.

The new location would shorten the total travel distance by approximately 450 feet in each direction. The new road would be completely within the Airport fenceline and thus separated from public traffic. With the shorter travel distance to Taxilane W-2 and the elimination of a security gate check procedure, all told, the new road would reduce transport time for the refueling trucks. An additional security and safety benefit would be incurred by reduction of travel through the existing Gate E, where tanker trucks require a delayed gate-closing system to ensure trucks clear the opening.

There would be environmental concerns associated with this alternative, particularly development of another Duck Creek crossing and removal of some upland and wetland habitat. However, there may also be an environmental benefit incurred by reduction in accident potential and reduced operations in close proximity to Duck Creek.

ES.2.3.3.2 FF-2: Install Pipelines from Fuel Farm to Central Fuel Distribution Port

This alternative would involve burying a fuel distribution pipeline extending from the fuel farm to a central refueling station on the Airport. The refueling station could be located just south of an un-named Airport road and would be used by tanker trucks that service aircraft. This alternative was developed to reduce environmental impacts associated with construction of a new fuel farm road and another Duck Creek crossing. It would also increase operational efficiency by further reducing the travel distance for airfield refueling trucks. The estimated cost to develop this fuel pipeline and refueling system is $721,726.

The pipeline system would follow approximately the same path as the fuel farm road. Multiple pipelines would be needed, since the products, such as AvGas and jet fuel, have to be separated by type, grade of fuel, and vendor and to allow fuel metering at the service station. These separate pipelines would be contained within a larger pipe to provide structural support, protection against damage from subsurface digging or drilling operations, and secondary containment in the event of leaks from a pipe.

The service station would be located in an area already disturbed and used for aviation facilities. The station would most likely consist of a series of pumps associated with each of the different AvGas, jet fuel, and (possibly) de-icing products. A clear zone of approximately 50 feet would be developed around the service facility; it may also be fenced as an added security precaution.

The product pipelines would most likely be installed by conventional trenching methods rather than directional drilling. The trench would be only a few feet wide, but the entire disturbance corridor for equipment maneuvering and vegetation clearing may reach 50 feet wide. Precautions would have to be taken during installation of the pipeline below Duck Creek. Ideally, trenching would occur during a period of low tides and low precipitation, to reduce the amount of in-stream flows that would have to be temporarily redirected. Screens and barriers would be used to prevent sediment disturbance and degradation of water quality. Alternatively, the pipelines could be installed during relocation of the Creek to avoid any trenching in an active channel. Vapor monitors could be used during the trenching operations to determine whether contamination from historic fuel spills or leaks is present in the subsurface.

Approximately 600 feet of 24-inch pipe would be laid in a trench extending from the fuel farm to the new refueling station. The larger pipe would encase additional 6-inch pipes for the fuel lines. Approximately two-thirds of an acre would be disturbed during trenching and installation of the pipelines, but there would be no net loss of habitat, as the construction path would be reclaimed and revegetated. No fill material would be necessary, although some select gravel and sand may be placed just under the pipes for stability.

The advantages of a pipeline system are similar to those of a new fuel farm access road: increased security and public safety, and more efficient operations because of reduced travel distance and time. A pipeline system would further reduce transport distance for the refueling trucks, as they would load AvGas or jet fuel at a new service station located just south of the un-named Airport road and adjacent to Taxilane W-2. Development of a service station in this area would occupy space that may otherwise be dedicated to aircraft parking. However, CBJ has expressed some concern about the use of buried pipelines carrying fuel, primarily because undetected leaks resulting from breaks or poor joint seals may not be detected immediately—possibly not before substantial subsurface contamination has occurred.

ES.2.3.3.3 FF-3: NO ACTION ALTERNATIVE

The No Action Alternative would retain the fuel farm access as it exists today with no change in route or entrance or exit location. Vehicles would exit the fuel farm to the east, travel on Alex Holden Way, and enter the Airports' Operations Area through security gates. This alternative would require operators of the tankers to obtain street licenses for these vehicles, and it could force the operators to acquire different tankers to meet street vehicle requirements. In accordance with the regulations implementing NEPA, this alternative is carried forward for detailed environmental consideration.

ES.2.4 REVISED WILDLIFE HAZARD MANAGEMENT PLAN (WHMP)

CBJ has proposed a number of habitat modifications to reduce and control the risks posed to aviation from wildlife on and near the Airport. The Wildlife Hazard Management Plan (WHMP) for the Airport (CBJ 2002) describes these habitat modifications as well as hazard control procedures, wildlife monitoring requirements, staff training requirements, and the basis for program evaluation. However, the labor and funding to support the hazard control program and the level of

control activity needed is generally not defined in the WHMP. In order to develop a range of alternatives, other hazard reduction options involving habitat modification or hazard control (i.e., hazard repellent) techniques were identified for the EIS. The Proposed Actions and hazard reduction options have been reviewed for effectiveness and ability to be implemented. Those determined to be viable methods for reducing wildlife hazards were retained for full analysis in the EIS and organized into the wildlife hazard management alternatives.

Each of the alternatives has the potential to alleviate specific wildlife management concerns and achieve, at least in part, the hazard reduction objectives. The alternatives are estimated to achieve varying degrees of hazard reduction via degrees of habitat modification. It is reasonable to expect that active wildlife control activities would increase if fewer habitat modifications are implemented, so that JNU can effectively maintain risks to a level deemed acceptable. Therefore, one of the alternatives incorporates a greater degree of active wildlife hazard management using control techniques with little habitat modification. The fourth alternative considered, the No Action, would continue the existing effort at wildlife hazard mitigation at JNU.

- WH-1, Wildlife Hazard Management Plan Action - Most Habitat Modification
- WH-2, Alternative 2 - Moderate Habitat Modification
- WH-3, Alternative 3 - Minor Habitat Modification and Adaptive Hazard Management Program
- WH-4, No Action - No Change in Habitat or Control Activities

FAA recognizes that there needs to be some inherent flexibility in wildlife hazard management to account for changing degrees of wildlife activity, influenced by such factors as migration seasons, food availability, human activity, weather, and so forth. The Airport needs to be able to adapt to the hazards by increasing or decreasing the use of hazard repellent and even depredation techniques, irrespective of other, regulated habitat modifications that may have been approved for wildlife hazard control. The ability and authority to make adjustments in the type and degree of hazard control is vested in the Airport Manager or delegated to the Wildlife Hazard Control Officer. Federal and state permits have been issued that define the methods and manner by which wildlife management takes place, particularly regarding the "take" of wildlife.

Subsequent to preparation of the WHMP and in coordination with development of this EIS, Airport staff has continued to evaluate and refine the habitat modifications under consideration. The actions currently proposed by JNU that would modify wildlife habitat incorporate many elements from Alternative WH-1, but some actions have been dropped or modified from JNU's initial proposal. Section ES.1.5.4 of this Executive Summary lists the components from each WHMP alternative that are incorporated into the Airport's Proposed Action.

Table ES-6 lists the habitat modifications and control activities of the alternatives to address the specific wildlife hazards identified in the WHMP. A complete description of the activities incorporated into each of the wildlife hazard management alternatives is found in Section 2.9 of the EIS. The following subsections summarize cost, estimated disturbance areas and fill volumes, and other information for each alternative.

Table ES-6. Habitat Modifications for Wildlife Hazard Management Alternatives

Wildlife Hazard Issue	Alternative WH-1 () Wildlife Hazard Management Plan	Alternative WH-2 () Moderate Habitat Modification	Alternative WH-3 () Minor Habitat Modification and Adaptive Hazard Management	Alternative WH-4 (4) No Action
a. Birds Attracted to Vegetated Areas near Runways and Taxiways	WH-1a. Pave grassed infield areas.	WH-2a. Install synthetic ground cover in the infield.	WH-3a. Grade infield areas to prevent water from ponding; alter vegetation management practices to attract fewer wildlife; increase hazing.	WH-4a. Continue Existing Hazard Management Program.
b. Birds Attracted to Wetlands on West Portion of Airport Property	WH-1b. Fill on-Airport wetlands west of runway to above high tide, at level of Northwest Development Area.	WH-2b. Regrade on-Airport areas by selective dredging and filling to eliminate ponds, channels, and swales that capture water.	WH-3b. Increased hazing of wildlife using control technologies.	
c. Birds Attracted to Wetlands on Refuge West of Airport Property	WH-1c. Fill of wetlands on Refuge west of JNU, creating free draining surface to Mendenhall.	WH-2c. Regrade area by selective dredging and filling west of JNU to eliminate ponds, channels, and swales that capture water.	WH-3c. Increased hazing of wildlife using control technologies.	
d. Birds Feeding on Fish Staging at the Mouth of Duck Creek	WH-1d. Relocate Duck Creek beginning at Airport Gate 'E' to the mouth, away from Alex Holden Way to north JNU boundary; discharge at former Gute property.	WH-2d. Relocate limited reach of Duck Creek, from Radcliffe Road, to create new channel trending west to Mendenhall River.	WH-3d. Increased hazing of wildlife using wildlife hazard control technologies,	
e. Birds Attracted to Surface Water Conveyances on JNU	WH-1e. Convert drainage ditches into underground drains; install treatment.	WH-2e. Regrade and line ditches with concrete or other synthetic material; install treatment.	WH-3e. Regrade and manage vegetation, with increased hazing.	

Table ES-6. Habitat Modifications for Wildlife Hazard Management Alternatives, continued

Wildlife Hazard Issue	Alternative WH-1 [0] Wildlife Hazard Management Plan	Alternative WH-2 [0] Moderate Habitat Modification	Alternative WH-3 [0] Minor Habitat Modification and Adaptive Hazard Management	Alternative WH-4 [(4)] No Action
f. Birds Attracted to Swales that Collect Rainwater	WH-1f. Remove swales and areas along edges that collect water, regrade to RSA.	WH-2f. Same as WH-1f.	WH-3f. Same as WH-1f.	
g. Ducks and Waterfowl Feeding on Float Plane Pond Vegetation	WH-1g. Mechanically remove vegetation from Float Plane Pond and fingers using dredges or other means.	WH-2g. Fill in Float Plane Pond fingers to eliminate waterfowl habitat.	WH-3g. Increased hazing of wildlife; elimination of hunting program.	
h. Birds Feeding on Fish at Mouth of Jordan Creek	WH-1h. Remove dam at mouth of Jordan Creek.	WH-2h. Same as WH-1h.	WH-3h. Same as WH-1h.	
i. Woodland Habitat Providing Perch and Nest Sites, and Wildlife Cover	WH-1i. Selectively thin trees, clear understory, and install deer fence.	WH-2i. Periodically remove corvid nests and install deer fence.	WH-3i. Increased hazing of wildlife using control technologies; adaptive management program as needed through Advisory Board consultation.	

Some increased labor effort and supplies would be needed for WH-1, but less than for other action alternatives. See Section 2.9.1 of EIS.
Increased labor effort and supplies would be needed for WH-2, more than WH-1 but less than for WH-3. See Section 2.9.2 of EIS.
Increased labor effort and supplies would be needed for WH-3, most of any action alternatives. See Section 2.9.3 of EIS.
[4] No Action Alternative means no change from existing conditions for that specific habitat modification or hazard abatement activity.

ES.2.4.1 WH-1: Implementation of Wildlife Hazard Management Plan (WHMP)

Alternative WH-1 represents most of the habitat modifications detailed in the current Wildlife Hazard Management Plan. As a consequence, it also would result in the most disturbance to areas on and adjacent to the Airport. Approximately 233 acres would be disturbed by the actions shown on Table ES-6, and approximately 501,500 cubic yards of fill material would be used to complete the habitat modifications. Implementation of all of the habitat modifications would require more than $20 million in construction costs. The estimated annual labor and materials cost associated with this alternative is $86,000, an increase of approximately $55,000 above that spent in 2003. This estimate includes an additional 1/4 full time equivalent (FTE; essentially, one FTE equals one person working full time for one year) for wildlife hazing and education, $20,000 in vehicle costs, and $10,000 for supplies such as shells, mortars, and so forth.

ES.2.4.2 WH-2: Moderate Habitat Modification

Alternative WH-2 also relies heavily on habitat modifications, although the types of modifications to address specific hazards differ from some of those incorporated in Alternative WH-1. Approximately 116 acres would be disturbed by the actions shown on Table ES-6, and approximately 462,500 cubic yards of fill material would be used to complete the habitat modifications. Implementation of all of the habitat modifications would require more than $27 million in construction costs, of which more than $20 million would be used to install artificial turf on 77 acres of Airport infield. The estimated annual labor and materials cost associated with this alternative is $101,000, an increase of approximately $70,000 above that spent in 2003. This estimate includes an additional 1/2 FTE for wildlife hazing and education, $20,000 in vehicle costs, and $10,000 for supplies such as shells, mortars, and so forth.

ES.2.4.3 WH-3: Minor Habitat Modification and Adaptive Hazard Management

Alternative WH-3 involves relatively little habitat modification, but it does require an increased commitment of staff and Airport resources to actively control wildlife hazards. This alternative was developed in response to numerous concerns raised during scoping, including:

- long-term effects of increased habitat reduction on and near the Airport,
- the need to reduce risks to aircraft using methods available that would cause the least impact to habitat,
- potential effects of habitat modifications on species of little concern to aviation safety, and
- a recommendation that adaptive habitat management be initially undertaken to try hazard control methods with the least environmental impact.

Most of the control actions incorporated into this alternative could be applied to all of the hazard areas and issues listed on Table ES-6. Approximately 33 acres would be disturbed by the actions shown on Table ES-6, and approximately 13,000 cubic yards of fill material would be used to complete the habitat modifications. Approximately $1.2 million would be required for initial habitat modifications, while estimated annual labor and materials costs would increase to approximately $140,000, an estimated $100,000 more than the Airport spent for related activities in 2003. This estimate includes an additional FTE for wildlife hazing and education, plus as much as 1/4 FTE in other staff assistance, for a total of approximately $105,000 in staff costs; $20,000 in vehicle costs; and $15,000 for supplies such as shells, mortars, and so forth.

ES.2.4.4 WH-4: NO ACTION ALTERNATIVE

This option would result in no changes to the Airport and near-Airport habitat for the purposes of wildlife hazard control. The hazard management program currently employed at JNU would remain in place.

ES.2.5 CONNECTED ACTIONS

In order to develop new aviation facilities in the Northeast Development Area of the Airport, the Remote Communications Outlet (RCO), Automated Surface Observation System (ASOS), and other FAA equipment would have to be relocated. Relocation of both the RCO and ASOS are considered connected actions in this EIS, because they would not occur unless another action (specifically, construction in the Northeast Development Area) takes place. Each of these systems has siting and use criteria that preclude construction of other facilities in their immediate vicinity. For example, radio frequency emissions in the vicinity of a candidate site must not produce interference with the RCO facility transmitters and receivers, and a clear zone must be established and maintained to protect the facility from frequency shadowing and radio interference. The following sections summarize information included in Section 2.10 of the EIS.

ES.2.5.1 REMOTE COMMUNICATIONS OUTLET (RCO)

FAA's study concluded that the Engineer's Cut, west of the Airport on the saddle between the Mendenhall River outwash and Auke Bay, would be the preferred, new location for the RCO and most of the components. RCO development would take place on federal lands that were withdrawn by the Secretary of the Interior on December 5, 1960, for sole use by the FAA in the maintenance of air-navigation facilities (Public Land Order 2212; Federal Register 60-11437). The Engineer's Cut is already being used for Airport navigational aids, including lead-in lights, a non-directional beacon, and a localizer directional aid with distance-measuring equipment. Much of the area around this equipment has been cleared and graded, so there should be little, if any, additional environmental impact associated with siting the RCO there.

FAA estimated that it would cost $742,665 to relocate the RCO equipment. Most of the cost (about $410,000) is associated with site upgrades at the Engineer's Cut. Other expenditures would include design work, drawings, site visits, electronics installation and other recurring expenses.

ES.2.5.2 AUTOMATED SURFACE OBSERVATION SYSTEM (ASOS)

The FAA owns the ASOS, which is used to monitor weather at JNU and the conditions for aviation, but National Weather Service maintains the system. The ASOS is currently co-located with the RCO in the Northeast Development Area of the Airport. The ASOS would also need to be relocated if new aviation facilities are constructed in this area.

The National Weather Service looked at different on- and near-Airport locations for relocation of the ASOS. In their feasibility analysis, most locations were quickly eliminated from further consideration because of critical siting concerns with respect to obstructions or lack of proximity to the runways. Two sites have been found to meet siting specifications.

ES.2.5.2.1 EAST OF TEMSCO SITE

Upon development of the Northeast Development Area of the Airport, the ASOS would be relocated approximately 600 feet to the east of TEMSCO, just south of the Miller-Honsinger Pond. This site is within the so-called "east block," an area the Airport has previously identified as potentially suitable to accommodate future additional aviation facilities, including fixed-base operations and helicopter facilities (see the Master Plan and also the approved Airport Layout Plan). Positioning the ASOS within the east block would preclude new facility development, because of the limitations on obstructions. The ASOS requires an approximately 500-foot-radius "clear" zone free of buildings or trees. Spruce trees that have been planted on the pond berm would need to be topped or removed in the future to prevent encroachment into the clear zone. The ASOS road and pad would be constructed on Airport property, but a ground easement to prevent tall structures from being constructed (or to prevent tall trees from growing) would be needed to maintain the required 500-foot radius obstruction free zone.

It is expected that the access road would be approximately 600 feet long and 12 feet wide, placed on approximately 4 feet of compacted clay to stay above the high water level. Recent correspondence from the National Weather Service indicates that a 80-×-40-foot pad would suffice for the ASOS pad, which would be constructed on sufficient fill material to raise the base 2 feet above any extreme high tide level and to the approximate height of the runway. Extensive subsurface work would also be undertaken for some of the weather sensing/equipment units and to establish foundations for underground wiring and grounding systems. Approximately 15,000 square feet would be disturbed by this action, and up to 2,700 cubic yards of fill would be required to construct the road and pad. The estimated cost to remove the existing ASOS building and components, construct a new access road, and build a new facility south of Miller-Honsinger Pond is $420,303.

The principal agent and owner of the Miller-Honsinger Pond submitted comments to the Corps of Engineers concerning the draft permit to allow construction and use of the ASOS at the proposed location (Weyhrauch 2005). The primary objection stated was that because of the need for a "clear zone" around the ASOS, and the proximity of the Pond to the ASOS and within the clear zone, the property owner would be precluded from conducting gravel dredging operations as authorized by their Corps Permit POA-1981-320-FF. FAA considered this concern during preparation of the Final EIS and consulted with National Weather Service. NWS staff concluded that dredging equipment would present a non-permanent condition within the clear zone (i.e., the equipment

would be periodically moved), and the type of equipment to be used would not represent a large obstruction or shadow in the clear zone (Hunter and Doerr 2005). An obstacle that occupies less than 10% of the horizon would probably not be considered an obstruction to proper wind measurement.

JNU initiated discussions with the property owner and representatives to address their concerns (Carson 2006b). At the time this FEIS was being prepared, JNU had developed a draft agreement between the Miller-Honsinger Pond owners/representatives and CBJ/JNU that would provide the Airport access to the ASOS and assure that trees adjacent to the Pond would be removed so as not to affect ASOS wind sensor accuracy. However, CBJ/JNU was unable to reach an agreement with the property owner, and FAA decided to include an alternative ASOS location in the FEIS.

ES.2.5.2.2 BRL SITE

The alternative ASOS site considered is located entirely on Airport property and sufficiently far from the Miller-Honsinger Pond, TEMSCO building, or other facilities to provide unobstructed data for wind sensors. This site is located adjacent to the Building Restriction Line (BRL) approximately 450 feet south and slightly east of the site described above as "East of TEMSCO." FAA, NWS, and CBJ/JNU have agreed this site would be acceptable and meet ASOS siting criteria.

Construction of the ASOS would be very similar to that described in the previous section. The ASOS would be reached by motor vehicle east on Taxiway A to a new access road, from the taxiway to the ASOS pad. The access road would be approximately 200 feet long by 12 feet wide at the top. As with the east of TEMSCO location, 24-hour access to the ASOS would be required. As a result the gravel access road would have to be placed on approximately 6 feet of compacted fill to stay above the high water level. This elevation above the existing surface should also keep most of the debris frequently carried by ice and high tides from collecting on or blocking the road. A 35- to 40-foot diameter bottomless arch culvert would be installed on Zig Zag Slough to maintain surface water exchange with the wetlands and sloughs north and east of the runway. Approximately 10,470 ft would be disturbed by this action and up to 2,327 cubic yards of fill would be required to construct the road and pad.

One concern expressed by FAA and NWS about the BRL site is the possible effect of helicopter traffic on instrumentation, particularly the wind sensors. The site is located directly under an approach path used by TEMSCO helicopters. At this location, helicopters would fly at relatively low elevations with airspeeds ranging from 60 to 80 knots, and the rotor wash could result in aberrant wind data. However, TEMSCO staff confirmed that the helicopter pilots have flexibility on these approaches and TEMSCO can ensure that they will not fly directly over the ASOS if placed adjacent to the BRL[6].

6. Comments made by Mitch Horton, TEMSCO to participants including Steve Turner, ATCT Manager; Allan Heese, Airport Manager; Tom Carson, Consultant; and Ken Wallace, EIS Consulting Team at meeting on January 25, 2006.

The estimated cost to remove the existing ASOS building and components, construct a new access road from Taxiway A, and build a new facility adjacent to the Building Restriction Line is similar to the estimate for the site by Miller-Honsinger Pond, about $400,000. More fill would be required for the pad and culverts would be needed for drainage channels, but the access road would be substantially shorter.

ES.2.5.3 Changes to other Runway Navigational Aids

Implementation of the RSA alternatives would necessitate changes to the navigational aids already in use at JNU. Where possible, the costs for these changes have been incorporated into the construction cost estimates provided in Appendix A of the EIS. The degree of change to runway navigational aids is dependent on the RSA alternative selected.

Few navigational aids would be affected by alternatives that require no change to a landing threshold. For example, for Alternatives RSA-1, -6C, -6D and -8, there would be no changes made to the runway centerline lights, Visual Approach Slope Indicators, or the High Intensity Runway Lights mounted on the edges of the runways. However, Alternatives RSA-5C, -5D, -5E, -6A, and -6B would require changes in some systems because of a shift of one or more landing thresholds. The eastward shifts to the Runway 08 MALSR for alternatives RSA-5C, -5E and -6A would have little additional effect on environmental resources, since the existing light spacing would be maintained. However, all of the MALSR lights for each of these alternatives would have to be shifted to the east commensurate with the amount of Runway 08 threshold displacement or relocation. For example, the lights placed 1,000 feet from the Runway 08 threshold for Alternative RSA-5E would have to be installed on pilings in the Mendenhall River near the east shoreline.

Some of the Runway 08 MALSR lights would be converted to "in-pavement" lights (i.e., mounted on frangible systems within the RSA gravel or grassed surface, or in the EMAS block network) for each of the RSA alternatives except RSA-8. Installation of the Runway 26 MALSR (Alternative NAV-2B) would allow the Airport to decommission and remove the existing Runway 26 end indicator lights.

ES.2.6 Preferred Alternatives

Council on Environmental Quality regulations implementing NEPA and FAA guidance require that the lead agency identify preferred alternatives in the Draft EIS if such preferences have been established (40 CFR §1502.14(e); FAA 2004a). The FAA has considered the impacts that may be incurred to the human environment for each of the alternatives evaluated in this EIS, and has identified preferred alternatives for all needs. The FAA also identified the environmentally preferred alternative for each need. The following sections summarize FAA's determinations with respect to the environmentally preferred alternatives and the Agency's preferred alternatives for these actions.

ES.2.6.1 Environmentally Preferred Alternative

For all actions, the No Action Alternative for each need is considered to be the environmentally preferred alternative. The CEQ 40 Most Asked Questions, Question 6a, defines the environmentally preferred alternative as "the alternative that will promote the national environmental policy as expressed in NEPA's Section 101. Ordinarily, this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural and natural resources." Although the FAA finds that the actions comprising the preferred alternatives, as identified in Section ES.2.6.2, incorporate all practicable measures to minimize harm from significant adverse environmental impacts, the FAA recognizes that the No Action alternatives for each action would impose the least environmental impacts.

ES.2.6.2 Agency Preferred Alternative

In identifying the FAA's preferred alternatives, each of the alternatives for each action carried forward for detailed analysis in the EIS was evaluated for their ability to meet relevant statutory considerations and the Purpose and Need for each action.

Table ES-7 summarizes the different needs for the Airport and the FAA's preferred alternatives for meeting those needs. Table ES-8 summarizes the overall impacts of the combination of all agency preferred alternatives. The cumulative impacts of the preferred alternatives in combination with other past, present, and reasonably foreseeable projects in the area are discussed in Chapter 5 of this EIS.

Table ES-7. Summary Needs and Actions Comprising the FAA's Preferred Alternatives

Need	Preferred Alternative
Runway Safety Area	RSA-5E
Navigational Improvements	NAV-2B
Snow Removal Equipment and Maintenance Facility	SREF-3B1
Aviation Facilities	FW/RW-2
Fuel Farm Access	FF-1
Wildlife Hazard Management Plan	WH-1: WH-1b, WH-2c, WH-1d, WH-3e, WH-1f, WH-1g, WH-1h, and WH-1i

Table ES-8. Summary of Combined Impacts of All Actions Comprising FAA's Preferred Alternative

Resource/Issue	Impact
Noise	No significant impact over noise sensitive areas.
Human Environment and Compatible Land Use	Permanent taking of Refuge land for RSA development, MALSR installation, and wildlife habitat modifications. Minor degradation of recreational opportunities (e.g., wildlife viewing and bird watching).
Socioeconomic	No measurable impact on air carrier operations Improved flight safety at JNU, providing good environment for economic/business growth.
Air Quality	No impacts in exceedence of State and Federal air quality standards; construction-related emissions increase in the short-term.
Hazardous Materials and Solid Wastes	Minor amounts of construction debris would be generated by preferred alternatives. No change in hazardous materials produced beyond slight increase in urea application. Risk of fuel truck petroleum spills reduced.
Water Resources and Floodplains	76% increase in impervious and less pervious surfaces (154 acres) within the project area. Loss of 331 acre feet of floodplain/tidal prism storage volume. Increased impervious surface would increase contaminant loads to receiving waters; water quality would remain within local, State, and Federal standards. Improved long-term sediment loading in Duck Creek but short-term increase in turbidity during construction.
Vegetation	Reduction of estuarine marsh communities by approximately 45.3 acres. Supratidal and forest communities would be reduced by 34.4 acres and 6.0 acres, respectively. Active relocation of a tidal channel around the east end of the runway would minimize alteration of existing plant community composition following construction.
Wetlands	Reduction of estuarine high and low marsh by approximately 55.3 acres within the landscape area. Palustrine wetlands would be reduced by 22 acres within the landscape area (16 acres of which would be dredged). No net loss of riverine habitat would occur and lacustrine wetlands would not be affected. Active relocation of a tidal channel around the east end of the runway would minimize the conversion of high marsh to low marsh and unvegetated tidelands in this area.

Table ES-8. Summary of Combined Impacts of All Actions Comprising FAA's Preferred Alternative, continued

Resource/Issue	Impact
Fisheries	Reduction of EFH by approximately 68 acres. Active relocation of a tidal channel around the east end of the runway would minimize the conversion of high marsh to low marsh and unvegetated tidelands in this area and maintain hydrologic connectivity north and south of Runway 26, thereby minimizing impacts on EFH. Benefits to Duck Creek through relocated, lined channel, and bottomless arch culverts. Lengthened culvert in Jordan Creek increases fish passage difficulty but installation of bottomless arch culverts would minimize these impacts. Expansion of impervious surfaces and conversion of ditches to drains may increase potential for injury to fish through increased contaminant loads but water quality would be maintained within local, State, and Federal standards.
Wildlife	Reduction in estuarine habitats by approximately 45.3 acres within the landscape area. Supratidal and forest habitats would be reduced by about 34.4 and 6.0 acres, respectively. No significant adverse effect on Steller sea lion or humpback whale, the two federally-listed species with the potential to occur in the area.
Cultural Resources	No known historic properties affected. Memorandum of Agreement between FAA, SHPO, and JNU for phased identification of subsurface resources and resolution of adverse effects is being prepared.
Visual Resources	Degradation of the natural character of some areas on Airport and surrounding landscapes, but consistent with previous development and land use objectives.
DOT Section 4(f)	Direct impact on 4(f) properties through use of Refuge land and relocation of Dike Trail. No constructive use of 4(f) lands.

ES.2.6.2.1 RUNWAY SAFETY AREA (RSA)

A wide range of alternatives was considered to address the need for standard RSA at the Airport. Those alternatives found to be both prudent and feasible were carried through a detailed examination of potential consequences to the human environment.

It is clear that the two RSA alternatives incorporating EMAS on both runway ends (RSAs-6A and -6B) would have much less environmental impact on wetlands, habitat, hydrology, and most environmental resources than alternatives incorporating standard RSA at one or both ends. All of the alternatives would directly affect DOT Section 4(f) lands, although RSA-6A would require the least amount of Refuge land to be acquired or disturbed. Alternative RSA-6D was designed to have reduced environmental impacts relative to other alternatives using standard safety areas that do not include EMAS on one or both runway ends.

The economic contrasts are similar, but inversely related to the environmental impacts. Alternatives using only standard RSA construction would cost an estimated 50% less to construct than alternatives with EMAS on both runway ends. The cost discrepancies are even greater over a 20-year lifespan for the alternatives because of the higher maintenance requirements for EMAS and the predicted need to replace the EMAS beds once during that period. The tables in Appendix A of the EIS illustrate that Alternatives RSA-6A and -6B could cost over 200% more to construct and maintain than Alternative RSA-6D, the least costly alternative.

Further, the high cost of installing and maintaining EMAS renders Alternatives RSA-6A and -6B unreasonable (not prudent) for implementation at JNU. FAA has developed guidance for identifying the maximum financially feasible (i.e., prudent) cost for RSA improvements (see FAA Order 5200.9; FAA 2004c). The threshold for financial feasibility is based on the length of RSA improvement required and corresponding EMAS bed length. At JNU, each runway end would require an EMAS bed 337 feet long by 150 feet wide. FAA has determined that the maximum feasible RSA improvement cost per runway for this type of installation is about $15 million, or $30 million for both runways, for the life-cycle of the system (FAA 5200.9, paras 9c(1) and 9d). As can be seen in Table 2-13 of the EIS, and in the detailed cost estimates provided in Appendix A, the total costs (life-cycle + mitigation) for Alternatives RSA-6A and RSA-6B exceed $30 million.

RSA-6D is the least costly alternative to construct, affects less habitat, and would have a smaller compensatory mitigation cost than other standard safety area alternatives. However, RSA-6D would also require a 5% reduction in landing length on both runways. While the major carrier into JNU has suggested that degree of change should have only minimal affect on their operations, the decision as to whether or not a runway length reduction would be acceptable rests by statute with the Airport authority.

Late in 2006, after publication of the Draft EIS and while revisions were being completed to this Final EIS, Congress passed and the President signed Public Law 109-443 to the National Transportation Safety Bill. Portions of this law address the proposed runway safety area improvements at JNU, and provide explicit direction to FAA concerning which alternative is preferred for implementation. As described previously in Section ES.2.1.10, Public Law 109-443 requires the Secre-

tary of Transportation to "only select as the preferred alternative the least expensive runway safety area alternative that meets the standards of the Federal Aviation Administration and that maintains the length of the runway as of the date of enactment of this Act." In determining the least expensive runway safety area alternative "…the Secretary shall consider, at a minimum, the initial development costs and life-cycle costs of the project."

FAA has determined that the least expensive runway safety area alternative that maintains the length of the runway and satisfies statutory requirements is RSA-5E. The Runway 08 threshold would be displaced 120 feet east of existing location, and the Runway 26 threshold relocated 520 feet east of existing location. Sufficient RSA would be constructed at both runway ends to meet FAA standards of 600-foot undershoot protection. The runways would be marked and designated in the Alaska Supplement to the Airport/Facility Directory and the Airport Layout Plan to provide for 1,000-foot aircraft overrun protection.

Public Law 109-443 provides clear direction to the FAA for selection of the preferred runway safety area alternative. The FAA's selection of an alternative is critical to the Juneau Airport's ability to implement required runway safety area improvements in several respects. Because FAA is the lead federal agency for the proposed actions, and will provide federal monies to fund most of the cost associated with RSA construction, the Airport could not be reasonably expected to fund any alternative other than a no action alternative without FAA's financial assistance. The FAA's role in funding decisions is critical, as Congress has placed sole responsibility on the FAA to approve use of federal Airport Improvement Program funds for airport improvement projects. In addition, the FAA has sole authority to approve the Airport Layout Plan depicting the proposed RSA improvements as well as the Airport's operating certificate under Federal Aviation Regulation Part 139. Whether for purposes of funding approval or approval of airport layout, the FAA cannot approve the Airport's Layout Plan or the Airport's operating certificate unless a runway safety area alternative were constructed that comports to Public Law 109-443. Therefore, an alternative not complying with Public Law 109-443 is not be available to the Airport for implementation. The FAA has determined that RSA-5E conforms to Public Law 109-443 and has, therefore, designated Alternative RSA-5E as the preferred alternative.

Although agencies other than the FAA have suggested they would not be bound by a statute pertaining to the Department of Transportation (i.e., Public Law 109-443), FAA notes that for the reason stated above, no other RSA alternative would be available to the Airport Sponsor for implementation except the RSA alternative that complies with P.L. 109-443.

While Alternative RSA-8, No Action, is considered the environmentally preferred alternative and Alternative RSA-6A would have the least environmental impact of all action alternatives, FAA is bound by Public Law 109-443 to select Alternative RSA-5E.

ES.2.6.2.2 NAVIGATIONAL ALIGNMENT

Only one alternative was identified that would satisfy the Need to improve pilot alignment with Runway 26 and the transition to visual references for landing at night and during poor weather conditions. FAA's preferred alternative to satisfy the Need is NAV-2B, installation of the medium

intensity approach lighting system with runway alignment indicator lights (MALSR). Although the MALSR would have a direct impact on the Refuge, a DOT Section 4(f) land, there is no prudent and feasible alternative to the use of such land for meeting the Need.

ES.2.6.2.3 SNOW REMOVAL EQUIPMENT AND MAINTENANCE FACILITY (SREF)

Two alternatives were carried forward for detailed analysis in the EIS that would satisfy JNU's need for a new, improved SREF. Each of these alternatives was assumed to incorporate the same design, but in different locations.

FAA's preferred alternative is SREF-3B1, to be located in the Northeast Development Area of the Airport just south of Yandukin Drive. While there are differences in the way each action alternative would affect the human environment, in general, SREF-1B and SREF-3B1 would have similar levels of environmental consequences, with SREF-1B having slightly lesser impact on environmental resources such as vegetation, wetlands, EFH, and wildlife habitat. FAA agrees with JNU, however, that SREF-3B1 would provide an operationally superior location for the center of snow removal and maintenance facilities that would reduce potential conflicts with other airfield development and use.

ES.2.6.2.4 AVIATION FACILITIES: AIRCRAFT PARKING AND STORAGE

As stated in Section ES.1.2.4, additional facilities and apron space are needed to satisfy the existing private and commercial aviation demands and to accommodate the projected growth in aviation needs.

FAA's preferred alternative is FW/RW-2. In general, the alternatives have similar environmental consequences and development costs, and would provide a comparable number of facilities to satisfy future aviation needs. Overall, Alternative FW/RW-2 would have slightly lesser impact on environmental resources than FW-RW-1 and would represent the least environmentally damaging of the two action alternative. FAA believes that it would be preferable to relocate most of Duck Creek that is on Airport property (and on the Refuge, west of the Airport) for a number of reasons. First, it would remove a development obstacle; it would be easier to complete the infrastructure for these facilities without the barrier of Duck Creek. Second, aviation facilities will be more integrated into the rest of the Airport if the Duck Creek corridor is moved, and this will prove beneficial in terms of both safety and operational efficiency. Third, lower Duck Creek is a severely degraded stream with poor water quality, with low flows (and at times no flows) in some stretches during dry seasons, and with poor conditions for fisheries. It is FAA's belief that airfield development combined with relocation of the Creek will provide an opportunity and incentive to improve conditions in the lower stream reach.

ES.2.6.2.5 FUEL FARM ACCESS

JNU has proposed to construct a new fuel farm access road to address operational and safety concerns described in ES.1.2.3. Two alternatives to satisfy the Need were evaluated in the EIS. Alternative FF-1 would include construction of a new, on-Airport access road to the fuel farm. Alternative FF-2 would entail installation of a system of fuel pipelines from the fuel farm to a new refueling station in the Northwest Development Area.

There are environmental and economic tradeoffs associated with both alternatives. Alterative FF-2 would involve a slightly larger disturbance area, but the disturbance between paved areas and the fuel farm could be reclaimed to native habitat. Although both alternatives would reduce the potential for accidents involving fuel trucks, by removing the trucks from travel on public roads, Alternative FF-1 would still have a greater risk than Alternative FF-2 of truck accidents and contaminant release to Duck Creek because of the new single-lane, creek crossing to reach the fuel farm. However, long-term environmental consequences and cleanup costs could be greater for the fuel pipeline system, because leaks may go unnoticed for some time, and access to underground lines would be more difficult to quickly address.

After considering the environmental consequences, FAA believes that both alternatives would be acceptable solutions to the existing Need for improved access to fuel farm supplies. However, the cost to install a fuel pipeline system would be much greater—approximately 250% the cost to construct a new road—and for this reason, FAA's preferred alternative is FF-1.

ES.2.6.2.6 WILDLIFE HAZARD MANAGEMENT PLAN (WHMP)

The number of bird strikes in the vicinity of the Airport and the abundance of wildlife using the Airport and surrounding areas necessitate the implementation of an updated WHMP to reduce potential for aircraft collisions with wildlife.

FAA has evaluated the environmental and economic consequences of the actions incorporated into each wildlife hazard management alternative. In addition, FAA has considered the hazards posed by wildlife using different areas of the Airport in terms of hazard location, wildlife abundance, and other relative risk factors, based on site-specific observations and strike history at JNU, as well as national databases relevant to wildlife hazard management. FAA, in general, concurs with JNU's revised proposal for wildlife hazard management that the following actions should be implemented:

- Filling and grading of the wetlands located near the mouth of Duck Creek on Airport property to a free-draining surface above high-tide level at about the level of the proposed Northwest Development Area.
- Selective dredging and filling of the wetlands on the Refuge, west of Runway 08 and extending north past the mouth of Duck Creek, starting above high-tide level to create a free-draining surface to the Mendenhall River.

- Relocating the mouth of Duck Creek to the north Airport boundary, from just south of the intersection of Cessna Drive and Alex Holden Way, so that it discharges to the Mendenhall River at about the location of the former Gute property.
- Removing swales and areas that pond water along the edges of the runway and parallel taxiway by filling, leveling, and grading the areas to approximately the level of the RSA.
- Alteration of vegetation management techniques and increased hazing in the infield areas.
- Removing vegetation from the Float Plane Pond by dredging it to a depth of at least ten feet in all waters south of the Float Plane Pond and in the main portion of pond where vegetation exists. (Dredging to greater depths would be conducted as necessary to provide materials for new construction projects associated with the RSA, facilities, etc.)
- Removing the dam at the mouth of Jordan Creek.
- Implementation of an adaptive hazard management approach to the Float Plane Pond woodlands. The Airport would continue to monitor, evaluate, and document hazards along with the effectiveness of wildlife hazard control techniques such as those described in Section 2.5.1.2 of the EIS to determine if additional habitat modifications (such as those incorporated in Alternative WH-1 of this EIS) would be required. If required, further habitat modifications would include:
  - Installation of a deer fence along the north side of the dike, from the existing fence on the west end to the existing fence on the east end, and
  - Removal of corvid nests as needed to prevent re-establishment of crow rookeries in the woodlands.

FAA also prefers the incorporation of the following elements into JNU's WHMP, as summarized from Section 2.9.3 of the EIS:

- Increased commitment of staff and resources allocated to the wildlife hazard management program for the purpose of hazard control, wildlife monitoring, documentation, program review, staff and public education, and planning.
- Elimination of the on-Airport waterfowl hunting program. Elimination of the hunting program should be done in conjunction with an increase in wildlife control activities, particularly through an increase of staff to prevent the Float Plane Pond fingers from serving as a refuge to waterfowl.
- Encourage establishment of a wildlife hazards working group to facilitate communication, cooperation and coordination between the Airport authority, the tenants, and the community at large.

Many of the actions comprising FAA's preferred WHMP alternative represent the least environmentally damaging action alternative for wildlife hazard management that do not rely on merely increasing hazing, which the FAA and JNU do not consider a sufficiently effective strategy on its own to reduce wildlife hazards at the Airport. However, a few of the alternatives do not represent

the least environmental impact among the action alternatives. FAA has selected these alternatives because of their substantially greater effectiveness than less impacting alternatives in addressing the specific wildlife hazard concerns at the Airport to which they are tailored.

ES.2.7 Compliance with Laws, Regulations, and Executive Orders

As noted earlier and listed in Table ES-2, there are a number of federal, state, and local agency approvals and permits that would have to be issued before the preferred alternatives could be implemented. There are also Executive Orders (EOs) such as those concerning floodplains (EO 11988) and wetlands (EO 11990), that may be applicable to one or more of the actions. The following sections summarize the degree to which the preferred alternatives described in Sections ES.2.6.2.1 through ES.2.6.2.6 are consistent with the laws, regulations, and Executive Orders not specific to FAA's regulatory authority.

Executive Order 11988: Floodplain Management and U.S. DOT Order 5650.2: Floodplain Management and Protection

FAA is bound by Public Law 109-443 to identify RSA-5E as the preferred alternative. As such, there is no practicable alternative available to the FAA to further avoid impacts to floodplains associated with this action. RSA-5E incorporates all practicable measures identified during the EIS process to minimize harm to and within floodplains.

For all actions evaluated in the EIS, there are no practicable alternatives to avoid impacts to and development in floodplains and still meet the Purpose and Need. Additionally, all preferred alternatives incorporate all identified practicable measures to minimize harm to and within the floodplain, and there would be no significant encroachment into floodplains as a result of their implementation. Further, they would not result in 1) a considerable probability of the loss of human life, 2) likely future damage associated with the encroachment that could be substantial in cost or extent, including interruption of service on or loss of a vital transportation facility, and 3) a notable adverse impact on natural and beneficial floodplain values.

Executive Order 11990: Protection of Wetlands and U.S. DOT Order 5660.1A

FAA is bound by Public Law 109-443 to identify RSA-5E as the preferred alternative. As such, there is no practicable alternative available to the FAA to further avoid impacts to wetlands associated with this action. In accordance with this Executive Order, this EIS considers impacts to a) public health, safety, and welfare, including water supply, quality, recharge and discharge; pollution; flood and storm hazards; and sediment and erosion; (b) maintenance of natural systems, including conservation and long term productivity of existing flora and fauna, species and habitat diversity and stability, hydrologic utility, fish, wildlife, timber, and food and fiber resources; and (c) other uses of wetlands in the public interest, including recreational, scientific, and cultural uses. RSA-5E incorporates all practicable measures identified during the EIS process to minimize harm to wetlands.

For all other actions, there are no practicable alternatives to avoid impacts to wetlands and still meet the Purpose and Need of these alternatives. The preferred alternatives incorporate practicable measures identified during the EIS process to minimize harm to wetlands.

National Historic Preservation Act (16 U.S.C. §470)

SHPO concurred with the FAA's determination of eligibility finding of No [known] Historic Properties Affected. However, the FAA and SHPO agree that additional efforts to identify historic properties are necessary before a finding of effect can be made. The FAA, SHPO, and JNU/CBJ will enter into a Memorandum of Agreement for phased identification of subsurface and obscured resources and will complete the Section 106 process of determining eligibility and resolving of adverse effects to newly located resources, should any such resources or effects be identified.

FAA consulted with the SHPO and Alaska Native groups as required by 36 CFR 800.2.

Clean Water Act (33 U.S.C. §1344) Sections 401, 402, and 404 and the Federal Water Pollution Control Act (33 U.S.C. §§ 1251-1387)

FAA is bound by Public Law 109-443 to identify RSA-5E as the preferred alternative. As such, there is no practicable alternative available to the FAA to further avoid impacts to wetlands associated with this action. RSA-5E incorporates all practicable measures identified during the EIS process to minimize harm to wetlands. Preferred alternatives for all other actions also incorporate all practicable measures identified during the EIS process to minimize harm to wetlands. In the case of unavoidable impacts to wetlands, a mitigation plan has been developed through consultation with the U.S. Army Corps of Engineers (USACE) and other state and federal agencies and will be a requirement of project implementation. Additionally, JNU will submit a Section 404 permit application to the USACE. This application will include the minimization measures incorporated into the preferred alternatives for discharge of fill into waters of the U.S. Issuance of the permit by the USACE and adherence by JNU to any conditions of approval will demonstrate compliance with Section 404 of the Clean Water Act.

Receiving waters on and surrounding the Airport (i.e., Duck Creek and Jordan Creek) already exceed water quality standards for such elements as sediment, debris, iron, dissolved oxygen, and fecal coliform. Total Maximum Daily Loads have been established for Duck Creek and are under consideration for Jordan Creek, which only has a TMDL established for residue. The preferred alternatives will not result in further exceedence of state and federal water quality standards, but they also will not improve current conditions. Measures to control stormwater runoff and other discharges from the Airport will be incorporated into the final design of the preferred alternatives and outlined in the Record of Decision. Further, JNU will develop an erosion and sediment control plan prior to commencement of construction to minimize impacts to water quality and to comply with all established TMDLs for receiving waters. JNU's Stormwater Pollution Prevention Plan will be amended and submitted to U.S. Environmental Protection Agency for an NPDES permit under Section 402 of the Clean Water Act and will incorporate measures to address increased runoff and contaminant loading associated with changes to discharges from implementation of the preferred alternatives. JNU will submit an application for certification of compliance with state water quality standards to the Alaska Department of Environmental Conservation under

Section 401 of the Clean Water Act. Issuance of the EPA's NPDES permit and the State Water Quality Certificate and adherence by JNU to any conditions of approval will demonstrate compliance with the federal and state water quality requirements.

Endangered Species Act (16 U.S.C.§460 et seq.)

FAA engaged in informal section 7 consultation with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service (NMFS) to determine if any federally-listed species were present or had the potential to be present in the immediate vicinity of the Airport. NMFS identified two species, the Steller sea lion and the humpback whale.

FAA completed a Biological Assessment, which was submitted to NMFS. FAA found that implementation of the preferred alternatives would have no significant adverse effects on any threatened, endangered, or sensitive species.

Rivers and Harbors Act (33 U.S.C. §403)

JNU will submit a Section 10 permit application to the USACE. This permit will incorporate all measures to minimize harm identified during the EIS process. Receipt of this permit and adherence by JNU to any conditions of approval would demonstrate compliance with this act.

Marine Protection, Research and Sanctuaries Act (33 U.S.C. §1413)

If the permit is determined necessary for implementation of the preferred alternatives, JNU will submit a permit application to the USACE. Minimization measures will be incorporated into preferred alternatives as identified in the FEIS. At the present time, the FAA does not believe this permit is needed.

Magnuson-Stevens Act (16 U.S.C. §1855(b))

This act requires consultation with the NMFS and identification of measures to minimize harm to Essential Fish Habitat (EFH). NMFS is a Cooperating Agency for the EIS and was consulted by the FAA throughout the NEPA process (NMFS 2002). An EFH assessment was submitted to NMFS summarizing anticipated impacts and outlining conservation measures developed during consultation with NMFS to minimize those impacts for all preferred alternatives. The impacts to EFH resulting from the preferred alternatives would have direct, adverse affects on the fish populations, including chum salmon, coho salmon, and Pacific herring, in the Mendenhall estuarine wetland system. However, the preferred alternatives would impact a relatively small proportion of available habitat in the landscape area. With the implementation of the proposed conservation measures identified in consultation with NMFS, the direct and indirect impacts to fish populations resulting from these actions would likely be negligible.

Marine Mammal Protection Act (16 U.S.C. §1361-1421, Public Law 92-522)

There would be no significant adverse effects on marine mammals.

Migratory Bird Treaty Act (regulations at 50 CFR Part 21.43) and Executive Order 13186

This EIS has considered impacts to migratory birds and, in particular, birds of conservation concern to the State of Alaska. No significant adverse effects on migratory birds would occur as a result of implementing any of the preferred alternatives.

JNU's existing permit issued by the U.S. Fish and Wildlife Service (USFWS) for harassment and depredation of birds under the Migratory Bird Treaty Act will be maintained for wildlife hazard control. To the extent practicable, measures to minimize impacts to migratory bird habitat are incorporated into preferred alternatives

Bald and Golden Eagle Protection Act (regulations at 50 CFR Part 22.23)

There would be no significant adverse effects to Golden or Bald Eagles. JNU will continue to implement the Airport's existing permit issued by the USFWS for the harassment of eagles creating wildlife hazards on Airport property.

Fish and Wildlife Coordination Act (16 U.S.C. §661-667e)

The USFWS, NMFS, Alaska Department of Fish and Game and other agencies have been consulted with throughout the EIS process in accordance with this act.

Clean Air Act (42 U.S.C. §7401 et seq.)

No air quality impacts exceeding state and federal standards for criteria pollutants would occur as a result of any preferred alternative. The preferred alternatives would conform to the Alaska State Implementation Plan for meeting NAAQS standards.

Aviation Safety and Noise Abatement Act (49 U.S.C. §47501 et seq.)

The preferred RSA alternative would result in increases of 1.5 or greater DNL above 65 DNL on Refuge lands. However, the resultant total DNL for the area would be compatible with Refuge land uses, as it would not exceed thresholds established by the FAA’s regulations governing airport noise compatibility for such properties.

U.S. Department of Transportation Section 4(f) (49 U.S.C. 303 and 23 U.S.C. 138)

There are no prudent and feasible alternatives that entirely avoid the use of Section 4(f) properties for the RSA, navigational alignments, aviation facilities, and WHMP preferred alternatives. FAA is bound by Public Law 109-443 to identify RSA-5E as the preferred alternative. As such, there is no prudent and feasible RSA alternative available to the FAA to avoid impacts to Section 4(f) properties associated with this action. All preferred alternatives incorporate all possible measures identified during the EIS process to minimize harm to Section 4(f) properties.

Executive Order 12898: Environmental Justice

There would be no disproportionate impacts to any minority or low income population as a result of any preferred alternative.

Executive Order 13045: Children's Environmental Health and Safety Risks

There would be no change is risk to health or safety for children as a result of any preferred alternative.

Anandromous Fish Act (AS §41.14.870)

JNU will submit a permit application to the Alaska Department of Natural Resources, Office of Habitat Management and Permitting (ADNR-OHMP). This application will include measures to minimize harm to and within anandromous water bodies that were incorporated into the preferred alternatives. Issuance of the permit by the ADNR-OHMP and adherence by JNU to any conditions of approval would demonstrate compliance with this act.

Fishway Act (AS §41.14.840)

JNU will submit a permit application to the ADNR-OHMP. Impediments to fish passage associated with preferred alternatives incorporate measures to minimize harm. Issuance of this permit by the ADNR-OHMP and adherence by JNU to any conditions of approval would demonstrate compliance with this act.

Alaska Coastal Management Program (6 AAC 80)

JNU will submit a revised Coastal Project Questionnaire to the ADNR Office of Project Management and Permitting, Coastal Management Program (CMP). The CMP has engaged in a consistency review with JNU during preparation of the EIS. Issuance of consistency finding by the CMP and adherence by JNU to any conditions of approval would demonstrate compliance with this program.

Juneau Coastal Management Plan (Section 49.70.950f)

CBJ will review the EIS for consistency with the Juneau Coastal Management Plan (JCMP). The required 50-foot setback, included in the JCMP by reference to the Juneau Comprehensive Plan, was incorporated into all preferred alternatives involving relocation of the lower portion of Duck Creek, and additional minimization measures were incorporated into all preferred alternatives. Issuance of a consistency finding by CBJ and adherence by JNU to any conditions of approval would demonstrate compliance with this plan.

Juneau Wetland Management Plan (CBJ Land Use Code 49.70.1065-1075)

CBJ will review the EIS for consistency with the Juneau Wetland Management Plan as part of the consistency review under the Alaska Coastal Management program process. JNU will submit an application for a conditional use permit to the CBJ Wetlands Review Board. Issuance of a consistency finding by CBJ and a permit by the Wetlands Review Board and adherence by JNU to any conditions of approval would demonstrate compliance with this plan

ADF&G Special Area Permit (5 AAC §95.420)

JNU will submit a special area permit application to the ADF&G for alteration of wildlife habitat in the Refuge. All identified practicable measures to minimize harm are incorporated into the preferred alternatives as well as compensatory mitigation required by the Refuge Management Plan and will be included in the permit application. Issuance of the permit by ADF&G and adherence by JNU to any conditions of approval would demonstrate compliance with this program.

Permit for Scientific, Educational, Propogative, or Public Safety Purposes (5 ACC §92.033)

JNU's existing permit issued by ADF&G will be maintained.

Leasing and Permitting of State-owned Lands (11 AAC §58, 11 AAC §62.690-730, 11 AAC§96)

JNU will submit a land use application to the ADNR Division of Mining, Land, and Water (DMLW) for any use of State-owned lands. Issuance of a permit or other land use authorization by the ADNR-DMLW and adherence by JNU to any conditions of approval would demonstrate compliance with this program.

Conveyance of State-owned Lands (AS §38.05.825 and AS §38.05.035(e))

On behalf of the City and Borough of Juneau (CBJ), JNU will request a conveyance of State-owned land in the MWSGR from the ADNR-DMLW to implement the preferred alternatives. ADNR-DMLW will conduct a best interest finding and decision process to convey the lands to CBJ, but since the land being requested is within the MWSGR the Commissioner of ADF&G must also determine that the conveyance is consistent or compatible with the purpose of the Refuge designation. A joint best interest finding by the ADNR-DMLW and ADF&G, and adherence by CBJ to any conditions of approval, would demonstrate compliance with this program.

Development in Flood Hazard Area (CBJ Ordinance 49.70.400)

CBJ will review the EIS for consistency with this ordinance. The development of preferred alternatives will not impede the flow of floodwaters, or otherwise cause danger to life and property, at, above or below their locations along the floodway. Altered or relocated portions of Duck Creek would not diminish the flood-carrying capacity of that waterway. Issuance of a consistency finding by CBJ and adherence by JNU to any conditions of that finding would demonstrate compliance with this ordinance.

ES.2.8 DETERMINATIONS UNDER 49 U.S.C. SECTIONS 47106 AND 47107

In accordance with applicable law, the FAA makes the following determinations for this project based upon the appropriate information and data contained in this EIS and the administrative record.

1. The proposed action is reasonably consistent with existing plans of public agencies responsible for development in the area (49 U.S.C. 47106(a)(1));

   The determination prescribed by this statutory provision is necessary for FAA approval of airport project funding applications. To make this determination FAA considered the following local land use and development plans:

- The proposed projects are consistent with the comprehensive land use plan that has been adopted by the CBJ. The existing CBJ Comprehensive Plan (1995, as revised 2004: Subarea 4 Map) designates the land in most of the area immediately surrounding the Airport as primarily for uses that are typically compatible with airport operations, including institutional public uses, general commercial, and industrial. The CBJ Comprehensive Plan also includes implementing actions related to the Airport, specifically actions 4.1.2, 4.1.3, 4.1.4, and 4.1.5 of Policy 4.1. The proposed projects are consistent with the applicable implementing actions of the Comprehensive Plan.
- The City and Borough Assembly approved the Airport Master Plan in 1999. The Airport Master Plan identified the needs for and the objectives of most of the actions evaluated in the EIS. The Preferred Alternatives are consistent with the Airport Master Plan.
- The Juneau Parks and Recreation Comprehensive Plan (1996) identifies the area around the Airport as an important recreational area and calls for the maintenance of public access to the Dike Trail. Consistent with the referenced plan, the Preferred Alternative will maintain public access to and use of the Dike Trail through the relocation of the trail around the Runway 08 RSA.
- The conceptual plan for relocation of the Duck Creek corridor presented in the EIS is consistent with improvements needed to address major problems identified in the Duck Creek Watershed Management Plan (Koski and Lorenz 1999) for the reach of Duck Creek on Airport property.
- Finally, the Preferred Alternatives incorporate efforts to avoid, minimize and compensate for unavoidable impacts to the Refuge in conformance with the Refuge Management Plan (ADF&G 1990). The Draft compensatory mitigation plan summarized in the FEIS was prepared in consultation with ADF&G and Alaska DNR, the two agencies with land management responsibilities and permitting authorities for the actions affecting the Refuge.
- The Refuge Management Plan also requires that Airport expansion not create a waterfowl attractant. The Preferred Alternatives have been developed to avoid the creation of waterfowl attractants, and in the case of the wildlife hazard management plan to reduce existing attractants.

In light of the above, the FAA finds that the projects are consistent with the existing land use and development plans of public agencies in the area in which the Airport is located. The FAA is satisfied that it has fully complied with 49 U.S.C. 47106(a)(1).

2. The Secretary [of Transportation] is satisfied that the interests of communities in or near the project location have been given fair consideration (49 U.S.C. 47106.(b)(2));

- The determination prescribed by this statutory provision is necessary for FAA approval of airport development project funding applications. The local planning process over the past nine years, beginning with the Airport Master Plan update and preparation of a draft environmental assessment, provided numerous opportunities for communities and residents near the Airport and within CBJ to voice concerns and specific interests. The FAA continued to solicit local input during the EIS, beginning with publication of a general Notice of Intent (NOI) on August 11, 2000 followed by a more specific NOI on June 1, 2001 to prepare an environmental impact statement. Nearby communities and their residents have had the opportunity to express their views during public scoping meetings on June 20 and September 18, 2001, during the Draft EIS comment period, at public meetings and public hearings for the DEIS, and during the 45-day review period following public issuance of the Final EIS. FAA solicitation of public and community input, from oral comment at informal meetings and public hearings to written comment during scoping and document review periods, provided opportunities for communities and residents to influence the scope of the EIS, alternatives considered, and impact analysis methods. The FAA's consideration of community interests, including those of federal, state, and local officials, public organizations, and individuals are set forth in Chapter 6 and Appendix M of the FEIS.

In light of the above, the FAA has determined that throughout the environmental process leading up to publication of the FEIS, beginning at its earliest planning stages, fair consideration was given to the interest of communities in or near the project location.

3. To the extent reasonable, the airport sponsor has taken or will take actions to restrict land uses in the airport vicinity including the adoption of zoning laws, to ensure the uses are compatible with airport operations (49 U.S.C. 47107.(a)(10)).

- On March 6, 2007 the Airport provided written assurance to the FAA that appropriate actions have been or will be taken to ensure that land uses in the vicinity of the airport are currently compatible and will be compatible with airport operations.
- Both the CBJ Comprehensive Plan and CBJ zoning ordinances were being revised at the time this FEIS was prepared. The Airport is working with CBJ's Community Development Department to ensure that the revisions to CBJ's Comprehensive Plan and zoning ordinances limit land uses in the vicinity of the Airport to those that are compatible with airport operations. The Airport specifically requested that land uses identified in the Comprehensive Plan update in the vicinity of the Airport be compatible with noise exposure levels identified on the noise contours developed for the EIS. It should be noted that implementation of the preferred alternatives would not result in a change in the number of aircraft operations, but would involve a slight shift in runway thresholds resulting in a minor shift in the noise contours.

In light of the above, the FAA is satisfied that the Juneau International Airport has taken and will continue to take actions necessary to restrict land uses in the Airport vicinity to ensure the allowed uses are compatible with Airport operations.

ES.3.0 ENVIRONMENTAL ANALYSIS

This section of the Executive Summary identifies the major environmental concerns and areas of controversy raised by the public and agencies during scoping. Environmental impacts associated with each of the actions and alternatives are also summarized in comparative form in this section.

ES.3.1 PROJECT SCOPING AND KEY ISSUES

The FAA used a process known as *scoping* to inform the public and other agencies about the Purpose and Need for each of the Proposed Actions, to obtain public and agency input, to identify important issues and areas of controversy, and to determine the extent of analysis necessary for the FAA and other agencies to make informed decisions. After scoping, the issues to be addressed by this EIS were then refined so that a range of reasonable alternatives could be developed for each Purpose and Need. The subsequent analysis of potential environmental effects has also focused on the major issues of concern identified during scoping.

Public and agency comments to the Draft Environmental Assessment (USKH 2000) were used to develop an initial scope of work for this EIS. FAA formally advertised a Notice of Intent to conduct an EIS for the Airport on June 1, 2001. This notification in the *Federal Register* initiated a 60-day public comment period to solicit input concerning the EIS. Early in the scoping period, FAA advertised initiation of the EIS through ads in the local newspaper, public service announcements, and direct mailing to more than 330 residents, agencies, and special interest groups. A public scoping meeting was held in Juneau on June 20, 2001, to inform people about the purpose of and need for the actions, and to solicit comments and questions.

The initial scope of work did not include actions related to wildlife hazard management. However, during the scoping period, a number of comments were received from individuals and other agencies that a pending WHMP was related to the environmental studies and should be evaluated in the EIS. The FAA recognized the merit of the comments and modified the scope of the EIS to include the WHMP. The formal scoping period was extended for an additional 60 days to allow sufficient time for public consideration and comment. A supplemental Notice of Intent was published in the *Federal Register*, additional advertisements and announcements were placed in the local media, and an additional public mailing was distributed. A second public scoping meeting was held on September 18, 2001.

The issues raised during scoping for this EIS were used to verify the need for actions, to guide development of alternatives, or to define analysis methods critical to understanding of the project impacts. Table ES-9 provides a consolidated list of the key issues raised by the public and

agencies during the scoping process for the Airport projects. (Table 1-9 in the EIS lists the entire range of scoping comments considered applicable to the EIS process, actions being considered, and environmental analysis.)

Some issues raised by the public and agencies during scoping were not considered for further analysis. After careful review by the FAA, it was determined that certain issues were either outside the scope of the project (i.e., unrelated to actions proposed) or could be easily addressed through standard construction or operation practices. Table 1-10 in the EIS lists a consolidated summary of the issues raised in public comment that are not considered for further analysis, including brief rationales for the dismissal of each issue from consideration.

ES.3.2 Environmental Impacts Analysis

NEPA and its implementing regulations require a comprehensive evaluation of the impacts to the human environment for major federal actions. The analysis of environmental impacts presented in Chapter 4 of this FEIS is based on FAA's guidance pursuant to requirements established in §1502.16 of the CEQ regulations implementing NEPA (see *Airport Environmental Handbook* [FAA Order 5050.4B, 2006] and *Policies and Procedures for Considering Environmental Impacts* [FAA Order 1050.1E, 2004a]). The critical elements of the human environment evaluated in the EIS include:

- Noise
- Human environment and compatible land use
- Socioeconomics
- Air quality
- Hazardous materials and solid waste
- Water resources and floodplains
- Vegetation
- Wetlands
- Fisheries
- Wildlife
- Cultural resources
- Visual resources
- Section 4(f) lands

Some resources and categories of analysis prescribed by FAA guidance are not applicable to the Airport EIS, as discussed in Section 4.2 of the Final EIS, including coastal barriers, Wild and Scenic Rivers, environmental justice, farmlands, and energy supplies and natural resources.

Table ES-9. Summary of Key Issues Considered in the JNU EIS

Topic ▪ Issue
Aircraft Access ▪ It is critical to maintain access to JNU at its highest level. ▪ The full runway length should be maintained and full RSA added, to account for the difficult landing and departing conditions. ▪ Runway changes should not affect special procedures used by Alaska Airlines (RNPs) to get in and out of Juneau.
Alternatives ▪ When considering alternatives and selection of a Preferred Alternative, all measures that reduce Refuge "takings" and/or the filling of wetlands should be given full consideration. Any Refuge takings should be fully justified by the design criteria of the JNU critical aircraft.
Alternatives – Runway Safety Area ▪ Water bodies and wetlands around the Airport complicate the development of RSA and should be considered justification for alternative methods to achieve FAA standards (such as EMAS). ▪ Consider using EMAS instead of enlarging the RSA. ▪ The FAA should accurately describe and respond to the intent and alternatives presented in FAA Order 5200.8. ▪ Use of "declared distances" to accommodate increased RSA should be evaluated as a viable alternative. ▪ Usable runway surface must take into consideration not only normal aircraft performance requirements but nonstandard, abnormal, and emergency requirements, including engine failures, hydraulic and control surface failures, breaking and anti-skid malfunctions, and over-weight landings. Other things to consider are adverse extreme weather and surface conditions, runway surface conditions, and in the case of JNU, a lack of any precision navigational guidance to the landing surface. ▪ The EIS should take into account that JNU is the only 24-hour airport between Vancouver and Anchorage that is available to all air carriers and types of aircraft.
Alternatives – Navigational Systems ▪ The east-end MALSR can be adequately maintained without constructing the proposed elevated access road (which, if constructed, would affect wetlands, disrupt nutrient and sediment cycling, etc.). ▪ Evaluate whether or not a road is necessary for maintenance of the MALSR. ▪ Ice flows in the intertidal zones could potentially make it impossible for vehicles to use the MALSR road. Vehicles could be forced to detour off the road surface causing unacceptable damage to the Refuge.

Table ES-9. Summary of Key Issues Considered in the JNU EIS, continued

Topic ▪ Issue
Mendenhall Wetlands State Game Refuge ▪ Address the impacts of changing the flow of tidewater on the remaining Refuge flats. ▪ Evaluate the importance of Jordan Creek to the estuarine wetlands of the Refuge. ▪ The management goals of the Refuge need to be considered in the EIS. ▪ To the extent possible, minimize the impact to or loss of fish and wildlife habitat in the vicinity of the Airport and the Refuge.
Mendenhall Wetlands State Game Refuge (continued) ▪ To the extent possible, maintain the existing recreational values of the Dike Trail. ▪ The EIS should include an assessment of what the Refuge will look like in 20 years as a result of naturally occurring processes, specifically isostatic rebound and the natural deposition of silt.
Miscellaneous Comments ▪ The EA assumptions (concerning aviation growth, existing demand, design aircraft, etc.) need to be reevaluated.
Native American Interests ▪ Protect the spruce trees in the wetlands by the Float Plane Pond. Culturally important baskets are woven from the long, straight roots that grow in the sand beds there.
Noise ▪ Evaluate the impacts of runway threshold shifts on noise in residential areas. ▪ Noise impacts are not sufficiently addressed [in the EA].
Other Actions at the Airport or Connected Actions ▪ The proposed rerouting of Duck Creek must provide a substantial noise buffer for the neighborhood and a streamside buffer for fish. ▪ Regarding the remote transmitter/receiver (identified as the Remote Communications Outlet or RCO in this EIS), the EIS needs to disclose the need for moving the RCO and the feasibility of doing so, i.e., how far away it can go, what the disturbance area is, and how much area is needed.
Recreation ▪ To the extent possible, maintain the existing recreational values of the Dike Trail, it is important to residents and the community. ▪ The analysis needs to describe why the Dike Trail is not protected by Section 4(f) of DOT statutes.

Table ES-9. Summary of Key Issues Considered in the JNU EIS, continued

Topic ▪ Issue
Social and Socioeconomic ▪ Find solutions without potential long-term damage to the regional economy. ▪ JNU is the critical transportation/economic hub for Alaska's capital city and the entire southeast Alaska region and should be constantly updated with the most sophisticated safety features. ▪ Safe and reliable air access now and in the future is vital to the survival of southeast Alaska. ▪ JNU must be positioned to not only efficiently meet current demand but to accommodate future aviation growth in the region and state. ▪ The Airport must be able to meet reasonably foreseeable future [aviation] needs and allow Juneau to take advantage of future opportunities to enhance service to citizens of Juneau, Alaska, and the nation.
Stormwater and Water Resources ▪ Consider effects of runoff, including chemicals from de-icing operations, from the Airport onto the Refuge and adjacent habitats. ▪ The loss of areas on Airport property that perform filtering needs to be assessed and, if appropriate, should be compensated for by improvements to the stormwater runoff control system. ▪ Additional measures must be taken to ensure that the proposed RSA improvement will not contribute to further impairment of Jordan Creek and Duck Creek. ▪ To improve water quality and fish habitat in Jordan Creek, the existing culvert under the runway should be retrofitted concurrently with the proposed lengthening at each end.
Wetlands ▪ Any mitigation must replace function, not just acreage, of wetlands. ▪ Further loss of wetland habitat would result in decreased value of the area as a migration stopover site. ▪ The high-value, emergent,estuarine wetlands on JNU property and the surrounding Refuge are extremely productive and rare in southeast Alaska (comprising 10% of the wetlands in Alaska). ▪ The EIS should include an accurate delineation, including functional analysis, of wetlands in the Northwest Development Area and should develop alternatives to avoid or minimize impacts to this important and productive area. ▪ Cumulative effects analysis should present information on all historic wetland loses and on all wetland losses and other effects associated with the JNU Master Plan.

Table ES-9. Summary of Key Issues Considered in the JNU EIS, continued

Topic ▪ Issue
Wildlife and Habitat ▪ Fish production in the area streams contributes to substantial and important sport, subsistence, and commercial fisheries in nearby marine waters. ▪ An analysis of essential fish habitat (EFH) should be included. ▪ Marine fish habitat should be considered separately from anadromous fish habitat. ▪ Significant reduction of the Mendenhall wetlands' productivity could have far-reaching impacts for a broad variety of both migratory and resident birds. ▪ Recent studies show that Jordan Creek is a very viable salmon fishery and habitat, and that would argue against any plans or proposals to join it with Duck Creek.
Wildlife Hazard Management ▪ The EIS must examine the recommendations of the May 2001 Wildlife Hazard Assessment (WHA) and provide opportunities for public and expert scrutiny. ▪ Some recommendations in the WHA could increase the likelihood of wildlife strikes. The potential for proposed management activities to cause greater risks needs to be evaluated and considered in the EIS. ▪ The WHA does not adequately justify the proposed management actions, given the low number of wildlife strikes. ▪ Many actions proposed in the WHA do not appear to be justified, as there is no indication of how much each hazard would be reduced. ▪ Some actions identified in the WHA would create one habitat while destroying another. Creative management could convert high-risk species habitat into habitat for lower-risk species instead of eliminating the habitat altogether. ▪ An adaptive management program beginning with minimal impact actions should be considered first. ▪ Development, enhancements, mitigation, or other work accomplished on or around the Airport should be done in a manner that minimizes hazards to aviation safety including those resulting from wildlife. ▪ The EA does not address the potential safety hazards to aircraft that could be caused by shifting the runway east and expanding the RSA into heavily utilized Vancouver Canada Goose foraging areas. ▪ The EIS should consider the history of aircraft strikes from wildlife at JNU and consider whether the probability for strikes is higher here than at other airports.

Table ES-9. Summary of Key Issues Considered in the JNU EIS, continued

Topic ▪ Issue
Wildlife Hazard Management, continued
▪ The EIS should consider the possibility that cutting the trees will make birds move inland and cross the runway.
▪ You need to determine what impact hazing is going to have, rather than just doing hazing because everybody else does hazing.
▪ Hunting may actually attract birds to fly to the area because of the use of decoys and the dead ducks left floating in the ponds.
▪ A risk of filling in the Float Plane Pond fingers is that birds will then be attracted to the Float Plane Pond only.
▪ The birds are adaptive, and if habitat is removed, other habitat will be used.
▪ Helicopters and small aircraft are now using the finger ponds as approach and departure routes (causing birds to take flight).

Resource specialists subjected the Proposed Actions and alternatives to a rigorous environmental analysis. Environmental impacts described in Sections 4.3 through 4.11 of the EIS are defined in terms of causal relationship (direct or indirect effects), magnitude (in many cases, using a numerical increase above baseline), incidence (either continuous, periodic, or one-time), and duration (usually described as temporary, short-term, long-term, or permanent). The impact characteristics are all means of comparing projected impacts to one another and to baseline conditions of a given resource.

The impact characteristics also help determine how the impacts compare to any thresholds FAA has established for determining significance for certain resources (FAA 2006, 2004a). For resources such as air quality, water, noise, cultural resources, and others, the criteria established by FAA regulation or guidance serve well as significance thresholds. These regulatory criteria are referenced in FAA's environmental guidance for NEPA documentation (FAA 2006, 2004a). For other resources, such as vegetation, wildlife, visual resources and socioeconomics, regulatory criteria have not been established that could serve as clear significance thresholds. FAA has provided guidance for determining significance thresholds for some of these resources, but in the absence of nationally-applied or recommended thresholds the *context* of the impact can become an even more important factor (FAA 2006, 2004a).

ES.3.3 COMPARATIVE SUMMARY OF ENVIRONMENTAL IMPACTS

Chapter 4 of the Final EIS provides a complete description of the environmental impacts projected to occur for each of the Proposed Actions and alternatives. For some environmental resources, such as noise and air quality, the conclusion from the analysis is that there would be relatively little or no adverse environmental impact, as measured against the existing baseline conditions or against conditions predicted for the No Action Alternatives. For other environmental resources, however, the environmental impacts are anticipated to be relatively substantial and, in some instances, reach or exceed the significance thresholds identified in Section 4.2 of the EIS. The following sections briefly summarize these more substantive environmental impacts in comparative form. The No Action Alternatives are not discussed in these sections though they are shown on the summary tables (Tables ES-10 through ES-15). The reader is referred to the impact summary tables in Chapter 2 of the EIS for a complete listing of impacts for all of the environmental resources.

ES.3.3.1 RUNWAY SAFETY AREA (RSA) ALTERNATIVES

Alternative RSA-5C would disturb approximately 39 acres of previously undisturbed lands, and generally result in the greatest environmental impacts of any runway safety area alternatives. However, each of the alternatives relying on traditional, graded safety areas on two runway ends would disturb at least 29 acres, typically with proportional impacts to habitat, water resources, vegetation, and so forth. Alternative RSA-1 would have the greatest impact on the Refuge, nearly all of it west of the Airport, and require more than 603,000 cubic yards of fill for construction. Of the traditional RSA alternatives, RSA-5E would have the least direct impact (4.1 acres) on the Refuge. The two EMAS alternatives (RSA-6A and RSA-6B) would cause approximately 33% less disturbance than Alternative RSA-5C and would require over 40% less fill than Alternative

RSA-1. The disturbance areas for Alternatives RSA-5D, -5E, and -6C are between these extremes and roughly comparable. Disturbance areas, fill volumes, and other ground-disturbance consequences of the RSA alternatives are listed in Table ES-10.

The relative costs to construct and maintain the RSA alternatives are generally inversely proportional to their disturbance areas and fill volumes. The two alternatives with EMAS at both runway ends are projected to cost more than $30 million to construct and maintain over a twenty-year lifespan, while RSA-6D would cost about $14.1 million to construct and maintain over the same period. Of the alternatives using traditional safety area construction, RSA-1 would have the highest cost while RSA-5E would have the lowest.

Other environmental impacts resulting from the RSA alternatives would be relatively proportional to disturbance areas. Alternative RSA-1 would have the greatest impacts on the Mendenhall River, but Alternatives RSA-5D, -6B, -6C and -6D would also entail some fill into the river and require channel modifications. Alternative RSA-5C would cause the greatest direct and indirect, adverse effects on tidal channels, surface water flows and quality, tidal prism volumes, and groundwater recharge east of the Airport. RSA-1, -5C, -5D and -6C would all have roughly equivalent negative impacts on wildlife habitat and vegetative communities and would have the most adverse effect on essential fish habitat. Without the replacement of the entire culvert under the runway, all of the RSA alternatives would have similar adverse impacts on fish and fish passage in Jordan Creek due to the extended culvert system.

All of the RSA alternatives would have some adverse impact on wetlands. However, the alternatives relying on standard safety areas on one or both runway ends would have greater adverse impacts due to their relatively large footprints in estuarine wetlands and disruption of hydrologic functions, including the functions of wetlands in the Refuge. All practicable measures to minimize impacts to Refuge resources were incorporated into each of the RSA alternatives.

The most substantial visual changes would also result from RSA-1, due to expansion into and shifting of the Mendenhall River or from RSA-5C, due to the introduction of approximately 1,300 feet of new linear form into the wetlands on the east runway end.

All of the RSA alternatives would have some direct impact on Department of Transportation Section 4(f) lands. Each alternative would require relocation of the Dike Trail, although this impact is generally not considered adverse, since the new trail location would be separated from Airport activities, and a dedicated parking area for cars would be created. The amount of Refuge land "taken" by each alternative is as follows:

- RSA-1 = 9.8 acres
- RSA-5C = 9.0 acres
- RSAs-5D, -6B, -6C, -6D = 8.1 acres
- RSA-5E = 4.1 acres
- RSA-6A = 1.9 acres

None of the alternatives would have constructive use impacts on DOT Section 4(f) lands.

ES.3.3.2 Navigational Aid Alternatives

There is only one prudent and feasible alternative to improve both pilot alignment with the runway and transition to visual references for landing at night and during poor weather. The environmental impacts associated with installing the MALSR would vary, however, depending on which RSA alternative was implemented.

The MALSR disturbance, consisting of service road, lights mounted on pads, and small service building, would be greatest with RSA-8, the No Action Alternative, approximately 2.1 acres. This is because the MALSR lighting system would extend approximately 2,400 feet east of the Runway 26 threshold; since there would be no additional RSA added with Alternative RSA-8, most of the MALSR lights and service road would be in currently undisturbed estuarine wetlands and tidal channel. In contrast, Alternative RSA-5C would cause the least disturbance, approximately 0.8 acres, since more of the MALSR lights would be mounted within the RSA extending 1,000 feet from the threshold. Disturbance area, fill volumes, and other consequences of the navigational aid alternatives are listed on Table ES-11.

FAA has estimated that the MALSR installation, including the service road, would cost approximately $1.5-2.0 million if constructed under existing conditions (i.e., the RSA No Action Alternative, with no additional RSA constructed on the east runway end). This cost would be reduced somewhat for the other RSA alternatives, as there would be a shorter service road needed and a lower unit cost per light for those placed on frangible mounts within the RSA.

The MALSR would have relatively little adverse environmental impact, no matter which RSA alternative is selected. There would be minor changes to hydrology in the estuarine wetlands, and small losses of wetlands, vegetation, wildlife habitat, and essential fish habitat. The new lighting system would also introduce a change in the existing visual landscape, similar to that associated with the MALSR west of the Airport. None of these environmental impacts would be significant. There would be a direct impact of up to 2.1 acres of Refuge land (a DOT Section 4(f) impact), with the greatest amount of impact associated with RSA-8. RSA-6D would have the highest impact of all action alternatives. There would be no constructive use impact on DOT Section 4(f) land.

ES.3.3.3 Snow Removal Equipment and Maintenance Facility (SREF) Alternatives

The disturbance areas, fill volumes, and costs associated with the two SREF action alternatives are relatively similar, reflecting a conceptual design that could be used in the Northeast or Northwest Development Areas. Each alternative would disturb approximately 6.7 acres. Alternative SREF-1B, to be located in the Northwest Development Area, would require slightly more fill, approximately 45,000 cubic yards, as opposed to the 40,000 cubic yards needed for SREF-3B1.

Table ES-11. Comparative Summary of Environmental Impacts: Navigational Alignment

Resource	NAV-2B: MALSR	NAV-3: No Action
Construction		
Disturbance area	Up to 2.1 acres, depending on RSA alternative, as follows: RSA-8 = 2.1 acres; RSA-1 and -6C = 1.3 acres; RSA-6A and -6D = 1.8 acres. RSA-5D = 1.6 acres; RSA-5E = 1.2 acres; RSA-5C = 0.8 acres; RSA-6B = 1.9 aces	None
Fill volume	Approximately 1,000 yd	None
Socioeconomics		
Short-term business income	$2,057,000	$0
Short-term (construction) FTE employment	14	0
Short-term (construction) payroll	$673,000	$0
Short-term sales tax revenues	$27,900	$0
Water Resources and Floodplains		
Floodplain volume	Low, minor loss of floodplain.	None
Riparian/Channel effects	Minor impacts.	None
Tidal prism volume	Low, minor loss of tidal prism.	None
Surface water quantity	Low, minor additional impervious surface.	None
Surface water quality	Low, short-term degradation.	None
Groundwater recharge	Low, minor loss of recharge.	None
Vegetation		
Direct impacts	0.8-2.1 acres of vegetation impacted, depending on RSA alternative (RSA-1, -5C, -5E, and -6C would have the least impact, RSA-8 the greatest).	None

Table ES-11. Comparative Summary of Environmental Impacts: Navigational Alignment, continued

Resource	NAV-2B: MALSR	NAV-3: No Action
Wetlands		
Modification of wetlands	Between 0.5 and 1.3 acres filled.	None
Impact significance and basis for conclusion?	No significant impact on hydrology needed to maintain wetland functions and values, and no affect on sustainability of the natural systems that maintain habitat. The MALSR would not be inconsistent with the state wetland strategy because there is no prudent and feasible alternative that would satisfy the need for navigational alignment.	No
Fisheries		
EFH lost	0.5–1.3 acres of EFH affected, depending on RSA alternative (RSA-1, -5C, and -6C would have the least impact, RSA-8 the greatest).	No loss.
Wildlife		
Overall habitat effect	0.8–2.1 acres of primarily high marsh wildlife habitat impacted, depending on RSA alternative (RSA-1, -5C, and -6C would have the least impact, RSA-8 the greatest).	None
Threatened, Endangered, High-interest, and Sensitive Species	Impacts to threatened endangered species would be insignificant. There would be no direct effects on sea lions and whales. Potential indirect effects to forage fish are not likely to adversely affect these species. Impacts to high interest and sensitive species would be insignificant, construction of the MALSR for all RSA alternatives not expected to have substantive effects on the populations of these species.	None
Visual Resources	Moderate, negative, long-term changes to existing visual quality in Refuge.	No changes in visual quality.
DOT Section 4(f) Lands		
Direct impact on land	Acquisition/use of up to 1.4 acres of Refuge or 1.2 acres for RSA-5E	None
Indirect impacts	Minor changes in hydrology and habitat but no substantial impairment of beneficial uses.	None
Constructive use impact (substantial impairment)?	No.	No

Summary Table condensed from Table 2-14 of EIS.

The estimated cost to construct each alternative is the same, approximately $15.6 million. Economic impacts and environmental consequences of the SREF alternatives are listed on Table ES-12.

Other environmental consequences of building a new SREF are somewhat greater for Alternative SREF-3B1 than for SREF-1B, but neither alternative would have significant impacts. Approximately 6 acres of native vegetation would be disturbed in the Northeast Development Area, for SREF-3B1, as opposed to approximately 4 acres of native vegetation disturbance in the Northwest Development Area with SREF-1B. Alternative SREF-3B1 would also disturb approximately 1 acre more of estuarine and palustrine wetlands than SREF-1B, although the amount of essential fish habitat lost is essentially the same for each alternative. There would be only minor hydrologic impacts with these alternatives and no direct or constructive use impacts on DOT Section 4(f) lands.

ES.3.3.4 AVIATION FACILITIES ALTERNATIVES

The disturbance areas, fill volumes, and costs associated with the two aviation facility development alternatives are relatively similar. Each alternative would disturb approximately 42 acres. Alternative FW/RW-2 would require slightly more fill than FW/RW-1 (220,500 cubic yards vs. 200,740 cubic yards, respectively), due primarily to the work associated with relocation of Duck Creek, including filling the old channel and creating a new creek corridor. Alternative FW/RW-2 would cost an estimated $18.6 million to develop the new apron areas, construct hangars and tiedowns, relocate the RCO and ASOS, and move Duck Creek. Alternative FW/RW-1 would cost approximately $18 million, or 3% less than FW/RW-2, primarily because there would be a much smaller modification to Duck Creek. Economic impacts and environmental consequences of the aviation facility alternatives are listed on Table ES-13.

Many of the environmental consequences for the two alternatives are similar, as might be expected, since the disturbance footprints and areas of development are essentially the same. However, full relocation of Duck Creek on Airport property, with Alternative FW/RW-2, also creates environmental benefits that the other alternative does not. For example, there would be a smaller net loss of essential fish habitat and estuarine and palustrine wetlands with FW/RW-2, and relocation of Duck Creek would help to compensate for some of the hydrologic impacts by creating a new channel that would retain more surface water flows and have better flood storage.

Both alternatives would require the relocation of the Dike Trail, a DOT Section 4(f) land, but this direct impact is considered generally beneficial because it would separate Airport and recreational uses and improve parking. There would be no constructive use impacts on DOT Section 4(f) lands.

Table ES-12. Comparative Summary of Environmental Impacts: Snow Removal Equipment and Maintenance Facility

Resource	SREF-1B	SREF-3B1	SREF-5: No Action
Construction			
Disturbance area	6.7 acres	6.7 acres	None
Fill volume	45,000 yd	40,000 yd	None
Socioeconomics			
Short-term business income	$21,382,000	$21,382,000	$0
Short-term (construction) FTE employment	169	169	0
Short-term (construction) payroll	$8,176,000	$8,176,000	$0
Short-term sales tax revenues	$289,700	$289,700	$0
Water Resources and Floodplains			
Floodplain volume	Low, minor loss of floodplain.	Low, minor loss of floodplain.	None
Riparian/Channel effects	None	None	None
Tidal prism volume	None	Low, minor loss of tidal prism.	None
Surface water quantity	Low, minor additional impervious surface.	Low, minor additional impervious surface.	None
Surface water quality	Low, short-term degradation.	Low, short-term degradation.	None
Groundwater recharge	Low, minor loss of recharge.	Low, minor loss of recharge.	None
Vegetation			
Direct impacts	Approximately 4 acres of native vegetation impacted including high marsh, supratidal, shrub-scrub, forest.	Approximately 6 acres of native vegetation impacted including high marsh and supratidal communities.	None

Table ES-12. Comparative Summary of Environmental Impacts: Snow Removal Equipment and Maintenance Facility, continued

Resource	SREF-1B	SREF-3B1	SREF-5: No Action
Indirect impacts	Moderate potential for introduction and spread of weed species in NW Development Area.	Minor; area surrounding proposed site is already infested with a variety of non-native, weedy plants.	None
Wetlands			
Modification of wetlands	1.5 acres estuarine and palustrine wetlands filled in NW Development Area.	2.5 acres estuarine and palustrine wetlands filled in NE Development Area.	None
Impact significance and basis for conclusion?	Insignificant. Minor direct impact. No substantial impact to hydrology, no affect on sustainability of natural systems that maintain habitat.	Insignificant. Minor direct impact. No substantial impact to hydrology, no affect on sustainability of natural systems that maintain habitat.	No
Fisheries			
EFH lost	1.7 acres. Impacts relatively minor based on small amount of EFH lost.	1.6 acres. Impacts relatively minor based on small amount of EFH lost.	No change.
Wildlife			
General wildlife habitat	Approximately 4 acres of native habitat impacted including high marsh, supratidal, shrub-scrub, forest.	Approximately 6 acres of native habitat impacted including high marsh and supratidal types.	None
Threatened and Endangered Species	Impacts to threatened or endangered species would be insignificant. There would be no direct effects on sea lions and whales and the potential indirect effects to forage fish are not likely to adversely affect these species. Impacts to high interest and sensitive species insignificant for both alternatives. Populations of high interest species unlikely to be affected by minor habitat loss.		
Visual Resources	Minor, negative changes in visual quality.	Minor, negative changes in visual quality.	No change in visual quality.

Table ES-12. Comparative Summary of Environmental Impacts: Snow Removal Equipment and Maintenance Facility, continued

Resource	SREF-1B	SREF-3B1	SREF-5: No Action
DOT Section 4(f) Lands			
Direct impact on land	None	None	None
Indirect impacts	None	None	None
Constructive use impact (substantial impairment)?	No	No	No

Summary Table condensed from Table 2-16 of EIS.
Assumes construction in northeast development area after relocation of Duck Creek, but without development of aviation facilities. Impacts consider preparation of 6.7 acre layout for SREF, sand shed, parking and turnarounds, and access road to apron. See Figure 2-33 of EIS.

Table ES-13. Comparative Summary of Environmental Impacts: Aviation Facilities[1,2]

Resource	FW/RW-1: Full Development of NE and NW Development Areas	FW/RW-2: Full Development with Duck Creek Relocation	FW/RW-3: No Action
Construction			
Disturbance area (including relocation of Duck Creek channel)	42 acres	42 acres	None
Fill volume	200,740 yd	220,500 yd	None
Socioeconomics			
Short-term business income	$24,465,000	$25,025,000	$0
Short-term (construction) FTE employment	190	197	0
Short-term (construction) payroll	$7,281,000	$7,501,000	$0
Short-term sales tax revenues	$320,600	$330,300	$0
Long-term revenue impacts (10 yrs)	$587,510	$560,140	$0

Table ES-13. Comparative Summary of Environmental Impacts: Aviation Facilities[1,2], continued

Resource	FW/RW-1: Full Development of NE and NW Development Areas	FW/RW-2: Full Development with Duck Creek Relocation	FW/RW-3: No Action
Hazardous Materials and Solid Waste			
Presence of buried hazardous waste or soil contamination	Moderate potential to encounter buried, hazardous wastes in NW Development Area or contaminated soil in NE Development Area.	Moderate potential to encounter buried, hazardous wastes in NW Development Area or contaminated soil in NE Development Area.	None
Water Resources and Floodplains			
Floodplain volume	Moderate, loss of Duck Creek floodplain.	Low, Duck Creek relocation offsets fill.	None
Riparian/Channel effects	Moderate, Duck Creek riparian area lost.	Low, Duck Creek relocation improves migration.	None
Tidal prism volume	Moderate, loss of NE Development Area.	Low-Moderate, loss of NE Development Area.	None
Surface water quantity	Moderate, additional impervious surface.	Low-Moderate, additional impervious surface.	None
Surface water quality	Moderate, short-term degradation.	Moderate, short-term degradation.	None
Groundwater recharge	Moderate loss of recharge capacity.	Moderate loss of recharge capacity.	None
Vegetation			
Direct impacts	20.1 acres of native vegetation impacted in NW Development Area with majority of impacts to shrub-scrub, woodland, and high marsh communities; 30.2 acres impacted in NE Development Area comprising primarily high marsh and supratidal communities.	Same as FW/RW-1 with slightly lesser impacts to marsh communities due to design of relocated Duck Creek corridor.	None

Table ES-13. Comparative Summary of Environmental Impacts: Aviation Facilities[1,2], continued

Resource	FW/RW-1: Full Development of NE and NW Development Areas	FW/RW-2: Full Development with Duck Creek Relocation	FW/RW-3: No Action
Wetlands			
Modification of wetlands	5.0 acres palustrine and estuarine wetlands filled in NW Development Area. 19.8 acres palustrine and estuarine wetlands filled in NE Development Area. Net loss of 24.9 acres wetlands.	1.2 acres palustrine and estuarine wetlands lost in NW Development Area. 19.8 acres palustrine and estuarine wetlands filled in NE Development Area. Net loss of 21.0 acres palustrine and estuarine wetlands.	None
Impacts significant?	Adverse impact on functions and values of wetlands and natural systems that support EFH. However, fish habitat is limited to sloughs, and high marsh does not supply adequate fish habitat during most of year. Impacts to wetlands are not significant.	Similar to FW/RW-1. Adverse impact on functions and values of wetlands and natural systems that support EFH. However, fish habitat is limited to sloughs, and high marsh does not supply adequate fish habitat during most of year. Impacts to wetlands are not significant.	No
Fisheries			
EFH lost	18.5 acres. Relatively minor loss of EFH and infrequency of tidal inundation in EFH lost.	15.7 acres. Relatively minor loss of EFH and infrequency of tidal inundation in EFH lost.	No change.
Access to Duck Creek	No change.	Improved, less dewatering.	No change.
Wildlife			
General wildlife habitat	20.1 acres of wildlife habitat impacted in NW Development Area with majority of impacts to shrub-scrub, woodland, and supratidal habitats. 29.6 acres impacted in NE Development Area comprising primarily high marsh and supratidal habitats.	Same as FW/RW-1, with slightly less impact to open water and high and low marsh habitats due to design of relocated Duck Creek corridor.	None

Table ES-13. Comparative Summary of Environmental Impacts: Aviation Facilities[1,2], continued

Resource	FW/RW-1: Full Development of NE and NW Development Areas	FW/RW-2: Full Development with Duck Creek Relocation	FW/RW-3: No Action
Threatened, Endangered, High-interest, and Sensitive Species	Aviation facility development impacts would be insignificant to threatened or endangered species. There would be no direct effects on sea lions and whales and the minor loss of forage fish habitat would not affect prey availability for Steller sea lion or humpback whale. Impacts to high interest and sensitive species would be insignificant because construction of the aviation facilities would not be expected to have substantive effects on the populations of these species.		
Visual Resources	Moderate, negative changes in visual quality from loss of vegetative screening, and short-term impacts from building construction.	Moderate, negative changes in visual quality, as for FW/RW-1; positive, long-term changes in visual quality from improvements to Duck Creek.	No impact on visual resources.
DOT Section 4(f) Lands			
Direct impact on land	Relocation of Dike Trailhead and parking lot (beneficial impact).	Relocation of Dike Trailhead and parking lot (beneficial impact).	None
Indirect impacts	Yes, minor indirect impacts from hydrologic changes, but no substantial impairment to beneficial uses of Refuge.	Yes, minor indirect impacts from hydrologic changes, but no substantial impairment to beneficial uses of Refuge.	None
Constructive use impact (substantial impairment)?	No constructive use impact.	No constructive use impact.	No impact.

Summary Table condensed from Table 2-20 of EIS.
Estimates include impacts associated with relocation of RCO and ASOS from northeast Airport area to Engineer's Cut and BRL site.

ES.3.3.5 Fuel Farm Access Alternatives

The two alternatives for fuel farm access, FF-1 consisting of a new on-Airport access road and FF-2 using pipelines to transport fuels to an on-Airport refueling facility, would follow the same corridor from the fuel farm to the apron. The 600-foot-long fuel pipeline corridor would have a greater initial, construction impact to clear vegetation and trench in the underground fuel lines: approximately 0.7 acres of impact. However, considering that this disturbance would be reclaimed, in the long term, there would be a smaller disturbance corridor than for Alternative FF-1, which is just over 0.2 acres for the new, 565-foot-long road. A minor amount of fill would be required for the road bed development, while no fill would be required for the fuel pipelines. The cost to construct a new access road, approximately $302,998, would be much less than that required for a new pipeline system and refueling station, approximately $721,726. Economic impacts and environmental consequences of the fuel farm access alternatives are listed on Table ES-14.

These alternatives would have only minor, non-significant environmental consequences; less than 1/10 acre of wetlands would be lost, and almost no essential fish habitat or other wildlife habitat would be affected. There would be minor hydrologic impacts, with the only notable consequence being a new arch culvert crossing of Duck Creek in relatively close proximity to two other culverts on the east side of the fuel farm. There would be no direct or constructive use impacts on DOT Section 4(f) lands.

ES.3.3.6 Wildlife Hazard Management Alternatives

The three wildlife hazard management action alternatives would cause distinctly different environmental consequences in terms of impact magnitude, intensity, and context. Alternative WH-1 would cause the greatest disturbance, approximately 233 acres, in keeping with its emphasis on habitat modification to control wildlife hazards. Alternative WH-2 would result in a disturbance of approximately 116 acres, and Alternative WH-3, which relies primarily on hazard control techniques and active hazard management, would disturb approximately 33 acres.

The amount of fill required is similar for alternatives WH-1 and WH-2: approximately 501,500 cubic yards and 462,500 cubic yards, respectively. Although it has a much smaller disturbance area, Alternative WH-2 requires almost as much fill because it would involve filling the Float Plane Pond fingers. Despite having a smaller disturbance footprint, Alternative WH-2 would cost substantially more than Alternative WH-1 ($27.4 million vs. $20.2 million), primarily due to the use of a synthetic ground cover over 77 acres of infield and the expense required to fill the Float Plane Pond fingers.

Alternative WH-3 would cost less than 1/10 the other action alternatives to construct—approximately $1.2 million—but the long-term maintenance costs would be higher, again reflecting this alternative's emphasis on hazard control. Economic and environmental consequences associated with the wildlife hazard management alternatives are listed on Table ES-15.

Table ES-14. Comparative Summary of Environmental Impacts: Fuel Farm Access

Resource	FF-1: Develop New Access Road to Fuel Farm	FF-2: Install Pipelines from Fuel Farm to Fuel Distribution Port	FF-3: No Action
Construction			
Corridor length	565 feet	600 feet	None
Disturbance area	0.23 acres	0.66 acres	None
Fill volume	2,000 yd	None	None
Socioeconomics			
Short-term business income	$411,000	$989,000	$0
Short-term (construction) FTE employment	4	8	0
Short-term (construction) payroll	$122,000	$323,000	$0
Short-term sales tax revenues	$5,400	$13,400	$0
Hazardous Materials and Solid Waste			
Presence of buried hazardous waste or soil contamination	Low potential to encounter buried, hazardous wastes.	Moderate potential to encounter buried, hazardous wastes.	None
Water Resources and Floodplains			
Riparian/Channel effects	Moderate, culvert crossing of Duck Creek.	None	None
Surface water quantity	Low impact, increased runoff from road.	Low, short-term impact; increased runoff during construction.	None
Surface water quality	Low impact, additional impervious surface to transport contaminants via storm drainage and short-term construction impacts.	Low, short-term construction impact.	None

Table ES-14. Comparative Summary of Environmental Impacts: Fuel Farm Access, continued

Resource	FF-1: Develop New Access Road to Fuel Farm	FF-2: Install Pipelines from Fuel Farm to Fuel Distribution Port	FF-3: No Action
Long-term (post construction)	Low impact; some increased runoff and potential for spills from collision.	Low impact due to potential low level leaks that might escape detection by monitoring instruments.	None
Vegetation			
Direct impacts	0.2 acres of permanent impact to shrub-scrub, lichen-moss, and woodland communities.	Minor, temporary impact to shrub-scrub followed by revegetation.	None
Wetlands			
Modification of wetlands	0.04 acres of shrub-scrub wetlands altered to emergent marsh.	0.04 acres of shrub-scrub wetlands altered to emergent marsh.	None
Impact significance and basis for conclusion?	Insignificant. No substantial impact on hydrology needed to maintain wetland functions and values; no effect on sustainability of the natural systems that maintain habitat. There would be no direct or indirect impact on Refuge wetlands.	Insignificant. No substantial impact on hydrology needed to maintain wetland functions and values; no effect on sustainability of the natural systems that maintain habitat. There would be no direct or indirect impact on Refuge wetlands.	No
Fisheries			
EFH lost	No change.	No change.	No change.
Wildlife			
Overall habitat effect	Minimal direct impact to general habitats, minor disturbance to wildlife associated with increased levels of human activity.	Minimal, temporary impacts to general habitats, negligible indirect effects follow reclamation of pipeline corridor.	None
Threatened and Endangered Species	Impacts to threatened or endangered species would be insignificant. There would be no direct effects on sea lions and whales, and the potential indirect effects to forage fish are not likely to adversely affect these species.		

Table ES-14. Comparative Summary of Environmental Impacts: Fuel Farm Access, continued

Resource	FF-1: Develop New Access Road to Fuel Farm	FF-2: Install Pipelines from Fuel Farm to Fuel Distribution Port	FF-3: No Action
High-interest and Sensitive Species	Impacts to high-interest and sensitive species would be insignificant because construction of either Fuel Farm Access alternative would not be expected to have substantive effects on the populations of these species.		
DOT Section 4(f) Lands			
Direct impact on land	None	None	None
Indirect impacts	None	None	None
Constructive use impact (substantial impairment)?	No	No	No

Summary Table condensed from Table 2-21 of EIS.

Table ES-15. Comparative Summary of Environmental Impacts: Wildlife Hazard Management Alternatives

Resource	WH-1: Wildlife Hazard Management Plan Action Most Habitat Modification	WH-2: Moderate Habitat Modification	WH-3: Minor Habitat Modification and Adaptive Management	WH-4: No Action
Construction				
Disturbance area	233.0 acres	115.7 acres	32.6 acres	None
Fill volume	501,500 yd	462,500 yd	13,000 yd	None
Socioeconomics				
Short-term business income	$36,598,000	$49,620,000	$2,176,000	$0
Short-term (construction) FTE employment	235	330	14	0
Short-term (construction) payroll	$13,793,000	$18,700,000	$820,000	$0
Short-term sales tax revenues	$820,000	$1,111,800	$48,700	$0

Table ES-15. Comparative Summary of Environmental Impacts: Wildlife Hazard Management Alternatives, continued

Resource	WH-1: Wildlife Hazard Management Plan Action Most Habitat Modification	WH-2: Moderate Habitat Modification	WH-3: Minor Habitat Modification and Adaptive Management	WH-4: No Action
Long-term economic impacts (from increased hazard control, payroll)	$1,184,000	$1,390,000	$1,927,000	$635,000
Water Resources and Floodplains				
Floodplain volume	Substantial loss of wetlands west of Airport and runway.	Moderate; some loss of wetlands at Duck Creek mouth.	None	None
Riparian/Channel effects	Low; Duck Creek relocation improves fish migration.	Low; Duck Creek relocation improves fish migration.	Low, positive; due to removal of dam on Jordan Creek.	None
Tidal prism volume	Low; loss of wetlands at Duck Creek mouth.	Low; loss of wetlands at Duck Creek mouth.	None	None
Surface water quantity	Major; ditches filled, and converted to pipes and extensive new impervious surface.	Moderate; ditches and infield filled and converted to synthetic turf, effects on stormwater reduced.	Low; ditches regraded and new vegetation treatment.	None
Surface water quality	Moderate, short-term and long-term degradation.	Minor, short-term degradation.	Minor, short-term degradation.	None
Groundwater recharge	Moderate loss of recharge.	Minor loss of recharge capacity.	Minor loss of recharge capacity.	None
Vegetation				
Direct impacts	94.5 total acres of vegetation affected in project and landscape areas; 30.2 acres native vegetation affected.	89.6 total acres of vegetation affected in project and landscape areas; 25.4 acres native vegetation affected.	No effect.	No effect.

Table ES-15. Comparative Summary of Environmental Impacts: Wildlife Hazard Management Alternatives, continued

Resource	WH-1: Wildlife Hazard Management Plan Action Most Habitat Modification	WH-2: Moderate Habitat Modification	WH-3: Minor Habitat Modification and Adaptive Management	WH-4: No Action
Indirect impacts	Establishment and growth of upland and wetland herbaceous plant species in thinned-out woodland area.	Colonization of filled areas with shrubs, grasses, and forbs; potential for weed colonization.	No effect.	No effect.
Wetlands				
Modification of wetlands	13.5 acres estuarine wetlands filled; 16.1 acres palustrine wetlands dredged.	5.7 acres estuarine wetlands filled; 16.7 acres palustrine wetlands filled.	None	None
Impact significance and basis for conclusion?	Direct loss of estuarine wetlands west of the runway. However, no hydrologic connectivity between these wetlands and rest of Refuge, and impact not significant.	Some direct loss of estuarine wetlands west of runway, but relatively small compared to WH-1. Loss of palustrine wetlands not significant since Float Plane Pond serves Airport function. Not significant.	Insignificant. No wetlands lost or habitat affected other than removal of dam at Jordan Creek; no measurable change in hydrology.	None
Fisheries				
EFH lost	13.5 acres. Relatively high loss of estuarine EFH compared to WH-2.	5.7 acres. Relatively small loss of estuarine EFH compared to WH-1.	No change.	No change.
Access to Duck Creek	Improved; less dewatering.	No change.	No change.	No change.

Table ES-15. Comparative Summary of Environmental Impacts: Wildlife Hazard Management Alternatives, continued

Resource	WH-1: Wildlife Hazard Management Plan Action Most Habitat Modification	WH-2: Moderate Habitat Modification	WH-3: Minor Habitat Modification and Adaptive Management	WH-4: No Action
Wildlife				
General wildlife habitats	74.6 acres of wildlife habitat affected in the project and landscape areas, 38.1 acres of which are native communities. Greatest relative impacts to the ditch grass (4.8 acres, or 100%) and shrub-scrub (10.4 acres, or 30.3%) communities in landscape area.	53.7 acres of wildlife habitat affected in the project and landscape areas, 24.6 acres of which are native communities. Greatest relative impacts to the ditch grass (4.8 acres, or 100%) and freshwater marsh (0.6 acres, or 4.3%) communities in landscape area.	Minimal impact on native habitats.	None
Threatened, Endangered, High-interest, and Sensitive Species	The wildlife hazard management alternatives would have no direct impact on threatened or endangered species. None of the alternatives would have substantive impacts on populations of forage fish, and there would be no significant indirect impact to Steller sea lions or humpback whale. Populations of high-interest and sensitive species would not be substantively affected by implementation of WH-1, WH-2, WH-3, or WH-4.			
Cultural Resources				
	No known impacts to historic properties. Spruce tree removal would have some effect on a locally important source of roots for basket making.	No known impacts to historic properties.	No known impacts to historic properties.	No impacts to historic properties.

Table ES-15. Comparative Summary of Environmental Impacts: Wildlife Hazard Management Alternatives, continued

Resource	WH-1: Wildlife Hazard Management Plan Action Most Habitat Modification	WH-2: Moderate Habitat Modification	WH-3: Minor Habitat Modification and Adaptive Management	WH-4: No Action
Visual Resources	Major to moderate, negative changes in visual quality from habitat modifications, deer fence construction, and tree thinning. Minor, positive changes by relocation and revegetation of Duck Creek.	Moderate, long-term, negative changes to visual quality from habitat modifications and deer fence construction. Minor, positive changes by partial relocation and revegetation of Duck Creek.	Negligible impacts on visual quality.	No changes in visual quality.
DOT Section 4(f) Lands				
Direct impact on land	Up to 10.0 acres of Refuge land filled or altered.	Up to 3.3 acres of Refuge land filled or altered.	None	None
Indirect impacts	Hydrologic and habitat impacts to Refuge west of Airport. Indirect impacts to recreation from fence, changes to woodlands adjacent to Dike Trail. No substantial impairment to beneficial uses of the Dike Trail or Refuge.	Hydrologic and habitat impacts to Refuge west of Airport. Indirect impacts to recreation from fence and fill of Float Plane Pond. No substantial impairment to beneficial uses of the Dike Trail or Refuge.	No indirect impacts.	None
Constructive use impact (substantial impairment)?	No	No	No	No

Summary Table condensed from Table 2-23 of EIS.

The other direct and indirect environmental consequences generally correlate to disturbance areas. Alternative WH-1 would adversely affect greater amounts of native vegetation, wildlife habitat, essential fish habitat, and estuarine wetlands than the other alternatives. It would also have more substantial impacts on water resources, including loss of floodplains, reduced groundwater recharge, and short- and long-term degradation of water quality due to increased runoff volumes. There would also be more noticeable visual changes on Airport property and in adjacent areas, due to vegetation removal in the Float Plane Pond woodlands and the fill of wetlands west of the Airport. Alternative WH-2 would also result in substantial direct and indirect environmental impacts of similar kind—lesser in magnitude than WH-1, still much greater than Alternative WH-3.

Alternatives WH-1 and WH-2 would have direct impacts on the Refuge, a DOT Section 4(f) land, due to fill of wetlands west of the Airport. None of the alternatives would have a constructive use impact on DOT Section 4(f) land.

ES.4.0 Minimization and Mitigation Measures

The proposed actions incorporate measures to minimize environmental impacts. Potential additoinal minimization measures for each action, as well as measures to mitigate impacts where avoidance or minimization is not practicable, are discussed in the following sections of the Executive Summary.

ES.4.1 Methods to Reduce and Minimize Environmental Impacts

The CEQ regulations implementing NEPA stipulate that the EIS must include measures to mitigate environmental impacts that are not already included in the Proposed Action or alternatives (40 CFR §1502.14(f)). Three types of mitigation are typically incorporated into an alternative design prior to construction: 1) *avoiding* an impact altogether, 2) *minimizing* the magnitude of impact, or 3) *reducing* the impact over time. Two other types of mitigation, rehabilitation and compensation, are also important to consider. These are methods of mitigation implemented after an impact has occurred.

This section of the Executive Summary summarizes possible design elements that could reduce or minimize the environmental impacts attributed to some of the alternatives. Section ES.4.2 includes a summary description of the mitigation plan CBJ and FAA have proposed to compensate for unavoidable impacts to wetlands and habitat.

Section 2.11 of the EIS describes in detail a number of possible design features that could minimize or help to reduce environmental impacts. Most of these features could be incorporated into RSA alternatives, although one option is described for an alternative MALSR access road that would avoid some estuarine wetlands.

ES.4.1.1 Runway Safety Area (RSA) End Slopes

The RSA Proposed Action and some alternatives include fill slopes[7] of 4:1 on one or both RSA ends, meaning that for every vertical drop of one foot from the RSA surface, there are four feet of horizontal fill. This angle represents a relatively gradual slope that is designed for ease of revegetation and for use by emergency access vehicles, if necessary. However, the gentle gradient of the toe slope creates a larger disturbance footprint that would affect wetlands, fish habitat and other resources.

One possible way of reducing the footprint and environmental impact is to steepen the toe slopes. Applied to one of the RSA alternative footprints, the use of a 1:1 toe slope could reduce overall disturbance in estuarine wetlands by an acre or more and also reduce fill volumes by as much as 8%. The negative aspect of a steep, 1:1 gradient is that emergency response vehicles would not be able to drive on the slope, although emergency access is not a design criterion for RSA-supporting structures or slopes. Anchor rock would be needed as cover to help stabilize the surface and protect against water erosion and ice scour. The preferred alternative, RSA-5E, uses a 2:1 end slope on the Runway 08 end, since emergency vehicle access could be provided by the Float Plane Access road. However, a 4:1 slope on the Runway 26 end was found to be necessary since there is no other way for emergency vehicles to access the areas around the RSA other than by use of the embankment.

ES.4.1.2 Runway Safety Area (RSA) Side Slopes

The Proposed Action and alternatives incorporate a steep, 1:1 supporting slope for the lateral RSA in order to minimize the environmental impact on habitat south of the runway. The cooperating agencies suggested that instead of the 1:1 slope, a vertical bulkhead could be used for RSA stabilization. The intent of this option would be to lessen the size of the RSA footprint and further reduce impacts on the tidal channels and estuarine habitat south of the runway. Such a bulkhead could be installed to extend the length of the new lateral RSA, a distance of approximately 3,500 feet for all of the alternatives, resulting in a savings of approximately 1.5 acres of habitat compared to the 1:1 fill option. Fill volumes would also be reduced. Two possible construction methods to reduce the footprint of the lateral RSA include open-cell bulkheads and gabions with mechanically stabilized earth walls.

Open-cell bulkhead construction has been used in marine port settings for docks and other applications in Alaska. A vertical retaining wall of sheet pile along the south face of the lateral RSA would extend approximately 3,500 lineal feet and an average height of approximately 30 feet, which would account for existing surface elevations, tidal fluctuations/possible overtopping, and an embedment of approximately 14 feet below surface. The chief disadvantage to this method at JNU would be the high cost, estimated at approximately $30 per square foot, or a total cost of approximately $3.1 million.

7. In other words, the slope of fill material supporting the RSA, EMAS, access road or other feature.

Gabions with mechanically stabilized earth walls constructed at a steep 0.6:1 slope are a lower cost alternative than sheet piling. A 3,500-foot-long gabion wall of approximately 24-foot height would cost approximately $800,000, assuming an installation cost of approximately $10 square foot. The freeboard and toe protection required to install this type of wall would increase wetland impacts approximately 1/3 acre more than the vertical sheet pile system described above, but the net effect compared to a 1:1 riprap slope would still result in 1.2 fewer acres of habitat lost. FAA's preferred Alternative RSA-5E would use gabion walls or some other technology to achieve steep support structures for the lateral safety area embankment, and thereby minimize environmental impacts.

ES.4.1.3 JORDAN CREEK CULVERT

The addition of lateral RSA to the runway would necessitate extension of the culvert system of Jordan Creek. The proposed extension, described in Section 2.6.2 of the EIS, would consist of connecting box or arch culverts to the existing corrugated metal pipe culvert. This method would be the least expensive to implement and would cause the least disruption to airport operations, but it would also create a more difficult passage for fish due to approximately 300 additional feet of culvert.

To reduce environmental impacts to Jordan Creek and the fish passage, the existing pipe culvert under the runway and taxiway could be replaced with a bottomless arch culvert or a bottomless box culvert. The new culvert would extend approximately 770 feet, to reach from the north RSA, under the taxiway and runway, and discharge into the tidal channels south of the expanded lateral RSA. A series of 4–by-6-foot daylight wells protected by steel grates on top of the new culvert would be used at approximately 100-foot intervals within the RSA.

The Jordan Creek system provides regionally important fish rearing habitat that would benefit from the enhanced stream characteristics offered by the culvert improvements. The key changes providing these benefits include oversizing of the arch culvert system to provide a natural channel bottom, and surface "windows" to allow daylight and starlight within the culvert for fish navigation, and a linear alignment to replace the existing, offset culvert.

Replacement of the entire culvert system would be expensive relative to the proposed "extension" system currently incorporated in the RSA alternatives. It is estimated that corrugated metal pipe culvert extensions would cost approximately $42,000; arch culvert extensions would cost $355,000; and a new, 770-foot arch culvert system; as described above, would cost approximately $2.3 million. Installation of the replacement arch culverts would necessitate closing of the runway in order to excavate to the creek, pull out the old culvert sections and install new spans. Ideally, the work would be done in conjunction with other major runway projects, such as the next runway reconstruction project, so as to reduce the runway closure time and limit use of the parallel taxiway for operations. During the interval the runway is closed, the taxiway would be used for aviation operations. By timing an arch culvert replacement to other runway work, there would be minimal additional runway closure cost incurred, but it would mean the environmental benefits of the new system would not be realized for some time, as a runway reconstruction project may not be needed at JNU for 10 years or more. The arch culvert replacement system under the runway

would only be conducted sooner than the next runway reconstruction if the existing culvert fails or is at the end of its useful life. The culvert extensions, either arch or corrugated metal pipe, could be installed concurrent with work on the lateral RSAs.

ES.4.1.4 EAST RUNWAY SLOUGH

The fill needed to construct the RSA would alter tidal flows to some areas and potentially block sloughs that drain and recharge the area south of the Miller-Honsinger Pond. The amount of fill varies by alternative, but up to 10 acres could be filled in the marsh and slough areas north, east, and south of the existing runway, reducing tidal exchange by approximately 50 acre feet for a typical tide cycle. In addition to the amount of fill, the location of the fill associated with the RSA alternatives is also important.

Additional analysis was performed for the Final EIS to better predict the effects that proposed filling of tidal channels and marshplain would have on the geomorphology of the local estuary system. The complete description of this analysis may be found in Vigil-Agrimis (2006) located in Appendix L of the Final EIS. A summary of the results follows.

Dredge Slough, Sunny Slough and East Runway Slough come together in the vicinity of the proposed RSA extensions. The various alternatives would sever this connection to differing degrees, depending on their size and location. Since the marshplain is not uniform in elevation, filling tidal channels affects patterns of drainage as well as the marshplain's access to tidal flows. Areas that are not filled, but are cut off from tidal inundation have the same affect as filled areas on tidal volumes and contribute to a reduction in channel size, and nutrient and sediment exchange. The area directly north of the RSA would experience a net decrease in flows. Flow impacts for the marsh and fish emigrating to and from Jordan Creek would also vary with the different RSA alternatives. The impacts would generally be proportionately greater the larger the fill volume. The impacts would not be as severe in the eastern part of the marsh, toward Sunny Point, because other flow paths would continue to provide tidal water to the slough and marsh area.

All of the alternatives include fill placement in the main tidal channel of East Runway Slough, but the eastward extent of the proposed fill varies. RSA-6B would require the shortest eastward disturbance, and therefore the least amount of fill, while Alternative RSA-5C would extend the RSA and taxiway the furthest east. RSA-5C also has the largest disturbance footprint and greatest fill volume, and would therefore affect tidal flows volumes the most. The reduction in tidal flow volume would likely decrease sediment transport leading to a reduction in the cross sectional area of tidal channels in the system. The East Runway Slough could be diverted east, effectively cutting off hydrologic recharge between the Airport north of the runway and the Gastineau Channel.

FAA has considered how to maintain the hydrologic connection to the marsh and other areas on the Airport and the Refuge that could be affected by hydrologic changes. The following discussions summarize methods to preserve flow through or past the RSA into the marsh, thereby limiting impacts to the wetlands and essential fish habitat. These evaluations use the Runway 26 end safety area incorporated in different RSA configurations for the purpose of discussion and cost comparison.

ES.4.1.4.1 Bottomless Arch Concrete Culverts for East Runway Slough

The first approach to pass flows in the slough was to consider four, 42 x 12 x 6-foot, bottomless concrete arch culverts through the RSA fill to keep the slough in the existing location. Construction of this option would be the most complicated, primarily because approximately 300 different segments of arch culvert would have to be installed in four separate alignments to carry 100% of the flows currently exchanged. One option discussed after completion of the DEIS would be to install fewer and smaller arch culverts, sufficient only to carry the flows needed for Jordan Creek, and assume that some natural drainage around the RSA would re-establish. The potential for channel avulsion (a dramatic displacement of the flow path) around the culverts would probably be relatively low, but the potential would increase with decreasing RSA fill. In other words, RSA-6B (and to a lesser extent, RSA-6A) would have a higher likelihood of tidal channel development around the east embankment if culverts are used because marshplain elevations at the end of the fill would be relatively low (between 5 and 8 feet msl) and frequently inundated by tides.

ES.4.1.4.2 Corrugated Metal Pipe Culvert for East Runway Slough

The second approach was to consider using 40 separate, 12-foot-diameter corrugated metal pipe culverts buried 4 feet deep, approximately every 20 feet. This configuration would provide about the same flow capacity as the bottomless arch culverts, but the channel width would be increased from approximately 160 feet to approximately 480 feet. This configuration would likely result in preferential flows along certain culverts. The higher friction value of corrugated metal pipe, the limited potential for scour without an open bottom, and the smaller openings make these types of culverts more likely than large arch culverts to clog with debris. Construction of this approach is less complicated than the bottomless arch culverts and would probably require only partial diversion of the existing flows.

For the same reasons described in the discussion of the bottomless arch concrete culvert approach above, the risk of a channel developing and bypassing the culverts would be the lowest for RSA-5C (since it would have the greatest eastward extent of fill) and greatest for RSAs-6A and -6B, with the smallest RSA footprints.

ES.4.1.4.3 Relocation of the East Runway Slough

The third conveyance approach would be to construct a new channel for East Runway Slough around the RSA. The constructed channel would be wide enough to pass scouring flows and deep enough to provide access to scouring tidal flows at common tidal elevations. The length and depth of the relocated slough channel would vary somewhat depending on the RSA alternative. Constructed channels for remaining alternatives incorporating EMAS or a relatively small east runway end footprint would extend approximately 1,385 feet north and east of the runway, and for another 2,800 feet south of the runway. Constructed channels for other alternatives, such as RSA-5E, would be longer.

A relocated slough channel would allow tidal flows to access the marshplain. Currently, the East Runway Slough channel also drains stormwater flows from Miller-Honsinger Pond. Positive drainage must therefore be maintained along the length of the relocated channel. Since the eleva-

tions at the beginning and end of the channel are fixed, the increased length of the channel required in RSAs-1, -5D, -5E and -6C would result in a flatter gradient channel. Because tidal systems are dynamic, the longer relocated channels may require more ongoing maintenance to ensure adequate drainage.

This option is less complicated to construct than the culvert options. Relocation of the channel to the east would necessitate a bridge or concrete arch culvert crossing to access the MALSR lights and maintenance road.

ES.4.1.4.4 Re-route Tidal Flow into Sunny Slough

A fourth conveyance approach developed for CBJ's draft permit application and adjusted in the FEIS has been incorporated into RSA-5C. The extensive fill footprint east of the runway for this alternative would make it very difficult to maintain tidal exchange using a constructed channel around the RSA embankment. The approach for this alternative would be to redirect tidal flow to the Gastineau Channel via Sunny Slough. This action would preserve tidal exchange through the East Runway Slough into the marshlands north of the runway, but the connection would be into Fritz Cove rather than the Gastineau Channel. Sunny Slough connects with East Runway Slough in the vicinity of the proposed safety area fill and parallel taxiway extension, but the two channels would be separated by the new construction. The length of this channel alteration would be approximately 600 feet. This option would have the greatest affect on the tidal channels south of the existing runway that connect Jordan Creek to Gastineau Channel. These channels would decrease in size as less tidal flow passes through them, with less ability to scour sediments.

ES.4.1.4.5 Assessment of Hydrologic Options for Each Alternative

FAA considered costs, technical feasibility, and probability of success, in evaluating these four options to convey tidal water past the RSA and to the marsh. The costs for the options described above range from approximately $13 million for bottomless arch culverts, to $7.6 million for corrugated metal pipe culverts, to approximately $1.5 million for a relocated, constructed channel (i.e., one created as part of project construction, as opposed to a channel that adjusts to a new fill footprint and through time creates a new hydrologic exchange channel). Each of the options could be designed and constructed, but their difficulty to implement parallels the cost variability: the most complex option, for bottomless arch culverts, would be the most challenging to install with the greatest potential for short-term, adverse environmental impacts during construction.

FAA examined the RSA alternatives with extensive east fill footprints (essentially all of the alternatives except RSA-6A and -6B) using arch culverts passing under the runway and RSA and relocated channels. Culverts maintain existing channel profiles, but there is risk that sediment or wood blockages could lead to bypassing the culverts. Active channel relocations would most accurately mimic the existing hydrology of the area, but the flatter profiles resulting from longer channel length could lead to the channel attempting to reestablish a steeper profile and eroding RSA slopes. Erosion of this nature could be minimized through the use of a gabion wall or riprap to stabilize the vulnerable portions of the RSA slope. The bottomless arch concrete culvert option would also cost approximately 9 times the cost of a relocated channel. It is likely that the East Runway Slough would adapt to the fill by incising new channels around the RSA, without the aid

of engineered and constructed features, but there would be risk of losing tidal exchange with habitats in some areas. Consequently, FAA has incorporated the construction of a new channel system around the east runway into the preferred Alternative RSA-5E.

ES.4.1.5 MALSR ACCESS ROAD

The MALSR access road as described in Section 2.7.2 of the EIS would extend east in a line from the runway with Alternatives RSA-5C and -5E, providing access to the approach and alignment indicator lights. This road configuration would offer the shortest distance to the lights from the runway and RSA, but it would also cross high-value habitat, including the East Runway Slough. FAA considered other options for light access to minimize impacts to habitat east of the runway.

One option considered was the use of an ATV in lieu of a permanent access road. However, access is needed during all weather conditions, and an ATV would damage vegetation and soils, and possibly leave tracks, when the ground is saturated. Also, ATVs are generally not able to transport a work crew and heavy equipment, such as a 500-pound replacement power cable spool, that is necessary for some maintenance.

An elevated "boardwalk" system was also considered, but a boardwalk 1) offered few environmental advantages, since it would need to be anchored with heavy piers into the wetlands, 2) required much more maintenance, due to the effects of ice and storm surges on the pilings, and 3) created distinct vehicle safety concerns, due to icing on the elevated surface.

Another method of reducing environmental impacts would be to use a helicopter for construction, routine maintenance and emergency access, thereby eliminating habitat destruction associated with road construction and use. The main problem with the use of helicopters is they would be operating in primary airspace, causing a disruption of operations and possibly exacerbating aviation safety concerns. In addition, helicopter access would be more limited during poor weather conditions (conditions under which the approach light system is most important for improving pilot alignment), and alternate means of access would still be necessary.

FAA concluded from the analysis that the use of an at-grade road provides the most assured surface for construction and maintenance access. It would also not create barriers to important surface water flows, maintain hydrologic recharge of the wetlands, and induce some revegetation through the road surface. The at-grade access road is already incorporated into the design for Alternative NAV-2B. Some alternatives considered would direct the MALSR access road south of the runway, across a constructed slough, and then east on higher ground along spoils "islands" deposited during dredging of Gastineau Channel. In this manner, the road would have less direct effect on estuarine wetlands and take advantage of "uplands" as much as possible. However, the FAA's requirements for direct, quick access to the lights would still necessitate a road connecting the entire system. The analysis in the Final EIS concluded that an at-grade access road, extending directly east from the RSA embankment and crossing the constructed slough channel using an arch culvert or span bridge, would minimize impacts to habitat and cost less than a route along the dredge spoil islands. This design is incorporated into the preferred Alternatives RSA-5E and NAV-2B.

ES.4.1.6 BIOENGINEERING TECHNIQUES FOR BANK STABILIZATION

Streams and river banks would need to be stabilized for any activities that modify nearby terrain and could potentially alter flow characteristics. Some resource agencies suggested during review of the Draft EIS that bioengineering techniques may be a suitable application for Duck Creek relocation, its confluence with the Mendenhall River, and the river-side slopes of the proposed fill at the west end of the runway. Bioengineering techniques use soil, wood, rock, and in many instances living plant materials to support unstable slopes or to protect against erosion. Designs may take many forms, but in riverine settings the emphasis tends to be the use of large woody debris in engineered log jams and log crib walls. Bioengineering concepts can be used to help dissipate stream energy against banks, relative to armored rock walls or sheet piling, and some types of plantings provide benefits to aquatic habitat.

Large wood masses may provide an alternative to large rock or riprap to dissipate the high channel energy associated with large flow events on the Mendenhall River, for example such as the 100-year flow velocities running 7-10 feet per second and 11-14 feet deep. Tidal inundation would severely limit the use of simple brush layering and vegetated crib walls. Roots wads and large wood members (>24" diameter and 40-60' long) can be used in these situations, but the buoyant forces and bending moments on wood members would be enormous, requiring deep burial and other anchoring. The technology is feasible, however, as engineered log jams have been used successfully for bank protection on even larger, more powerful glacial rivers such as the Hoh River on Washington's Olympic Peninsula (mean annual flow 2,520 cfs, and peak flow of 54,500 cfs).

Bioengineering is a viable alternative to riprap for use on the low-energy Duck Creek system, and could easily be incorporated into the relocation design. The analysis conducted for this EIS suggests it is also feasible for use on Mendenhall River banks, along areas where fill will be placed to eliminate habitat for waterfowl, gulls, and other birds, but the design and construction effort level increases substantially from Duck Creek to the Mendenhall River. Considerable information and analyses would be required to apply bioengineering techniques to protect vital transportation infrastructure along the Mendenhall. Key to the successful application of bioengineering techniques on the Mendenhall is an understanding of the power of the river and the processes that are operating along the reach, not just the fill placement site. This is a complex setting and one where bioengineering techniques may be applicable, but likely at cost above that of standard treatments such as riprap or armored walls.

CBJ and JNU staff members have also expressed strong reservations about the use of bioengineering techniques on the Mendenhall River. They consider bioengineering an "experimental" concept for bank stabilization, with little record of performance history, uncertain durability, and poorly defined maintenance requirements. Further, concern exists that bioengineered bank stabilization features could be attractive to certain wildlife, such as perching birds, which would create a wildlife hazard near the end of the runway. However, birds such as eagles commonly perch on riprap, logs, or whatever material is present and elevated above the river, so bioengineered materials may not present any greater hazard than traditional bank stabilization structures.

While the changes in hydraulics and geomorphology resulting from placement of fill for some RSA alternatives along the Mendenhall River appear manageable, special attention should be paid to the effects that the proposed fills would have on both the east and west banks of the Mendenhall River especially in the vicinity of the MALSR and along the dike adjacent to the Float Plane Pond.

ES.4.1.7 STORMWATER MANAGEMENT

ES.4.1.7.1 STORMWATER POLLUTION PREVENTION PLAN

The Airport has a Stormwater Pollution Prevention Plan for Construction and Multi-Sector General Permits. This plan identifies a number of best management practices employed to reduce environmental impacts during construction. However, JNU's Multi-Sector Permit for Stormwater expired in 2005. Additional stormwater control procedures and requirements to be incorporated into an updated plan were identified by JNU in response to questions and concerns expressed by cooperating agencies (Carson 2006). The new SWPPP will be revised as needed and finalized once final decisions identifying specific alternatives have been approved for the runway safety area, facilities, SREF, and other projects. New best management practices have been identified that would be incorporated into a revised permit. Some of the practices to reduce environmental impacts include:

- Stormwater from the Airport will not be discharged into Duck Creek to comply with the TMDL for that waterbody. A TMDL for Jordan Creek is under consideration which may also preclude stormwater discharge from the Airport.
- Equipment cleaning and washdown will be limited to specific areas in order to minimize the volume of water generated by such activities, and the area potentially affected.
- A review of Airport deicing operations will be conducted to determine whether over-application of deicing compounds is occurring and what measures may be taken to reduce and eliminate over-application while preserving air safety. The review will include evaluation of measures to capture and treat deicing runoff.

ES.4.1.7.2 SNOW REMOVAL AND SNOW STORAGE

Snow storage can be an operational impediment to safe aircraft movement and an environmental problem. Airport crews must work quickly to clear runways and taxiways so as not to slow operations. In addition, stored snow can accumulate into large volumes at discrete locations around the infield and along the taxiway and runways. Because of a lack of storage space, at times crews have pushed snow into wetlands adjacent to the infield, and even alongside and into Duck and Jordan Creeks. The snow contains sediments and possibly other compounds hazardous to aquatic life, particularly chemicals associated with aircraft deicing such as glycols, and nitrogen-rich urea used for runway anti-icing.

The conceptual designs evaluated in this EIS include the need for buffer zones along habitat and surface waters to prevent inadvertent contamination by snow removal operations. Snow storage locations have been identified for some facilities, such as a site east of the SREF. The updated

stormwater pollution prevention plan would include specific operational practices to be employed by equipment operators to ensure snow removal and storage does not adversely affect sensitive habitat.

ES.4.1.7.3 OIL/WATER SEPARATORS

Oil/water separators are multi-chambered devices designed to remove hydrocarbon compounds, typically found in fuels, oi,l and grease, from an aqueous solution. They are common first-step treatment systems employed in a variety of applications, such as in a drain system from a vehicle maintenance shop. JNU has recognized there is insufficient treatment of stormwater from at least some areas of the Airport before the water discharges to surrounding waters. As part of the updated stormwater planning process JNU will consider the benefits of oil/water separator installation in one or more of their stormwater discharge systems. However, oil/water separators can be difficult to use effectively in stormwater treatment because of the variable flow rates and often high concentrations of sediments. JNU will therefore also be considering the development of catch basins and/or wet treatment ponds to capture hydrocarbons prior to stormwater discharge, or to settle solids before the waste stream is passed through further treatment. One possible solution is to use the Float Plane Pond as the receiving water for all stormwater from the Airport. The pond was constructed for aviation purposes, and therefore should not be considered as a "swimmable" or "drinkable" water body. Discharge into the pond would provide residence time and biochemical treatment for compounds such as urea, glycols, and possibly hydrocarbons.

ES.4.1.8 RUNWAY ACCESS

An operational concern with some alternatives involving displaced or relocated thresholds is access to the departure start points, primarily on Runway 26. The parallel taxiway at JNU currently extends east to a connector taxiway that directs aircraft on to the Runway 26 threshold. A change in departure threshold to the east could necessitate extension of the parallel taxiway a comparable distance, although the need for an extension even with a threshold change is also dependent on specific departure procedures for design aircraft, weight requirements, runway length needs, and other factors. Construction of additional taxiway therefore results in greater environmental impact to the estuarine wetlands. One means of reducing environmental impact is to eliminate taxiway extension from some alternatives. However, taxiway entrance at a location other than the departure threshold or behind the departure threshold, could result in the need for some aircraft to backtaxi and turn 180 degrees before starting takeoff roll. This activity means more aircraft residence time on the runway, and can slow down aircraft arrival activity during busy operations.

Alternatives RSA-5C, -5D and -5E all incorporate taxiway extensions into their design at the request of JNU. FAA considered design aircraft operations when evaluating the need for a taxiway extension for RSAs-6A and -6D. Each of those alternatives includes an eastward shift in Runway 26 departure point from the existing threshold. The shift for Alternative RSA-6A is relatively minor at 188 feet, and all aircraft, including B737-400s and -900s, would be expected to continue using the displaced Runway 26 threshold as the starting point for departures. Alternative RSA-6D, however, would allow up to 600 additional feet for takeoff roll on Runway 26 departures, because the new runway safety area would be constructed to full runway pavement condi-

tions. Aircraft that do not backtaxi would have a reduced accelerate-stop distance on Runway 26 departures relative to existing conditions. To ensure that these conditions would not have a negative affect on aviation operations, FAA consulted with Alaska Airlines about the thresholds changes. Alaska Airlines concluded that "if the existing runway entrance points were maintained, the need to backtaxi will be low". However, Alaska Airlines also pointed out that extending the runway without also extending the taxiway to the threshold "... would increase our taxi times, and the time we are on the runway, possibly reducing the frequency of operations and the capacity of the airport" (Alaska Airlines 2006a).

FAA weighed the environmental benefits of requiring aircraft to backtaxi to obtain the full possible takeoff length for Runway 26 versus the safety and operational concerns associated with more runway residence time for aircraft and the concerns of Alaska Airlines, the primary commercial air carrier using the airport, and the Airport Sponsor. Full-length parallel taxiways segregate taxiing aircraft from aircraft landing and taking off. In those cases where backtaxiing is necessary, aircraft would be on the runway for longer periods of time, which further increases the possibility of runway incursions. Backtaxi situations complicate air traffic control and detract considerably from airport efficiency during peak operating hours. The ATCT tower at JNU has adopted a new policy, effective February 5, 2007 to decline to issue "position and hold" instructions. This policy, designed to reduce the possibility of runway incursions, may affect airfield efficiency and operational flexibility at JNU. Implementation of this policy without a full parallel taxiway would increase the time the runway was unavailable and delay use by other aircraft. Additionally, basic pilot training, and operational policies encourage the use of full runway length. Pilot preference for use of the full runway length to provide an increased margin of safety would result in an increase in runway occupancy times. For all of these reasons, FAA considers a full parallel taxiway to be a basic component of Airport infrastructure. The lack of a full parallel taxiway with Alternatives RSA-6A, -6B, and -6D, while reducing overall environmental impacts by a maximum of 3 acres (under RSA-6D), is considered a substantial drawback of these alternatives.

FAA determined, based on the rational presented above, that the preferred Alternative RSA-5E would include an extension of the parallel taxiway commensurate with the 520-foot Runway 26 threshold relocation.

ES.4.2 MITIGATION

The FAA and other federal agencies use a sequential approach to assessing environmental impacts and mitigation for adverse impacts that may result from projects such as those being evaluated in this EIS. For example, the U.S. Fish and Wildlife Service, in coordination with CEQ regulations (Part 1508.20) on mitigation, has published a representative mitigation strategy that includes the following steps (U.S. Fish and Wildlife Service Mitigation Policy, *Federal Register,* Vol. 46, No. 15, Friday, January 23, 1981):

1. Avoiding the impact altogether by not taking a certain action or parts of an action.
2. Minimizing impacts by limiting the degree of magnitude of the action and its implementation.

3. Rectifying the impact by repairing, rehabilitating, or restoring affected environment.
4. Reducing or eliminating the impact over time by preservation maintenance operations during the life of the action.
5. Compensating for the impact by replacing or providing substitute resources or environments.

The FAA has attempted to avoid or minimize environmental impacts in three ways. First, the need for each proposed action has been scrutinized and independently evaluated. In this manner the Proposed Action and alternatives are limited in scope to only that development which is needed, and not necessarily to that which the Sponsor would prefer to have approved. For example, the FAA has determined that fewer aviation facilities are needed now and in the reasonably foreseeable future than were forecast in the Master Plan and originally requested by the Sponsor.

Second, where possible, FAA has developed alternatives that would avoid certain environmental resources. These efforts are clearly represented by the runway safety area alternatives. For example, the use of EMAS reduces the overall runway safety area footprints. When EMAS is combined with threshold displacements, direct environmental impacts to the Refuge east of the Airport can be avoided. However, efforts to avoid or minimize impacts to natural resources may have other tradeoffs, such as increased cost or operational impacts that may not be acceptable. For example, the actions included in FAA's preferred alternatives incorporate the following steps to avoid impacts:

- Wildlife hazard management would include adaptive management practices to evaluate success of control techniques and avoid habitat modifications where possible (such as clearing of woodland habitat) by establishing monitoring and documentation protocols to demonstrate effectiveness of less environmentally damaging actions. These protocols would also be used to determine whether additional hazard abatement, potentially including habitat modifications, could be justified and implemented.
- Development projects take advantage of on-site conditions by using the float plane ponds for most fill material (other than riprap), thereby avoiding the social and environmental impacts associated with transporting materials by truck from an off-site quarry to the Airport.

Finally, FAA has identified alternatives and components of alternatives that may not avoid environmental impact to some resources but would minimize the magnitude of impact. The use of EMAS is one example. In addition, new alternatives have been added, since the Draft EIS, that use declared distances criteria to take advantage of new FAA criteria allowing shorter runway safety undershoot area, thereby reducing overall disturbance footprints. Section ES.4.1 described other design elements that would reduce environmental impacts, such as features to maintain hydrologic connection to wetlands or enhance fish passage or reduce fill volumes in wetlands. While it is anticipated that additional impact minimization elements will be identified in conjunction with the design documents for permitting (such as best management practices and so forth; see, for example, the 2006 Mitigation Plan) a representative sample incorporated into the preferred alternatives includes:

- RSA footprint has been shifted to the east to keep fill out of the Mendenhall River, and reduce direct impacts to the Refuge. The preferred alternative has the least direct impact on the Refuge of any alternative not incorporating EMAS into the design.
- The design for RSA west of the runway was prepared in recognition that activities to reduce wildlife hazards would also affect this part of the Refuge. By overlapping the RSA and WHMP disturbance footprints west of the runway environmental impacts to wetlands east of the runway are minimized.
- Embankment slopes for lateral RSA and some RSA embankments are steep (0.6:1 using gabion walls, and up to 1.5:1 in some areas on the west runway end) so as to reduce fill footprints.
- The proposed RSA alternative takes advantage of declared distances criteria and recent FAA guidance for undershoot protection to minimize the disturbance footprint while maintaining acceptable landing length for the design aircraft
- The fuel farm access road would be narrowed to a single lane bridge crossing over Duck Creek to reduce impacts to aquatic habitat.
- Expansion of apron, including new hangars and facilities for FBOs, would be limited to that for which an existing demand has been established or aviation forecasts predict a need within the planning horizon for this EIS.
- The MALSR access would be via an at grade road which would minimize impacts to high value wetlands in essential fish habitat.

However, each of the preferred alternatives would cause some unavoidable impacts to the environment, even with the application of best available technologies and other design features. For this reason, the FAA and other federal and state agencies will apply mitigation policies to compensate for environmental impacts.

ES.4.3 MITIGATION POLICIES AND REGULATIONS

Compensatory mitigation for the Airport projects would involve a number of state, federal, and local agencies because of specific and overlapping regulatory authorities. Generally, however, mitigation planning and approval is done in concert with and through the Corps of Engineers permit authority under the Clean Water Act and the consistency review and determination completed through the ADNR/Office of Project Management and Permitting. Mitigation requirements are generally applied as conditions for permit approval.

The Corps of Engineers provides guidance for the mitigation of wetland impacts in its Regulatory Guidance Letter (RGL) 02-2. This letter applies to all compensatory mitigation proposals under Corps of Engineers jurisdiction. Within the framework of this letter, the Corps of Engineers' Alaska District may choose how mitigation will be implemented for a specific project. The letter states that all districts will follow a watershed and/or ecosystem approach to mitigating wetlands. This includes assessing wetlands functions for wetlands that would be impacted, assigning debits to the area impacted and creating and implementing an ecologically sound compensatory mitiga-

tion plan. The RGL also defines what types of mitigation are eligible for credit. The Corps' Alaska District also published supplemental guidance including a Compensatory Mitigation Plan Checklist to assist in the preparation and review of Mitigation Plans.

A concern specific to airports and applicable to JNU is attraction of a mitigation property to hazardous wildlife, meaning those that could endanger aviation operations. FAA Advisory Circular (AC) 150/5200-33, Hazardous Wildlife Attractants on or Near Airports, addresses the issue of siting certain land uses that are incompatible with safe airport operations because they attract hazardous wildlife. Wetlands are generally considered incompatible with safe airport operations because they are attractive to wildlife including many species commonly involved in aircraft wildlife strikes. As a result, FAA recommends that wetland mitigation projects that may attract hazardous wildlife be sited at least 10,000 feet from airports, such as JNU, that serve turbine-powered aircraft. In addition, a distance of 5 statute miles separation is recommended if the wildlife attractant (i.e., wetlands) may cause hazardous wildlife movement into or across the approach or departure airspace. The Corps of Engineers have incorporated FAA's siting criteria into their Regulatory Guidance Letters on compensatory mitigation. The siting criteria was applied during development of the mitigation plan when identifying possible mitigation sites, in particular for areas south of the Airport in aircraft approach and departure airspace, such as Lemon and Vanderbilt creeks.

Other federal agencies have recognized the unique circumstances that can apply to mitigation projects involving airports. In 2003, the FAA and EPA, FWS, USDA, Department of the Army and U.S. Air Force signed a Memorandum of Agreement (MOA) to address aircraft-wildlife strikes. The signatories to the MOA agreed that development of mitigation habitat that could attract hazardous wildlife to airports or nearby areas is one of three "activities of most concern." The MOA encourages stakeholders of projects to develop land uses within the siting criteria of AC 150/5200-33, referenced above. Further, the signatories agreed they will cooperatively review proposals to develop or expand wetland mitigation sites that may attract hazardous wildlife, and that when planning such sites they will consider the siting criteria and land use recommendations of AC 150/5200-33.

The siting criteria from AC 150/5200-33 were applied during development of the mitigation plan when identifying possible mitigation sites. In particular, the criteria heavily influenced the decision by FAA and CBJ to not pursue compensatory mitigation projects in some sites that otherwise scored high in compensatory value, such as Schweitzer and Vanderbilt creeks. These areas are both within 10,000 feet of the Airport, and they could serve as hazardous wildlife attractants, particularly because they reside within aircraft departure airspace.

The FAA's wildlife hazard siting criteria does not, however, preclude the preservation of existing wetlands on and around the Airport as long as other conditions are met. For example, FAA would provide grant money to JNU for development of projects and also for compensatory mitigation. Assurances incorporated into the grant would require that the Airport comply with FAA Advisory Circulars such as AC 150/5200-33A regarding hazardous wildlife on or near airports. This circular addresses existing wetlands on or near airports and recommends that public use airports work with local, state, and Federal regulatory agencies to correct any wildlife hazards resulting from such wetlands. Additionally, the circular recommends the establishment of a wildlife hazard

working group to help implement wildlife hazard management plans at airports, a recommendation also incorporated into FAA's preferred alternative (see Section 2.13). In the case of JNU, the wildlife hazard advisory group would help to address known and potential hazards from wildlife use of on-airport and near-airport wetlands. The Refuge statute stipulates that the ADNR and ADF&G work with the Airport to address waterfowl attractants on the Refuge that may pose a safety hazard for Airport operations. Therefore, the FAA can agree to preservation of existing wetlands on and around JNU as compensation for the loss of Refuge or even non-Refuge lands affected by the Airport projects, as long as grant assurances are met and the agencies work with the Airport to address waterfowl hazards, as required by statute.

ES.4.4 Process to Develop a Compensatory Mitigation Plan

The FAA recognized at the start that some of the Airport actions considered in this EIS could not be implemented without adversely affecting environmental resources. Consequently, consultation with interested agencies concerning compensatory mitigation began prior to scoping. An introductory, pre-scoping meeting with representatives from state, local and federal agencies[8] was held May 3, 2001 at which time possible mitigation sites were identified. This discussion included a review of types of sites that would be most desirable, such as accreted lands and specific sites within CBJ, an overview of the mitigation process, and a summary of FAA's guidance with respect to wildlife hazards and mitigation. This mitigation discussion helped to define some EIS tasks, including prioritizing the coverage for aerial photography and mapping.

For approximately two years, many subsequent meetings, conference calls, and written communication with interested agencies concerning mitigation were focused on resource delineation, covering such topics as data adequacy, methods for data collection and analysis. In February, 2002 a draft technical working paper *Delineation of Jurisdictional Waters of the U.S.* was prepared and submitted to the Corps and other cooperating agencies for review. This document, which was later revised and approved with one exception by the Corps on October 2, 2002 served as the basis for determining the types and extent of wetland resources that would be affected by the actions and alternatives evaluated in this EIS. FAA's Consultant Team also prepared technical documents for biological and water resources which served similar functions. The documentation of impacts to natural resources presented in this EIS is the basis for determining the types and extent of compensatory mitigation to be applied.

In September 2003, FAA, Cooperating Agencies and other agencies, and CBJ met to begin mitigation planning. All parties to this and subsequent discussions agreed that the planning effort would not commit a particular agency to a specific action or alternative, but that open communication would be useful in developing mitigation components that could be more readily accepted if one or more Airport projects were to be approved. At this meeting the participants reviewed mitigation policies and goals, identified specific mitigation opportunities, and discussed permitting requirements in conjunction with mitigation plan development. Field trips were conducted the following day to look at specific sites and discuss applicability of those sites with the types of impacts anticipated from Airport projects. Shortly after these meetings, the FAA prepared an

8. Including CBJ, JNU, USFWS, ADF&G, NMFS, EPA, USDA, ADEC, FAA and consultants.

outline of a mitigation plan for interagency review and comment. The outline included a draft site screening analysis of potential mitigation sites that considered a number of criteria, developed in consultation with the agencies and the Airport, including: NWI wetland types to be affected by projects; wetland functions important to the analysis including environmental scores and functional capacity units offered by the sites; and institutional functions potentially important to the consideration of sites such as recreational opportunities, wildlife hazards, mitigation enhancement opportunities, current and future land uses, management requirements, and potential acquisition costs.

FAA used the mitigation plan outline and site screening analysis, making adjustments based on comments by interagency reviewers, to develop a proposed compensatory mitigation plan that would conform to applicable federal and state guidelines. The plan was to be submitted to the Corps with a draft application for permits in April 2005; other agencies also received a review copy of the mitigation plan. A revised plan was to be prepared and submitted to the Corps at approximately the same time this EIS would be published.

The DEIS contained a Conceptual Habitat Mitigation and Monitoring Plan proposing the purchase and preservation of private property at Eagle Beach, northwest of Juneau, as full compensation for the wetlands and habitat affected by the proposed projects. However, by the time the DEIS was published steps had already been taken by other parties to preserve the subject property. Subsequently, JNU took the lead in developing an alternative compensatory mitigation proposal in coordination with state, federal, and local agencies under auspices of the Alaska Coastal Management Program (ACMP).

The following sections summarize key elements of the proposed compensatory mitigation plan, as submitted to the ACMP on March 7, 2006 (JNU 2006). The basis for the extent and type of compensation is the impact analysis conducted for this EIS, identifying the amounts, functions, and values of wetlands affected or lost by the proposed projects. The projects represented in the JNU 2006 mitigation plan are those for which permit applications were submitted, including proposed RSA Alternative RSA-5C.

ES.4.5 Summary of JNU 2006 Compensatory Mitigation Plan

JNU would establish an in-lieu fee for the mitigation and provide the fee to Southeast Alaska Land (SEAL) Trust in accordance with terms of an existing agreement between the Corps and SEAL Trust, and subject to additional considerations including FAA wildlife hazard siting criteria. This agreement authorizes SEAL Trust to accept in-lieu fees for mitigation projects and defines the operational procedures for fee management. SEAL Trust has undertaken a number of such projects in Southeast Alaska during the past decade.

SEAL Trust makes use of an advisory committee to recommend, evaluate, and review mitigation projects. A JNU representative would be part of the advisory committee to ensure that mitigation targets would not increase wildlife hazards to aviation. ADF&G would also be part of the

advisory committee to ensure that lands acquired to address the Refuge Management Plan requirements are of at least equal value to those lost (using the functional capacity units (FCU) methodology described in Section 3.8.1, as modified from Adamus (1987)).

Using a portion of the in-lieu fee, SEAL Trust would establish a reserve fund dedicated to acquiring accreted lands within the original Refuge boundary, with a goal of fully mitigating for direct unavoidable impacts to the Refuge and for unavoidable impacts to wetlands within the impacted Refuge lands caused by the Airport projects within the Refuge. The total extent of unavoidable impacts to these resources are expressed as the calculated FCU losses. The amount set aside would be based on the actual FCU loss within the Refuge and the established dollar value per FCU set forth in the mitigation plan.

The remaining portion of the in-lieu fee would be used to acquire lands or carry out mitigation projects recommended by the SEAL Trust advisory committee.

The Mitigation Plan calculated that 77 acres of wetlands would be affected, with about 16.5 acres of Refuge land included in this total. An average 126.3 FCU per acre was applied to the mitigation formula, based on a total loss (from the 77 acres) of 9,719 FCU. An estimated average economic value of $30,000 per acre was established for accreted wetlands adjacent to the Refuge, using the results of a Market Value Study for Wetlands within the Refuge conducted by Horan and Company (November 2005). These values were used to determine an average rate of $238 per FCU. When this rate is multiplied by the total number of FCUs lost as a result of JNU's proposed projects (9,719) a baseline compensation value of $2,308,590 is established.

However, the agencies participating in the ACMP, including FAA and JNU, agreed that the baseline value would be insufficient compensation for the losses for three primary reasons. First, the mitigation plan would only preserve existing wetlands, not create new habitat. In other words, there would be a net loss of wetlands using a 1:1 compensation ration. Second, the wetlands lost would be high value, further justifying an increase in the mitigation ratio. Finally, there is a precedent for larger projects affecting high value wetlands and habitat to compensate in greater proportion than smaller projects. A compensation ratio of 2:1 (in terms of dollars to be spent for value lost, or FCUs preserved for FCUs lost) was accepted by the agencies. Direct project and administrative costs to be incurred by SEAL Trust would also be incorporated in the funding. In addition, it was agreed that the mitigation package would provide an additional $235,000 for two special projects required by DNR Habitat as compensatory mitigation: a 5-year monitoring project for Duck Creek, and funding for foot bridges on the Under Thunder trail system on Jordan Creek. The overall total for the JNU 2006 mitigation package was about $5,834,000. The final amount of compensation to be applied to mitigation will depend on the projects approved by FAA for implementation and permitted by the applicable state and federal agencies. While the mitigation plan based impacts upon methodology used in the DEIS, this FEIS includes additional RSA alternatives and more refined analysis of impacts based upon a greater level of project design than the DEIS incorporated. Alternatives preferred in this FEIS by FAA and proposed by CBJ have somewhat lesser impacts than the combined projects proposed in the 2006 mitigation plan, so it is likely that the final compensation package will be less than described above. Nevertheless, the

2006 mitigation plan's estimate of functional losses, habitat impacted and compensation value will almost certainly be relatively close to the final accepted numbers upon which a permit will be based.

ES.4.6 MITIGATION MONITORING AND ENFORCEMENT

In accordance with 40 CFR 1505.3, the FAA would take appropriate steps through Federal funding grant assurances and conditions, airport layout plan approvals, and contract plans and specifications, to ensure that the following mitigation actions are implemented during project development, and would monitor the implementation of these mitigation actions as necessary to assure that representations made in the FEIS with respect to mitigation are carried out. These mitigation actions would be made the subject of a special condition included in future Federal airport grants to the City and Borough of Juneau.

The Mitigation section (Section 2.12) of the FEIS and Section ES.4.2 of this Executive Summary include a summary of compensatory mitigation measures to be implemented in the event that any action alternative is implemented as a result of the Record of Decision. Section 2.11 of the FEIS and Section ES.4.1 and its subsections of this Executive Summary summarize the avoidance and minimization measures considered for and incorporated into the configuration of each action alternative. Mitigation measures for those impact categories where necessary to avoid or minimize significant environmental impacts beyond the measures incorporated into the alternatives themselves, as well as proposed monitoring and enforcement programs, are summarized below:

1. JNU would implement the avoidance, minimization, and compensatory mitigation measures incorporated into the preferred alternatives as identified in Section 2.11 and as outlined in Section 2.12 (and its subsections) of the FEIS and the compensatory mitigation plan.
2. JNU would prepare a quarterly update on the status of the mitigation measures and provide this to the FAA until such mitigation efforts are complete. The FAA would monitor the implementation of these mitigation actions as necessary to assure that they are carried out as project commitments. These measures, which constitute all practicable means to avoid or minimize environmental harm from the preferred alternatives, would be adopted.
3. JNU would obtain all necessary permits and authorizations prior to construction as identified in Section 2.13.7 of the FEIS.
4. JNU would develop an erosion and sediment control plan prior to commencement of construction of build alternatives identified in the ROD.
5. To minimize impacts as much as possible, JNU would direct contractors and consultants to design and use "best management" construction practices outlined in the erosion and sediment control plan referred to above to minimize impacts to water quality and to comply with established Total Maximum Daily Loads (TMDL's) for receiving waters including Duck Creek and, if established, Jordan Creek as discussed in the FEIS.
6. JNU would carry out the stipulations of the Memorandum of Agreement between the FAA, Alaska State Historic Preservation Officer, and JNU.

7. JNU would, in the unlikely event that historic properties are discovered during construction, cease activity in the area and the contact Alaska State Historic Preservation Officer and other appropriate agency officials within 48 hours of the discovery.

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