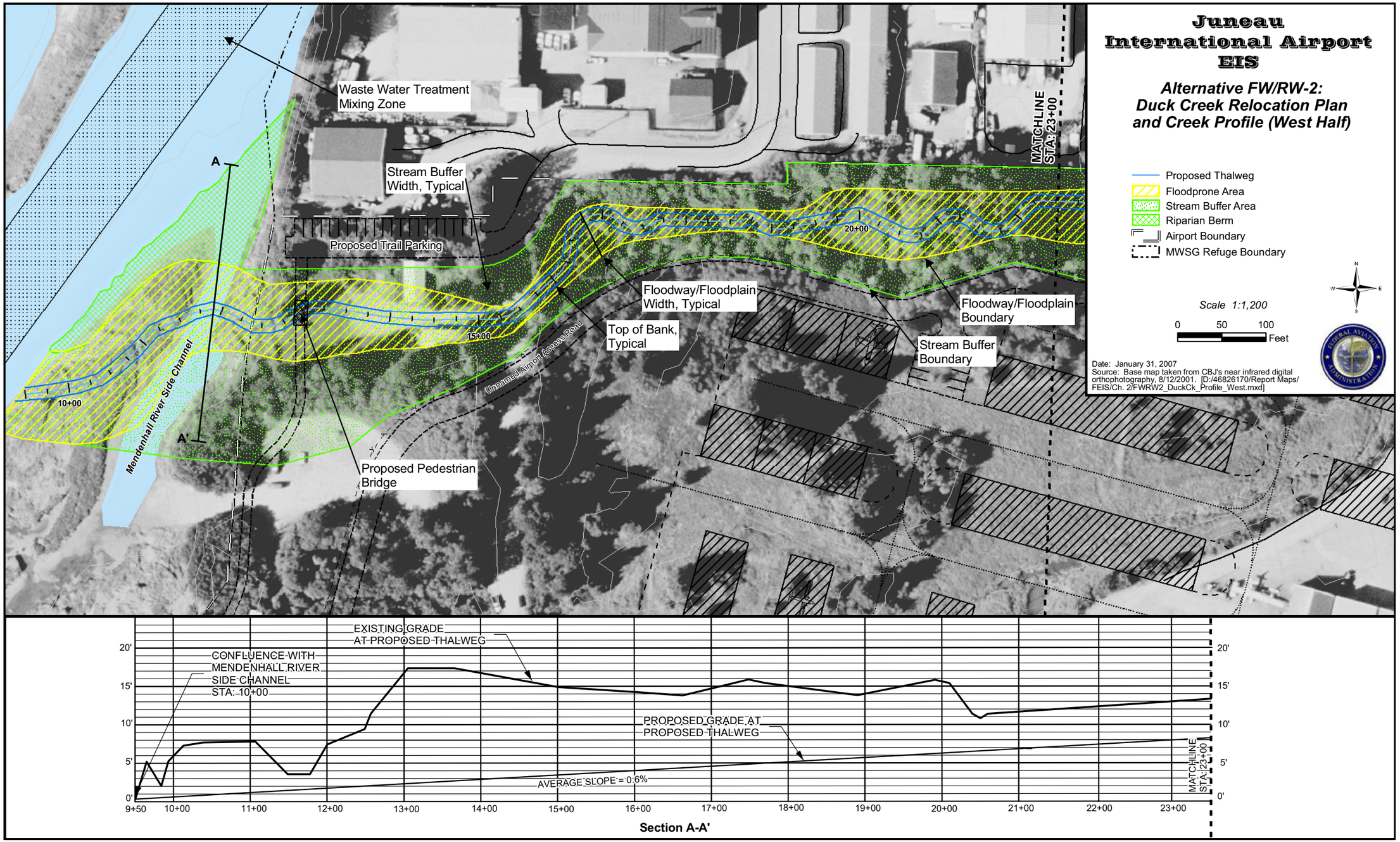

Figure 2-39. Alternative FW/RW-2: Duck Creek relocation plan and creek profile: west half.

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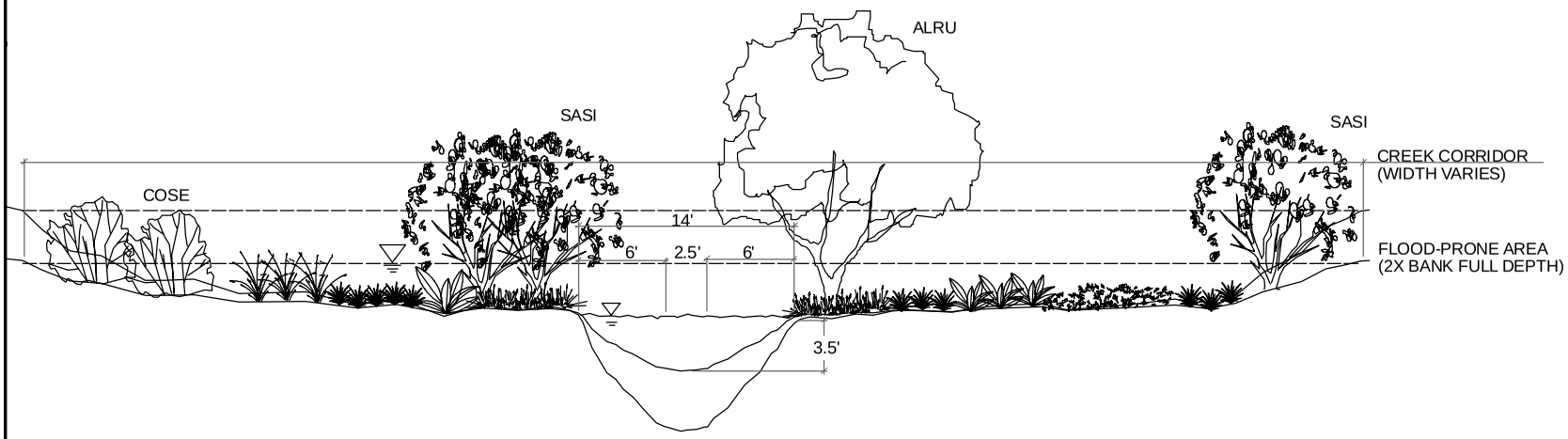
Proposed Revegetation Plant List

BOTANICAL NAME	COMMON NAME	ABBREVIATION	BOTANICAL NAME	COMMON NAME	ABBREVIATION
Achillea millefolium	yarrow	ACMI	*Alnus crispa*	*Sitka alder*	ALCR
Angelica genuflex	bentleaf angelica	ANGN	*Alnus rubra*	*red alder*	ALRU
Calamagrostis canadensis	bluejoint	CACA	*Picea sitchensis*	*Sitka spruce*	PISI
Carex kellogii	Kellogg's sedge	CAKE	*Populus trichocarpa*	*black cottonwood*	POTR
Carex lynbygeii	Lyngbye sedge	CALY	*Salix barclayi*	*Barclay willow*	SABA
Carex sitchensis	Sitka sedge	CASI	*Tsuga heterophylla*	*western hemlock*	TSHE
Deschampsia caespitosa	tufted hairgrass	DECA			
Eleocharis palustris	spikerush	ELPA	*Cornus sericea*	*red-twig dogwood*	COSE
Elymus alaucus	western ryegrass	ELAR	*Rubus articus*	*nagoonberry*	RUAR
Heracleum lanatum	cow parsnip	HELA	*Rubus spectabilis*	*salmonberry*	RUSP
Hordeum brachyantherum	meadow barley	HOBR	*Salix sitchensis*	*Sitka willow*	SASI
Iris setosa	iris	IRSE	*Viburnum edule*	*highbush cranberry*	VIED
Juncus articus	Arctic rush	JUAR			
Lupinus nootkatensis	Nootka lupine	LUNO			
Plantago maritime	Goosetongue	PLMA			
Pucinellia nutkatensis	Pacific alkaligrass	PUNU			

Juneau International Airport EIS

Alternative FW/RW-2: Duck Creek Relocation Typical Transition Section

Date: November 22, 2006
[D:46826170/Report Maps/FEIS/Ch. 2/DuckCreek_Transition.mxd]



TYPICAL MAIN CHANNEL SECTION - TRANSITION

SCALE: 1" = 11'

Figure 2-40. Alternative FW/RW-2: Duck Creek relocation plan: typical transition section.

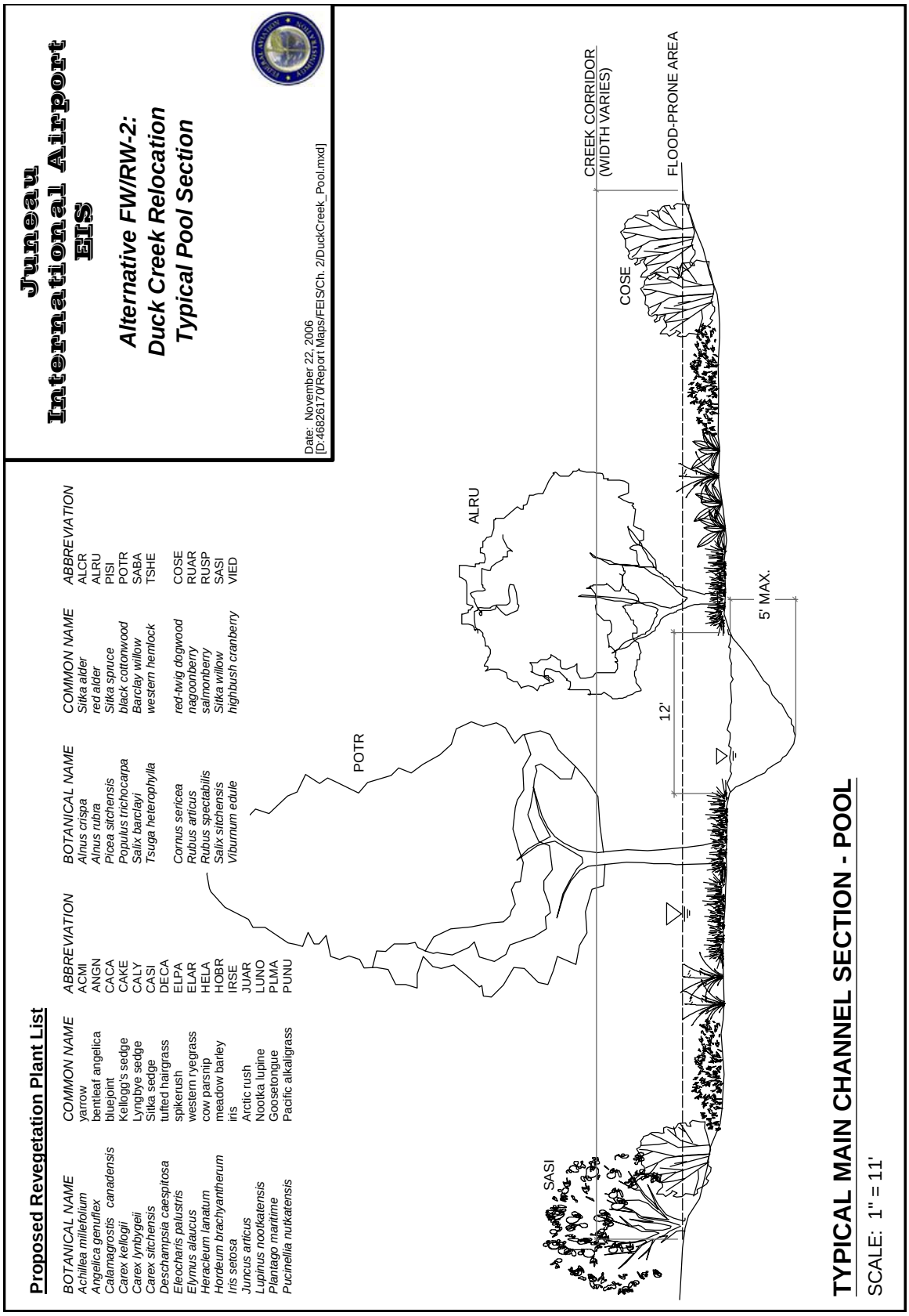


Figure 2-41. Alternative FW/RW-2: Duck Creek relocation plan: typical pool section.

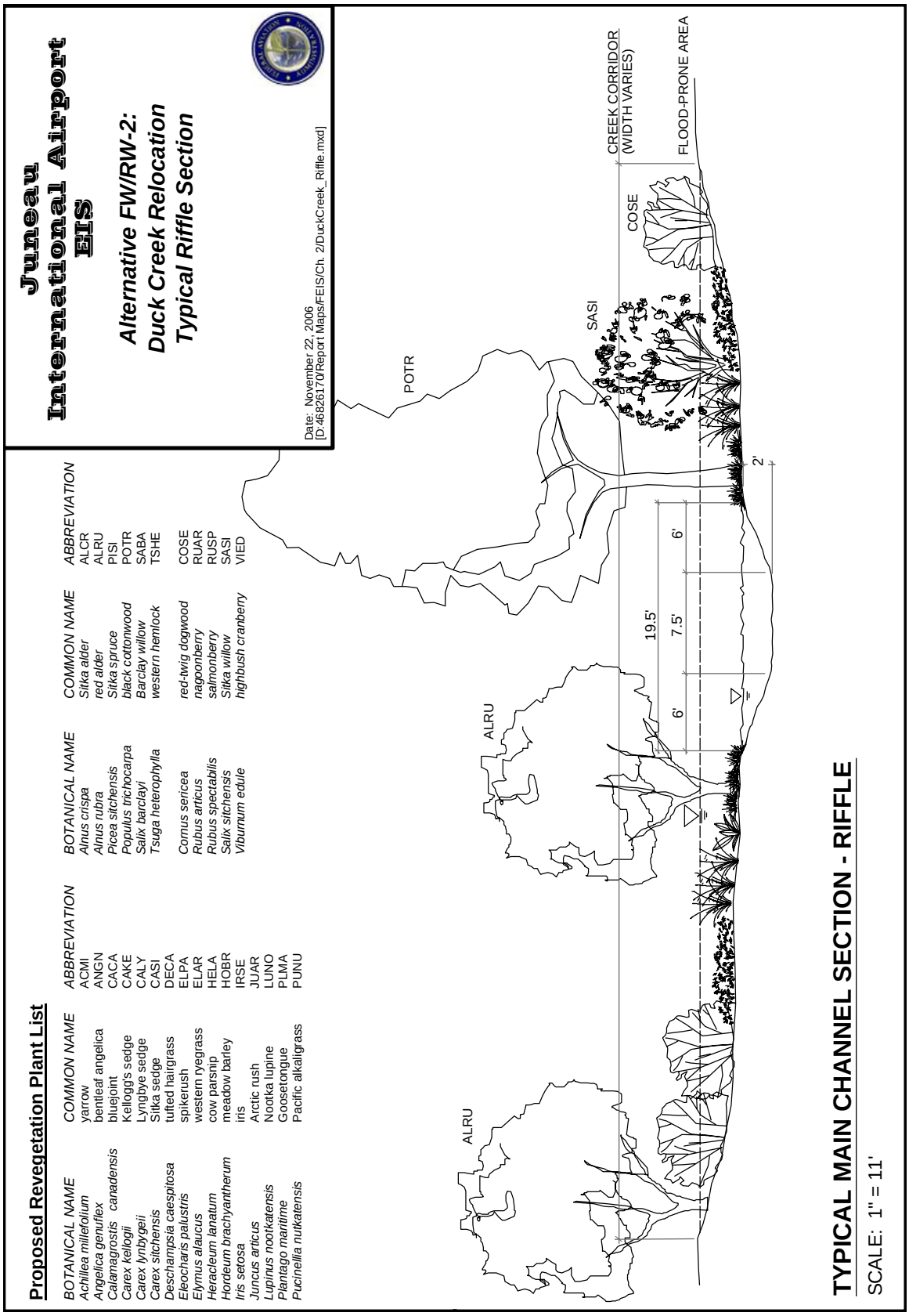


Figure 2-42. Alternative FW/RW-2: Duck Creek relocation plan: typical riffle section.

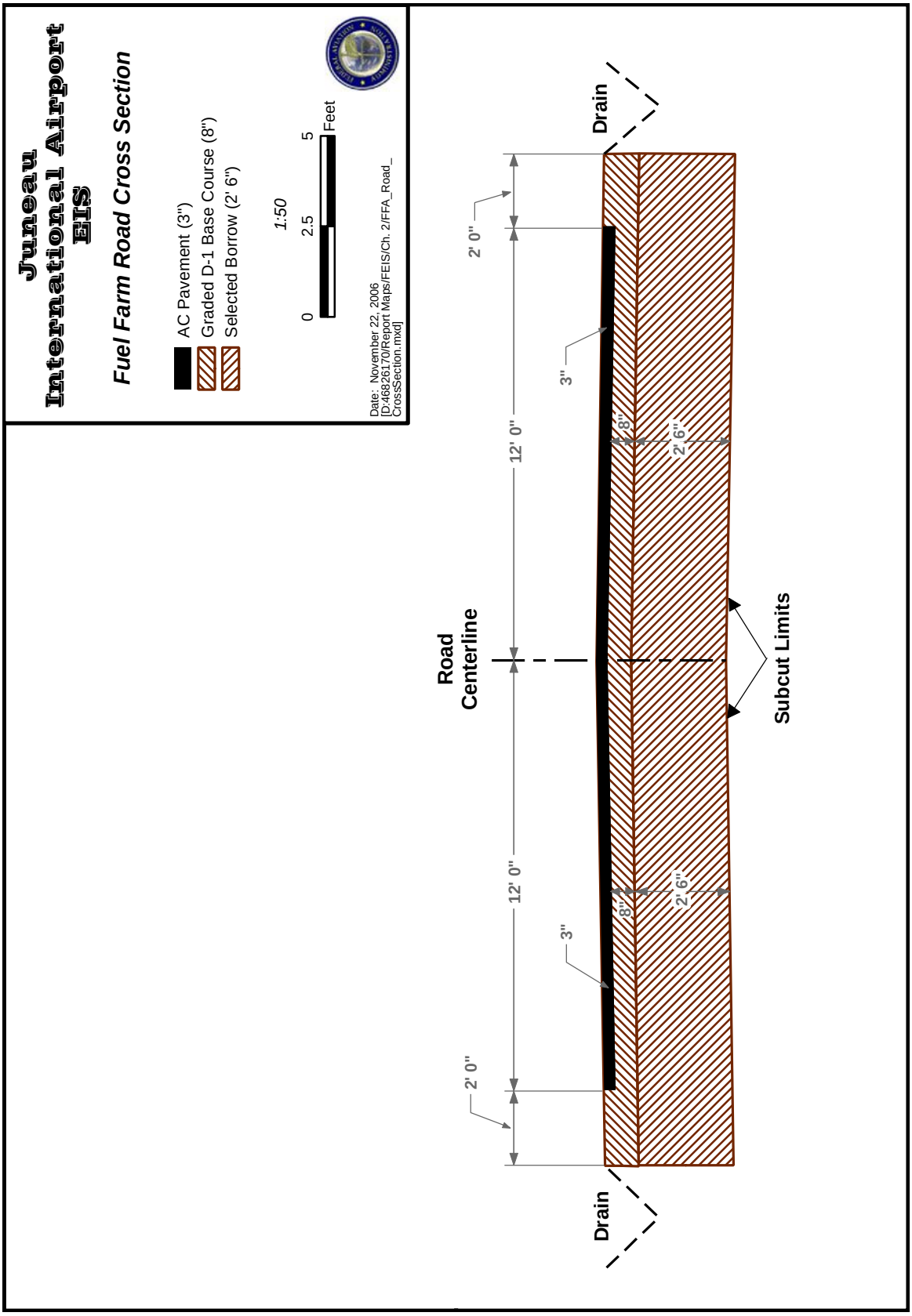


Figure 2-43. Fuel farm road cross section.

Table 2-20. Comparative Summary of Environmental Impacts: Aviation Facilities[1]

Resource	FW/RW-1: Full Development of Northeast and Northwest Areas	FW/RW-2: Full Development with Duck Creek Relocation	FW/RW-3: No Action
Construction			
Disturbance Area (includes relocation of Duck Creek channel)	42 acres	42 acres	None
Fill Volume	200,740 yd^3	220,500 yd^3	None
Cost			
Construction	$18.05 million	$18.60 million	$0
Mitigation	$1,325,184	$1,137,640	$0
Total Cost (Construction + Mitigation)	$19,375,184	$19,737,640	$0
Noise			
1.5 DNL or Greater Noise Increase in 65 or Greater DNL Contour?	None	None	None
3.0 DNL or Greater Noise Increase in 60-65 DNL Contour?	None	None	None
Incompatible Noise?	No	No	No
65 DNL & greater (square mile)	1.01	1.01	1.08
Human Environment and Compatible Land Use			
Noise Sensitive Areas	None	None	None
Developed Recreation/Dike Trail	Minor, positive and negative	Minor, positive and negative	None
Dispersed Recreation (hunting, bird- watching, hiking, etc.)	None	None	None
Socioeconomics			
Short-term Business Income	$24,465,000	$25,205,000	$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 Economic Impacts	None	None	None
Long Term Revenue Impacts (10 yrs)	$587,510	$560,140	None
Long-term Social Impacts	Minor, positive and negative	Minor, positive and negative	None
Air Quality			
Changes in Operating Emissions due to Action (year 2015)	None	None	None
$PM_{10}/PM_{2.5}$ (tons/year) - Operating	1.5	1.5	1.5
$PM_{10}/PM_{2.5}$ (tons/year) - Construction	1.5	3.1	0
$PM_{10}/PM_{2.5}$ (tons/year) - Total	3.0	4.6	1.5

Table 2-20. Comparative Summary of Environmental Impacts: Aviation Facilities[1], continued

Resource	FW/RW-1: Full Development of Northeast and Northwest Areas	FW/RW-2: Full Development with Duck Creek Relocation	FW/RW-3: No Action
Fugitive Dust (tons/year, peak year)	18.0	24.0	0.0
Hazardous Materials and Solid Waste			
Presence of Buried Hazardous Waste or Soil Contamination	Moderate potential to encounter buried, hazardous wastes in northwest area or contaminated soil in northeast area	Moderate potential to encounter buried, hazardous wastes in northwest area or contaminated soil in northeast area	None
Hazardous Materials Use/Pollutant Generation	No increase in use or pollutant generation. Low potential for asbestos to be uncovered or present in existing ASOS and RCO facilities	No increase in use or pollutant generation. Low potential for asbestos to be uncovered or present in existing ASOS and RCO facilities	No change
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
Snow Storage	Low, loss of NE development area and decreased Duck Creek riparian area	Low, loss of NE development area and decreased Duck Creek riparian 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
Long-Term (post construction)	Low impact, increased runoff	Low impact, increased runoff	None
Short-Term (construction)	Moderate degradation	Moderate degradation	None
Groundwater Recharge	Moderate loss of recharge capacity	Moderate loss of recharge capacity	None
Vegetation			
Direct Impacts	21.3 acres of native vegetation impacted in NW Airport area with majority of impacts to shrub-scrub, woodland, and high marsh communities; 30.2 acres impacted in NE Airport area comprised primarily of 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
Indirect Impacts	Minor potential for introduction of weed species along existing Duck Creek corridor.	Moderate potential for introduction of weed species along relocated Duck Creek corridor.	None
Wetlands			
Modification of Wetlands	5.0 acres palustrine and estuarine wetlands filled in NW Airport area; 19.8 acres acres palustrine and estuarine wetlands filled in NE Airport area. Net loss of 24.8 acres palustrine and estuarine wetlands.	1.2 acres palustrine and estuarine wetlands lost in NW Airport area; 19.8 acres acres palustrine and estuarine wetlands filled in NE Airport area. Net loss of 21.0 acres palustrine and estuarine wetlands.	None
Impact 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			
Essential Fish Habitat Lost	18.5 acres. Relatively minor loss of EFH and infrequency of tidal inundation in EFH lost.	12.4 acres. Relatively minor loss of EFH and infrequency of tidal inundation in EFH lost.	No change

Table 2-20. Comparative Summary of Environmental Impacts: Aviation Facilities[1], continued

Resource	FW/RW-1: Full Development of Northeast and Northwest Areas	FW/RW-2: Full Development with Duck Creek Relocation	FW/RW-3: No Action
Access to Jordan Creek	No change	No change	No change
Access to Duck Creek	No change	Improved, less dewatering	No change
Overall construction impacts (e.g. disruption of fish movement and activity)	Minor disruption of fish movement	Moderate disruption of fish movement	None
Overall indirect impacts	Increased exposure to contaminants	Increased exposure to contaminants	None
Wildlife			
General Wildlife Habitat	21.3 acres of wildlife habitat impacted in NW Airport area with majority of impacts to shrub-scrub, woodland, and supratidal habitats; 29.6 acres impacted in NE Airport area comprised primarily of 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. No net loss or gain of habitat under this alternative.	None
Threatened and Endangered 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.		
High Interest Species	NW Airport Area: 21.3 acres (0.5%) of habitat lost in landscape area for bald eagle and other raptors; 3.3 acres (2.0%) lost for rufous hummingbird. NE Airport Area: acres (0.7%) lost for bald eagle and other raptors; 27.4 acres (2.2%) lost for songbirds in landscape area.	Similar to FW/RW-1.	None
	Impacts to high interest species would be insignificant because construction of the aviation facilities would not be expected to have substantive effects on the populations of these species.		
Sensitive Species	Potentially suitable habitat for Queen Charlotte goshawk reduced by 47.1 acres (3.7%) and peregrine falcon habitat by 37.9 acres (0.9%) in the landscape area. Suitable habitat for olive-sided flycatcher and Townsend's warbler reduced by 5.6 acres (6.2%) in the landscape area.	Similar to FW/RW-1.	None
	Impacts to sensitive species would be insignificant under all alternatives because construction of the aviation facilities would not be expected to have substantive effects on the populations of these species.		
Cultural Resources	No known impacts to historic properties, low potential for future discovery.	No known impacts to historic properties, low potential for future discovery.	No impacts to historic properties.
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	Yes, relocation of Dike Trailhead and parking lot (beneficial impact).	Yes, relocation of Dike Trailhead and parking lot (beneficial impact), relocation of a portion of Duck Creek to Refuge property.	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

[1] Estimates include impacts associated with relocation of RCO and ASOS from northeast Airport area to Engineer's Cut and BRL site, respectively.

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2.8.3.2 FF-2: Install Pipelines from Fuel Farm to Central Fuel Distribution Port

The pipeline system would follow approximately the same path as the fuel farm road, shown on Figures 2-35 and 2-36. There would be multiple pipelines 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 (FAA 1982). Based on the types of fuels currently stored at the fuel farm and different formulations of those fuels, six separate pipelines would be required for existing demand and projected future uses. This includes the possibility of one pipeline dedicated to de-icing compounds. Additional contingency pipes could be added to the system at construction to anticipate other fuel types or vendors. 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 size for each of the individual pipes would have to be determined during detailed design, if this alternative is selected for implementation, but the secondary pipe would be no greater than 24 inches in diameter.

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. Meters would be installed to monitor how much product is pumped by each truck. Individual vendors using the station would have access cards or pass codes to begin pumping. An approximately 50-foot clear zone would be developed around the service facility, and it may also be fenced as an added security precaution. Other requirements specified in such applicable regulations as the International Fire Code and National Fire Protection Association code would be applied, including the presence of emergency disconnect switches.

The product pipelines would most likely be installed by conventional trenching methods rather than direction drilling. Trenching typically involves the use of a backhoe or large trenching machinery to dig a corridor sufficiently wide and deep for the secondary pipeline. 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. The trench would be cut to below the subsurface frost zone to reduce potential for soil heaving. The trench would also be lined with graded material to prevent differential settling and unnecessary strain on the secondary pipeline. Support bases or brackets may be used to further anchor the system.

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.

The trench construction technique is also a preferred method when there is the potential for encountering subsurface debris or contamination, as may be the case near the fuel farm. During the 1990s, a private company operated a bulk terminal station on the west-central portion of the fuel farm. Both aboveground and underground tanks were used to store jet fuel and AvGas. There was at least one fuel spill of a measurable quantity at the station, involving more than 300 gallons

of petroleum product. Most of the product was recovered, but some may still be present in the subsurface. Vapor monitors could be used during the trenching operations to determine whether contamination is encountered or not.

The pipeline system would extend approximately 600 feet from the fuel tanks to the new refueling station. The cost for this alternative is primarily dependent on the manner of construction, number and size of pipelines installed. For example, the rate to directionally drill and install a 6-inch pipe is estimated at $23 per lineal foot, whereas a 24-inch pipe may cost as much as $573 per lineal foot using the same technique. A trench and backfill installation method would be much less expensive but have greater potential to affect Duck Creek flow and quality, unless the construction occurred during relocation of the channel. The rate to install a 6-inch pipe using trench and backfill is estimated at $6 per lineal foot, while a 24-inch pipe installation would cost about $27 per lineal foot. All of these rates are dependent on other factors as well including equipment availability, weather, conditions imposed upon the construction, and so forth.

For the purpose of this cost estimate it was assumed that Duck Creek would be relocated as a result of RSA development on the west runway end and/or habitat modifications west of the Airport to reduce wildlife hazards. Relocation of Duck Creek would allow the opportunity to stage work so that a trench and backfill pipeline installation could take place during other alterations within the watershed. The fuel pipelines would first be installed under the new Duck Creek channel, and after construction of the new channel the pipes would be joined by finishing the trenching through the old, no-longer used creek channel.

Approximately 600 feet of 24-inch pipe would be laid in a trench extending from the fuel farm to the new refueling station. Additional 6-inch pipes for the fuel lines would be installed within this secondary containment system. Three separate pump units would be needed with multiple ports at each for the different lines and fuel types. Emergency shut off valves, leak detection systems, security systems, and a fence with controlled access would be installed. The estimated cost for the refueling station alone would be $484,303, raising the total estimated cost for this alternative to $721,726. If directional drilling were used to install the fuel pipes the cost would increase to an estimated $1.2 million.

A significant concern with buried pipelines is leak detection. Automatic sensors can be installed to monitor pressure within the individual pipes, and the meters at the service station can be used to compare amount of product pumped vs. the amount of product leaving the bulk storage tanks. In the event of a leak there should be no disruption to supplies for aviation operations, as the leaking pipeline would be isolated or, if the specific line could not be determined and the entire system had to be shut off, fuel trucks could always travel to the fuel farm until pipeline repairs are made. However, the automatic systems are not able to detect relatively low pressure drops, as could occur with a small leak. A substantial amount of product could be lost before leaks are detected or differences between the product pumped vs. product delivered are noticed. Even small leaks of petroleum compounds can have significant impacts on groundwater. Duck Creek could also be affected by subsurface contamination as it is recharged by groundwater under certain conditions.

Installation of fuel pipelines may have short-term environmental impacts during construction, but the surface damage would be repaired after the trench is filled, graded, and revegetated. Environmental impact would be minimized by trenching during relocation of the Creek to avoid an active channel. The new service station would be installed in an area already disturbed and partially paved.

About 2/3 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. No fill material would be necessary although some select gravel and sand may be placed just under the pipes for stability.

2.8.3.3 FF-3: No Action Alternative

In accordance with regulations implementing NEPA, the No Action Alternative is carried forward for detailed analysis. The existing needs for more efficient, safer, and secure access to the fuel farm would not be met under this alternative.

2.8.3.4 Comparative Summary of Impacts: Fuel Farm Access

Table 2-21 provides a summary comparison of the environmental impacts associated with the fuel farm access alternatives. A full treatment of the resources listed on this table and the important criteria used to determine the extent and severity of environmental effects are found in Chapter 4 of this EIS.

2.9 Description of Wildlife Hazard Management Plan Alternatives – Design Concepts and Construction

Proposed activities and other options to reduce wildlife hazards at JNU were described in Section 2.5.2. Some of those options were eliminated from further evaluation. The following sections describe the alternatives compiled from the prudent and feasible options. Complete detail is provided for WH-1, which represents, with some modification, the actions proposed in the WHMP. Only those activities differing from WH-1 are described for the remaining alternatives. Table 2-22 lists disturbance areas and estimated fill volumes associated with each of the habitat modifications.

2.9.1 WH-1: Implementation of Wildlife Hazard Management Plan (WHMP)

The following sections describe the proposed wildlife hazard control actions for specific species and areas of the Airport as described in the WHMP.[28] Detailed specifications for these actions are not included in the WHMP, but sufficient information is available to evaluate environmental impacts and justify comparisons with other alternatives. The estimated annual labor and materials

28. As was mentioned in Section 1.5.4, early in development of this EIS the actions contained in this alternative were those proposed by JNU for implementation. The Airport has subsequently modified its proposal so that it includes elements from each of the alternatives. See Section 2.13.

cost associated with this alternative is $86,000, an increase of about $55,000 above that spent in 2003. This estimate includes an additional ¼ FTE for wildlife hazing and education, $20,000 in vehicle costs, and $10,000 for supplies such as shells, mortars, and so forth.

2.9.1.1 WH-1A: Eliminate Grassed Infield Areas by Paving

This action represents the most assured remedy for the aviation risk presented by birds using the infield grass as cover or to forage for insects. Turf would be removed, and the approximately 77 acres of infield would be re-graded and paved with asphalt or an artificial turf product. This action could probably only be undertaken in conjunction with a complete re-design of the storm-water drainage system, since the new pavement would eliminate recharge to groundwater. As a result, significantly more storm-water would have to be captured in the infield and directed to drainage ditches.

Approximately 278,000 cubic yards of fill material from the Float Plane Pond would be needed to grade the infield and raise it to near the height of the adjoining apron surface. Less fill would be needed if central portions of the infield are to be used for snow storage. A 2-inch asphalt overlay would be used for the surface, placed on top of 6 to 10 inches of compacted base material.

CBJ has notified FAA that federal funding of the initial cover application and subsequent replacements would be required to implement this action, estimated to cost $11.99 million. This would be an expensive action to implement, and it may not be eligible for federal funding assistance.

2.9.1.2 WH-1B: Fill On-Airport Wetlands to Above High Tide Mark

The Airport has proposed to fill on-Airport wetlands to reduce the potential for bird strikes with aircraft taking off to, or landing from, the west. The area proposed for fill extends from the northern property boundary, west of Duck Creek, to the westernmost property boundary at the southernmost point adjacent to the Mendenhall River at low tide. To complete this action, the lowest reach of Duck Creek, from about the Dike Trail crossing to the current mouth at the Mendenhall River, would have to be relocated north (see WH-2d description, Section 2.9.2.4). In proposing this action, the Airport has referenced FAA Advisory Circular 150/5200-33, which documents the attractiveness of wetland habitats to wildlife species, and the challenges of managing and maintaining wetlands in the vicinity of airports. This alternative illustrates the proximity of the runway to habitat for feeding and loafing birds, and the added risk of any RSA alternative that incorporates a westward relocation of the runway threshold. This is because a shift of the runway threshold would result in aircraft passing over the estuarine habitat and Mendenhall River at a lower altitude, increasing the potential for bird strike. Many bird species, particularly gulls, commonly feed on the river, and their flight activity is generally restricted to altitudes lower than 50 feet above ground level. Aircraft approaching Runway 08 (based upon a 3-degree instrument landing system glide slope) would cross the river approximately 1,000 feet from the threshold, at approximately 50 feet above ground level. Even slight displacement of the runway threshold to the west could result in a significant increase in the probability of striking gulls feeding on the Mendenhall River, by lowering aircraft into the altitude levels used by the foraging birds. These wetlands could also be partially filled and graded as a result of RSA development off the end of Runway 08.

Table 2-21. 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^3	None	None
Cost			
Construction	$302,998	$721,726	$0
Mitigation	$2,070	$2,070	$0
Total Cost (Construction + Mitigation)	$305,068	$723,796	$0
Noise			
Long-term Noise Changes due to Action (does not include short-term, construction related noise increases)	None	None	None
65 DNL & greater (square mile)	1.08	1.08	1.08
Human Environment and Compatible Land Use			
Noise Sensitive Areas	None	None	None
Developed Recreation/Dike Trail	None	None	None
Dispersed Recreation (hunting, bird- watching, hiking, etc.)	None	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
Long-term Economic Impacts	Minor, positive	Minor, positive	None
Long Term Revenue Impacts	None	None	None
Long-term Social Impacts	Moderate, positive	Moderate, positive	None
Air Quality			
Changes in Operating Emissions due to Action	None (not measurable)	None (not measurable)	None
$PM_{10}/PM_{2.5}$ (tons/year) - Operating	1.5	1.5	1.5
$PM_{10}/PM_{2.5}$ (tons/year) - Construction	0.4	1.1	0
$PM_{10}/PM_{2.5}$ (tons/year) - Total	1.9	2.6	1.5
Fugitive Dust (tons/year, peak year)	2.7	1.5	0.0

Table 2-21. 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
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
Hazardous Materials Use/Pollutant Generation	No increase in use or pollutant generation. Decreased risk of spill of petroleum compounds to environment due to removing fuel trucks from public roads	No increase in use or pollutant generation. Decreased risk of spill of petroleum compounds to environment due to removal of trucks from public or access road; increased potential for leak from pipeline	No change. Greatest risk of spill of petroleum compounds.
Water Resources and Floodplains			
Floodplain Volume	Minor decrease in volume	None	None
Riparian/Channel Effects	Moderate, culvert crossing of Duck Creek	None	None
Tidal Prism Volume	Minor impacts	None	None
Snow Storage	Low, minor additional impervious surface	Low, minor additional impervious surface	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
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
Short-Term (construction)	Low impact due to construction degradation	Low, minor loss of recharge during construction	None
Groundwater Recharge	Low, some minor loss of recharge	Low to none, virtually no loss of recharge	None
Vegetation			
Direct Impacts	0.2 acres permanent impact to shrub-scrub, lichen-moss, and woodland communities	Minor, temporary impact to shrub-scrub followed by revegetation	None
Indirect Impacts	Minor potential for weed introduction	Minor potential for weed introduction	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 affect 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 affect on sustainability of the natural systems that maintain habitat. There would be no direct or indirect impact on Refuge wetlands.	No
Fisheries			
Essential Fish Habitat Lost	No change	No change	No change
Access to Jordan Creek	No change	No change	No change
Access to Duck Creek	No change	No change	No change
Overall construction impacts (e.g. disruption of fish movement and activity)	Minor disruption of fish activity	Moderate disruption of fish activity	None

Table 2-21. 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
Overall indirect impacts	Small decrease in risk of fish kills	Change in risk of fish kills	No change in risk of fish kills
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.		
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.		
Cultural Resources	No known impacts to historic properties	No known impacts to historic properties	No impacts to historic properties
Visual Resources	Minor, negative impacts to visual quality	Minor, short-term, negative impacts to visual quality	No change in visual quality
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

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Table 2-22. Disturbance Areas and Fill Volumes for Wildlife Habitat Modifications

Wildlife Hazard Issue	Description	Disturbed Area (acres)	Est. Fill Volume (yards^3)
Birds Attracted to Vegetated Areas near Runways and Taxiways			
WH-1a	Pave grassed infield areas	77.0	278,000
WH-2a	Install artificial turf product in the infield	77.0	278,000
WH-3a	Alter vegetation management practices, increase hazing	0.0	0
WH-4a	No Action	0.0	0
Birds Attracted to Wetlands on West Portion of Airport Property			
WH-1b	Fill on-Airport wetlands west of runway to elevation of proposed northwest development area	2.7	32,500
WH-2b	Re-grade wetlands on Airport by selective dredge, filling of swales, ditches	2.7	12,500
WH-3b	Increase wildlife hazing	0.0	0
WH-4b	No Action	0.0	0
Birds Attracted to Wetlands West of Airport Property			
WH-1c	Fill of wetlands on Refuge west of JNU to estimated bank level, create free draining surface to River	10.2	108,000
WH-2c	Re-grade wetlands west of Airport by selective dredge, filling of swales and ditches	3.3	17,500
WH-3c	Increase wildlife hazing	0.0	0
WH-4c	No Action	0.0	0
Birds Feeding on Fish Staging at the Mouth of Duck Creek			
WH-1d	Relocate Duck Creek to northern portion of Airport, discharge into main Mendenhall River channel	1.0	3,000
WH-2d	Relocate limited reach of Duck Creek, from Radcliffe Road trending west to Mendenhall River	0.1	500
WH-3d	Increase hazing along Duck Creek and vicinity	0.0	0
WH-4d	No Action	0.0	0
Birds Attracted to Surface Water Conveyances			
WH-1e	Convert drainage ditches into underground drains, install treatment for stormwater	15.7	80,000
WH-2e	Regrade and line ditches with concrete or synthetic material such as artificial turf, install treatment	15.7	18,000
WH-3e	Regrade ditches and manage vegetation to reduce wildlife attractant	15.7	13,000
WH-4e	No Action	0.0	0

Table 2-22. Disturbance Areas and Fill Volumes for Wildlife Habitat Modifications, continued

Wildlife Hazard Issue	Description	Disturbed Area (acres)	Est. Fill Volume (yards^3)
Birds Attracted to Swales that Collect Rainwater			
WH-1f	Remove swales along pavement edges that collect water, regrade to RSA	0.0	0
WH-2f	Same as WH-1f	0.0	0
WH-3f	Same as WH-1f	0.0	0
WH-4f	No Action	0.0	0
Ducks and Waterfowl Feeding on Float Plane Pond Vegetation			
WH-1g	Mechanically remove vegetation from Float Plane Pond and fingers using dredges	82.8	0
WH-2g	Fill In Float Plane Pond fingers to eliminate waterfowl habitat	16.9	136,000
WH-3g	Increase hazing of wildlife, eliminate hunting program	0.0	0
WH-4g	No Action	0.0	0
Birds Feeding on Fish at Mouth of Jordan Creek			
WH-1h	Remove dam at mouth of Jordan Creek	0.0	0
WH-2h	Same as WH-1h	0.0	0
WH-3h	Same as WH-1h	0.0	0
WH-4h	No Action	0.0	0
Woodland Habitat Providing Perch and Nest Sites, and Wildlife Cover			
WH-1I	Selectively thin trees from about 1/3 of woodland, clear understory, install deer fence	44.0	0
WH-2I	Periodically remove Corvid nests and install deer fence	0.0	0
WH-3I	Increased hazing of wildlife using control technologies, adapt program as needed through Advisory Board consultation	0.0	0
WH-4I	No Action	0.0	0

Notes for Table 2-22

WH-1a, 2a	Fill to runway height (est. 21' MSL)
WH-1b,	Fill to above high tide (est. 14' MSL)
WH-1c	Fill to bank (16' MSL) with a gradual slope (1:1)
WH-2c	Selectively fill in channels and areas that pond water, estimated at 5' MSL feet
WH-1d	Existing channel to be relocated is 5 acres and has a fill volume of 3,000 cubic yards, based on average 10' width for existing channel.
WH-2d	Existing channel to be relocated is .1 acres and has a fill volume of 500 cubic yards, based on average 8' width for existing channel.
WH-1e	Fill to 1' below runway (20' MSL')
WH-2g	Fill with an average of a 5' depth

The area would be filled to a height above the extreme high tide mark, approximately 16 feet msl. An estimated 32,500 cubic yards of fill would be obtained from the Float Plane Pond for this action. Once dredged, the fill material would be trucked from the de-watering site at the Float Plane Pond and placed and graded to create a free-draining slope toward the Mendenhall River. Filled areas would remain unvegetated and covered with riprap to stabilize the slope. The estimated cost to complete this alternative is $804,102.

2.9.1.3 WH-1C: Fill of Wetlands on Refuge West of JNU

Wetlands on the Refuge between the Airport and the Mendenhall River also present an increased risk of bird collision with aircraft, particularly those arriving from the west on to Runway 08. Approximately 108,000 cubic yards of borrow material would be imported from the Float Plane Pond to fill these wetlands and approximately 10.2 acres of Refuge would be disturbed by this action. The fill surface would begin on the east at approximately 16 feet msl to connect with the on-Airport fill surface established with Alternative WH-1b. Ponds, channels and swales would first be filled. The areas in between would be graded and filled as needed, with the entire surface sloped toward the Mendenhall River to create a free-draining surface to the bank. Some areas closest to the River would be covered in riprap to prevent tidal erosion. Relocation of Duck Creek would be needed to fully implement this action, although a new channel would be created in the northern portion of the filled area with a discharge into the River. This action could also be taken in conjunction with the development of new runway safety area or installation of EMAS. The estimated cost to complete this alternative is $2.5 million.

After publication of the Draft EIS some agencies requested that FAA consider dredging wetlands on the west Airport area, including the Refuge between the Airport and the Mendenhall River. FAA This action would essentially replace wetlands with open-water riverine habitat. FAA considered this request and determined it would not be an appropriate solution without substantial, frequent long-term maintenance and expense. The Mendenhall River and the intertidal system would continue to deposit new sediment in the dredged areas, creating new wetlands that would then have to be dredged again. Point bars in stream channels typically are self sustaining features, so the required maintenance would be frequent (approximately every two years). This option is not appropriate for the dynamic Mendenhall River system.

2.9.1.4 WH-1D: Relocate Mouth of Duck Creek Away From Flight Path

Relocation of Duck Creek would reduce hazards to aircraft by eliminating a food source for birds. Figure 2-36, illustrating an alternative for layout of the Northwest Development Area of the Airport, shows the relocated channel for Duck Creek and Figures 2-35 through 2-40 provide design details for the new channel. A new corridor for the creek would be constructed through the current backwater channel and into the main channel of the Mendenhall River, approximately 1,200 feet north of the Runway 08 centerline, shifting bird activity away from the approach and departure path for aircraft. This area would be well south of the regulatory mixing zone for the Mendenhall Treatment Plant. The new channel would be designed to maintain flows and facilitate fish passage in the creek. This action could eliminate much of the problem associated with stranded fish and fish carcass accumulation, thereby diminishing feeding opportunities for eagles and gulls in particular. However, an undesirable result of this action could also be to increase the

level of airborne bird activity near the approach and takeoff flight path, as birds move from other areas of the Refuge upstream to the relocated creek mouth. CBJ would design the new creek to reduce wildlife attractants by minimizing pool formation and spawning habitat development, maintaining flows within the channel, and encouraging growth of vegetation that would minimize habitat for birds representing a hazard to aviation but stabilize banks and prevent erosion. Taller trees would not be planted so as to avoid possible creation of airspace penetrations. The old creek channel would be filled with approximately 3,000 cubic yards of material dredged from the Float Plane Pond in conjunction with other wildlife habitat modifications to eliminate wetlands. Creek relocation could also be undertaken to construct new aviation facilities, as described in FW/RW-2, or as a result of new runway safety area/EMAS installation. More details concerning the creek relocation and design are included in Section 2.8.2.3. The estimated cost to complete this alternative is $1.27 million.

2.9.1.5 WH-1E: Convert Drainage Ditches into Underground Drains

New drainage systems to collect storm-water and snow melt would be installed in the existing ditches between Taxiway A and the Airport apron. Drainage areas (essentially all areas below the ramp, runway, and taxiway interlink elevations) would be reconstructed to prevent standing water that serves as a bird attractant. Surface drains would be installed to channel water to new underground storm drain pipes. Drain pipes would be installed and covered, and transport of collected water to settling basins or other treatment systems prior to discharge in Duck Creek, Jordan Creek or wetlands would be arranged. Oil and water separation units or comparable treatment units would be installed at the east and west ends of the drainage system to filter out some contaminants prior to discharge. The drainage ditches would not be entirely filled in, however, as they would continue to be used for storage of snow removed from runways and the apron. The disturbed areas would be paved, covered with an artificial turf product, or covered with gravel.

A result of this action would be some loss of groundwater recharge and a reduction in the physical/biological treatment that occurs as surface water is filtered through the subsurface. The stormwater discharge volume would increase in both Jordan and Duck Creeks. Due to the loss of subsurface treatment, there could be increased levels of contaminants, such as de-icing compounds entering the creeks.

Approximately 15.7 acres would be disturbed, requiring approximately 80,000 cubic yards of fill obtained from the Float Plane Pond. An estimated $1.85 million would be needed to convert the drainage ditches into underground drain systems. This estimate does not include cost for oil/water separators or comparable treatment units to be placed at stormwater discharge locations.

2.9.1.6 WH-1F: Remove Swales and Areas Along Pavement Edges That Collect Water, and Grade and Re-Pave

The action proposed by CBJ would not result in new disturbance, because the areas of concern merely represent broken or uneven sections of the apron. Removal of old pavement, and grading and re-paving the swales along pavement edges should prevent precipitation from ponding and eliminate an attraction to eagles, ravens, and other birds. The estimated cost to remove swales and regrade to the RSA elevation is $838,240.

2.9.1.7 WH-1G: Mechanically Remove Vegetation from Float Plane Pond

CBJ has proposed to remove the food source attracting birds by dredging the bottoms and sides of the Float Plane Pond. Dredging would also remove mollusks, another food source used by diving ducks. It is anticipated that removal of the food sources would reduce overall numbers of birds using the Float Plane Pond on a regular basis. The Float Plane Pond would be dredged to a depth of at least ten feet in all waters south of the main pond and in the main pond where vegetation exists, as well as in select locations of the pond that are too shallow for aircraft movement. Dredging would probably be conducted in association with fill removal for approved infrastructure projects (such as construction of a RSA), and could be extended to a depth of 30 feet to provide sufficient construction materials. The two small islands in the float plane pond fingers would also be dredged during the vegetation removal and establishment of the construction borrow source. As is described for the RSA construction projects, de-watering areas would be created and haul roads developed adjacent to the dredge areas. The Airport will consider the best method for moving the dredge equipment into and out of the Float Plane Pond. One option is to use haul trucks to transport equipment. Another option is to breach the dike between the Float Plane Pond and trail, so that the barge-mounted equipment could be moved up the Mendenhall River and directly into or out of the Pond.

Aquatic vegetation removed from the pond would be burned or disposed of in a manner that does not attract feeding wildlife. Up to 82.8 acres within the float plane ponds could be disturbed, but the amount of fill removed would depend on needs in other portions of the Airport. The estimated cost to complete this action is $288,282.

It is uncertain how long this action would remain effective. Presumably, the more material that is removed and the deeper the ponds are dredged, the longer it will take for vegetation to re-establish itself. A monitoring program would be implemented with any dredging program to periodically evaluate vegetation growth in areas that have been dredged.

2.9.1.8 WH-1H: Remove Dam at Mouth of Jordan Creek

The dam creating a small pond at the mouth of Jordan Creek, where it discharges from the culvert extending under the runway, would be removed. Fish congregate and carcasses accumulate in the pond, attracting eagles and herons and other birds. Ducks have also been observed feeding on aquatic vegetation in this pond. However, ADF&G has indicated the dam and pond were likely constructed to improve upstream fish passage through the culvert because the runway culvert is undersized and impeded downstream fish passage at some stages of the tide. There are alternatives to the dam that could help with upstream fish passage that do not create a collection area for spawned out fish and attract birds. Such alternatives may include bioengineering or excavation of the pool to make fish passage into the culvert easier. Evaluation of these alternatives should include consideration of wildlife hazard attractants. Timing of the dam removal and seasonal work restrictions would be stipulated in the permits authorizing modification of the culvert and dam.

The dam would be breached to allow Jordan Creek to freely flow into the tidal drainage south of the runway. The action would have to be repeated in time, because the existing culvert configuration likely contributes to the pool formation. However, development of a lateral RSA on the south side of the runway would nullify the need for this action, since a longer and larger culvert would be installed and the dam would be covered by the RSA fill. The estimated cost to remove the dam without RSA construction and restore the channel is $12,234.00.

2.9.1.9 WH-1I: Thin Vegetation, Remove Understory, and Install Deer Fence in the Float Plane Pond Woodlands

All vegetation in the woodlands up to a height of ten feet be removed, including limbing of larger trees up to the ten foot level. Approximately one-third of the trees in the area would be removed, with the largest spruce specifically targeted for removal. The general pattern for removal would be to start on the eastern third of the Float Plane Pond and work south toward the EVAR/Dike Trail, progressing as time and funding permit. This effort would likely help to reduce attractiveness of the area to some problem species such as crows and ravens, and reduce cover for large mammals. Cleared vegetation would be properly disposed at the discretion of Airport Management and the Contractor.

JNU has estimated that the initial effort to clear the understory in 44 acres of woodlands at an average cost estimate of $6,000 per acre, or approximately $264,000 (Stone 2004b). However, there would also be a significant annual maintenance cost involved, since understory vegetation would grow quickly and require thinning at least once per year. JNU has estimated this cost at $23,000 per year, but the level of uncertainty with this effort is high since it is unknown how quickly and densely the vegetation would rebound.

JNU has proposed to evaluate the benefits of this work after the eastern 1/3 of the Float Plane Pond has been treated. Presumably, if it appears that species of concern are using the area less frequently and/or in fewer numbers, and the work has not created a significant attractant to other species, the program would continue for the middle and western thirds of the woodlands.

A fence would be installed along the north side of the dike from the existing fence on the west end to, if conditions allow, the existing fence on the east end. However, terrain and intertidal flow conditions with ice scour could prevent maintenance of a fence in this area. If so, the fencing would be installed around the woodlands on the east end above the influence of tidal hydrology. Gates for staff and emergency vehicle ingress/egress would be installed at select locations. The fence would be comprised of 8-foot tall, 9-gauge chain link topped with 3 strands of barbed wire. About 7,055 feet of fence would be installed. The total estimated cost for this alternative is $636,685. This estimate assumes that spruce trees removed from the woodlands would be sold, balancing the cost of removal.

2.9.2 WH-2 Moderate Habitat Reduction Alternative

The following sections describe an alternative to the Proposed Action that also incorporates a number of significant habitat modifications, but usually to a lesser degree. Some of the components of this alternative are the same as described for the Proposed Action, including:

- WH-2f: Remove swales along pavement edges and regrade to RSA
- WH-2h: Remove dam at mouth of Jordan Creek

Those actions differing from WH-1 are discussed in the following sections. The estimated annual labor and materials cost associated with this alternative is $101,000, an increase of about $70,000 above that spent in 2003. This estimate includes an additional ½ FTE for wildlife hazing and education, $20,000 in vehicle costs, and $10,000 for supplies such as shells, mortars, and so forth.

2.9.2.1 WH-2A: Install Synthetic Ground Cover on Infield

Infield areas that are covered in grass would be replaced with a synthetic material that would not attract wildlife. Some new products have come on the market in recent years that could be suitable. For example, AvTurf™ is synthetic matting that reportedly allows surface water infiltration but does not trap water on the surface or promote vegetative growth. This means it would eliminate the water and food sources attracting birds to the infield. The material is also reported to be sufficiently strong to support vehicles and occasional aircraft excursions, an important feature given the proximity of the infield areas to taxiways and runway. AvTurf™ has not been used in comparable situations for a sufficient period to know whether it is suitable for this climate, snow removal requirements, and other operational aspects of JNU critical to the evaluation. For example, it is not known whether a product of this type would through time collect sand and sediments that would effectively reduce permeability and increase surface water runoff. However, FAA and CBJ believe this material or other synthetics are worth considering as a substitute to paving that could achieve nearly the same degree of wildlife hazard abatement. It may also be applicable as a RSA cover, since it would not provide forage for birds yet it would not generate the FOD problems associated with a gravel cover.

As with the Proposed Action, up to 77 acres of infield could be disturbed and filled with up to 278,000 cubic yards of fill. Information obtained from the vendor suggests AvTurf could cost more than paving, due to the high materials cost (as much as $4.00 per square foot) and ground preparation specifications that are similar to asphalt. Other artificial turf products are likely to have similar installation costs. It is estimated that as much as $21.78 million could be needed to prepare the infield surface and install an artificial turf product on all 77 acres.

2.9.2.2 WH-2B: Selectively Regrade Wetlands on Airport west of Runway

This alternative would involve the placement of some fill of wetlands on the west area of the Airport, but on a selective basis to reshape the existing landscape. Areas on the Airport west of the runway that collect rain or tidal water would be dredged or filled and graded. Material borrowed from higher portions of the area could be used so that this alternative would, to the extent possible, minimize importation of fill from the Float Plane Pond. Recontouring would focus on elimination of swales and depressions. Some new channels could be cut so that tidal flows drain more effectively.

Approximately 2.7 acres would be regraded and recontoured, supplemented by the addition of approximately 12,500 cubic yards of fill from the Float Plane Pond. The estimated cost to complete this alternative is $328,704.

2.9.2.3 WH-2C: Selectively Regrade Wetlands on Refuge West of JNU

This alternative would also involve fill of Refuge lands, but on a selective basis to reshape the existing landscape. Areas of the Refuge between the Airport and the Mendenhall River that pond rain or tidal water would be dredged or filled and graded. Material borrowed from higher portions of the area could be used so that this alternative would, to the extent possible, minimize importation of fill from the Float Plane Pond. Recontouring would focus on elimination of swales and depressions. Some new channels could be cut so that tidal flows drain more effectively.

Approximately 3.3 acres would be filled to some extent, receiving an estimated 17,500 cubic yards of fill from the Float Plane Pond. However, the entire area (approximately 10.2 acres) would be disturbed as landforms are shaped and recontoured. Riprap would be placed on disturbed areas for stabilization. The estimated cost to complete this alternative is $554,688.

2.9.2.4 WH-2D: Relocate Limited Reach of Duck Creek

This alternative would differ from the Proposed Action in that only a limited reach of Duck Creek on the Airport property would be moved. Beginning at about the Radcliffe Road culvert, where the Dike Trail crosses Duck Creek, the channel would be redirected toward the west and discharge in a backwater channel of the Mendenhall River. This alternative would serve the same purpose of moving the creek away from the flight paths, so that birds feeding on spawning fish or carcasses are not hazards to incoming and departing aircraft. The new reach of creek would be designed according to the features described in the Proposed Action but due to the limited reach of channel to be improved it is expected that opportunities for fish migration up- and down-stream would be improved little. The old creek channel would be filled and contoured, requiring an estimated 500 cubic yards of fill. This alternative would integrate well with one of the aviation facility development alternatives (FW/RW-1) or it could be implemented as a stand-alone activity to reduce wildlife hazards. The estimated cost to relocate a limited reach of lower Duck Creek is $231,398.

2.9.2.5 WH-2E: Regrade and Line Ditches with Concrete

The ditches between the apron and Taxiway A, and other surface water capture basins as needed, would be regraded to improve surface water drainage. This action would be designed to eliminate surface water ponding and attractiveness to wildlife. The ditches would be lined with concrete to facilitate water transport and prohibit vegetation growth, thereby eliminating the food sources and cover for loafing. Concrete ditches would be easy to maintain, but they would also reduce the naturally occurring biological treatment afforded by adsorption and photodegradation of contaminants trapped by surface soils and vegetation.

Approximately 15.7 acres of infield would be disturbed by this action. Up to 18,000 cubic yards of fill imported from the Float Plane Pond could be needed, but this amount would decrease if drainage channels in the infield are maintained for snow storage. The estimated cost to regrade the drainage ditches and line them with concrete is $918,259. This estimate does not include cost to install oil/water separators or other treatment systems at the drainage discharge locations.

Another option would be to install an artificial turf product that would also reduce attraction to wildlife by eliminating forage and cover. A possible concern with the synthetic groundcover is that sand, used extensively in snow removal and ice control, can clog the membrane pores. This effect would reduce water infiltration capacity and result in more runoff and less groundwater recharge and biochemical treatment. Also, this material has not been used on such a large scale application as envisioned for JNU (about 15.7 acres or more, if used on other areas such as RSA). Therefore, overall effectiveness and long-term functionality has not yet been demonstrated. This alternative therefore relies on concrete for the stormwater channels.

2.9.2.6 WH-2G: Fill Float Plane Pond Fingers

This action would represent a major change to the existing landscape and character of the Airport south of the main Float Plane Pond. The extensions to the pond, known as fingers, would be filled completely. This action would eliminate a large area that currently provides shelter and food for waterfowl. Low shrubs or other vegetation that would be less attractive to geese and other species would be planted.

Approximately 16.9 acres of aquatic habitat would be eliminated, requiring approximately 136,000 cubic yards of fill material. The fill material would have to come from off site, since it is doubtful that the main Float Plane Pond could provide sufficient borrow for this action and all of the other Airport developments. In fact, eliminating the Float Plane Pond fingers as a borrow source (see discussions of dredging these areas in Section 2.6.1.2) could mean other projects would need fill from off site. CBJ probably does not have quarries available that could provide the fill. One option would be to mine the spoils piles on the Refuge, left over from previous dredging in the Gastineau Channel. The estimated cost to fill the Float Plane Pond fingers is $2.39 million.

2.9.2.7 WH-2I: Remove Corvid Nests and Install Deer Fence

This alternative represents a treatment for the woodlands that would entail virtually no habitat modification. The crow rookery[29] would be managed by periodically removing nests and harassing birds, to prevent them from constructing new nests. Nests of other species such as ravens and herons (but not bald eagle) would also be removed. A deer fence would be installed as described in WH-1I, Section 2.9.1.9 to limit deer and large mammal access to the area. The estimated cost to remove corvid nests twice in one season and install a deer fence is $324,365.

29. Surveys conducted during this EIS and reports from various persons using the Dike Trail suggest the crow rookery has not been active, although crows still use the woodlands.

2.9.3 WH-3 Minor Habitat Modification and Adaptive Hazard Management Alternative

The following sections describe an alternative that results in relatively little habitat modification, but requires 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 undertaken to initially try hazard control methods with the least environmental impact.

Two components of this alternative are the same as described for the Proposed Action, including:

- WH-3f: Remove swales along pavement edges and regrade to Runway Safety Area
- WH-3h: Remove dam at mouth of Jordan Creek

Other habitat modifications including realignment of Duck Creek and filling of habitat on the west runway end could be implemented if otherwise selected as part of the decisions made concerning aviation facilities and runway safety area improvements.

The following sections outline the approach envisioned for an adaptive hazard management program at JNU. Since most of the control actions are relevant to all of the hazard areas and issues identified in Section 1.4.4.3, this discussion concentrates on the hazard control activities that would be employed across the Airport. The estimated annual labor and materials cost associated with this alternative is $140,000, an increase of about $109,000 above that spent in 2003. An explanation of the increased funding is provided in the next section.

2.9.3.1 WH-3: Increased Staff Commitment to Hazard Control

As was described in Section 2.5.2, there is no single person on the JNU staff whose primary job responsibility is wildlife hazard control. Using figures supplied by JNU it can be estimated that a total of about 0.25 combined man-year is spent on hazard control activities.[30] A major component of this alternative would be to increase the amount of time that staff at JNU spends on the wildlife hazard control program.

30. Estimate includes JNU staff for monitoring and hazing, hazard call outs, and time spent by USDA wildlife control officer supporting the JNU WHMP.

This alternative incorporates a recommendation included in the Wildlife Hazard Assessment conducted by USDA for JNU in 2000 and 2001 (CBJ 2001). A full-time wildlife control officer would be employed whose duties and responsibilities include but are not limited to the following:

- Update and annually revise the WHMP based on detailed observations of wildlife on and near the Airport, and monitoring of effectiveness of hazard control techniques.
- Train JNU and local FAA staff and pilots on reporting procedures and specific hazards posed by habitats on or near JNU and the species using those areas.
- Maintain a database for reporting hazard management activities including call outs, runway sweeps, inspections, and strike information from pilots.
- Maintain a database of wildlife observations by species, locations sited, day and time noted, numbers, movement patterns, and other variables so as to develop a long-term picture of wildlife use at JNU.
- Carry out daily wildlife control activities including hazing and depredation as needed.
- Oversee habitat modifications (such as removal of the dam at the mouth of Jordan Creek, filling of swales) and habitat management actions (including vegetation management to help control species using the infield grass and placement of perch deterrents on runway alignment lights).
- Review all Airport projects for potential to create wildlife attractants, and help JNU staff develop design measures to eliminate, mitigate, and/or manage the hazards.

Other activities and responsibilities would be applied as outlined in the WHMP, recommended in the Wildlife Hazard Assessment, and identified in the FAA's manual for wildlife hazard management at Airports.

The Wildlife Hazard Assessment for JNU supported the recommendation for additional staff by noting the limited hours being devoted to wildlife deterrence. Better education of airport staff, along with more frequent hazard monitoring and control efforts and the documentation of those efforts and their results, should help to reduce wildlife strike risks to aviation.

An increased commitment to staff resources would also result in the use of more supplies and equipment devoted to hazard control activities. At a minimum it is expected that more propane, capa rounds, lights, batteries, and shotgun and cracker shells would be consumed. To compare the cost of this alternative with habitat modification and no action alternatives it was estimated that expenditures for materials and supplies would almost double, from approximately $9,000 spent in 2003 to about $15,000 per year. It is also recommended that a vehicle be dedicated to the wildlife control program, adding an estimated $20,000 per year in costs.

With the exception of the two habitat alterations concerning Jordan Creek and runway swales, there would be no construction cost associated with this alternative. However, annual management costs to the Airport would increase considerably. It is estimated that $80,000 would be required on an annual basis to employ a full time hazard control officer for the Airport[31]. Other staff would still be used for wildlife hazard control activities, on a more frequent basis, to respond

to call outs and perform hazard control and monitoring when the wildlife officer is not on duty. It is estimated for the purpose of this EIS that an additional 0.25 man-year would be allocated for staffing, at an annual cost of $25,000.

2.9.3.2 WH-3: Increased Hazing and Frequency of Control Activities

As noted above, the commitment of a full-time hazard control officer would substantially increase the time and resources applied to wildlife hazard control. The technologies to be employed would not differ substantially, though, from current practices. JNU uses the pyrotechnic hazard control technologies that are commonly employed at many airports, and considered relatively effective. A dedicated control officer could monitor these activities and over time, develop an assessment of how well specific control technologies work in various areas of the Airport and at what frequency, and make recommendations for adjustments in the wildlife control program (see following Section 2.9.3.3 on adaptive hazard management).

2.9.3.3 WH-3: Adaptive Hazard Management

An adaptive approach to hazard management would be employed with this alternative. This approach explicitly recognizes that the consequences of habitat management and hazard control activities at JNU cannot be predicted with certainty, and it provides a framework for adjusting management actions to appropriately manage hazardous wildlife. Inherent in the adaptive management approach is an iterative cycle of assessing wildlife hazards, taking management actions to control those hazards, and monitoring target species to determine if the management action(s) had the desired effect. If not, new management approaches are used and evaluated through this iterative process until the desired result is achieved. For example, actions taken to reduce hazards at the Float Plane Pond woodland, such as installation of a deer, are expected to reduce wildlife hazards to aircraft. The fence would create a barrier to prevent deer from entering the woodlands from the Refuge south or east of the Airport, and presumably reduce numbers crossing the runway. Airport staff could establish a monitoring system to count numbers of deer observed during specific maintenance activities. This data and reports of deer observations from pilots, trail users, and others would be collected and compared to pre-fence installation numbers to assess how well the fence is working to keep deer away from the active runways. An analysis of this nature should be carefully planned, to ensure a systematic approach is used and conclusions can take into account variability in seasons, field conditions, and so forth. If the conclusion is reached that additional effort is necessary then recommendations (for wildlife control or habitat management) would be presented to the wildlife hazards working group for input and advice (see next section).

The Wildlife Hazard Control Officer would be responsible to document the need for changes to wildlife control activities or recommendations for habitat modification. Changes in control activities should not need the review and approval of FAA or agencies outside of JNU, unless increased depredation is recommended. Program adaptations that incorporate habitat modifications would require full consideration under NEPA, although the degree of analysis (for example an EIS, envi-

31. This figure is a "burdened" salary, meaning it includes wages plus cost to CBJ for benefits such as life insurance, medical, etc.

ronmental assessment, or categorical exclusion) would depend on the type of habitat to be affected and degree of modification. Approval from FAA would be necessary, and the action could necessitate permits from agencies other than FAA. Recommendations for changes could be discussed and deliberated by the Airport's Wildlife Hazards Working Group, although the decision to implement new control activities or apply for approval to implement habitat modifications would still rest with the Airport Manager.

2.9.3.4 WH-3: WILDLIFE HAZARDS WORKING GROUP

Actions undertaken by the Airport in recent years to mitigate wildlife hazards by habitat modification (either as a primary purpose or as a perceived benefit while addressing a different Airport need) have generated substantial discussion and comment from members of the Juneau community and resources agencies. Many of the concerns are reflected in comments submitted during scoping of this EIS. The establishment of a Wildlife Hazards Working Group (WHWG) would help to facilitate the communication, cooperation and coordination of the Airport with tenants and the community at large. The FAA recognizes that community outreach of this nature is valuable for an effective WHMP at any Airport, particularly for a situation such as that found at and near JNU—habitat in close proximity to the Airport offering such important functions to wildlife, wetlands, and even recreation.

The WHWG would serve many purposes. For example, Airport certificate holders must be aware of proposed land use changes, or modification of existing land uses, that could create hazardous wildlife. Certificate holders, at the very least, must be on the notification list of the local planning board or equivalent review entity for all communities located within 5 miles of the Airport, in order to receive notification of any proposed project to review for attractiveness to hazardous wildlife. The WHWG would assess the proposed land use changes and provide a well-informed, diverse set of recommendations to the Airport and CBJ concerning possible effects on aviation.

The WHWG could also serve as a first-order clearinghouse for the Wildlife Control Officer. Periodic wildlife monitoring reports and summaries of hazing activities would be provided to the WHWG, along with the officer's recommendations concerning changes in control activities to adapt to different conditions, seasons, and wildlife hazards. The WHWG would not have jurisdictional authority concerning recommended changes in the hazard control program or other developments on the Airport; these decisions appropriately rest with the Wildlife Hazard Control Officer, Airport Manager, Airport Board and FAA, as well as regulatory agencies. However, the WHWG would provide meaningful comment that should result in better and more informed decisions by these authorities.

Since preparation of the DEIS the Airport has commented that a wildlife hazards advisory group was formed some time ago, although comments from the Airport Board indicate such a group had not yet been designated (for examples, see comments no. 216 and 319). Regardless, both the Airport Board and JNU appear to recognize that the recommendation of the WHMP and this EIS to make use of a wildlife hazard advisory group is worthwhile (CBJ 2002a). FAA believes that the WHWG should consist of applicable Airport staff, tenants, representatives from the Refuge, USDA and other agencies such as USFWS. Persons from the local community with particular skills such as species identification, representing Audubon or the MCAG, and recreational users

of the Dike Trail, also provide valuable anecdotal documentation of wildlife use and habits. The Airport Board, or CBJ Assembly, would be responsible for taking this recommendation and designating a WHWG, its membership, function and responsibilities.

2.9.3.5 WH-3: ELIMINATE ON-AIRPORT HUNTING PROGRAM

The waterfowl hunting program at JNU would be discontinued in this alternative. FAA staff and consultants specializing in wildlife hazard abatement concurred with many of the conclusions documented in the Wildlife Hazard Assessment (CBJ 2001) and listed in Section 2.5 of this EIS. The most serious concern associated with on-Airport hunting is it represents an uncontrolled form of wildlife hazing. As a consequence, birds can unexpectedly take flight during aircraft movement without coordination between the tower, aircraft, and hunters on the ground. Although most hunters have the best intention of shooting toward the Refuge and away from the Airport, the flight patterns of birds once airborne cannot be controlled. Recreationists and bird watchers using the Dike Trail and Refuge have provided anecdotal but unverified reports of birds taking flight in response to gunshot and moving directly across active runways at JNU or migrating toward other resting grounds such as Auke Lake, thereby crossing or following approach and departure paths for the Airport. The potential risks associated with the existing hunting program described in the Wildlife Hazard Assessment may outweigh any minor benefits, despite the Airports' contention that "…the hunting program has greatly reduced the potential for wildlife strikes." (CBJ 2002a). However, if the hunting program is eliminated it should only 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.

2.9.3.6 WH-3A: ALTERATION OF VEGETATION MANAGEMENT PRACTICES TO ATTRACT FEWER WILDLIFE AND INCREASED HAZING

This alternative would use different vegetation management practices to reduce the attraction of birds to the grassed infield. The existing grasses in the infield area would be allowed to grow for most of the season, potentially limiting bird accessibility to worms and insects. However, even if this action is effective at reducing species attracted to worms and insects from grazing on the infield, other species may be attracted to the increased cover. Small mammal populations may also increase and attract more raptors. This alternative would have to be implemented in coordination with a more active wildlife harassment program. The new vegetation management program would be implemented across the estimated 77 acres of grassed infield, but no new disturbance in the form of regrading or fill would be needed.

2.9.3.7 WH-3E: REGRADE DITCHES AND MANAGE VEGETATION

The drainage ditches between Taxiway A and the apron would be regraded to prevent surface water from ponding. A cover of grass or other vegetation type would be maintained, although it would be managed to reduce attractiveness to geese and other loafing/feeding birds. This option was developed to maintain the groundwater recharge and natural treatment functions of these ditches. Approximately 15.7 acres of infield would be disturbed by this action, with much less fill required (up to 13,000 cubic yards) from the Float Plane Pond. The estimated cost to complete this action is $350,144.

2.9.4 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 existing hazard management program, as described in Section 2.5.2, would remain in place.

2.9.5 Comparative Summary of Impacts: Wildlife Hazard Management

Table 2-23 provides a summary comparison of the environmental impacts associated with the wildlife habitat modifications for each alternative. A full discussion of the resources listed on this table and the important criteria used to determine the extent and severity of environmental effects is found in Chapter 4 of this EIS.

2.10 Connected Actions

In order to develop new aviation facilities in the Northeast Development Area of the Airport, the RCO, ASOS, and other FAA equipment would have to be relocated. Each of these systems has siting and use criteria that preclude construction of other facilities in the 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 describe the RCO and ASOS, the siting requirements for each, and the locations available for their relocation. Relocation of both the RCO and ASOS are considered connected actions, because they would not occur unless another action (specifically, the Northeast Development Area) takes place.[32]

Relocation of Duck Creek could be considered a connected action with some wildlife habitat modifications, or construction of the Runway 08 RSA or facilities in the Northwest Development Area. However, it was also described as a stand-alone alternative for habitat modification, and the costs associated with partial or full relocation on the Airport were independently derived.

2.10.1 Remote Communications Outlet

The RCO, termed the Remote Transmitter Receiver or RTR in previous Airport-related documentation, is co-located with the ASOS in the middle of otherwise undeveloped property in the Northeast Development Area of the Airport (see Figure 2-44). The RCO supports a number of necessary and complicated systems for operations on and around the Airport, including navigational equipment, weather sensing and reporting equipment, radio communications equipment, electrical power and control equipment, monitoring equipment, and others. Each of these systems has a unique purpose and a specific operational requirement that must be considered when

32. FAA maintains equipment other than the RCO in the proposed Northeast Development Area, such as the Automated Terminal Information Service (ATIS) transmitter and the Antenna Tower. However, this other equipment would be relocated within the context of the new facilities shown on 2-28.

assessing the feasibility of relocation. All equipment and systems that are displaced with this relocation must be brought back to full operational status as a part of this relocation effort. The RCO systems include the following:

- Three main and standby transmitters and receivers, using different radio frequencies.
- Monitors for non-directional beacons at Haines, Sister Island, and Coghlan Island.
- An air traffic information service radio facility that broadcasts to aircraft entering controlled airspace in the JNU area.
- Disconnect switches for the runway end identifier lights and the visual approach slope indicator.
- Ancillary telephone and power distribution equipment.
- A very high frequency omni-directional range test transmitter that allows pilots to check accuracy of the aircraft's on-board omni-directional range navigation system.
- Runway visual range system data processing and standby radio link equipment.

Due to the operational nature of this various equipment, some of these systems must remain on the airfield. Others may be located away from the airfield, but only in a location that does not diminish performance specifications.

The FAA conducted a siting study to evaluate potentially suitable sites for relocation of the RCO (FAA 2002c). Seven sites were considered in the study, two of them located off Airport property. Figure 2-44 identifies the sites considered for RCO relocation. Evaluation criteria used to screen the possible sites included:

- Topography, to consider possible obstructions to radio coverage and line-of-site requirements for some equipment.
- Radio interference, addressing nearby radio transmitting facilities and background noise that could interfere with RCO transmitters and receivers.
- Ground conductivity.
- Land ownership and potential acquisition costs.
- Availability of or access to utilities.
- Road access for construction and equipment maintenance.
- Security, to prevent unauthorized access and vandalism.
- Environmental conditions.

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 location for a new RCO and most of the components. This site meets objectives for most of the siting criteria. It is easily

Table 2-23. Comparative Summary of Environmental Impacts: Wildlife Hazard Management Plan 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 acres	115.7 acres	32.6 acres	None
Fill Volume	501,500 yd^3	462,500 yd^3	13,000 yd^3	None
Cost				
Construction (not including on-going labor and management expenses associated with wildlife control activities)	$20.19 million	$27.38 million	$1.20 million	$0
Mitigation	$1,672,664	$1,247,124	$0	$0
Total Cost (Construction + Mitigation)	$21,862,664	$28,617,124	$1.20 million	$0
Noise				
Long-term Noise Changes due to Action (does not include short-term, construction related noise increases)	None	None	None	None
65 DNL & greater (square mile)	1.08	1.08	1.08	1.08
Human Environment and Compatible Land Use				
Noise Sensitive Areas	None	None	None	None
Developed Recreation/Dike Trail	Minor, negative	Minor, negative	Minor, negative	None
Dispersed Recreation (hunting, bird- watching, hiking, etc.)	Minor, negative	Minor, negative	Minor, negative	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
Long-term Economic Impacts (from increased hazard control, payroll)	$1,184,000	$1,390,000	$1,927,000	$427,000
Long Term Revenue Impacts	None	None	None	None
Long-term Social Impacts	None	None	None	None
Air Quality				
Changes in Operating Emissions due to Action	None	None	None	None
$PM_{10}/PM_{2.5}$ (tons/year) - Operating	1.5	1.5	1.5	1.5
$PM_{10}/PM_{2.5}$ (tons/year) - Construction	2.1	2.1	1.6	0

Table 2-23. Comparative Summary of Environmental Impacts: Wildlife Hazard Management Plan 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
$PM_{10}/PM_{2.5}$ (tons/year) - Total	3.6	3.6	3.1	1.5
Fugitive Dust (tons/year, peak year)	103.3	96.7	14.9	0.0
Hazardous Materials and Solid Waste				
Presence of Buried Hazardous Waste or Soil Contamination	Low potential to encounter buried, hazardous wastes	Low potential to encounter buried, hazardous wastes	Low potential to encounter buried, hazardous wastes	None
Hazardous Materials Use/Pollutant Generation	No increase in use or pollutant generation	No increase in use or pollutant generation	No increase in use or pollutant generation	No change
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
Snow Storage	Moderate, filling ditches	Moderate, ditches filled and converted to synthetic turf	Low, ditches regraded and new vegetation treatment	None
Surface Water Quantity	Major, ditches filled, and converted to pipes and extensive new impervious surface	Moderate, ditches & infield filled 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
Long-Term (post construction)	Moderate impact, increased runoff and contaminant loads	Low impact, some increased runoff	Low impact, some increased runoff	None
Short-Term (construction)	Minor level of degradation	Minor level of degradation	Minor level of 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, 30.2acres native vegetation affected	89.6 total acres of vegetation affected in project and landscape areas, 25.4acres native vegetation affected	No effect	No effect
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 the Refuge. Impact to wetlands is 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. Impact to wetlands is not significant.	Insignificant. No wetlands loss or habitat affected other than removal of dam at Jordan Creek; no measurable change in hydrology.	None.

Table 2-23. Comparative Summary of Environmental Impacts: Wildlife Hazard Management Plan 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
Fisheries				
Essential Fish Habitat 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 Jordan Creek	No change	No change	No change	No change
Access to Duck Creek	Improved, less dewatering	No change	No change	No change
Overall construction impacts (e.g. disruption of fish movement and activity)	Moderate disruption of fish activity	Minor disruption of fish activity, loss of some resident fish in float plane pond fingers	None	None
Overall indirect impacts	Increase in exposure to contaminants due to increased surface runoff from impervious surfaces	Some increase in exposure to contaminants	Minor increase in exposure to contaminants	None
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 and Endangered 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 and humpback whale.			
High Interest Species Habitats	Greatest magnitude impact on bald eagle, other raptors, and corvids: 74.6 acres of potentially suitable habitat affected; greatest relative impact on black bear and Sitka black-tailed deer with 3.0% habitat affected in landscape area. Notable impact on Vancouver Canada goose habitat with 2.1% of landscape area affected	Substantial impact on bald eagle, other raptors, and corvids: 62.7 acres of potentially suitable habitat affected; highest relative impact on Vancouver Canada goose at 2.3% of habitat in landscape area	With exception of seeded grassland habitat used by Vancouver Canada goose, minimal habitat affected for high interest species	None
	Impacts insignificant for all of the wildlife hazard management alternatives. Populations of high interest species unlikely to be jeopardized by implementation of WH-1, WH-2, WH-3 or WH-4.			
Sensitive Species Habitats	1.2% of potentially suitable Queen Charlotte goshawk habitat affected in landscape area; 1.2% peregrine falcon habitat affected.	0.4% of potentially suitable Queen Charlotte goshawk habitat affected in landscape area; 1.4% peregrine falcon habitat affected; 0.0% olive-sided flycatcher and Townsend's warbler habitat affected.	Minimal impact	None
	Impacts insignificant for all of the alternatives. Populations of sensitive species unlikely to be jeopardized 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 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 2-23. Comparative Summary of Environmental Impacts: Wildlife Hazard Management Plan 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 would be produced by the partial relocation and revegetation of Duck Creek	Moderate, long-term, negative changes to visual quality from habitat modifications, deer fence construction. Minor, positive changes would be produced by the 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	Yes, up to 10 acres of Refuge land filled or altered	Yes, up to 3.3 acres filled or altered on Refuge	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

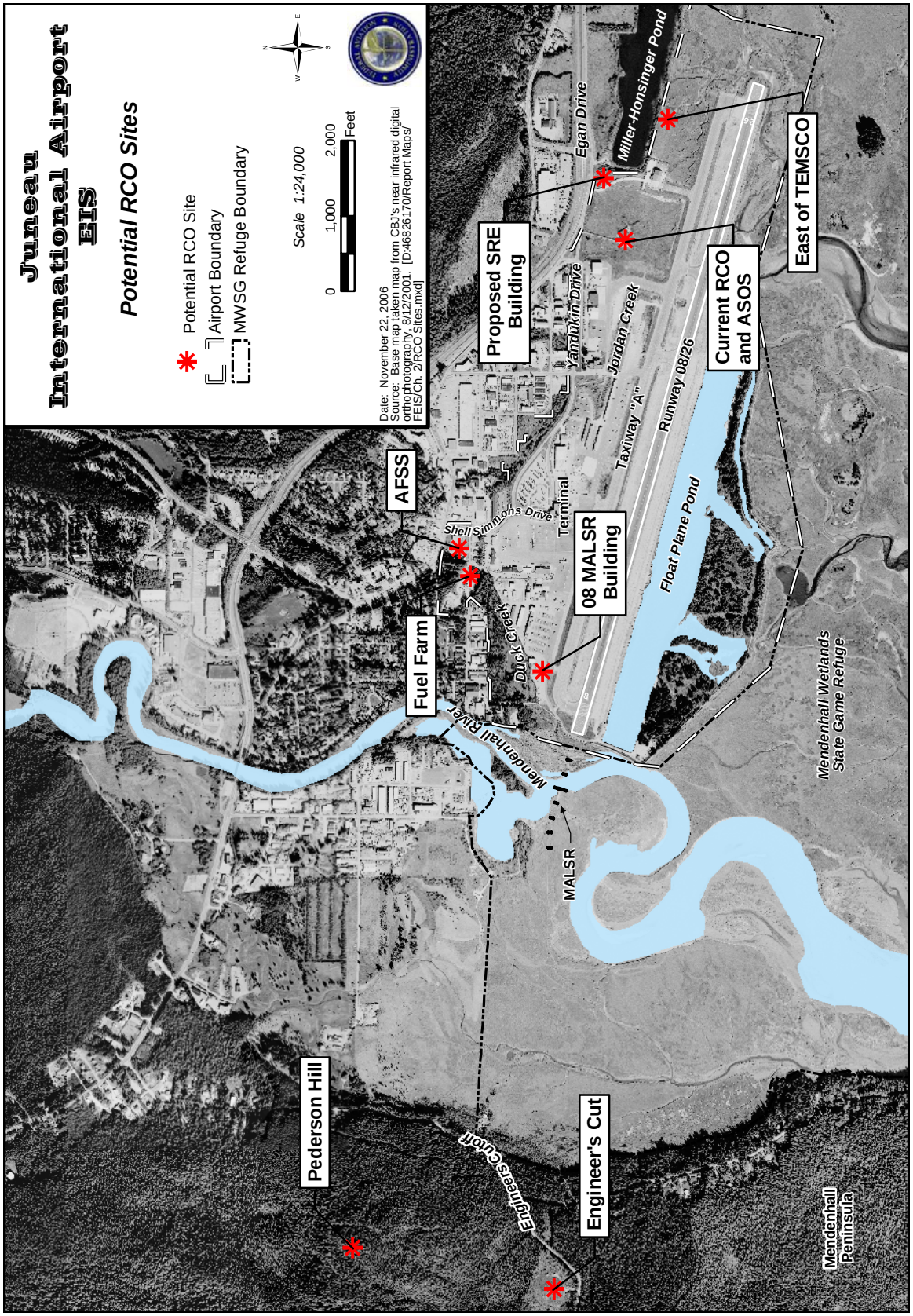

Figure 2-44. Sites considered for relocation of RCO components.

accessible via existing road, provides good line-of-site coverage to most locations, already has all needed utilities, and would provide no concerns with respect to ground conductivity. A security fence would have to be constructed at this location.

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 the RCO.

A few systems from the current site could interfere with the standby remote transmitter receiver already in use at the Engineer's Cut. These facilities would not benefit from relocation, however, and could remain on the Airport. As a consequence, the plans for development of the Northeast Development Area of the Airport include relocation of the air traffic information service and VHF omni-directional range test transmitter to a location on the south end of the proposed Northeast Development Area (see Figure 2-34). The runway visual range data processing unit, used to measure airfield visibility, would be relocated to the FAA air traffic control tower at JNU.

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.

2.10.2 Automated Surface Observation System

The FAA owns the Automated Surface Observation System (ASOS), 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 (see Figure 2-44). The ASOS would also need to be relocated if new aviation facilities are constructed in this area.

The ASOS includes a number of different automated, weather-observing systems. They provide real-time meteorological information to the air traffic control tower and pilots, concerning variables such as wind direction and speed, air pressure and temperature, cloud height, and precipitation. These instruments must be strategically located as close as possible to aviation operations to provide pilots with the most accurate information. The ASOS cannot, however, violate runway or taxiway safety areas, obstacle-free zones, or instrument flight procedure surfaces (USDC/NOAA 1994). At the same time, the ASOS location must minimize or eliminate the effects of man-made or geographical obstructions.

The National Weather Service looked at different on- or near-Airport locations for relocation of the ASOS. Sites considered included locations on and adjacent to Airport property, in the Refuge, just northwest and southwest of the west runway end; sites south of the Float Plane Pond but on Airport, north of the Dike Trail, and a location west of TEMSCO. Most locations in their feasibility analysis were quickly eliminated from further consideration because of critical siting

concerns with respect to obstructions or lack of proximity to the runways. A possible site on the west end of the Airport, near the existing LORAN facility and relatively near the runway was eventually eliminated, because the Mendenhall River would disproportionately affect some sensors (through changes in humidity and temperature, primarily). One site, located on the Airport east of TEMSCO, was found to meet siting specifications[33]. After publication of the DEIS another site was identified that would eliminate the possibility of land use conflicts with private property. Both locations have been evaluated in this EIS and are described in the following sections.

2.10.2.1 East of TEMSCO Site

The ASOS road and pad would be constructed on Airport property at the location shown on Figure 2-45. 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.

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 (see Figure 2-45). 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 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[34]. 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 (Hunter and Doerr 2005).

It is expected that the ASOS site would require construction of an access road approximately 425 feet long by 12 feet wide at the top. NWS personnel have indicated that 24-hour access would be required, and that even short-duration disruptions in access (such as during the highest high tides, which reach this area of the Airport) would not be acceptable[35]. As a result the gravel access road would have to be placed on approximately 4 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. Culverts could be installed under the road if it is necessary to maintain hydrologic connection between the Miller-Honsinger Pond and the wetlands. Power cables would be trenched and buried adjacent to the road.

33. Siting criteria are found in Federal Standard for Siting Meteorological Sensors at Airports, FCM-S4-1994. See Chapter 8 of this EIS for the complete reference.
34. The actual distance of the clear zone can vary, since it also depends on the height of any potential obstructions. In simple terms, taller obstacles must be further away, with the obstruction height increasingly lowered as the ASOS is approached.
35. Personal communication with Ed Doerr, National Weather Service in Anchorage and Ken Wallace, EIS Consulting Team Project Manager, on November 20, 2003.

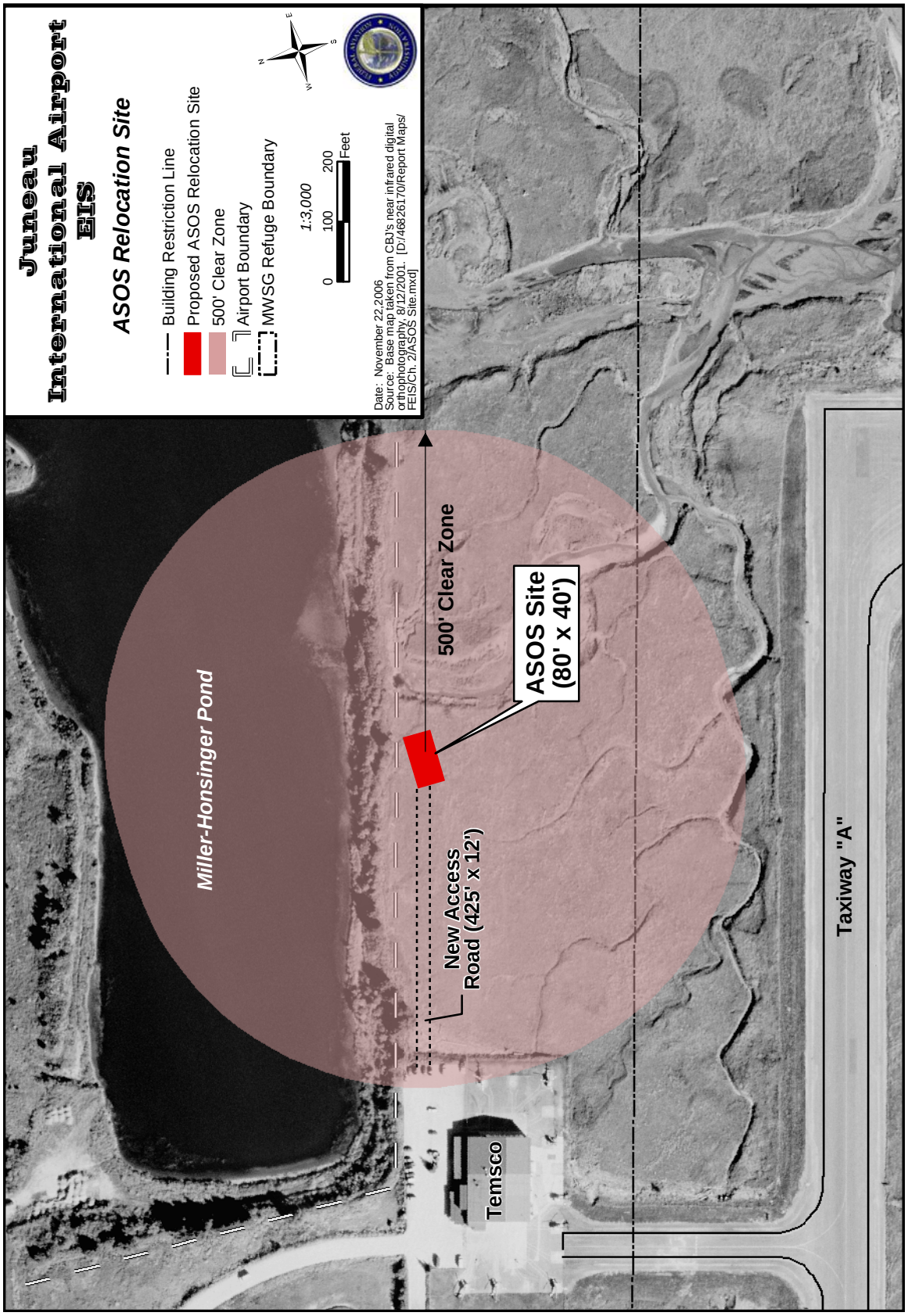

Figure 2-45. East of TEMSCO ASOS relocation site.

Normal installation for an ASOS would be to mount the facility on a 150-foot-long, 50-foot-wide gravel pad, although recent correspondence from NWS indicates a smaller, 80-foot by 40-foot pad would suffice.[36] The pad must be oriented along a true (not magnetic) East-West axis on the long dimension, as shown in Figure 2-45. The weather sensors are mounted on the pad and attached to the subsurface by galvanized steel pipe extended below the frost line. The pad 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, so that weather sensors depict runway conditions as nearly as possible. Protective berms would have to be placed around the building as it is critical to prevent water from infiltrating the highly sensitive electrical systems and sensor equipment. Extensive subsurface work would also be undertaken to establish the units and foundations for underground wiring and grounding systems. Figure 2-46 illustrates the ASOS construction.

Approximately 15,000 ft would be disturbed by this action and up to 2,700 cubic yards of fill would be required to construct the road and pad. In an attempt to reduce environmental impacts, FAA considered whether the access road could be placed on top of the berm extending along the south side of the Miller-Honsinger pond. However, the Airport property line is approximately 5 to 30 feet south of the berm. If relocation of the ASOS is approved, CBJ will determine whether or not the road could be located even closer to the pond through easement or land acquisition.

In response to concerns about impact to wetlands and habitat at the location shown on Figure 2-45, NWS has considered the possibility of placing the ASOS building on a platform that would reduce fill and allow some natural hydrology to be maintained. The intent of this design would be to reduce wetland fill and impact to essential fish habitat, and maintain hydrology in this tidal recharge zone of emergent wetland vegetation. A benefit of the design would be to elevate the facility out of an area where tidal waters could seep into the building. NWS has used non-traditional ASOS facilities in locations where geography, weather, or other factors preclude on-ground installation. For example, the ASOS at both Yakutat and Talkeetna are located within platform buildings to stay out of the frequent deep snow conditions.

Aside from the noted benefits of reducing environmental impacts, there are some operational concerns raised by such a design. An elevated ASOS would mean that the facility periodically operates fully surrounded by water, at least during the highest tides. This could locally affect some of the instrument readings, particularly humidity and dewpoint, although the relative change may not be significant considering how high both factors normally are in this area of Juneau. The piers supporting the platform would have to be resistant to ice scour and also corrosion caused by the salty marine water.

An alternative for access to the ASOS would be to install an at-grade road similar to that described for the MALSR access. A geotextile honeycomb would be placed on geotextile fabric and recessed into the ground at least 1 foot. The honeycomb would be filled with a granular aggregate, so that the top of the road would be flush with the existing ground surface. In this location the road would allow vehicle passage at most times of the day and season, although tides could prevent access for a few hours. A particular concern with the road in this location is ice and debris deposi-

36. Statement prepared by Ed Doerr, NWS, for use by HDR Consultants in Airport permit applications. February 1, 2005.

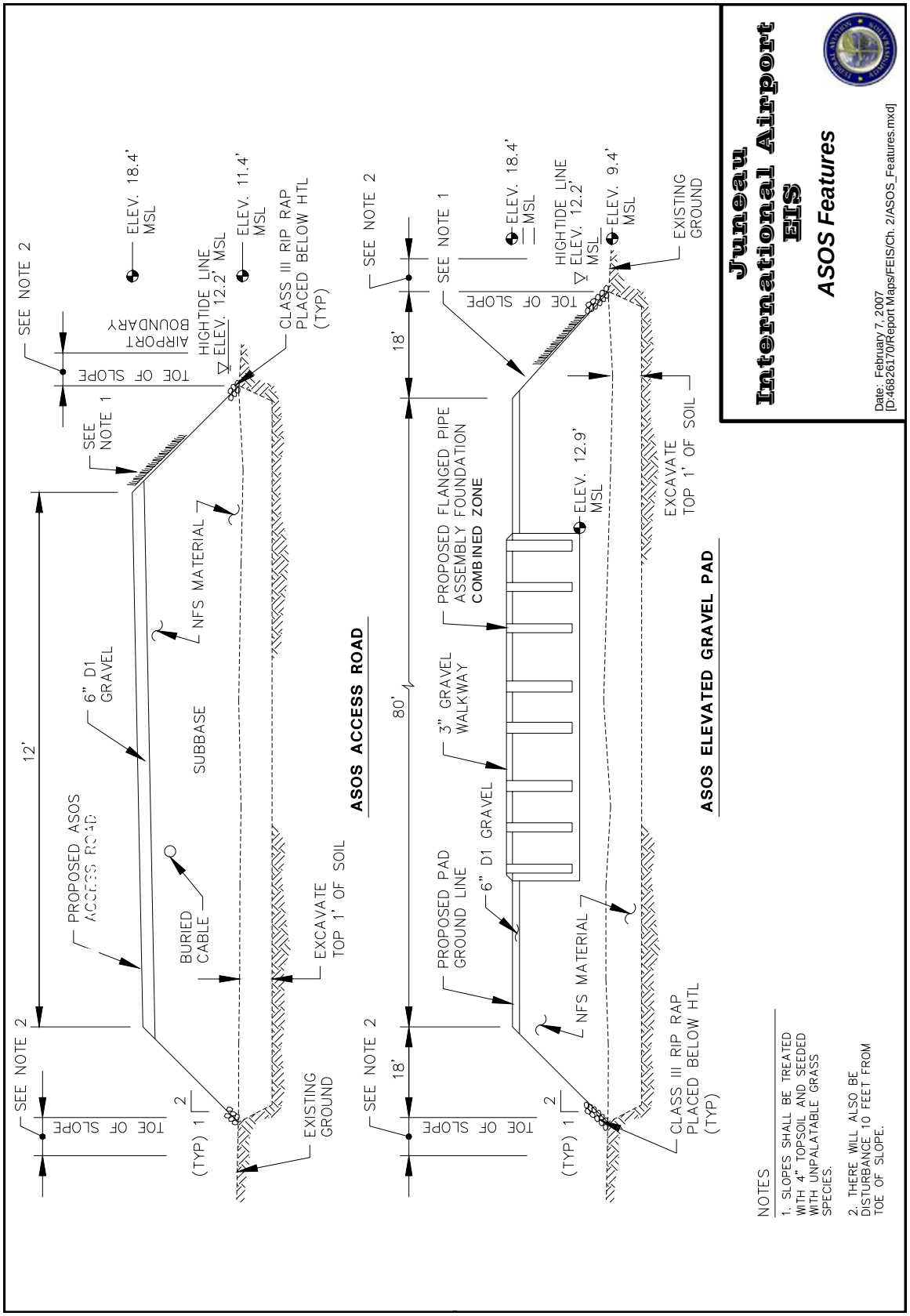

Figure 2-46. Cross-section of ASOS access road and pad (as shown for the East of Temsco site).

tion. The high tides carry ice blocks which get deposited near the south berm of the Miller-Honsinger Pond as tidal waters recede. Debris from the Gastineau Channel, such as logs and wood, also ends up in this area. The ice and debris would create significant barriers to access along an at-grade road.

The National Weather Service has considered the feasibility of both the at-grade road system and the elevated ASOS facility, and determined that neither option is suitable for the conditions at Juneau[37]. As a result, this EIS will evaluate the impacts associated with construction and use of gravel road built on fill, connected to an ASOS facility constructed on top of a prepared base elevated above high tide level.

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.

2.10.2.2 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, shown on Figure 2-47, is located adjacent to the Building Restriction Line (BRL) approximately 450 feet south and slightly east of the site shown on Figure 2-45. FAA, NWS, and CBJ/JNU have agreed this site would be acceptable and meet ASOS siting criteria.

37. Personal communication, Ed Doerr of National Weather Service, with Ken Wallace, EIS Consulting Team Project Manager, November 21, 2003.

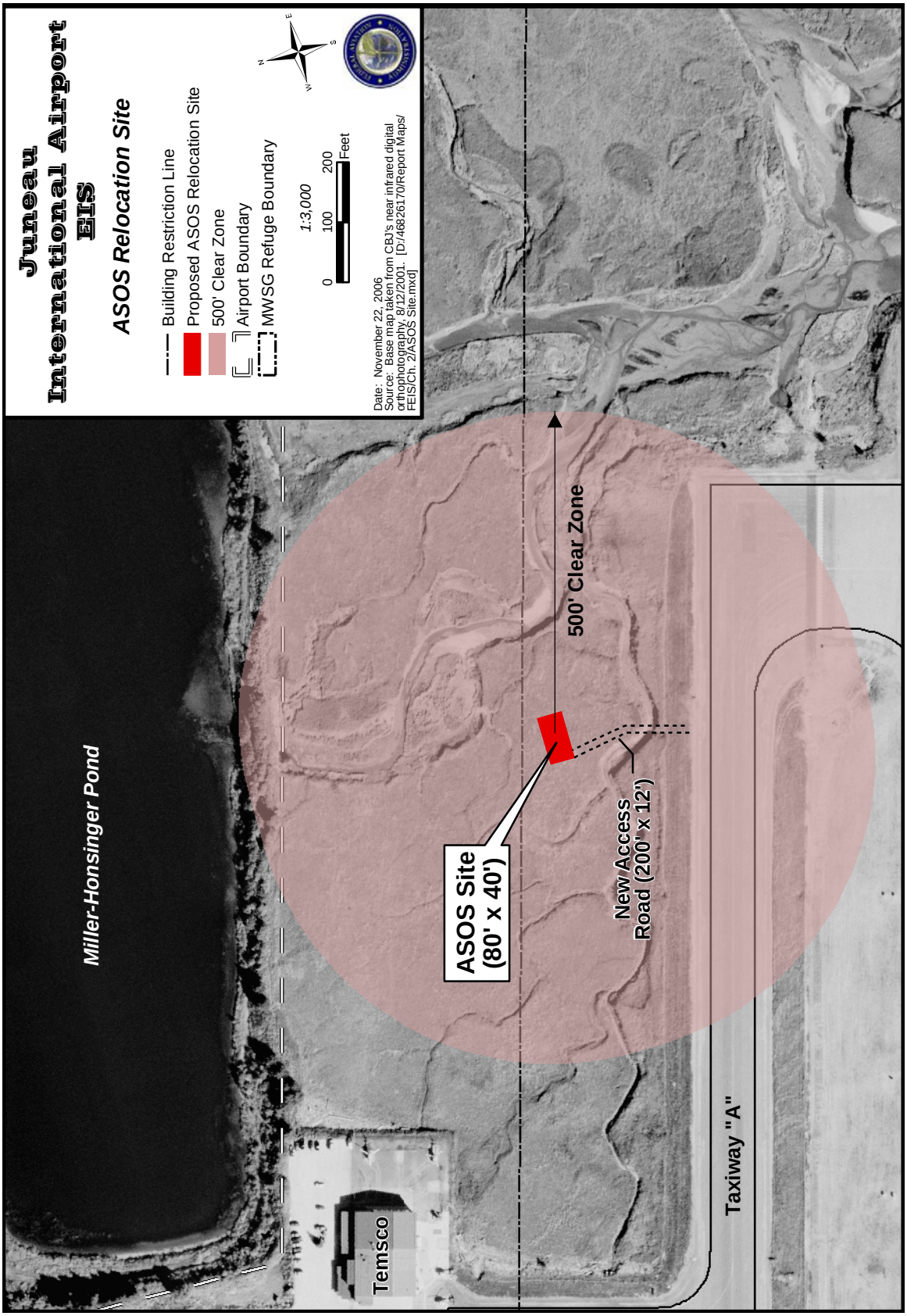

Figure 2-47. BRL ASOS relocation site.

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[38]

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.

2.10.3 Changes to other Runway Navigational Aids

Implementation of the runway safety area 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. Changes to the runway navigational aids are summarized in Table 2-24.

38. 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.

Table 2-24. Changes to Navigational Aids as a Result of RSA Implementation[1]

Navigational Aid	RSA-1	RSA-5C	RSA-5D	RSA-5E	RSA-6A	RSA-6B	RSA-6C	RSA-6D
Runway 08 Medium-intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR)	No shift, but some lights converted to in-RSA mounts	Relocate east consistent with threshold shifts; some lights mounted in RSA	No shift, but some lights converted to in-RSA mounts	Relocate east consistent with threshold shifts; some lights mounted in RSA	Relocate east consistent with threshold shifts; some lights mounted in EMAS	No shift, but some lights converted to in-EMAS mounts	No shift, but some lights converted to in-EMAS mounts	No shift, but some lights converted to in-EMAS mounts
Runway 26 Runway End Identifier Lights[1]	Assume Decommission	Assume Decommission	Assume Decommission	Assume Decommission	Assume Decommission	Assume Decommission	Assume Decommission	Assume Decommission
Future Rwy 26 MALSR[1]	To be installed, some lights mounted in RSA	To be installed, some lights mounted in RSA	To be installed, some lights mounted in RSA	To be installed, some lights mounted in RSA	To be installed, some lights mounted in EMAS	To be installed, some lights mounted in EMAS	To be installed, some lights mounted in RSA	To be installed, some lights mounted in RSA
Rwy 08 Visual Approach Slope Indicator (VASI)	No change	Relocated and assume upgraded to PAPIs[1]	No change	Relocated and assume upgraded to PAPIs[1]	Assume maintain with adjustment to aiming angle	Assume maintain with adjustment to aiming angle	No change	No change
Rwy 26 VASI	No change	Relocated and assume upgraded to PAPIs[1]	Relocated and assume upgraded to PAPIs[1]	Relocated and assume upgraded to PAPIs[1]	No change	Assume maintain with adjustment to aiming angle	No change	No change

Table 2-24. Changes to Navigational Aids as a Result of RSA Implementation[1], continued

Navigational Aid	RSA-1	RSA-5C	RSA-5D	RSA-5E	RSA-6A	RSA-6B	RSA-6C	RSA-6D
Runway Centerline Lights	No change	Relocate at west end and extend on east end	Modify east end	Relocate at west end and extend on east end	Modify west end	Modify west and east end	No change	Modify west and east end
High Intensity Runway Lights (on runway edge)	No change	Extend, modify in accordance with dual lens/ declared distances lighting criteria	Modify east end in accordance with dual lens/ declared distances lighting criteria and extend west end	Extend, modify in accordance with dual lens/ declared distances lighting criteria	Modify west end in accordance with dual lens/ declared distances lighting criteria and extend east end	Modify east end in accordanc e with dual lens/ declared distances lighting criteria and extend west end	No change	No change

[1] There would be no change to most navigational aids with the no action alternative, RSA-8. However, it is assumed that the proposed Rwy 26 MALSR would be installed (Alternative NAV-1) and, as a result, the Rwy 26 Runway End Identifier Lights would be decommissioned

[2] PAPI = Precision Approach Path Indicator

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 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 edge of the runways. 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 affect 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.

In addition, some of the Runway 08 MALSR lights would be converted to "in-pavement" (i.e., mounted on frangible systems within the RSA gravel or grassed surface, or in the EMAS block network) lights 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.

None of the changes to runway navigational aids connected to installation of runway safety area or the Runway 26 MALSR would cause substantive environmental impacts.

2.11 Methods to Reduce and Minimize Environmental Impacts

The Council on Environmental Quality regulations implementing NEPA stipulates that the EIS must include measures to mitigate environmental impacts that are not already included in the proposed action or alternatives (40CFR§1502.14(f)). "Mitigation" may typically include methods to 1) avoid an impact altogether, 2) minimize the magnitude of impact, or 3) reduce the impact over time. These types of mitigation, when implemented, would be incorporated into an alternative design prior to construction so as to avoid, minimize, or reduce the environmental effects. Two other types of mitigation, rehabilitation and compensation, are also important to consider. However, these are methods of mitigation implemented after impact has occurred. Section 2.12 of this chapter describes a proposed mitigation plan for the actions proposed by JNU.

Alternatives to the proposed actions have been developed where possible to avoid environmental impacts. This section of the EIS identifies other options to reduce or minimize environmental impacts for some of the actions.

2.11.1 RSA End Slopes

The RSA alternatives include fill slopes[39] on the ends ranging from 1.5:1 to 4:1 (a 1.5:1 slope means that for every vertical drop of one foot there are 1.5 feet of horizontal fill, whereas a 4:1 slope would have four feet of horizontal fill). A 4:1 slope is relatively gradual, easy to revegetate,

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

and could be driven on by emergency vehicles, if necessary. However, the gentle gradient of the toe slope creates a larger disturbance footprint affecting wetlands, fish habitat and other resources. One way of reducing the footprint of RSA embankments and environmental impact is to steepen the fill slopes at the runway ends.

Four different toe slope gradients were applied to a possible RSA disturbance footprint to provide a relative indication of how much habitat would be preserved using steeper slopes, as shown below:

	4:1	3:1	2:1	1:1
Area of Disturbance (acres)	26.5	26.2	26.0	25.6
Fill Volume Required (yd^3)	334,841	321,000	318,103	309,458

The use of steeper end slopes would have some environmental benefit by reducing impacts to surrounding habitat. The use of a 1:1 slope would save approximately 3.5% more habitat than the 4:1 slope, and require approximately 8% less fill material. 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 runway safety area supporting structures or slopes. Even though less fill is required for the steeper design there would probably be little difference in cost compared to the 4:1 slope, because expensive anchor rock would be needed as cover to help stabilize the surface and protect against water erosion and ice scour. Nevertheless, to reduce fill footprint and minimize encroachment into the Mendenhall River, Alternatives RSA-5D, -6B, -6C and -6D use a 2:1 fill slope from the west runway RSA end down to the Float Plane Pond road, and a 1.5:1 fill slope from the road to the EVAR/Dike Trail. RSA-5E uses identical slope angles, but also incorporates a shift in runway thresholds to keep fill out of the river channel.

Despite efforts to reduce impacts on the Mendenhall River, the alternatives mentioned above would result in the placement of about 12,000 cubic yards of fill into the channel on the east river bank, with additional fill to support the RSA and roads and trail in the wetlands that are periodically inundated by higher tides at floods. To help compensate for the changes caused by the east bank fill – including altered channel morphology, reduced channel width west and southwest of the Airport, and a raise in the river water level - a section of the west river bank would be removed as shown in Figures 2-25, 2-28, 2-29, and 2-30. Approximately 39,000 cubic yards would be removed from the bank, restoring as much as possible the current channel shape and flow path, and thereby minimizing any change in river water levels. This last point is particularly important because of the potential upstream effects of water level increases. Should one of the alternatives that includes this RSA and channel fill/cut conceptual design be selected, a more rigorous evaluation will be conducted to ensure that impacts on upstream areas, and on commercial and recreational activities, are not unacceptable.

2.11.2 RSA SIDE SLOPES

The proposed action and alternatives incorporate a steep, 0.6:1 supporting slope for the lateral RSA using gabions and mechanically stabilized earth walls, in order to minimize the environmental impact on habitat south of the runway. The cooperating agencies suggested that a vertical bulkhead could be used for RSA stabilization. The intent of this option would be to further reduce the impacts on the tidal channels and estuarine habitat south of the runway.

The 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 about 1.5 acres of habitat compared to the 1:1 fill option. Fill volumes would also be reduced. A couple of methods are potentially applicable that could be used to derive this benefit.

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 about 3,500 lineal feet and an average height of about 30 feet, accounting for existing surface elevations, tidal fluctuations to prevent overtopping, and an embedment of about 14 feet below surface. As many as 300 pilings could be needed assuming one per 12 lineal feet. The chief disadvantage to this method at JNU would be the high cost, estimated at about $30 per square foot or a total cost of about $3.1 million. However, this cost estimate is considered the minimum likely, since subsurface conditions could dictate a much greater depth of embedment is needed.

Gabions and 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 about 24-foot height would cost about $800,000, assuming an installation cost of about $10 square foot. The freeboard and toe protection required to install this type of wall would increase wetland impacts about 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.

While a bulkhead system would reduce direct environmental impacts on wetlands and habitat, it would also have indirect effects on water quality. JNU removes snow from the runways by pushing it from the center of the runway toward the edges and the RSA. From there, snow is continually pushed further back, ultimately clearing the RSA. A fill slope on the south side of the RSA would provide storage volume for snow pushed in that direction. The fill slope would also provide a measure of biological treatment to remove de-icing and anti-icing compounds from snow. As the snow melts and infiltrates the fill slope surface, vegetation and soil would help to attenuate and degrade the contaminants. If a bulkhead were to be employed, snow would be pushed over the edge, releasing these contaminants directly into the tidal channels. The bulkhead would therefore have a greater impact on surface water quality.

Figure 2-48 illustrates a footprint for the lateral RSA using a gabion wall with Alternative RSA-1, RSA-5D, or RSA-6C. Similar information is provided for RSA-5C on Figure 2-49, for RSA-5E on Figure 2-50 and for RSA-6A, -6B, and -6D on Figure 2-51. Figure 2-52 shows the East Runway Slough relocation with a MALSR access road extending directly east from the RSA, with an arch culvert slough crossing. A cross section illustrating the use of a gabion wall with slough

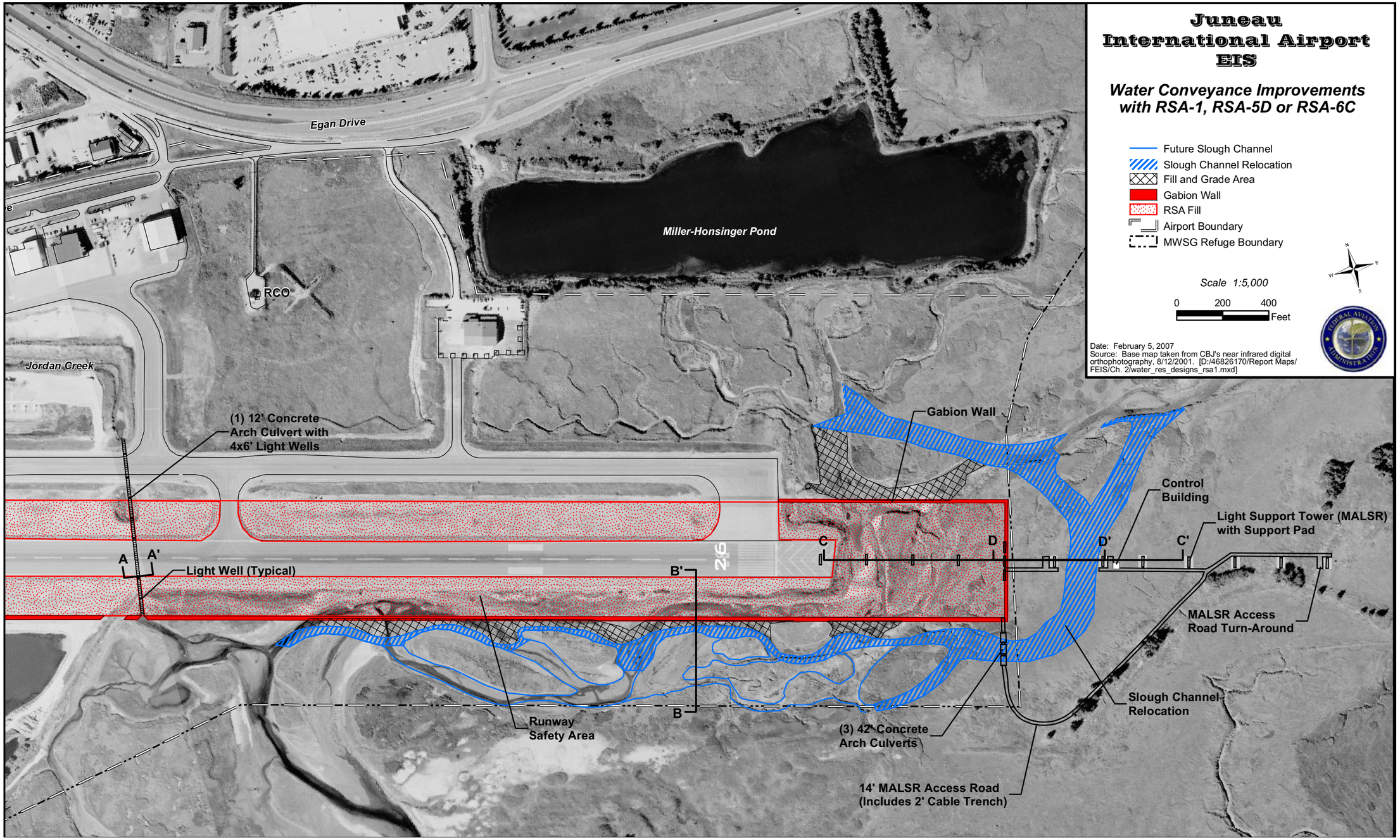

Figure 2-48. Alternatives RSA-1, -5D, and -6C: water conveyance improvements.

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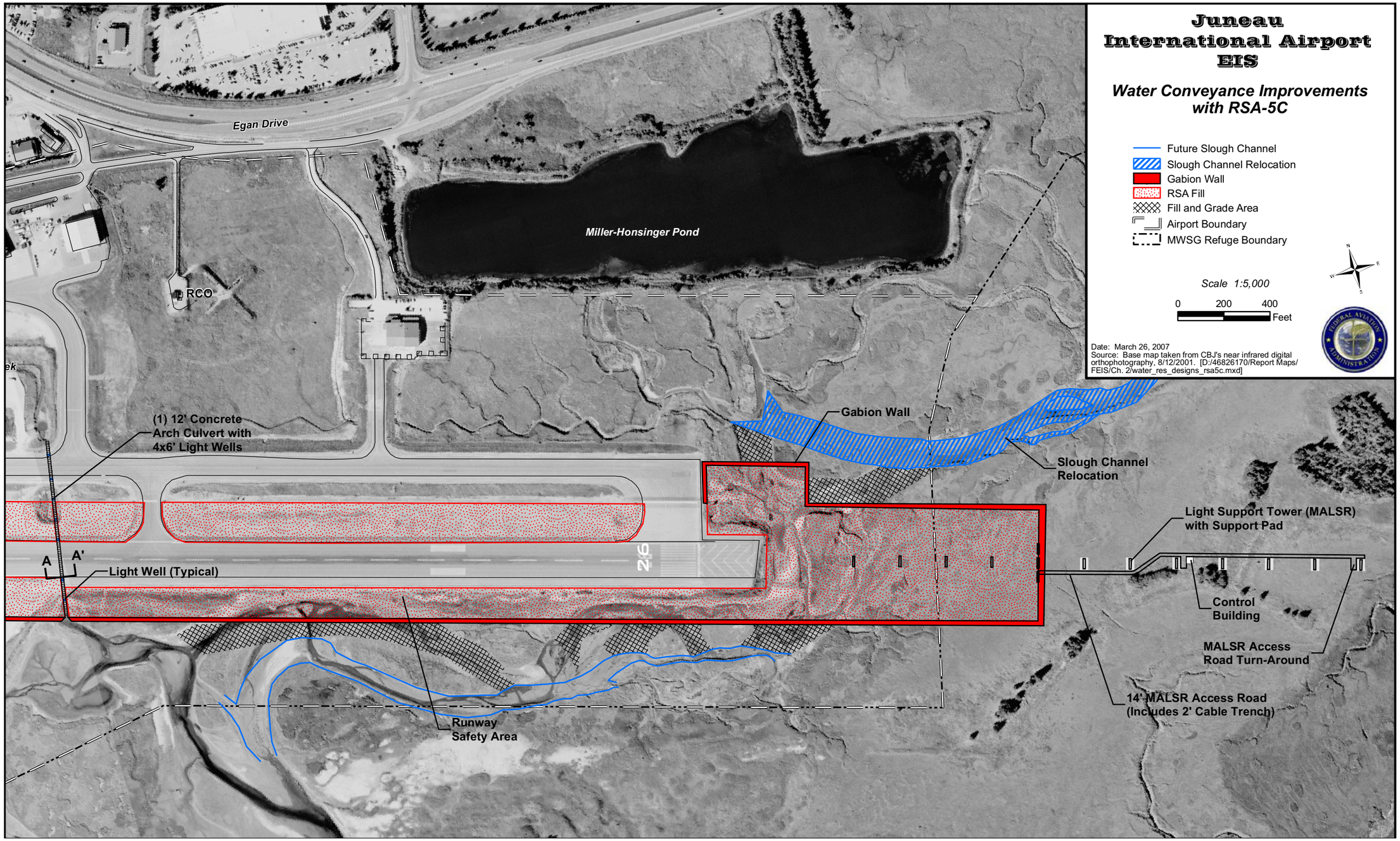

Figure 2-49. Alternative RSA-5C: water conveyance improvements.

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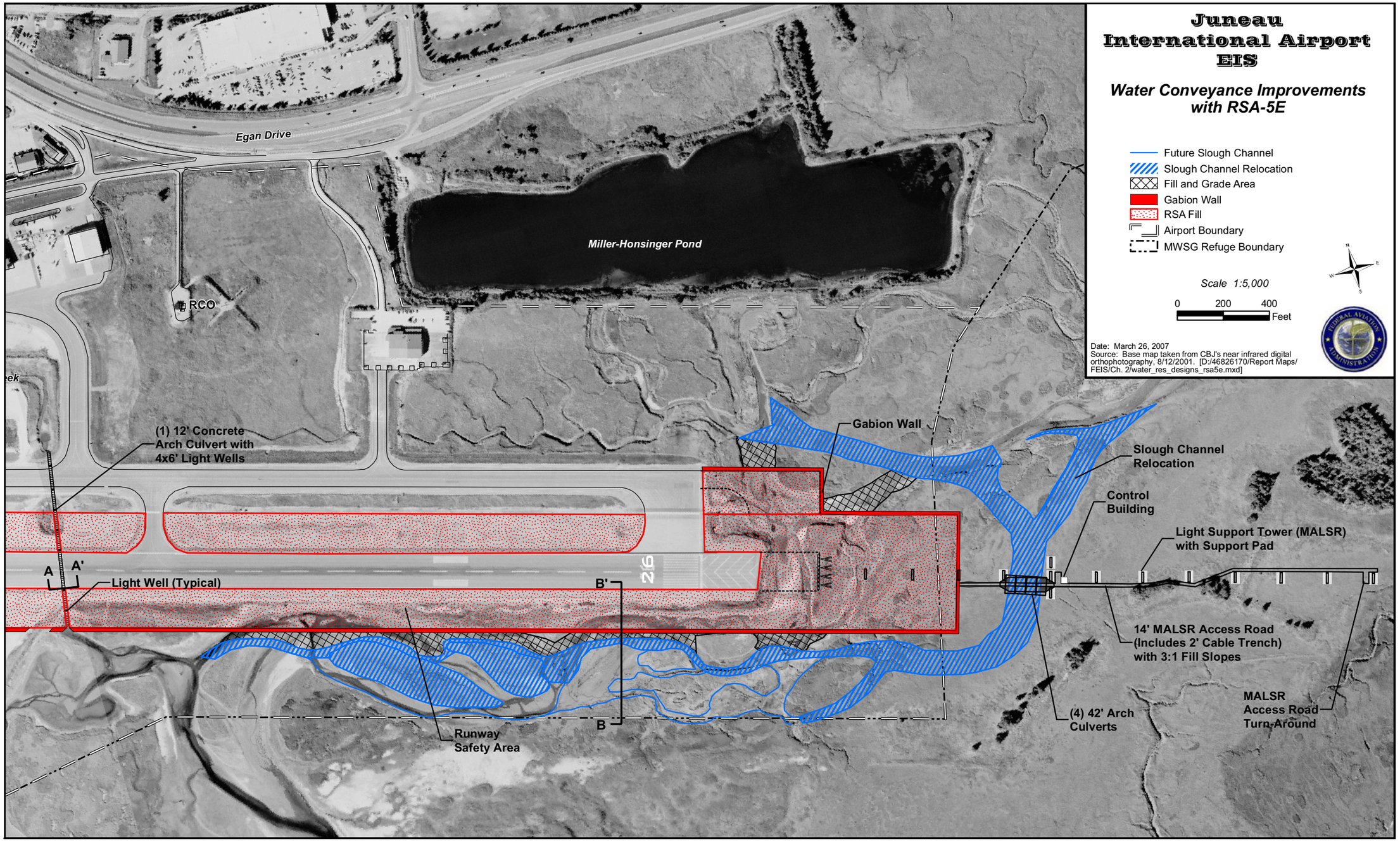

Figure 2-50. Alternative RSA-5E: water conveyance features.

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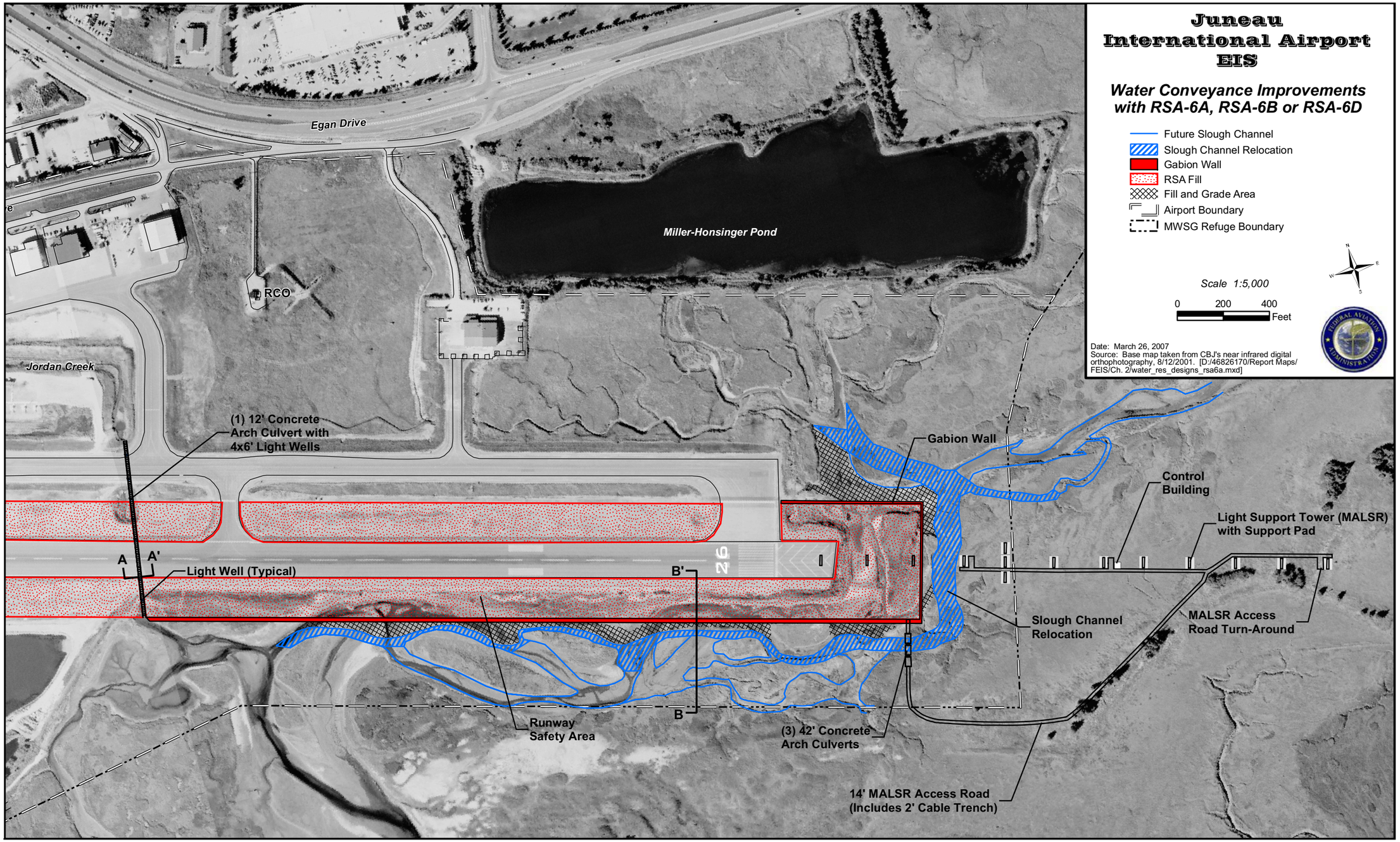

Figure 2-51. Alternatives RSA-6A, -6B, and –6D: water conveyance improvements (using RSA-6A for example).

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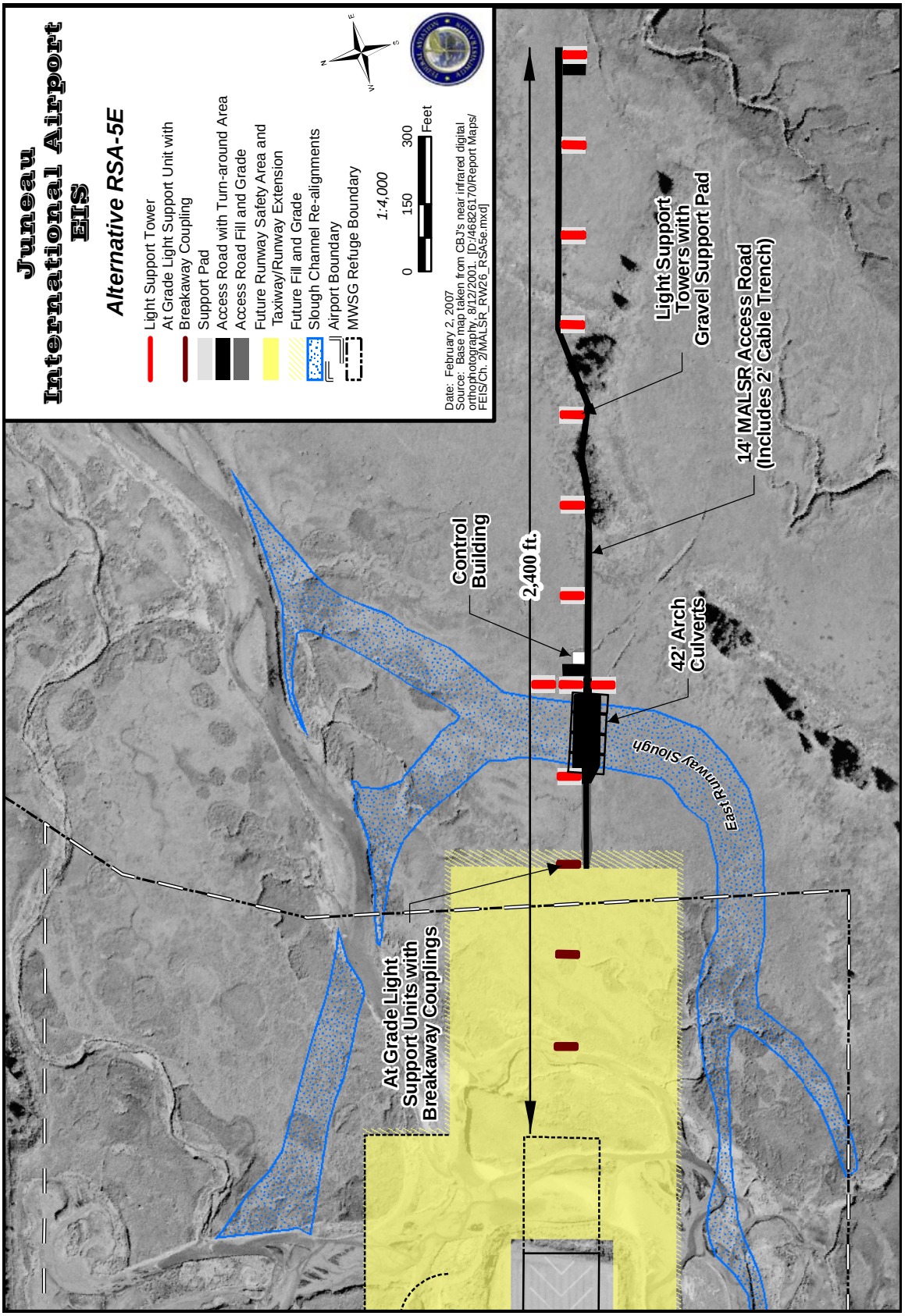

Figure 2-52. MALSR light and access road configuration shown for Alternative RSA-5E.

relocation is shown on Figure 2-53. Other possible water resource mitigation methods are also shown on this figure and described in the following sections. Figure 2-54 provides a cross section of possible additional minimization features on the Runway 26 and slope in association with the relocated channel.

2.11.3 JORDAN CREEK CULVERT

The addition of lateral safety area to the runway would necessitate extension of the culvert system carrying Jordan Creek. The proposed extension, described in Section 2.6.2, 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 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, the existing pipe culverts under the runway and parallel 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-foot 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. Figure 2-55 illustrates the Jordan Creek culvert improvements.

The conceptual design for the bottomless arch culvert was developed considering estimated maximum loads of the design aircraft, a B737-900. Similar arch culverts have been used at many airports including George Bush Intercontinental Airport, Buffalo Niagara International Airport, and Clinton County Airport (an Airborne Express international hub).

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. The new culvert system would have:

- A 12-foot span with 10-foot arch height, versus the existing 8-foot diameter.
- A more natural channel bottom than the current culverts, with some room to meander.
- Approximately a 10% reduction in velocities below 100 cubic feet per second (cfs)
- An increased flow capacity from 207 cfs to 813 cfs.
- A channel slope of 0.16%.
- A linear alignment; currently, the culvert under the taxiway is directionally offset from the runway culvert.
- An estimated flow velocity of 4.1 feet per second versus 4.3 feet per second at 120 cfs.
- Natural light vents placed approximately every 100 feet in the new RSA using 4-foot by 6-foot light wells.

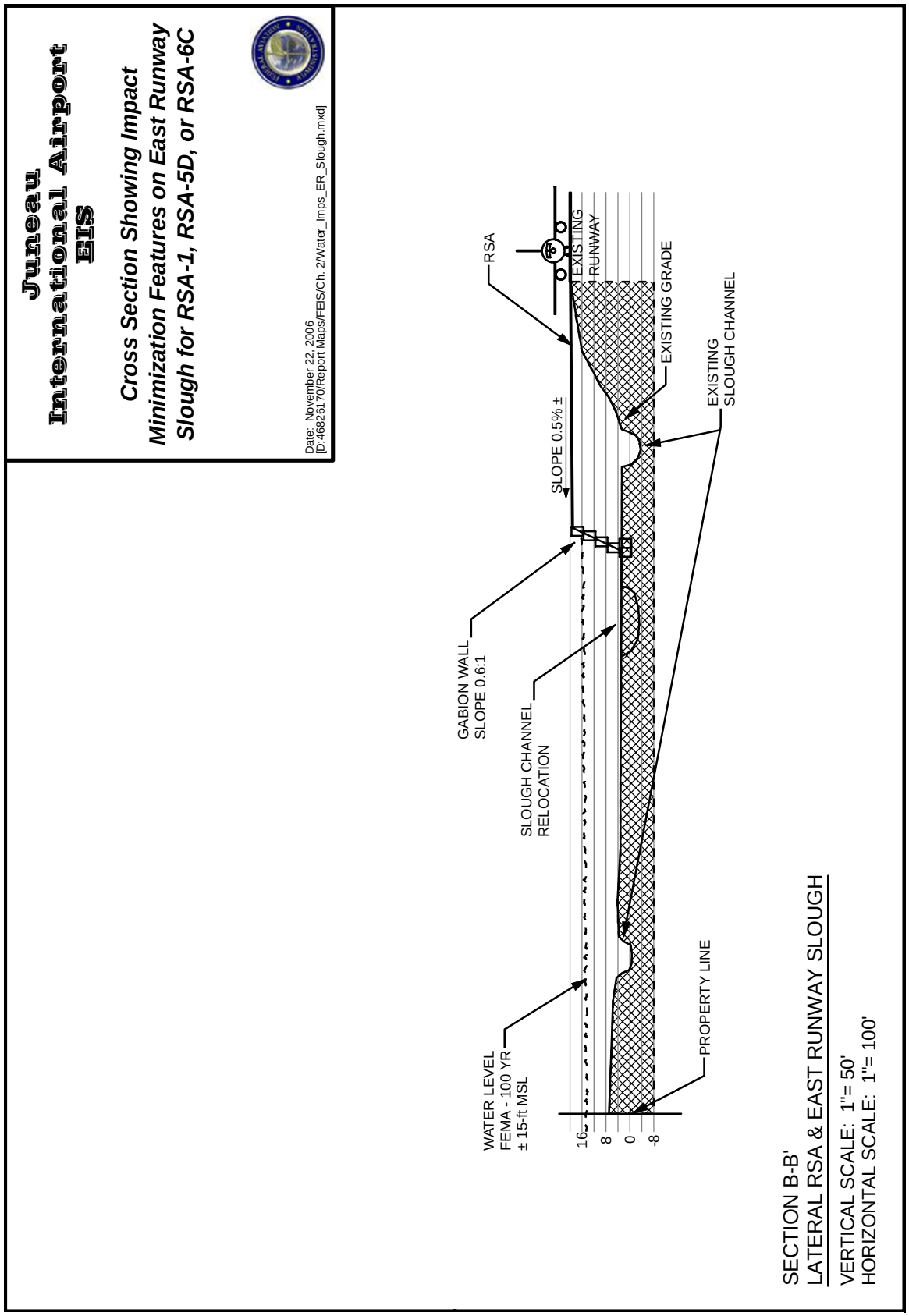

Figure 2-53. Cross section showing impact minimization features on East Runway Slough for RSA-1, -5D, or -6C.

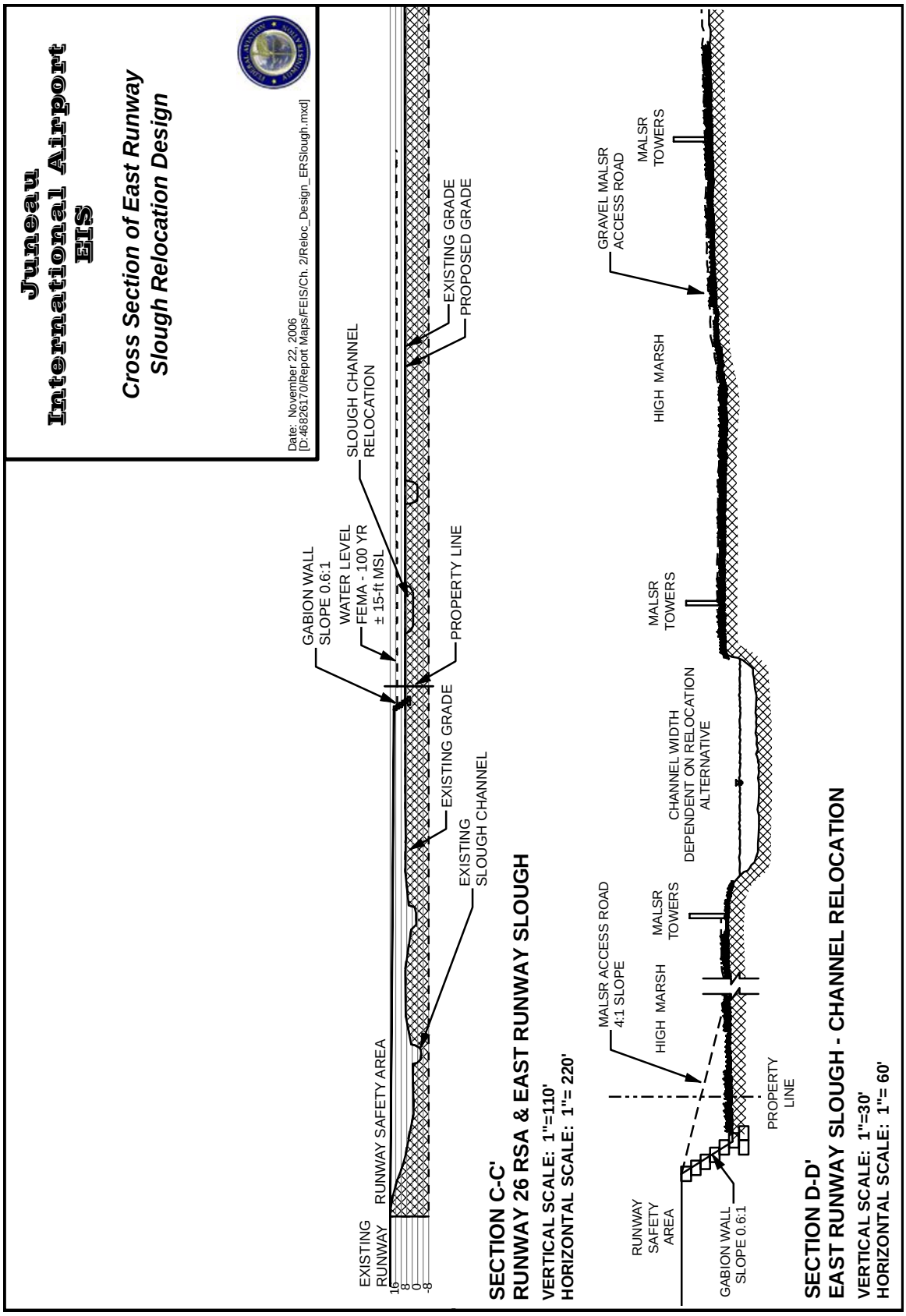

Figure 2-54. Cross section of East Runway Slough relocation design.

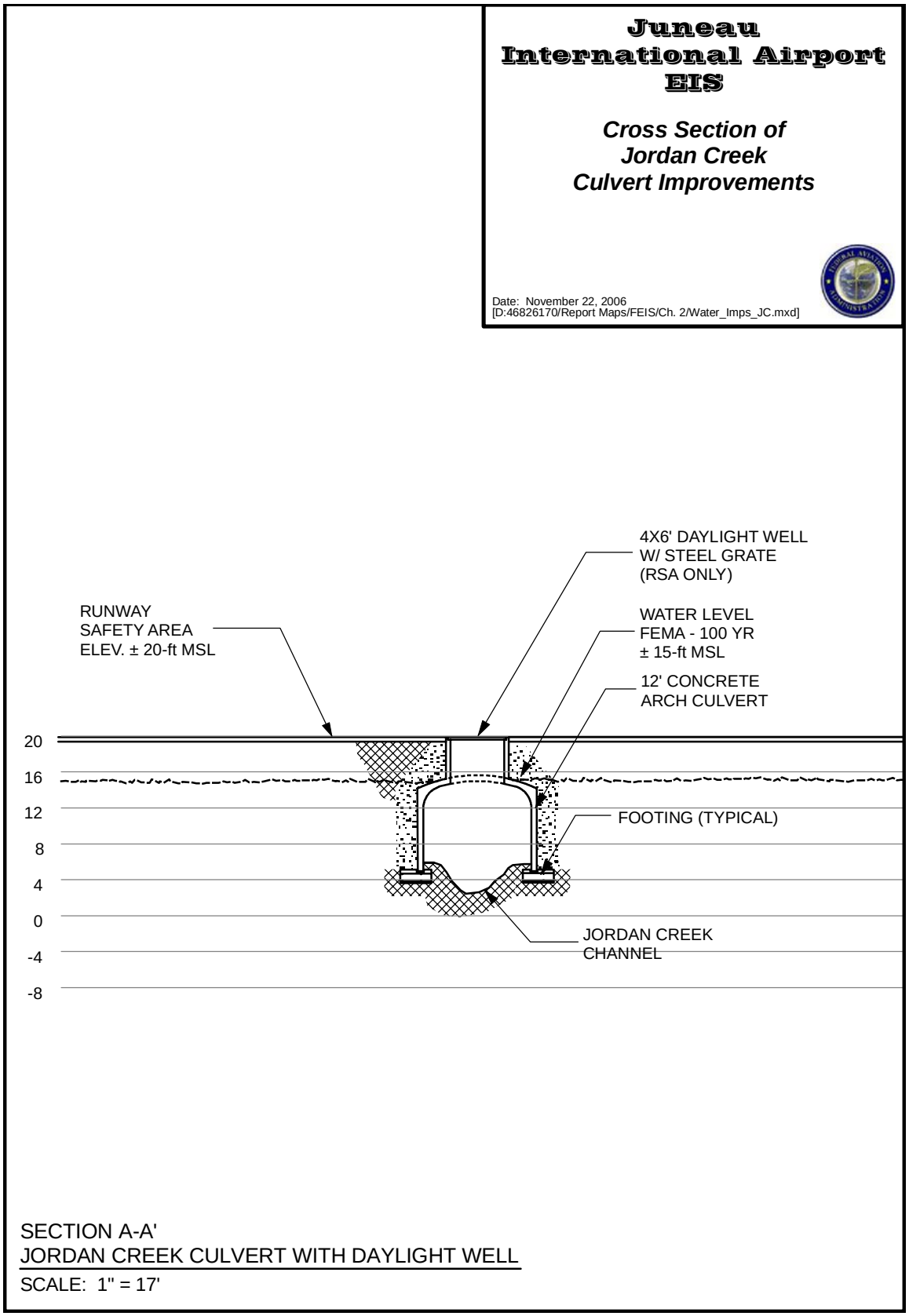

Figure 2-55. Cross section Jordan Creek culvert improvements.

Two important drawbacks are identified for this option. First, replacement of the entire culvert system would be expensive relative to the proposed "extension" system described in Section 2.6.2. A breakdown of the estimated costs for major components of the culvert replacement and extension options is provided in Appendix A. It is estimated that corrugated metal pipe culvert extensions would cost approximately $42,000, arch culvert extensions as proposed in Section 2.6.2 would cost $355,000, and a new 770-foot arch culvert system as described above, would cost about $2.3 million. This does not take into account any additional costs incurred due to the complicated installation requirements imposed by work on the active runway, raising the second concern.

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. Runway closure for any reason can represent a significant operational and safety concern, as aircraft would be forced to use the parallel taxiway in the interim. Ideally, the culvert work would be done in conjunction with other major runway projects, such as the next runway reconstruction project, so as to minimize the runway closure period to one event. By timing an arch culvert replacement to other runway work there would be no additional runway closure cost incurred, but it would mean the environmental benefits of the new system would not be realized for some time, as runway reconstruction may not be needed at Juneau 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 safety areas.

2.11.4 East Runway Slough

The fill installed 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 (or Miller-Honsinger Marsh). 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 focus of this analysis was the volume of water exchanged through tidal fluctuations, using a 24-foot range in tidal water elevation (from mean higher high water at 11 feet msl to mean lower low water at -13 feet msl). This large variability in flow, combined with the relatively flat ground surface on and around JNU, makes flow predictability more challenging. To reduce uncertainties the analysis established stream order and channel classifications for the major channels in the East Runway Slough system, created channel profiles using most current survey data, and conducted flow measurements in key channels to establish likely flow distributions. The complete description of this analysis may be found in Vigil-Agrimis 2006 located in Appendix L. 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, followed by RSA-6A and RSA-6D, and then RSAs-1, -5D, -6C and -5E. Alternative RSA-5C would extend the RSA and taxiway the furthest east. This alternative 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. The EMAS designs incorporated in Alternatives RSA-6A and -6B would disturb smaller areas and less habitat and costs to maintain hydrology would be accordingly lessened. Efforts to maintain hydrology would be most challenging and costly for Alternatives RSA-1, -5D,-5E and -6C, due to the greater safety area footprint and extent of disturbance into the Refuge east of the Airport. Although RSA-5C would have the largest disturbance footprint east of Runway 26, the hydrologic correction actions would actually be simpler and cheaper than for some alternatives because flow would be routed directly to the Sunny Slough.

An extreme high tide event was used to estimate potential flows that a channel or culverts would have to convey to maintain approximate hydrology to the area. For the highest tides, in the range of 20 to 23 feet msl, the borders of the marsh basin appear to include approximately 380 acres south and east of Miller-Honsinger Pond to approximately Sunny Point, out to the dredge islands and back to Jordan Creek. The existing topographic mapping is limited, so this estimate may be overly conservative. The peak existing tidal flow is then approximately 30,000 cfs. Using these assumptions, four options were considered to preserve flow.

2.11.4.1 Bottomless Arch Concrete Culverts for East Runway Slough

The first approach to pass flows in the slough was to consider four, 42 ft x 12 ft x 6 ft bottomless concrete arch culverts to keep the slough in the existing location. A channel width of approximately 160 feet would closely approximate existing conditions, but some preferential flow would be likely to occur through the culverts. The potential for channel avulsion (a dramatic displacement of the flow path) around the culverts would probably be low. 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 in order to carry 100% of the flow currently exchanged. This effort could require two construction seasons to complete, while flows are diverted entirely or at least partially during construction. 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 a tidal channel to develop around the RSA, in addition to or completely bypassing the new arch culverts, would probably be lower than for other culvert options such as corrugated metal pipes (see next section). This possibility is less likely for the alternatives with the greatest eastward fill footprints, and particularly for RSA-5C because fill would extend to an area of the marsh where land surface elevations are high (between 9 and 12 feet msl) and are therefore inundated only at higher tides. Conversely, RSA-6B (and to a lesser extent, RSA-6A) would have a higher likelihood of tidal channel development around the east embankment because marshplain elevations at the end of the fill would be relatively low (between 5 and 8 feet msl) and frequently inundated by tides.

2.11.4.2 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 approximately four feet deep and spaced 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 and greatest for RSAs-6A and -6B. With this in mind, fewer culverts could be used for the smaller footprints so that a combination of culverts and channel re-establishment provide 100% of the necessary tidal exchange.

2.11.4.3 Relocation of the East Runway Slough

The third conveyance approach is 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. For RSA-1, -5D, or -6C, the length of the relocated channel north and east of the runway would be approximately 3,000 feet and the depth of the excavation would be about 5 feet at the highest land surface elevation along the proposed slough alignment. As shown on Figure 2-48, the channel would be directed west, just south of the RSA, for about 2,800 additional feet to connect with Jordan Creek and sloughs south of the runway. However, the length and depth of the relocated slough channel varies somewhat depending on the RSA alternative. The channel construction required for Alternative RSA-5C would be relatively short, about 600 feet, to establish a connection with the tidal channels east of the Airport (see Figure 2-49, and discussion in next section). 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. This configuration is shown on Figures 2-50 and 2-51.

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 elevations 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. Figure 2-54 is a cross section showing the slough relocation features (based on the layout and sections provided in Figure 2-51).

2.11.4.4 Re-route Tidal Flow into Sunny Slough

A fourth conveyance approach that has been incorporated into RSA-5C is 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 (see Figure 2-49). 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. One challenge presented by this drainage option is that the marshplain and channel network south of Miller-Honsinger Pond is at a lower elevation than the highest point along Sunny Slough. As a result, water from high tides and stormwater runoff would be trapped in a "basin" south of Miller-Honsinger Pond. Sunny Slough would need to be deepened to provide positive drainage to this area. 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.

2.11.4.5 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. As shown in Appendix A, their costs 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.

Examination of archival aerial photographs shows that the existing hydrologic system has developed considerable channel complexity since first construction of the runway and subsequent improvements. As a result of isostatic rebound and uplift, the area continues to rise at an estimated 0.05 feet per year (see Section 3.5.3.7). The system has adapted so far by meandering to adjust to man-made activities and natural events. It is prudent to assume that the hydrologic system would adjust relatively quickly to any new barriers, such as the RSA, by continuing to develop new channel meander paths. This natural response suggests a low probability of success for a design using corrugated metal pipe culverts, since the high potential for preferential flow paths to develop would make it the most prone to failure.

The bottomless arch concrete culverts under the runway and RSA could, if successfully installed and maintained, aid in mimicking the existing hydrology of the area, but active relocation of the existing tidal sloughs would provide the most accurate restoration of current conditions. Culverts would maintain existing channel profiles, but there is risk that sediment or wood blockages could lead to bypassing the culverts. This is more likely with Alternative RSA-6B and, to a slightly lesser extent, RSA-6A and RSA-6D. Although active channel relocations would most accurately mimic the existing hydrology of the area, 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.

As noted in the introduction to Section 2.11.4, the potential threat to hydrology in areas drained and recharged by the East Runway Slough increases with the amount of fill placed east of Runway 26 and the eastward extent of that fill. Alternative RSA-5C would have the greatest disturbance to the east, with the RSA extending well into the Refuge. Without construction of a channel to direct flow north and west of the RSA, this alternative would disconnect the East

Runway Slough from the wetlands south of the Miller-Honsinger Pond. At the other extreme, Alternative RSA-6B would disturb relatively little area east of the runway (and Alternatives RSA-6D and -6A slightly more than RSA-6B). 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.

2.11.5 MALSR Access

The MALSR access road as described in Section 2.7.2 would extend east on a line from the runway, 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. Figures 2-48 through 2-51 illustrate MALSR configurations and possible access routes for the different alternatives.

2.11.5.1 MALSR Access Road

Figure 2-48 illustrates a MALSR access road configuration in conjunction with Alternatives RSA-1, RSA-5D, or RSA-6C that would be shorter than the one shown in Figure 2-17, and would lessen impacts to the high value wetlands and essential fish habitat. Arch culvert spans would be installed south from the east corner of the RSA across the tidal channel. It is estimated that up to 3 arch culvert spans would be placed in parallel. Each span would have 3 segments 42 feet wide by 14 feet high by 8 feet long. The purpose of the arch culvert spans is to support a road across the tidal channel on Airport property where it is much narrower or branched in different directions, as is expected to occur east of the runway. The road would then be directed on higher ground along spoils "islands" deposited during dredging of Gastineau Channel. This road along the spoils islands and the access to individual lights would be at grade, as described in Section 2.7.1.1.

The cost of the road alone in this option would be between $350,000 and $706,000, substantially more than a direct road from the RSA east to the final light stanchion. It was assumed that a 2,300-foot, all weather 14-foot wide road would be constructed at about $10 per square foot. Nine segments of 14-foot wide bottomless arch culverts at $75,000 per segment would add up to $675,000 more, but a 14-foot wide bridge crossing could be used to cut the channel crossing cost in half, to $318,000. Synthetic road surfacing and fill material would add another $10,000 to the estimate.

The access road would be somewhat simplified the farther east the RSA is completed. For example, with RSA-5C, the road leading from the RSA embankment to the lights would extend directly east, since a slough crossing would not be required. This same approach has been incorporated into Alternative RSA-5E, using a road on fill sloping down from the RSA to an at-grade road leading directly to the MALSR lights. For this alternative, illustrated on Figures 2-53 and 2-54, four arch culverts or a span bridge would be used to cross the newly constructed East Runway Slough to reach the lights east of the channel.

Alternatively, with the EMAS alternatives RSA-6A or -6B the access road would have to cross more estuarine habitat to reach the dredge islands, and there would be more light support pads located in the wetlands. In these instances the use of an access road trending directly east from the EMAS end would be required to reach lights on the Airport side of the reconstructed slough channel, while another road would be needed to cross the channel south of the runway and follow the dredge spoil islands.

2.11.5.2 Other MALSR Access Options

FAA considered other methods to reduce impacts to wetlands for this project. 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 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. FAA concluded from this analysis that 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.

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. Helicopter access to the MALSR would greatly increase maintenance costs, but the main concern that eliminates this method from potential application is operational. The helicopters would be operating in primary airspace, causing a disruption of operations and possible aviation safety concern. In addition, helicopter access would obviously be limited during poor weather conditions (this coincides with the conditions under which the approach light system is most important for improving pilot alignment) and alternate means of access would still be necessary.

FAA also considered other methods of construction that could reduce wetland impacts, such as using a barge to float construction equipment into the area on high tides. However, the need for a permanent access road eliminates the value of such difficult and expensive construction methods.

2.11.6 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 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.

2.11.7 STORMWATER MANAGEMENT

2.11.7.1 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 2006c). 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.

2.11.7.2 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.

2.11.7.3 OIL/WATER SEPARATORS

Oil/water separators are multi-chambered devices designed to remove hydrocarbon compounds, typically found in fuels, oil, 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. Discharge into the pond would provide residence time and biochemical treatment for compounds such as urea, glycols, and possibly hydrocarbons.

2.11.8 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 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.

2.12 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 (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. The actions proposed include the following steps to avoid impacts:

- The proposed RSA alternative (RSA-5E), which is also the preferred RSA alternative, avoids fill into the Refuge west of the Airport and minimizes direct impacts on the Refuge east of the Airport.
- Wildlife hazard management, under the preferred alternative, 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 DEIS, that use declared distances criteria to take advantage of new FAA criteria allowing shorter runway safety undershoot area, thereby reducing overall disturbance footprints. Section 2.11 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 proposed actions includes:

- RSA footprint has been shifted to the west (with relatively little affect on the Mendenhall River) as much as possible in recognition that activities to reduce wildlife hazards would also impact 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. Alternatively, Alternative RSA-5E was developed to prevent the placement of any runway safety area fill into the Mendenhall River channel.
- 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 Proposed Actions and 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.

2.12.1 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 mitigation 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.

2.12.2 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[40] was held May 3, 2001 at which time possible mitigation sites were identified. This discussion included

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

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 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.

2.12.3 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.

2.12.4 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 this FEIS includes 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 summarizes 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, 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.
3. JNU would obtain all necessary permits and authorizations prior to construction as identified in Section 2.13.7.
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 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.

2.13 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.

2.13.1 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 2.13.2, 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.

2.13.2 AGENCY PREFERRED ALTERNATIVES

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 2-25 summarizes the different needs for the Airport and the FAA's preferred alternatives for meeting those needs. Table 2-26 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 2-25. Summary Needs and Actions Comprising the FAA's Preferred Alternative

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 2-26. 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.

Table 2-26. Summary of Combined Impacts of All Actions Comprising FAA's Preferred Alternative, continued

Resource/Issue	Impact
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.
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.

Table 2-26. Summary of Combined Impacts of All Actions Comprising FAA's Preferred Alternative, continued

Resource/Issue	Impact
	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.

2.13.2.1 RUNWAY SAFETY AREA

A wide range of alternatives was considered to address the need for runway safety area 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. Table 2-13 in this chapter provides a comparative summary of the expected impacts.

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 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 on Table 2-13, and in the detailed cost estimates provided in Appendix A, the total cost (life-cycle + mitigation) for Alternatives RSA-6A and RSA-6B exceeds $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. 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."

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.

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 development of 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.

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 P.L. 109-443 to select Alternative RSA-5E.

2.13.2.2 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. Table 2-14 provides a comparative summary of the environmental impacts for two alternatives, NAV-2B and the No Action Alternative, NAV-3. 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.

2.13.2.3 Snow Removal Equipment and Maintenance Facility

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 were assumed to incorporate the same design, but in different locations. Table 2-16 provides a comparative summary of the environmental impacts associated with these and the no action alternative.

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 between the two action locations considered and their affect on 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.

2.13.2.4 Aviation Facilities: Aircraft Parking and Storage

As stated in Section 1.4.3, 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. After a rigorous analysis of the projected growth in aviation at JNU, FAA developed two comprehensive alternatives for facilities development on the Airport. Each alternative would use the Northeast Development Area for commercial and fixed base operations, as well as large aircraft hangars, and the Northwest Development Area for general aviation users, typically based tie downs as well as executive and t-hangars. The main difference between the two alternatives is FW/RW-1 would adapt the facilities layout around the existing Duck Creek corridor, while FW/RW-2 incorporates relocation of Duck Creek into the design. The costs to implement these two alternatives are similar, although relocation of Duck Creek would add approximately 7% to the overall development expense. Table 2-20 provides a comparative summary of the environmental consequences associated with these two alternatives and the no action.

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, low and at times no flows in some stretches during dry seasons, and 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.

2.13.2.5 Fuel Farm Access

JNU has proposed to construct a new fuel farm access road to address operational and safety concerns described in Section 1.4.3.2. Two alternatives to satisfy the needs 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. Table 2-21 provides a comparative summary of the environmental consequences associated with these two alternatives and the no action alternative.

There are environmental and economic tradeoffs associated with these two alternatives. Alterative FF-2 would involve a slightly larger disturbance area, but in the long term the disturbance between paved areas and the fuel farm could be reclaimed to native habitat. Both alternatives should 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 three times that to construct a new road, and for this reason FAA's preferred alternative is FF-1.

2.13.2.6 Wildlife Hazard Management Plan

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 include actions to reduce potential for aircraft collisions with wildlife. The actions described in JNU's WHMP (CBJ 2002a) were incorporated, with some modifications, into a comprehensive Alternative WH-1 for evaluation in this EIS. FAA subsequently developed two other alternatives (WH-2 and WH-3) incorporating varying amounts of habitat modification and wildlife hazard control to provide a range of alternatives for evaluation. In general, WH-1 would include the most habitat modification on and adjacent to the Airport.

With the exception of one action to fill the Float Plane Pond fingers to reduce attractants to waterfowl, Alternative WH-2 would include less habitat modification than Alternative WH-1 but it would also cost more to construct, primarily because of the use of synthetic cover material on infield areas. This alternative would also require a greater level of wildlife hazard control in the form of staff time and supplies; therefore, WH-2 would have greater annual operating costs than

WH-1. The construction cost of Alternative WH-3 would be substantially less than the other action alternatives because there would be much less habitat modification. Instead, the general emphasis in Alternative WH-3 would be increased staff commitment to hazard control and the use of adaptive management techniques (through education, monitoring, and evaluation) to adjust the program according to seasonal needs and species-specific concerns. As a result, though, Alternative WH-3 would have a greater annual operating cost than the other action alternatives.

FAA has evaluated the environmental and economic consequences of the actions incorporated into each 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, and national databases relevant to wildlife hazard management. FAA in general concurs with JNU's modified 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 (see Figure 2-56 for a representation of the location and nature of this fill in conjunction with the preferred RSA alternative, RSA-5E).
- Relocating the mouth of Duck Creek toward the north Airport boundary, from just south of the intersection of Cessna Drive and Alex Holden Way discharging 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 in the future to determine if additional habitat modifications (such as those incorporated in Alternative WH-1 of this EIS) would be required. 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, and
    - Removal of corvid nests as needed to prevent re-establishment of crow rookeries in the woodlands.

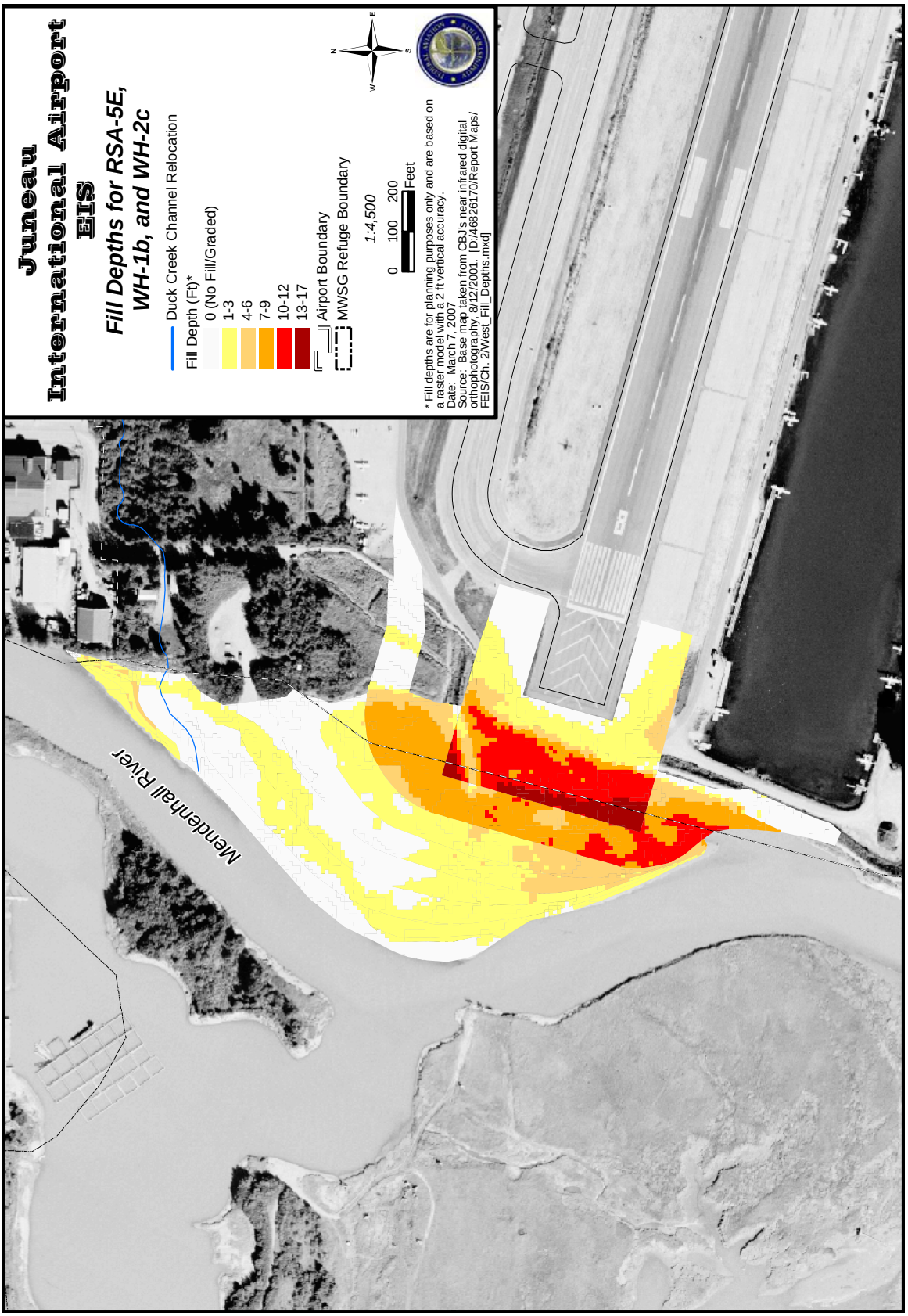

Figure 2-56. West end fill and grading depths for RSA-5E and wildlife hazard management actions WH-1b and WH-2b.

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

- 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, 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.

2.13.2.7 Compliance with Laws, Regulations, and Executive Orders

As noted earlier and listed in Table 1-8 of Chapter 1, 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 would be applicable to one or more of the actions. The following sections summarize the degree to which the preferred alternatives described in Sections 2.13.2.1 through 2.13.2.6 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 incor-

porated 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 identified 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 and adherence by JNU to any conditions of approval. 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.

2.13.2.8 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.

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