Alaska Department of Transportation & Public Facilities

Seward Airport Improvements

April 20, 2016

- Introductions & Project Purpose

  by Robin Reich, Solstice Alaska

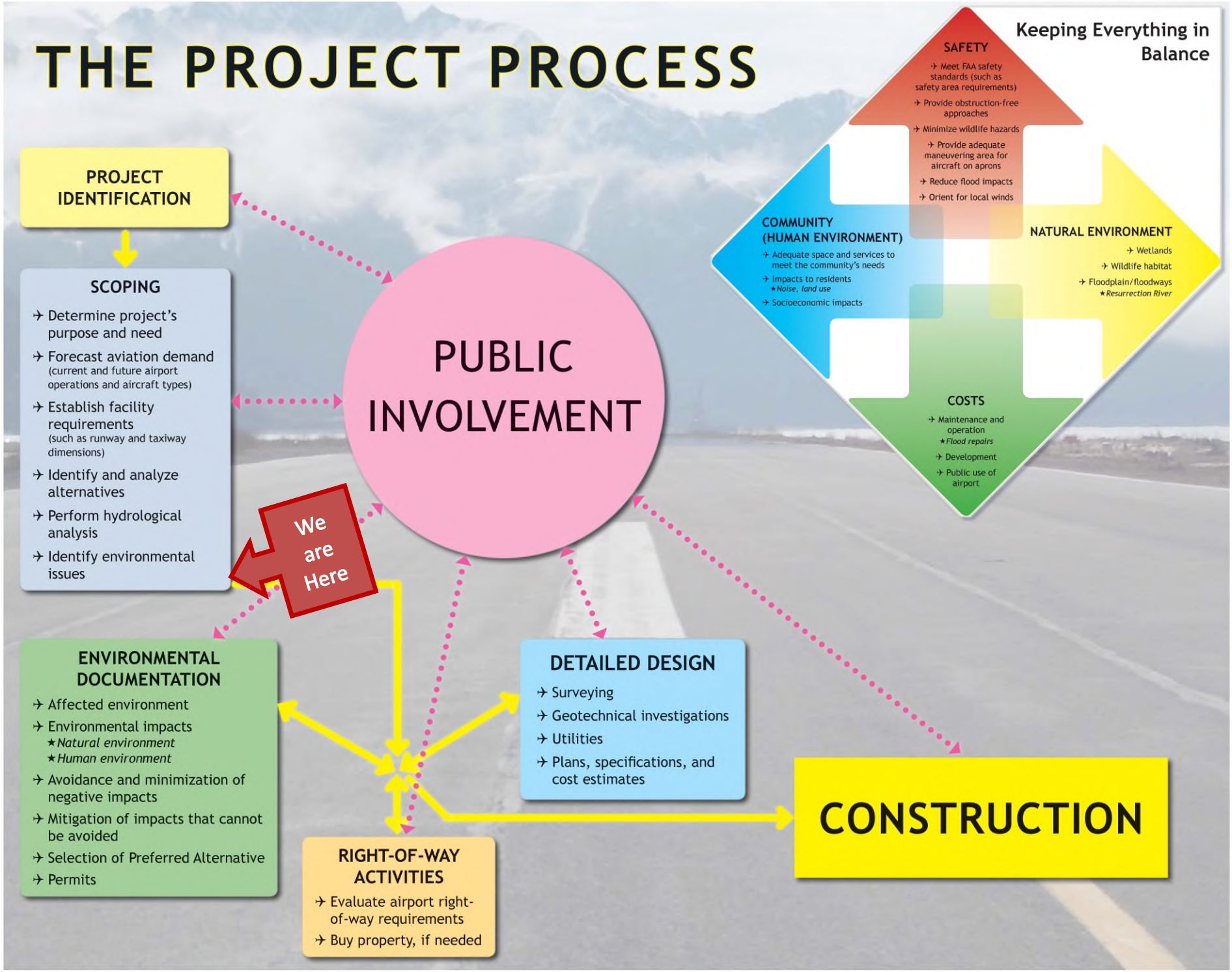
- Welcome

  by Barbara Beaton, DOT &PF

Project team

- **ADOT&PF**
  - Barbara Beaton, P.E.
    - Project Manager
  - Joy Vaughn, P.E.
    - Consultant Coordinator
  - Paul Janke
    - State Hydrologist
- **PDC Engineers**
  - Royce Conlon, P.E.
    - Project Manager
  - Angela Smith, P.E.
    - Project Engineer
  - Patrick Cotter, AICP
    - Project Planner
- **Solstice Alaska**
  - Robin Reich
    - Public Involvement Coordinator/Biologist
  - Carla SlatonBarker
    - Public Involvement Specialist
- **Hydraulics & H Modeling**
  - Ken Karle, P.E.
    - Project Hydrologist
- **Shannon & Wilson**
  - Kyle Brennen, P.E.
    - Geotechnical Engineer

THE PROJECT PROCESS



Recap of Project and The Challenges

- Hydrology
- Aviation Demand
- Funding

Challenge: HYDROLOGY

River flooding has caused:

- Extensive erosion that compromises the runway's pavement structure. As floodwaters recede, fines (the binding material or "glue") in the base materials are washed out, leaving voids between the large rocks under the pavement.
- Reduction of pavement strength, resulting in weight restrictions being placed on the main runway.

Why is River Hydrology an Engineering Challenge?

Solutions to river flooding must be cost-effective, long-lasting, and compliant with the requirements to secure environmental permits — a tough set of requirements considering:

River "Flood Zone"

- As you can see from the photos above, the Resurrection River isn't just near the airport—the main runway is located within the river's floodway. No engineering solution can permanently change the fact that the runway and the river compete for the same real estate.

River Type — On the Move and Hard to Control

- The Resurrection River is a braided river, meaning that it constantly moves from channel to channel within the floodplain—as the photos above show. Where any braided river will move over time is always a guess, but this is particularly true for the Resurrection River, which carries a lot of natural sediment (gradually clogging existing channels as it settles out) and meltwater (carving new channels during peak seasonal flows). Attempts to control braided rivers provide only short-term benefits, or else require constant maintenance and demand continual funding.

The Resurrection River has caused recurring damage to Seward Airport.

In 2013 alone, the river overtopped the runway 10 times.

Ways to Address the Challenging Hydrology

Raise, Armor, and Reconstruct Runway 13-31	The project will explore ways to better **protect Runway 13-31** (the existing main runway) from flooding by raising the elevation, adding armor protection, and then reconstructing the runway.	See Alternative 1.1 at Station 3
Close Runway 13-31 and Improve Runway 16-34 Instead	The project will explore ways to **improve Runway 16-34** (the existing crosswind runway) in terms of length, width, elevation, and flood protection/armoring. This idea explores closing the main runway to allow floodwater better access to the existing floodplain.	See Alternative 2.2 and Alternative 3.0 at Station 3
Reroute and/ or Dredge the Resurrection River	Rerouting the river via dredging or other in-stream options **is not viable.** These types of solutions require continual maintenance, funding, and permitting. Neither a dedicated funding source nor staff to manage the effort are available from DOT&PF.	Not an option

Seward Airport Today

- Runway 13-31 (main runway) 4,249 feet x 100 feet
- Runway 16-34 (crosswind runway) 2,289 feet x 75 feet

The project will focus on solutions to meet **near-term needs** of the current based aircraft PLUS medevac aircraft (King Air B200).

- A minimum runway length of **3,300 feet** will serve the existing based aircraft and medevac operations. (See the highlighted "Current Demand & Medevac" column in the table at right for the other minimum dimensions.)

The project will continue to consider a longer, 4,000-foot runway as a future growth scenario to accommodate the potential demand for commuter aircraft such as the Beech 1900 or the Dash-8.

- See the "Growth Scenario & Emergency Preparedness" column in the table at right for other minimum dimensions.

Challenge: AVIATION DEMAND

Ways to Address the Aviation Demand Challenges

Required Runway Dimensional Standards

(highlighted column notes dimensions to meet aviation demand at Seward Airport)

Feature	Current Based Aircraft Group	Current Demand & Medevac (King Air B200) *Recommended for Near-Term Development*	Growth Scenario & Emergency Preparedness (Beech 1900) *Consider for Long-Term Development*	Dimensions of Existing Main Runway (13-31)
Aircraft Approach Category	A	B	B	B
Aircraft Design Group	I	II	II	II
Runway Length	3,300 feet	3,300 feet	4,000/4,700 feet	4,249 feet
Runway Width	60 feet	75 feet	75 feet	100 feet
Visibility Minimums	1 mile	1 mile	1 mile	1 mile
Crosswind Component	10.5 knots	13 knots	16 knots	13 knots
Runway Safety Area	120 ft x 3,780 ft	150 ft x 3,900 ft	150 ft x 5,300 ft	150 ft x 4,749 ft
Object Free Area	400 ft x 3,780 ft	500 ft x 3,900 ft	500 ft x 5,300 ft	500 ft x 4,749 ft
Runway Protection Zone	1,000 ft x 500 ft x 700 ft	1,000 ft x 500 ft x 700 ft	1,700 ft x 500 ft x 1,010 ft	1,000 ft x 500 ft x 700 ft
Part 77 Primary Surface	500 ft x 3,700 ft	500 ft x 3,700 ft	500 ft x 5,100 ft	500 ft x 4,649 ft
Part 77 Approach Slope	20:1 (visual)	20:1 (visual)	20:1 (visual)	20:1 (visual)

Station #3 shows these dimensional standards as Alternatives.

Alternative 2.2 is the alternative recommended for near-term development. It meets FAA criteria for improvements to meet expected aviation demand.

FAA will support development of the airport to meet Aircraft Approach Category B and Aircraft Design Group II (B-II), which is 3,300 feet long by 75 feet wide, with visual approach capabilities. This standard is consistent with the 2008 Airport Master Plan and approved Airport Layout Plan.

Challenge: AVIATION DEMAND

Why is Aviation Demand an Engineering Challenge?

Sometimes what we ***want*** to design/fund differs from what we ***can*** design/fund. Improvement funding is determined by aviation demand. Specific challenges related to aviation demand in Seward include:

The number of operations (landings + takeoffs) at Seward Airport is **low** when compared to other airports statewide.

- The Seward Airport forecast estimates the number of operations will grow as shown below.

Operations	Base Year: 2013	+5 Years		+10 Years		+15 Years	
Local GA	2,000	2,127	2,208	2,260	2,438	2,402	2,693
Itinerant GA	4,000	4,252	4,417	4,520	4,877	4,805	5,387
Medevac	200	213	220	228	243	243	268
Air Taxi/Charter	4,500	4,713	4,969	5,085	5,485	5,406	6,056
TOTALS	10,700	11,375	11,814	12,093	13,043	12,856	14,404

Reference: Seward Airport Improvements, Revised DRAFT Aviation Activity & Facility Requirements, July 13, 2015.

- The number of operations is also low when compared to similar airports.

Airport	Annual Operations (2013)
Seward Airport (SWD)	10,700
Kenai Airport (ENA)	38,950
Homer Airport (HOM)	48,085
Dillingham Airport (DLG)	50,823

Aircraft using the airport now and in the future determine improvements.

- FAA can't fund "build it and they will come" improvements. Engineers must design improvements to serve the existing and forecast aircraft fleet mix based on the design aircraft. Below is the historical fleet mix.

Operator	Aircraft	Airport Approach Category	Airport Design Group	Use
LifeMed	King Air B200	B	II	Medevac
LifeFlight	King Air B200	B	II	Medevac
Guardian	King Air B200	B	II	Medevac
Scenic Mountain Air	Cessna 172	A	I	Flightseeing / air taxi
Seward Air	Super Cub PA-18	A	I	Personal
Private	Cessna 172 Super Cub PA-18	A	I	Personal
Private	Cessna 170	A	I	Personal
Grant Aviation	King Air B200	B	II	Air taxi / charter
Homer Air	Cessna C206/207/209/210 Stationair	A	I	Air taxi / charter
Smokey Bay Air	Cessna C206/207/209/210 Stationair	A	I	Air taxi / charter
Iliamna Air Taxi	Pilatus PC-12	A	II	Air taxi / charter
Island Air Service	Cherokee 6	A	I	Air taxi / charter
Alaska Central Express	Beech 1900	B	II	Air taxi / charter
ERA Aviation	Beech 1900	B	II	Air taxi / charter
Frontier Flying Service	Beech 1900	B	II	Air taxi / charter
Warbelows	Cessna 172	A	I	Air taxi / charter
Wright Air Service	Cessna 208 Caravan	A	II	Air taxi / charter
Other: Operators who requested permission to land in 2013	Lear 35 (11 requests) Gulfstream 5 (16 requests) DC-6	C C B	I III III	
Other: U.S. Coast Guard search and rescue activities and exercises	C-130	C	IV	

Reference: Seward Airport Improvements, Revised DRAFT Aviation Activity & Facility Requirements, July 13, 2015. Data from 2007-2013.

A facility as large as the existing airport isn't needed to accommodate the expected future aviation activity.

That means funding improvements that rebuild the airport to the existing size may not be possible or practical.

Additional Challenges

FAA design guidance requires the selection of a design aircraft, based on operations, to determine the size of facility that can be funded.

- **The design aircraft is the most demanding aircraft** (or family of aircraft) that REGULARLY uses the airport (now or in the future). The size of this aircraft sets the airport's length, width, and other dimensions.
- "Regular use" is defined as 500 operations (landings + takeoffs) per year.
- The most demanding aircraft (largest wingspan and longest runway length needed) currently using Seward Airport is the **King Air B200**, which is used for medical evacuations. While the annual operations of the medevac airport alone don't meet the FAA threshold of 500, the B200 is a part of the "family" of B-II aircraft serving Seward, which taken together do meet the threshold.
- Larger aircraft such as the C-130 and small charter jets do not fly into or out of Seward Airport often enough to meet the FAA's threshold of **regular** use.
- FAA does not fund public airports to support military operations or aircraft.

"Need to Know" Concepts

Aircraft Approach Category is a letter code (A to E) that classifies aircraft based on the speed at which the aircraft approaches a runway for landing. Category A aircraft approach at a slower speed than Category E aircraft; the higher the approach speed, the longer the runway needed.

Aircraft Design Group is a numerical code (I to VI) that groups aircraft by wingspan size. Group I has the smallest wingspan range, while Group VI aircraft has the widest wingspan range. The wider the wingspan range, the wider the runway needed.

Challenge: FUNDING

Challenge Number One

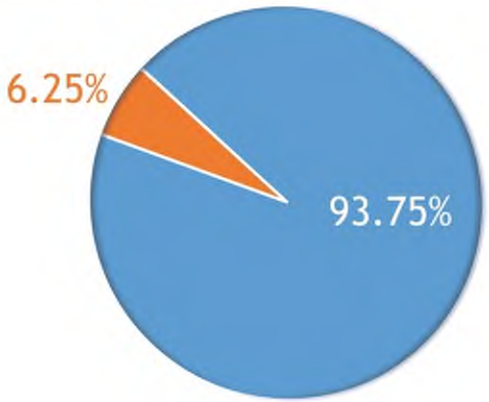
The FAA Airport Improvement Program (AIP) funding is based on a **competitive** scoring system. To receive funding, a project must score well. For the Seward Airport this is a challenge because of:

- The Competition!—Alaska has 249 state-owned airports and 20 municipally owned airports, all seeking funding. Many of these airports are the only means of year-round transportation of people, clothing, food, and fuel for their respective communities.
- Alternative Access—Airports with alternative access such as roads, railroads, and marine vessels do not score as high.
- No other funding source is readily available to DOT&PF. State funding through other sources is not likely in the near term due to Alaska's current fiscal crisis.
- Combining funding sources, although not impossible, proves to be difficult due to timing and commitments of other agencies.

Sources of Funding

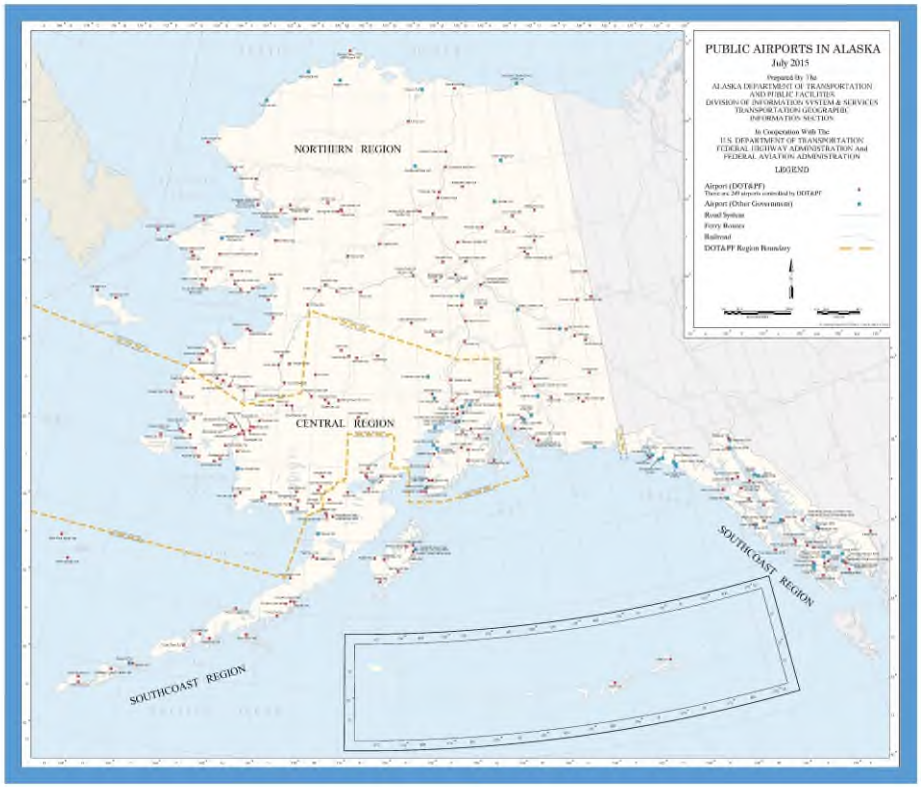
Primary: FAA Airport Improvement Program

Secondary: State of Alaska funds



"Since 2007, economic pressures—including high fuel prices, the financial crisis, and the ensuing recession of 2007-2009—contributed to airline restructuring...general aviation activity, which includes all forms of aviation except commercial and military, has also declined over the last decade. **Because many sources of airport funding, including federal support and locally generated revenue, are tied to aviation activity, for many airports these trends mean less funding available** for infrastructure development."

Statement of Gerald L. Dillingham, Ph.D., Director, Physical Infrastructure Issues
Highlights of GAO-14-658T, a testimony before the Subcommittee on Aviation, Committee on Transportation & Infrastructure, House of Representatives



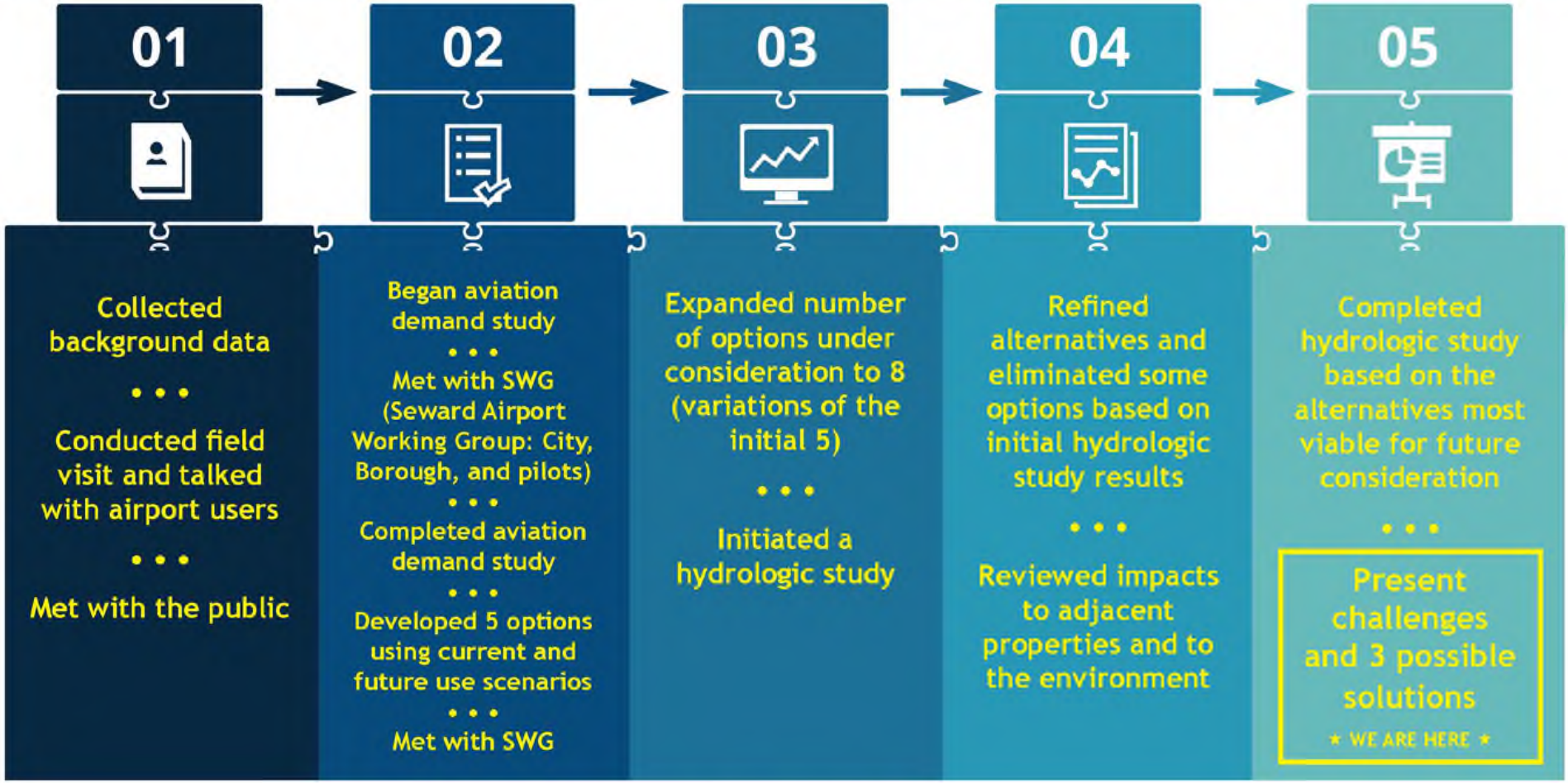
...And More Challenges...

- The AIP program has about $213 million to spend each year, and this is typically spread over 10 to 15 projects per year.
- The current estimate for the Seward Airport Improvements Project is about $20 million (about 10% of the AIP annual budget).
- Federal/state dollars continue to shrink, while the cost of construction increases.
- Due to budget cuts, future funding is not secure.

The Evaluation Process

Initial Alternatives and Refinement Process

What we've done so far:



Today we want to:

Show you the results of this work—our three final alternatives.

Gain additional input on the advantages and disadvantages of these three alternatives.

Evaluation Criteria

What Aspects of the project are most important to you?

COST

- Construction/earthwork cost
- Maintenance and operations (M&O)
- Right of way—preliminary costs only
- Eligibility for FAA funding

SAFETY, ENGINEERING, AND USER CONSIDERATIONS *(not covered by Cost)*

- Wind coverage
- Airspace/Runway Protection Zone (RPZ)/ approach obstructions
- User function/runway reliability/level of service (LOS)
- Long-term stability/risks
- Construction considerations

ABILITY TO SERVE THE COMMUNITY'S NEEDS

- Medevac
- Meets General Aviation (GA) needs
- Search and rescue
- Economic development

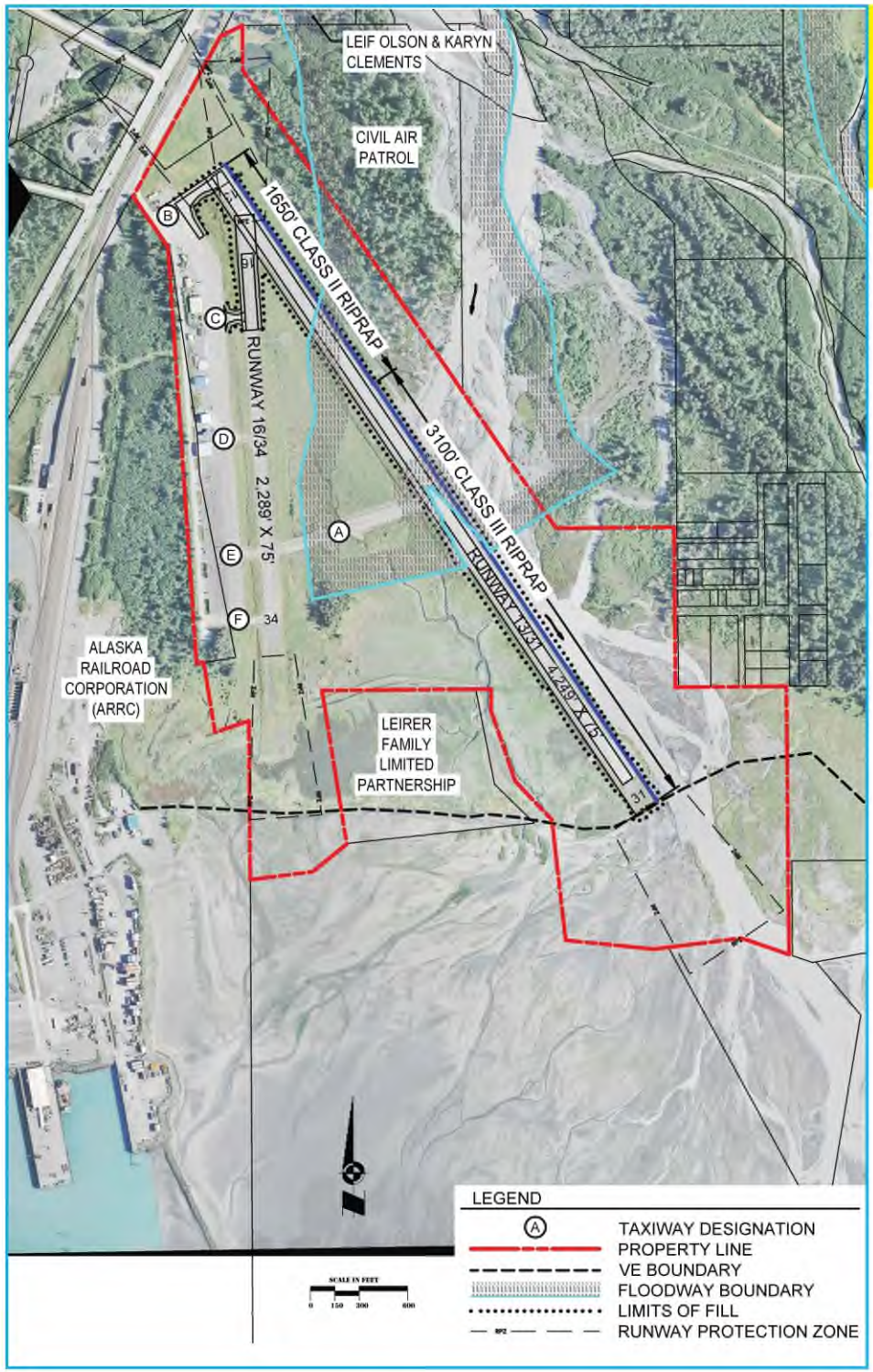
ENVIRONMENTAL CONSIDERATIONS

- Floodplain/floodway impacts
- Fish habitat impacts
- Wetlands impacts
- Endangered Species Act (ESA)/bald eagle habitat
- Human (socioeconomic) impacts—right-of-way impacts, compatible land use, etc.

Evaluation Matrix

Alternative Descriptions		Alternative 1.1		Alternative 2.2		Alternative 3	
	Main Runway Disposition	Raise the main runway (maintain existing length and embankment width) - protect from overtopping and protect from erosion		Allow main runway to be overtopped by floodwaters		Allow main runway to be overtopped by floodwaters	
	Crosswind Runway (CW) Disposition	Raise crosswind runway on north to match raised main runway.		Offset CW runway from apron to allow Design Group II aircraft; shift threshold north to avoid VE impacts; widen to 75' (150' safety area) and lengthen to 3300' (3800' safety area)		Offset CW runway from apron to allow Design Group II aircraft, shift alignment to avoid ARRC on south end, shift north to reduce impact in VE zone; widen to 75' (150' safety area) and lengthen to 4000' (4600' safety area)	
	Hydraulic Analysis	Use Q100 with 2-foot freeboard on main runway. This option is within the floodway; consider impacts to properties due to change in the floodway		Use Q100 with 2-foot freeboard on CW; raise CW elevation; provide erosion protection		Use Q100 with 2-foot freeboard on crosswind; raise CW elevation; provide erosion protection; provide protection for the portion in the VE zone	
Evaluation Criteria		*Advantage*	*Disadvantage*	*Advantage*	*Disadvantage*	*Advantage*	*Disadvantage*
Cost							
	Construction/Earthwork Cost - for comparison only -Not total project costs		$13 million		$11 million		$16 million
	Maintenance & Operations (M&O)	Acts as a levee to protect the apron from 100-year flood	More snow removal and pavement surface to maintain than others - assumes the erosion protection is stable/permanent and no additional costs for M&O within the design life. More lighting and pavement markings to maintain.	M&O costs will be less; pavement and lighting for only one runway; new runway embankment acts as a levee to protect the apron from flooding	Maintain closed runway markings; assumes the stabilization is permanent and no additional costs for M&O within the design life	M&O costs less than existing. Only one runway with pavement and lighting to maintain. Embankment acts as a levee to protect the apron from flooding	Similar to Alt 2.2, although slightly more because the longer runway requires additional maintenance due to extra pavement, markings, lights, etc.
	Right of Way - preliminary costs only		$1,300,000		$950,000		$950,000
	FAA Funding Eligibility	Generally easier to get approval of work on existing facility	Two runways may be seen as unwarranted; Environmental impacts could trigger scrutiny of funding	Should be eligible	None	Should be eligible for FAA funding up to 3300' length.	4000' length would require other funding sources to supplement the FAA funding.
Ability to Serve the Community's Needs							
	Medevac	Longest runway - best for jets; also see wind coverage. Allows C-130 access in case of a mass casualty event (very infrequent need).		Serves the King Air 200, provides for basic medevac service	Too short for jets	Longer than Alt 2.2, 4000' length preferable for King Air pilots.	Too short for long-range jets with destinations outside of Alaska
	Meets General Aviation	Improves Runway. Exceeds the forecasted aviation needs.		Improves Runway most often used and adds length. Wider/longer runway accomodates operational tolerance during occasional strong winds.		Improves Runway most often used and adds length. Wider/longer runway accomodates operational tolerance during occasional strong winds.	
	Search and Rescue	Improves Runway		Better Apron Access	Eliminates Longer Runway	Better Apron Access	Shorter than Alternative 1.1
	Economic Development	Longest runway - supports occasional use by Lear jets, tourism opportunities, larger cargo and passenger planes, improves reliability (runway open under a greater range of conditions) and potential for aviation-related business development at the airport including Lear jets and commuter operations	No change to apron area, which limits use of large aircraft on the apron, thus limits business development.	Runway offset provides for larger aircraft (DG II) on the apron taxilane; provides more areas for use by larger aircraft and thus could provide FBO's with greater operational area	Runway too short for Beech 1900 commuter service	Runway offset provides for larger aircraft (DG II) on the apron taxilane, longer runway facilitates use by FBO's including commuter aircraft and some short range jets	
Safety, Engineering & User Considerations (Items not covered by Costs)							
	Wind	Two runways provide slightly better wind coverage for small aircraft. Combined coverage DG II >98.99, DG I = 99.64	Longer runway (13/31) orientation is not as good as the "crosswind" runway. RW 13/31 coverage DG I = 91.1%, DG II = 96.8%	Provides longer/wider runway for best wind coverage orientation; DG I = 98.6% ; DG II = 99.53%. A number of pilots seem to favor improving the cross-wind versus the main runway.	Slightly reduced coverage due to single runway but meets FAA guidelines for a single runway.	Provides longest runway for best wind coverage orientation; DG I = 98.6% ; DG II = 99.53%. A number of pilots seem to favor improving the cross-wind versus the main runway.	Slightly reduced coverage due to single runway but meets FAA guidelines for a single runway.
	Airspace/Runway Protection Zone (RPZ)/Approach Obstructions	**Airspace**: Higher runway, slightly less penetration of airspace	**RPZ**: Main runway has undesirable uses in the RPZ (Public Road, Railroad) **Approach:** Existing obstructions in the RW 13 approach (road, railroad) would remain. ARRC is planning barge loading/unloading facilities under the approach of RW 34.	**Approach**: Horizontal shift of runway moves the RW 34 approach away from the proposed ARRC development; Closing the main runway significantly reduces RW 13 RPZ obstructions.	RPZ: ARRC development for barge operations (jetty, access road) may occur in RPZ.	**Approach**: Horizontal shift of runway moves the RW 34 approach away from the proposed Alaska Railroad development. Significantly reduces RW 13 RPZ obstructions.	RPZ: ARRC development for barge operations (jetty, access road) may occur in RPZ. RPZ and approach extend into the planned ARRC barge basin.
Environmental Considerations							
	Floodplain/Floodway Impacts	Provides flood protection for apron since runway acts a levee. Raises Main RW 2 feet above 100-year flood level.	In the floodway - increases the flood elevation by up to 4', impacts additional private properties. Permitting will face more obstacles due to public process and floodway impacts = expensive and time delays. Impacts the floodway - requires revision to the FIRM map. Process includes public involvement.	Provides flood protection for apron since runway acts a levee. Does not impact the floodway - no change to the FIRM map needed. Eventual breach of main runway would partially remove an obstruction in the floodplain/ floodway.	Greater chance for channel movement into the floodplain when flood waters breach the main runway. In floodplain - increases the flood elevation by <1 foot (with coastal flooding considered), (however based on previous discussions by DOT with FEMA and City 1' rise is okay)	Provides flood protection for apron since runway acts a levee. Eventual breach of main runway would partially remove an obstruction in the floodplain/ floodway. Construction penetrates the VE zone, but is still more likely permittable than Alt 1.1.	Greater chance for channel movement into the floodplain when flood waters breach the main runway. In floodplain - increases the flood elevation by <1 foot (with coastal flooding considered), (however based on previous discussions by DOT with FEMA and City 1' rise is okay). Does not impact floodway but a revision to the FIRM map needed to change the limits of the VE zone.
	Fish Habitat Impacts	Least impact to intertidal (coastal) EFH area for salmon and marine fish species	Requires in water work to place erosion protection; most impacts to Resurrection River mainstream, which is EFH for salmon species	Fewer impacts to intertidal EFH than Alt 3. No impacts to Resurrection River than Alt 1.1.	More impacts to intertidal EFH than Alt 1.1.	In instream impacts to the Resurrection River	Greatest impacts to intertidal EFH; but is not within marine habit.
	Wetlands Impacts	No wetlands fill associated with RW 16-34.	Most impacts to wetlands from fill in River to raise RW 13-31. May be difficult to permit because Clean Water Act requires selection of practicable alternative with least impacts.	Most permittable. Fewer acres of impacts than Alt 1.1.	Similar wetland impacts to Alt 3, but less due to shorter RW).	Fewer acres of impacts than Alt 1.1.	Similar wetland impacts to Alt 2.2 but more due to longer runway. Fill for longer RW would be harder to justify.
	Endangered Species Act (ESA)/Bald Eagle	Farthest from Resurrection Bay where sea lions, otters and harbor seals are known to be located. Most acceptable under ESA and MMPA	Possible bald eagle nest impacts (based on 2004 nest sites), more so than with other alternatives	Similar distance from Resurrection Bay as Alt 3. Less fill near or in the bay than Alt 3.	Fill in/near Resurrection Bay and possible bald eagle nest impacts	Similar distance from Resurrection Bay as Alt 2.2.	Least acceptable under ESA and MMPA. More fill than Alt 2.2 in/near Resurrection Bay.
	Human (Socioeconomic) Impacts (ROW Impacts, Compatiable Land Use)	Greater reliability of main RW and keeping both runways provides increased capacity, higher LOS. This option would provide additional protection for the ARRC facilities	Flood plain impacts would impact more private properties adjacent to River and the affect their property values; portions of the impacted property are undeveloped and the properties lack access.	Flooding affects reduced therefore less property impacts during Q100. Longer RW 16-34, but not as long as in Alt 3.	Loss of main RW and short length of RW 16-34 less favorable to the City from Economic development potential standpoint. Restricts access to floatplane takeout area.	Longer RW 16-34 than Alt 2.2; provides oppunitty for larger aircraft	Loss of main RW; Restricts access to floatplane takeout area.

large infrequent aircraft, such as Coast Guard C-130 will be unable to use as well as some larger commuter aircraft.	Lengthens the runway along the orientation for prevailing winds; improves apron expansion opportunities; reduces congestion; provides full safety area. Higher (above the flood) runway will improve the reliability of the airport. Shorter taxi path.	Still limits use by infrequent large aircraft, but functions well for based aircraft, medevac, and future commuter aircraft; Single runway provides lower LOS than two runways
Potential risk to downstream (ARRC) facilities if the river moves	Provides flood protectors for apron. Runway is sited further from the river, less potential for flood impacts.	Potential risk to downstream (ARRC) facilities if river moves; is within VE zone and susceptible to tidal influence (greater potential effects from sea level rise).
Construction phasing will be most challenging. If excavation from abandoned runway is used for fill, both runways will be under construction concurrently.	Same as Alt 2.2.	Runway extends out into tidally influenced region. Requires extension of Riprap into the tidal zone. CLOMAR/ LOMAR may be required and could delay construction, but expected to be easier and quicker to obtain than Alt. 1.1. Longer runway is more flexible for construction phasing.



ALTERNATIVE 1.1

Reconstruct Existing Main Runway (13-31) (4,249 feet x 75 feet)

- ✈ Reconstruct and raise Runway 13-31 above the 100-year flood level. Install riprap to protect the embankment.
- ✈ Adjust elevations of Runway 16-34 and Taxiways B and C to match new runway elevation. Eliminate Taxiways A, D, and E to comply with new FAA guidance.

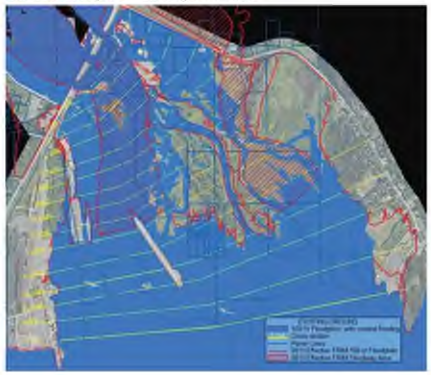
Key Advantage

+ Runway will still accommodate historical jet traffic, although it will be slightly shorter to provide the full required Runway Safety Area.

Key Disadvantages

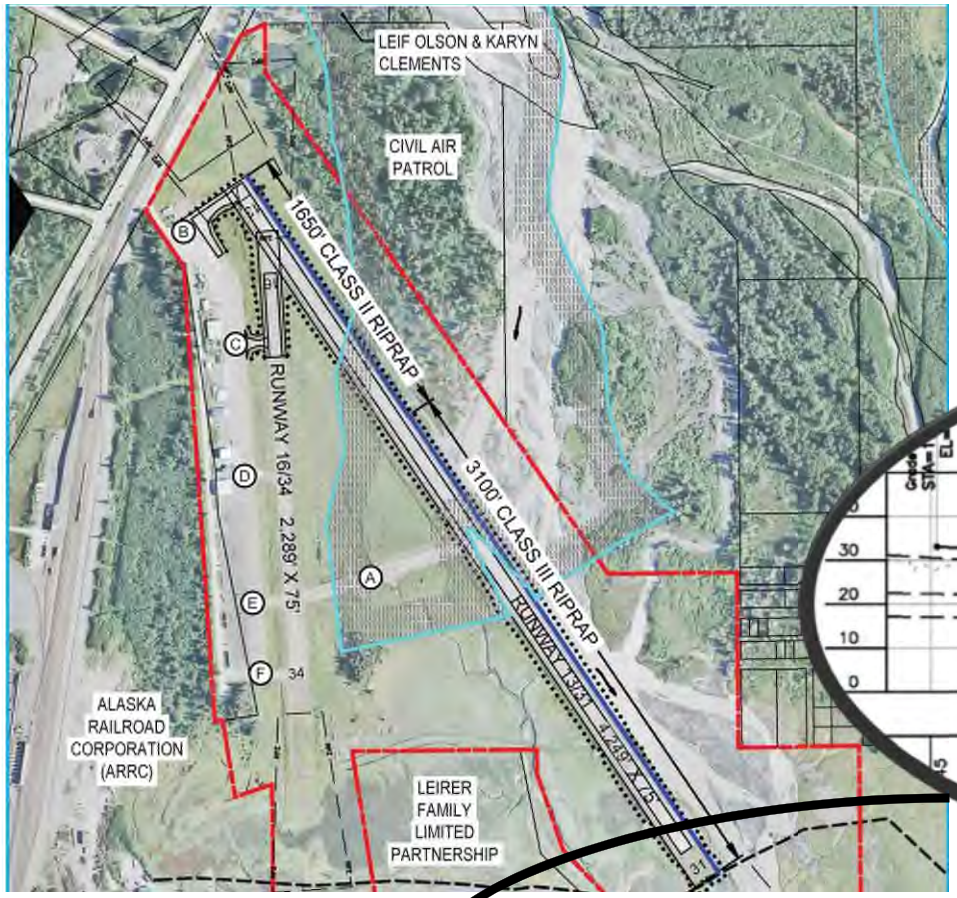
- Creates the greatest flood impacts.
  - Requires armoring and raising the runway by 4 feet on average.
  - The higher runway will redirect more flood water further to the other side of the river, impacting more properties than the other alternatives, thereby lengthening the property acquisition phase.
  - Impacts the Resurrection River floodway, requiring a revision of the FIRM (flood) map. May not be achievable due to the additional impacts to river properties. Requires a public process. The FIRM revision is expected to lengthen the permitting process by about 2 years.
- Most difficult option to permit and construct due to the work required in the river.
- Offset from the apron remains substandard for large aircraft.

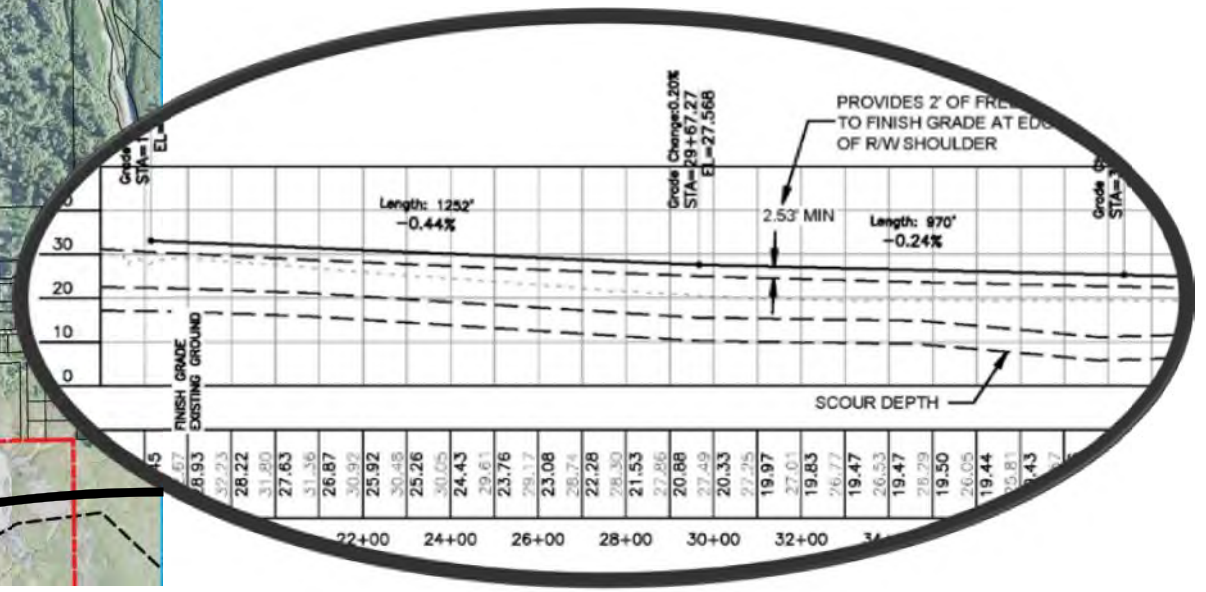
100-Year Floodplain - Existing Conditions

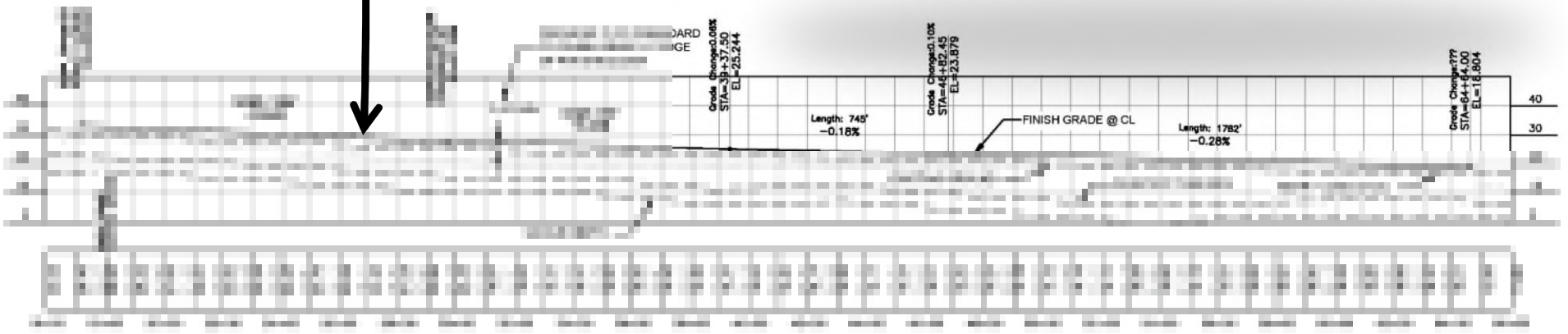


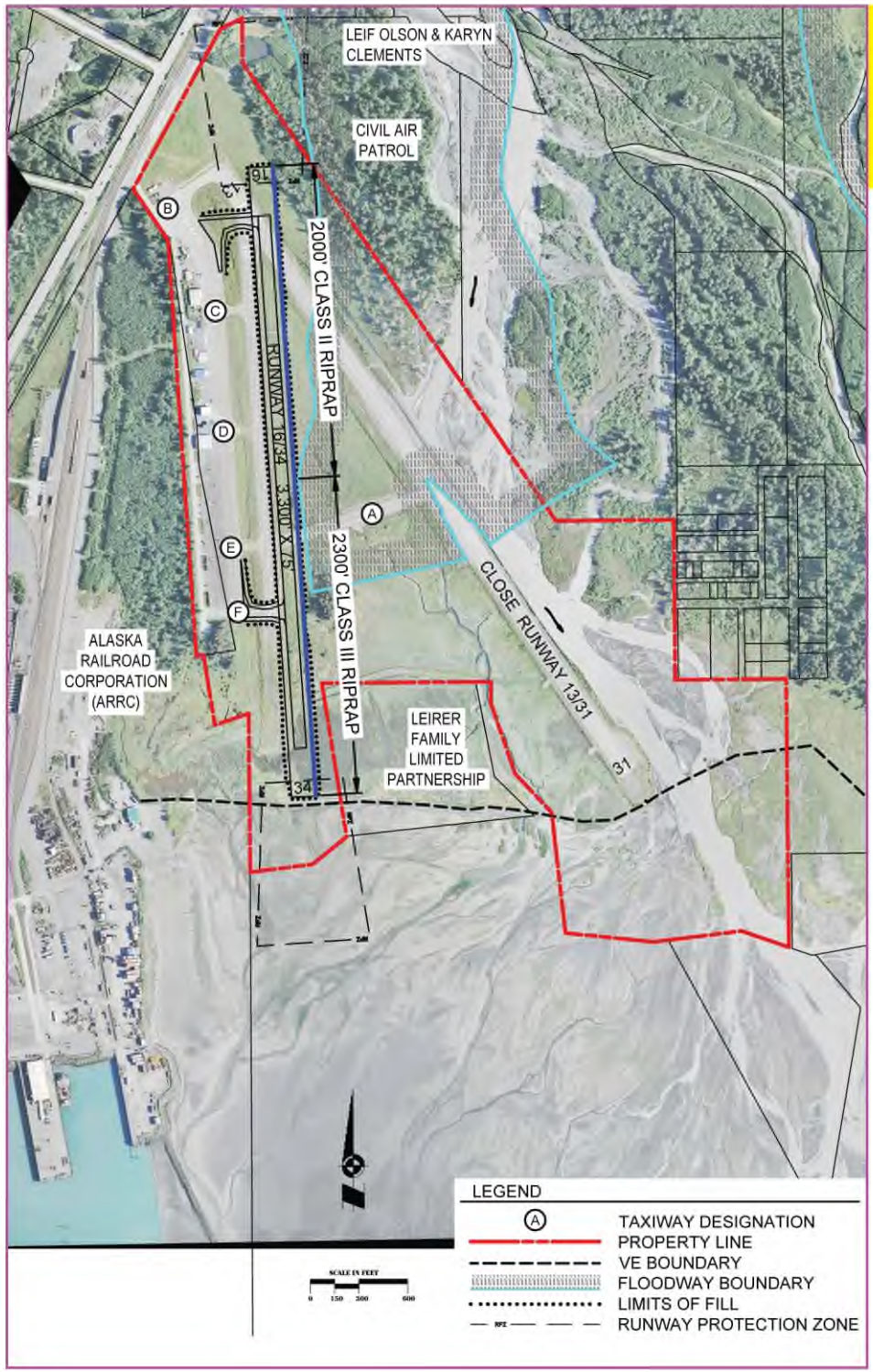
100-Year Floodplain - Alternative 1.1

Alternative 1.1









ALTERNATIVE 2.2

Shift Existing Crosswind Runway (16-34) East & Add 1,011 Feet (3,300 feet x 75 feet)

- ✈ Close Runway 13-31 and allow floodwater to overtop it.
- ✈ Reconstruct and raise Runway 16-34 above the 100-year flood level. Install riprap to protect the embankment.
- ✈ Relocate Taxiway B and adjust Taxiway F to match new runway elevation. Eliminate Taxiways A, C, D, and E to comply with new FAA guidance.

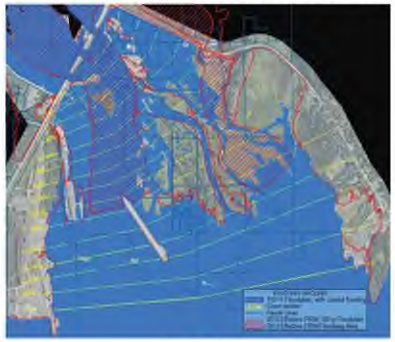
Key Advantages

+ Sufficient for current and predicted aircraft demand. Accommodates the design aircraft.
+ Less susceptible to flood damage than Alternative 1.1, since improvements are located further away from the river threat.
+ Lengthens the runway that is best aligned with the predominant wind direction.
+ Increases the runway offset from the apron to allow larger aircraft to use the apron.
+ Has the least environmental and flood impacts of all alternatives. Impacts the floodplain but not the floodway.
+ Raises the 100-year flood level by less than 1 foot, resulting in minor additional flood impacts to river properties. Fewer properties to be acquired than Alternative 1.1, and consequently, a shorter property acquisition process.
+ Could be phased to extend to a longer runway as future demand warrants.
+ Easiest option to construct.

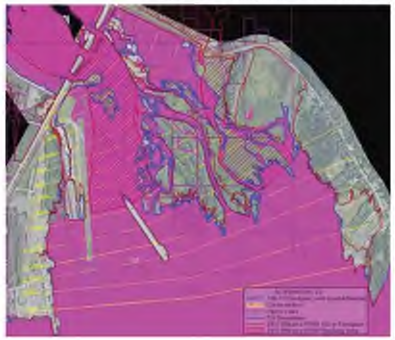
Key Disadvantages

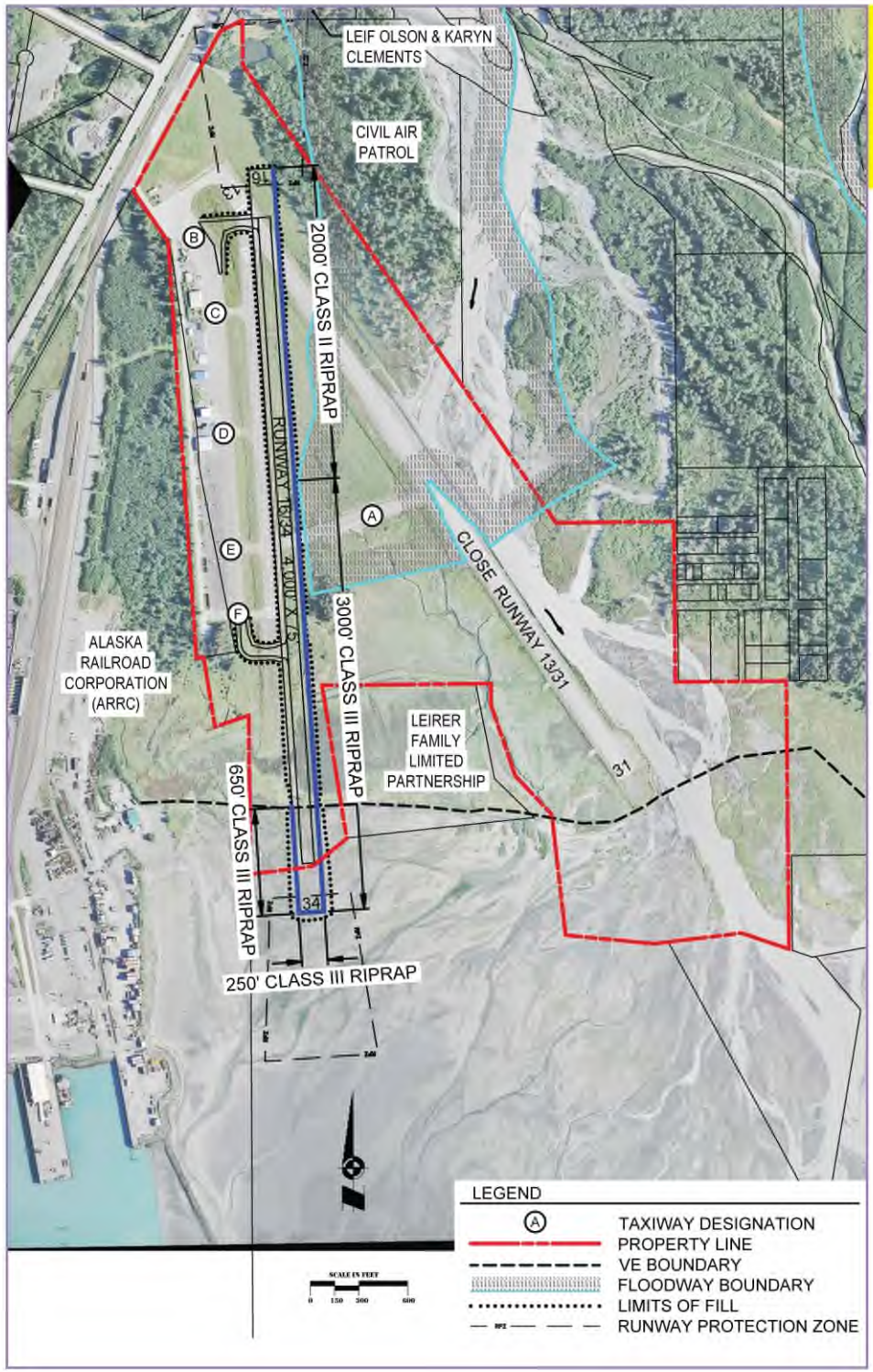
- One runway (13-31) would be eliminated.
- The new, improved Runway 16-34 would be 949 feet shorter than the abandoned runway.

100-Year Floodplain - Existing Conditions



100-Year Floodplain - Alternative 2.2





ALTERNATIVE 3.0

Shift Existing Crosswind Runway 16-34 East & Extend by 1,711 Feet (4,000 feet x 75 feet)

- ✈ Close Runway 13-31 and allow floodwater to overtop it
- ✈ Reconstruct and raise Runway 16-34 above the 100-year flood level. Install riprap to protect the embankment.
- ✈ Relocate Taxiway B and adjust Taxiway F to match new runway elevation. Eliminate Taxiways A, C, D, and E to comply with new FAA guidance.

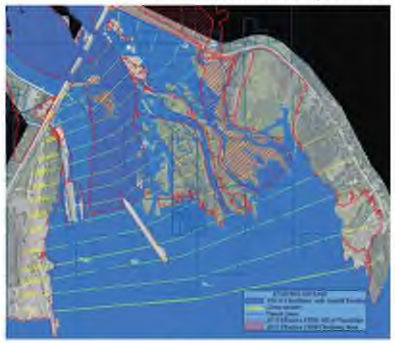
Key Advantages

+ Less susceptible to flood damage than Alternative 1.1, since improvements are located further away from the river threat.
+ Is longer than Alternative 2.2, which allows for use by commuter aircraft such as the Dash-8.
+ Lengthens the runway that is best aligned with the predominant wind direction.
+ Increases the runway offset from the apron to allow larger aircraft to use the apron.
+ Raises the 100-year flood level by less than 1 foot, resulting in minor additional flood impacts to river properties. Fewer properties to be acquired than Alternative 1.1, and consequently, a shorter property acquisition process.

Key Disadvantages

- Requires an alternative funding source. The additional 700 feet of runway length do not qualify for federal funding.
- Impacts the Velocity Zone (tidelands) on the FIRM (flood) map, requiring a revision to the FIRM map. Necessitates additional engineering to provide protection against the Resurrection Bay flood impacts.
- May take longer to obtain permits than for Alternative 2.2 due to tideland impacts, but shorter time than Alternative 1.1.

100-Year Floodplain - Existing Conditions



100-Year Floodplain - Alternative 3.0