2.0 ALTERNATIVES

The development of alternatives for the Gravina Access Project has been an evolving process to identify the location and type of crossing of Tongass Narrows that would best meet the purpose of and need for the project. The DOT&PF reviewed previous engineering studies, conducted detailed engineering and environmental studies, and obtained input from the Ketchikan community and local, state, and federal agencies, Tribal governments, and other Native organizations to develop the project alternatives (see also Chapter 7). This chapter describes the 10 project alternatives evaluated in this EIS and identifies the DOT&PF and FHWA preferred alternative for the project. It also identifies alternatives that were initially considered as conceptual build options and the reasons they were eliminated from further consideration.

2.1 ALTERNATIVES EVALUATED IN THIS EIS

During the spring of 2000, the DOT&PF developed 18 build concepts for crossing Tongass Narrows. These concepts were based on previous studies, input from agencies and the public, engineering analysis, and the objectives in the purpose and need statement for the project (see Chapter 1). The build concepts consisted of 11 bridge options, 2 tunnel options, 1 tunnel-and-bridge option, and 4 supplemental ferry options (see Figure 2.1)[1]; a No Action Option was also under consideration from this initial phase. These initial options were reviewed with input from the Ketchikan community and local, state, and federal agencies, Tribes and other Native organizations, to identify reasonable alternatives for the Gravina Access Project (see Section 2.4). Factors related to the ability to meet the project purpose and need, cost, environmental impacts, impacts to 4(f) properties, and transportation impacts were examined for each of the initial options. Those options that were not considered practical or feasible from a technical and economic standpoint were eliminated from further consideration (see Section 2.3).

Additional technical studies and public and agency input resulted in the identification of nine reasonable build alternatives and the No Action Alternative for the Gravina Access Project. Sections 2.1.1 through 2.1.3 describe the reasonable alternatives that are evaluated in detail in this EIS: the No Action Alternative; six bridge alternatives, C3(a), C3(b), C4, D1, F1, and F3; and three ferry alternatives, G2, G3, and G4. The descriptive name of each alternative includes the crossing's "takeoff" point on Revillagigedo Island and/or the "touchdown" location on Gravina Island.

Table 2-1 provides a summary of the key features of the reasonable project alternatives and Figure 2.2 shows the alignments of the reasonable alternatives. Typical cross-sections of the proposed roadway and bridges are shown in Figure 2.3. Figure 2.4 shows the configuration of the Ketchikan International Airport access road and parking facilities, which are common to all build alternatives. All build alternatives (bridges and ferries) include a parking structure and access improvements to accommodate additional traffic to the airport resulting from improved access. **Each build alternative also includes a spine road to access other developable lands on Gravina Island (see Section 2.4.4). This spine road is consistent with Ketchikan Gateway Borough planning for future development on Gravina Island. Any improvements on airport property would be coordinated with Ketchikan International Airport's Airport Security Program, which was developed in compliance with**

[1] All referenced figures in this Chapter 2 are at the end of the chapter.

Transportation Security Regulations.[2] The total cost for this future airport development is estimated at $11 million—$3 million for program development costs and $8 million for construction costs. Other figures (as noted in the following descriptions of project alternatives) depict the alignment of each alternative individually. **Depending on the availability of funding, DOT&PF may phase construction of the proposed spine road and airport parking structure, and related airport access improvements.**

The current fund source for the project is high-priority project funding (approximately $20.4 million) appropriated in TEA-21. This funding is expected to cover much of the initial project development cost, including preparation of the environmental documentation and design effort. DOT&PF has committed to provide the required 20 percent matching funds for these initial phases. Funding for complete project construction cost, both federal and state funds, has not yet been identified. Any improvements constructed as a result of the Gravina Access Project would become a state facility that would be maintained and operated by DOT&PF. DOT&PF has committed to cover the annual costs of operation and maintenance (O&M).

TABLE 2-1
SUMMARY OF DESCRIPTIONS OF REASONABLE ALTERNATIVES

	No Action	*Bridge Alternatives*						*Ferry Alternatives*		
		C3(a)	C3(b)	C4	D1	F1	F3	G2	G3	G4
Crossing Location	2.8 mi. north of down-town	1,600' north of airport terminal	2,600' north of airport terminal	1,600' north of airport terminal	Due east of airport terminal	1.4 mi. south of down-town	1.5 mi. south of down-town	2 mi. north of airport terminal	1.3 mi. south of airport terminal	2.8 mi. north of down-town
Bridge Dimensions:										
Bridge Length (ft)	—	5,690	4,250	4,980	3,220	**6,300**	5,400	—	—	—
Maximum Height (ft)	—	250	195	250	160	E: 250 W:160	E: 140 W: 250	—	—	—
Vertical Clearance (ft)	—	200	120	200	120	E: 200 W:120	E: 60 W: 200	—	—	—
Horizontal Clearance (ft)	—	550	500	550	500	E: 550 W: 500	E: 500 W: 550	—	—	—
Road Dimensions										
Length, without bridge (ft)	**--**	20,070	20,970	19,660	18,210	**43,080**	35,370	18,920	20,300	16,670
Width (road top)	**--**	**11.9 ft lane / 7.9 ft shoulder / 39.4 ft total (same for all build alternatives)**								
Aviation Zone Intrusion?	No	Yes	No	Yes	No	No	No	No	No	No
Block Cruise Ships?	—	No	Yes	No	Yes	No	No	No	No	No
Additional Ferry Service:										
New Terminals (number)	—	—	—	—	—	—	—	2	2	2
New Vessels (number)	—	—	—	—	—	—	—	2	2	2
Travel Time to Airport from Downtown Ketchikan (minutes)	27	14	12	11	11	13	13	42	35	25
Estimated Costs ($ million):										
Construction	0	145	125	145	100	170	155	45	45	40
Program Development[1]	0	55	45	50	35	60	55	15	20	15
Totals	0	200	170	195	135	230	205	60	70[3]	60[2]

[2] Title 49 of the Code of Federal Regulations, administered by the Transportation Security Administration of the Department of Homeland Security; Subchapter C Civil Aviation Security, Part 1542 Airport Security.

	No Action	*Bridge Alternatives*						*Ferry Alternatives*		
		C3(a)	C3(b)	C4	D1	F1	F3	G2	G3	G4
Crossing Location	2.8 mi. north of down-town	1,600' north of airport terminal	2,600' north of airport terminal	1,600' north of airport terminal	Due east of airport terminal	1.4 mi. south of down-town	1.5 mi. south of down-town	2 mi. north of airport terminal	1.3 mi. south of airport terminal	2.8 mi. north of down-town
Average Annual Operation & Maintenance	2.09	0.15	0.16	0.15	0.13	0.11	0.11	4.98	4.98	4.97
Life-Cycle[3]	10	160	135	160	105	190	170	90	100	90
Quantity of fill—wetlands (cy)	0.0	213,00	250,000	189,900	176,000	500,000	412,000	206,000	230,000	171,000
Quantity of fill—marine (cy)	0.0	280,000	140,000	280,000	295,000	0.0	0.0	0.0	0.0	0.0
Quantity of marine dredging (cy)	0.0	0.0	0.0	0.0	0.0	0.0	184,000	1,400	15,200	18,600

[1] Includes right-of-way acquisition costs.
[2] Numbers have been rounded; totals are not a direct sum.
[3] Note that in the DEIS, life-cycle costs were characterized as 50-year life cycle costs, but in reality, are 20-year life-cycle costs.

2.1.1 No Action Alternative

Existing airport ferry service

The National Environmental Policy Act (NEPA) requires an EIS to describe and analyze the impacts of No Action, as a benchmark that enables comparison of the magnitude of the environmental effects of the various project alternatives.[3]

Under the No Action Alternative, no bridge would be constructed and no additional ferry service would be provided between Revillagigedo Island and Gravina Island. The only public access between the islands would continue to be provided by the existing airport ferry service across Tongass Narrows, private boats, and floatplanes. On Revillagigedo Island, the existing ferry terminal is located 2.8 miles north of downtown Ketchikan; on Gravina Island, the terminal is on the waterfront, just east of the airport terminal. The No Action Alternative is shown on Figure 2.5.

The Borough operates the airport ferry service. The ferry service would continue to operate 16 hours per day and the frequency of service would remain the same, with departures every 30 minutes in winter and every 15 minutes in summer. The Borough has acquired a provisional permit from the U.S. Army Corps of Engineers (COE) for construction of a new road around the west side of the airport to the Lewis Reef development area (i.e., Proposed Ketchikan Airport Access Road shown in Figure 2.2). At this time, funding has not been secured for construction of the road. If the road were constructed, the ferry schedule could change to accommodate passengers who land other than at the airport.

[3] Council on Environmental Quality, *Forty Most Asked Questions Concerning CEQ's NEPA Regulations*, 46 Fed. Reg. 18026 (March 23, 1981), as amended, 51 Fed. Reg. 15618 (April 25, 1986).

Cost. Although this alternative would have no new construction costs, the estimated life-cycle cost would be approximately $10 million, and the estimated average annual O&M cost for the life-cycle would be approximately $2.1 million (see Appendix A). The cost estimates assume that the ferries would have their engines replaced or significantly overhauled after 25 years and that the vessels would be replaced after 50 years.

2.1.2 Bridge Alternatives

The following sections describe the six bridge alternatives evaluated in this EIS. The alignments of these bridge alternatives are shown on Figures 2.6, 2.7, 2.8, 2.9, 2.10, and 2.11. Bridge profile sheets, showing cross-sectional views of the bridges, navigational openings, roadway gradients, and conceptual design, are provided in Figure 2.12 (for Alternatives C3[a] and C3[b]), Figure 2.13 (for Alternatives C4 and D1), and Figure 2.14 (for Alternatives F1 and F3). Note that the existing airport ferry service would be discontinued under all of the bridge alternatives.

2.1.2.1 Alternative C3(a): 200-foot Bridge Between Signal Road and South of Airport Terminal

Bridge Structure. Alternative C3(a) includes a bridge across Tongass Narrows approximately 1,600 feet north of the airport terminal. The bridge would be 5,690 feet long, and have a maximum height of approximately 250 feet. The main span of the bridge would have a vertical navigational clearance of 200 feet above high tide and a horizontal navigational clearance of approximately 550 feet (see Figure 2.12). The main span of the bridge would be centered on the cruise ship tracklines and would be over water with depths in excess of 40 feet (at low tide) to accommodate deep draft vessels. These clearances would accommodate one-way passage of cruise ships and two-way passage of most other ships (including Alaska Marine Highway System [AMHS] ferries).

Alternative C3(a) bridge from north of Wolff Point on Tongass Avenue, looking south

Alignment. The alignment of Alternative C3(a) is shown in Figure 2.6. On Revillagigedo Island, the alignment would connect to Signal Road at North Tongass Avenue. The connection at North Tongass Avenue would be the only access to this alternative alignment on Revillagigedo Island; no neighborhood streets would be used for cut-through access. From this terminus, the alignment would traverse the hillside southward, gain elevation, and turn southwestward. The bridge would cross Tongass Avenue and Tongass Narrows, and then turn southward to parallel the airport runway and touch down (reach the ground surface) on Gravina Island south of the terminal. A 0.4-mile-long airport return loop road would connect the airport terminal and the bridge terminus. The main road would continue around the southern end of the airport runway and then arc northward, extending parallel to and west of the airport runway approximately 2.2 miles to the northern end of the Airport Reserve zone. At the southern end of the runway, the road would be constructed at a grade low enough to accommodate the planned future expansion of the runway, with the runway extended as an overpass of the road.

Cost. The estimated life-cycle cost of this alternative is approximately $160 million. The estimated average annual O&M cost is approximately $150,000 (see Appendix A).

2.1.2.2 Alternative C3(b): 120-foot Bridge Between Signal Road and Airport Terminal

Bridge Structure. The Alternative C3(b) bridge would be approximately 4,250 feet long, and have a maximum height of approximately 195 feet. The main span of this bridge would have a vertical navigational clearance of 120 feet above high tide and a horizontal navigational clearance of approximately 500 feet (see Figure 2.12). The main span would be located over water with depths in excess of 40 feet at low tide. These clearances would accommodate passage of AMHS ferries, but not larger cruise ships.

Alternative C3(b) bridge from north of Wolff Point on Tongass Avenue, looking south

Alignment. The alignment of Alternative C3(b) is shown on Figure 2.7. Alternative C3(b) would have the same general alignment on Revillagigedo and Gravina Islands as Alternative C3(a), but with a lower bridge profile. The position of the C3(b) bridge over Tongass Narrows and at its touchdown on Gravina Island (near the airport terminal) would be north of the C3(a) alignment. This alternative would not need an airport return loop road because the bridge would touch down in front of the airport terminal. The main road would continue around the southern end of the airport runway and then arc northward, extending parallel to and west of the airport runway approximately 2.2 miles to the northern end of the Airport Reserve zone. At the southern end of the runway, the road would be constructed at a grade low enough to accommodate the planned future expansion of the runway, with the runway extended as an overpass of the road. The connection at North Tongass Avenue would be the only access to this alternative alignment on Revillagigedo Island; no neighborhood streets would be used for cut-through access.

Cost. The estimated life-cycle cost of this alternative is approximately $135 million. The estimated average annual O&M cost is approximately $160,000 (see Appendix A).

2.1.2.3 Alternative C4: 200-foot Bridge Between Tongass Avenue North of Cambria Drive and South of Airport Terminal

Bridge Structure. The Alternative C4 bridge would be approximately 4,980 feet long and have a maximum height of approximately 250 feet. The main span of this bridge would have a vertical navigational clearance of 200 feet and a horizontal navigational clearance of approximately 550 feet (see Figure 2.13). The main span of the bridge would be centered on the cruise ship tracklines and would be over water with depths in excess of 40 feet (at low tide) to accommodate deep draft vessels. These clearances would accommodate one-way passage of cruise ships and two-way passage of most other ships, including AMHS ferries.

Alternative C4 bridge from north of Wolff Point on Tongass Avenue, looking south

Alignment. The alignment of Alternative C4 is shown on Figure 2.8. On Revillagigedo Island, the alignment would connect to Tongass Avenue north of Cambria Drive, across from the access to the existing ferry terminal. The connection at Tongass Avenue would be the only access to this alternative alignment on Revillagigedo Island; no neighborhood streets would be used for cut-through access. From this terminus, Alternative C4 would extend northward and traverse the hillside around the quarry; the bridge would cross over Tongass Avenue and Tongass Narrows, turn southward to parallel the airport runway, and then touch down on Gravina Island south of the airport terminal. A 0.4-mile-long airport return loop road would connect the airport terminal and the bridge terminus. The main road would continue around the southern end of the airport runway and then arc northward, extending parallel to and west of the airport runway approximately 2.2 miles to the northern end of the Airport Reserve zone. At the southern end of the runway, the road would be constructed at a grade low enough to accommodate the planned future expansion of the runway, with the runway extended as an overpass of the road.

Cost. The estimated life-cycle cost of this alternative is approximately $160 million. The estimated average annual O&M cost is approximately $150,000 (see Appendix A).

2.1.2.4 Alternative D1: 120-foot Bridge Between Tongass Avenue at Cambria Drive and Airport Terminals

Alternative D1 bridge from near Wolff Point on Tongass Avenue, looking south

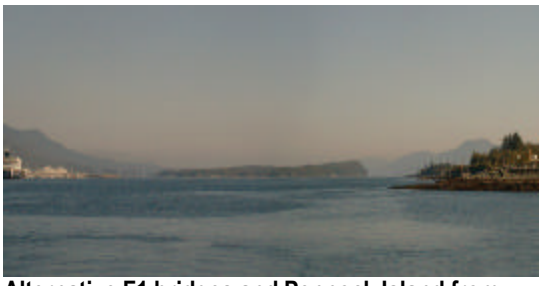
Bridge Structure. The Alternative D1 bridge would cross Tongass Narrows directly east of the airport terminal. The bridge would be approximately 3,220 feet long and have a maximum height of approximately 160 feet. The main span of this bridge would have a vertical clearance of 120 feet above high tide and a horizontal clearance of 500 feet (see Figure 2.13). The main span would be located over water with depths in excess of 40 feet at low tide. These clearances would accommodate passage of AMHS ferries, but not larger cruise ships.

Alignment. The alignment of Alternative D1 is shown on Figure 2.9. On Revillagigedo Island, the alignment would connect to Tongass Avenue at Cambria Drive near the existing airport ferry terminal. The connection at Tongass Avenue would be the only access to this alternative alignment on Revillagigedo Island; no neighborhood streets would be used for cut-through access. From this terminus, the alignment would rise along the hillside and turn westward; the bridge would cross over Tongass Avenue and Tongass Narrows, and then turn southward to parallel the shoreline on Gravina Island and touch down south of the airport terminal. A 0.4-mile-long airport return loop road would connect the airport terminal and the bridge terminus. The main road would continue around the southern end of the airport runway and then arc northward, extending parallel to and west of the airport runway approximately 2.2 miles to the northern end of the Airport Reserve zone. At the southern end of the runway, the road would be constructed at a grade low enough to accommodate the planned future expansion of the runway, with the runway extended as an overpass of the road.

Cost. The estimated life-cycle cost of this alternative is approximately $105 million. The estimated average annual O&M cost is $130,000 (see Appendix A).

2.1.2.5 Alternative F1 (DOT&PF and FHWA preferred): Bridges (200-foot East and 120-foot West) Between Tongass Avenue and Airport, via Pennock Island

Bridge Structures. Alternative F1 would cross Tongass Narrows via Pennock Island with two bridges. One bridge would cross the East Channel and the other would cross the West Channel. The East Channel bridge would be approximately **3,610** feet long and have a maximum height of approximately 250 feet. The bridge would have a vertical navigational clearance of 200 feet above high tide and a horizontal navigational clearance of approximately 550 feet (see Figure 2.14). The main span of the bridge would be centered on the cruise ship tracklines and would be over water with depths in excess of 40 feet (at low tide) to accommodate deep draft vessels. These clearances would accommodate one-way passage of cruise ships and two-way passage of most other ships, including AMHS ferries. The West Channel bridge would be approximately **2,690** feet long and have a maximum height of approximately 160 feet. The bridge would have a vertical navigational clearance of 120 feet above high tide and a horizontal navigational clearance of approximately 500 feet (see Figure 2.14). The main span would be located over water with depths in excess of 40 feet at low tide. These clearances would accommodate passage of AMHS ferries, but not larger cruise ships.



Alternative F1 bridges and Pennock Island from mid-Tongass Narrows near the airport, looking south

Alternative F1 200-foot bridge from cruise ship dock, looking south

Alignment. The alignment of Alternative F1 is shown in Figure 2.10. **Note that the alignment presented herein reflects a minor design modification from Alternative F1 as it was presented in the Draft EIS (see Figure S.1 for a comparison of the original Alternative F1 and the modified Alternative F1). The bridge crossings of East and West Channels have been shifted to be perpendicular to the main navigational channels. This design modification was made to Alternative F1 in response to concerns and comments expressed by marine pilots and others with regard to the original alignment of Alternative F1. The analyses of impacts associated with Alternative F1 presented in Chapter 4 of this Final EIS have been revised where necessary to reflect this minor design modification. The figures in the document have also been revised accordingly.**

On Revillagigedo Island, Alternative F1 would connect to Tongass Avenue just south of Tatsuda's grocery store and near the southern end of the quarry. The connection at South Tongass Highway would be the only access to this alternative alignment on Revillagigedo Island; no neighborhood streets would be used for cut-through access. From this terminus, the alignment would rise to the southeast along the hillside (and east of the tank farm, the cemetery, and the USCG Station), turn westward (skirting the southern end of the USCG Station property,

and north of the Forest Park subdivision) and cross over Tongass Avenue approximately 1.4 miles south of downtown Ketchikan, then cross the East Channel to Pennock Island. The roadway would cross Pennock Island at grade. From Pennock Island, the West Channel bridge would cross to Gravina Island, touching down approximately 2.7 miles south of the airport runway. The road would continue northward approximately **5.4** miles to the northern end of the Airport Reserve zone. A 1.2-mile airport access road would be constructed at the southern end of the airport runway. The airport access roadway would be constructed at a grade low enough to accommodate the planned future expansion of the runway, with the runway extended as an overpass of the road.

Cost. The estimated life-cycle cost of this alternative is approximately $190 million. The estimated average annual O&M cost is approximately $110,000 (see Appendix A). **Note that the minor design modification made to Alternative F1 has not changed its total costs from what was presented in the Draft EIS; therefore, no change to Appendix A has been made since publication of the Draft EIS.**

2.1.2.6 Alternative F3: Bridges (60-foot East and 200-foot West) Between Tongass Avenue and Airport, via Pennock Island

Bridge Structures. Similar to Alternative F1, Alternative F3 would have two bridges that cross Tongass Narrows via Pennock Island. One bridge would cross East Channel and the other bridge would cross West Channel. The East Channel bridge would be approximately 2,065 feet long and have a maximum height of approximately 140 feet. The bridge would have a vertical navigational clearance of 60 feet above high tide, (lower than any of the other bridges), and a horizontal clearance of approximately 500 feet (see Figure 2.14). The main span would be located over water with depths in excess of 40 feet at low tide. These clearances would not accommodate passage of AMHS ferries or taller cruise ships that currently use the East Channel as their primary navigational route. The West Channel bridge would be approximately 3,270 feet long and have a maximum height of approximately 250 feet. The bridge would have a vertical navigational clearance of 200 feet above high tide and a horizontal navigational clearance of approximately 550 feet (see Figure 2.14). The main span would be located over water with depths in excess of 40 feet at low tide. These clearances would accommodate one-way passage of cruise ships and two-way passage of most other ships, including AMHS ferries.

Alternative F3 60-foot bridge over East Channel from south of USCG Station on Tongass Avenue, looking north

Alternative F3 bridges and Pennock Island from mid-Tongass Narrows near the airport, looking south

Alignment. The alignment of Alternative F3 is shown in Figure 2.11. On Revillagigedo Island, the East Channel bridge would connect to South Tongass Highway, approximately 1.5 miles south of downtown Ketchikan between the USCG Station and the Forest Park subdivision. The connection at South Tongass Highway would be the only access to this alternative alignment on

Revillagigedo Island; no neighborhood streets would be used for cut-through access. From this terminus, the bridge would cross the East Channel to Pennock Island. The roadway would cross Pennock Island at grade. From Pennock Island, the West Channel bridge would cross to Gravina Island, touching down approximately 2.7 miles south of the airport runway. The road would continue northward approximately **5.1** miles to the northern end of the Airport Reserve zone. A 1.2-mile airport access road would be constructed at the southern end of the airport runway. The airport access roadway would be constructed at a grade low enough to accommodate the planned future expansion of the runway, with the runway extended as an overpass of the road.

Channel Widening. In response to concerns expressed by cruise ship pilots, DOT&PF **has committed to** widening a portion of the West Channel under Alternative F3 to improve its navigational characteristics and mitigate adverse impacts to cruise ships transiting the West Channel. The channel widening would occur in the narrowest part of the West Channel (see Figures 2.15 and 2.16). Currently, the width of the navigable portion of West Channel (i.e., with respect to large cruise ships) is approximately 400 feet at its narrowest point with a minimum depth of 40 feet below low water. With the channel modifications, this portion of the West Channel would have a channel width of 750 feet: the center 550 feet would have a minimum depth of 40 feet below low water and both sides of the channel would have a minimum depth of 30 feet below low water. The deepest part of the channel would be centered on the navigational opening of the West Channel bridge.

The bridge would be located at the southern end of the widened channel, which would extend approximately 2,000 feet north of the bridge. South of the bridge crossing, and north of the channel improvement area, the existing channel is wider and deeper than the improved channel would be.

Cost. The estimated life-cycle cost of this alternative is approximately $170 million. The estimated average annual O&M cost is approximately $110,000 (see Appendix A).

2.1.3 Ferry Alternatives

The alignments of the three ferry alternatives are shown on Figures 2.17, 2.18, and 2.19. Each of the ferry alternatives would augment the existing airport ferry service, with the existing ferry service continuing to operate at its current location and under its current schedule. Each ferry alternative would include two new ferry vessels (similar to the most recently constructed airport ferry vessel), a new ferry terminal on Revillagigedo Island, and a new ferry terminal on Gravina Island (similar to the existing ferry terminals). The schedule of the new ferry service under each alternative would be similar to that of the existing ferry service: one vessel would operate during the winter (16 hours per day, crossing every 30 minutes), and both vessels would operate during the summer (also 16 hours per day, crossing every 15 minutes). The cost estimates assume that the ferries would have their engines replaced or significantly overhauled after 25 years and that the vessels would be replaced after 50 years.

2.1.3.1 Alternative G2: Ferry Between Peninsula Point and Lewis Point

Alternative G2 would be a new ferry service for vehicles and passengers between Peninsula Point on Revillagigedo Island and Lewis Point on Gravina Island, crossing Tongass Narrows approximately 2 miles north of the airport (see Figure 2.17).

Alternative G2 ferry from Gravina Island shoreline near the northern end of the airport runway, looking north

Facilities and Roadway. This alternative would require construction of a new ferry terminal on each side of Tongass Narrows and two new ferry vessels. A 4.3-mile road would be constructed on Gravina Island that would extend from the ferry terminal southward approximately 2.6 miles, wrap around the southern end of the airport runway, and then turn northward to the airport terminal. The road at the southern end of the runway would be constructed at a grade low enough to allow for planned future expansion of the runway, with the runway extended as an overpass of the road.

Cost. The estimated life-cycle cost of this alternative is approximately $90 million, and its estimated average annual O&M cost is approximately $4.98 million (see Appendix A).

2.1.3.2 Alternative G3: Ferry Between Downtown and South of Airport

Alternative G3 ferry from the north parking area adjacent to Plaza Port West, looking northwest toward Gravina Island

Alternative G3 would be new ferry service for vehicles and passengers between Ketchikan (near the Plaza Mall at Bar Point) on Revillagigedo Island and a location approximately 0.6 miles south of the airport runway on Gravina Island (see Figure 2.18).

Facilities and Roadway. This alternative would require construction of a new ferry terminal on each side of Tongass Narrows and two new ferry vessels. Dredging may be required to provide adequate navigational depths for the ferry terminal on Revillagigedo Island. The existing breakwater could also be widened and extended for use as the ferry terminal pier. A road would be constructed on Gravina Island from the ferry terminal northward approximately 3.0 miles to the northern end of the Airport Reserve zone. A 1.2-mile airport access road would be constructed around the southern end of the airport. The road at the southern end of the runway would be constructed at a grade low enough to allow for future planned expansion of the runway, with the runway extended as an overpass of the road.

Cost. The estimated life-cycle cost of this alternative is approximately $100 million, and its estimated average annual O&M cost is approximately $4.98 million (see Appendix A).

2.1.3.3 Alternative G4: Ferry Between New Terminals Adjacent to Existing Terminals

Alternative G4 would be new ferry service for vehicles and passengers adjacent to the existing airport ferry route, crossing Tongass Narrows 2.8 miles north of downtown (see Figure 2.19).

Facilities and Roadway. This alternative would require construction of a new ferry terminal on each side of Tongass Narrows, adjacent to the existing airport ferry terminals, and two new ferry vessels. A 3.2-mile road would be constructed on Gravina Island that extends southward from the airport ferry terminals; the roadway would wrap around the southern end of the airport runway, and then turn northward, extending parallel to and west of the airport runway approximately 2.2 miles to the northern end of the Airport Reserve zone. The road at the southern end of the runway would be constructed at a grade low enough to allow for future planned expansion of the runway, with the runway extended as an overpass of the road.

Cost. The estimated life-cycle cost of this alternative is approximately $90 million, and its estimated average annual O&M cost is approximately $4.97 million (see Appendix A).

2.1.4 DOT&PF's and FHWA's Preferred Alternative

Based on the analyses of alternatives presented in this EIS and public and agency input, the DOT&PF **and FHWA have identified their own agency preferred alternative [40 CFR 1502.14(e)]. Considering all factors, including beneficial and adverse impacts and the natural, social, and economic environments, DOT&PF and FHWA have determined Alternative F1 to be their Preferred Alternative. These factors are detailed as follows.**

- **Improved Access to Gravina Island**: Alternative F1 improves convenience and reliability of access to Ketchikan International Airport and developable and recreation lands on Gravina Island by providing a hard link between Revillagigedo Island and Gravina Island. The travel time between the airport and downtown Ketchikan using Alternative F1 would be approximately 14 minutes faster than the travel time using the existing airport ferry. Although the travel times for the existing ferry and Alternative F1 between the airport and areas north of downtown Ketchikan are essentially the same, Alternative F1 would provide unlimited access for travel between the islands 24 hours per day, whereas ferry access is limited to a 16-hour-per-day schedule with two to four transits per hour, depending on the season.

- **Economic Impacts**: Because Alternative F1 would allow the continued safe passage of large cruise ships northbound and southbound through Tongass Narrows and East Channel, there would be no reduction in cruise ship port calls in Ketchikan and, therefore, no reductions in cruise-related spending, which is a major component of Ketchikan's economy.

- **Navigational Requirements for Tongass Narrows**: Alternative F1 would allow the continued passage of large cruise ships northbound and southbound through Tongass Narrows and East Channel, and the continued separation of cruise ship traffic (East Channel) from the AMHS and other marine traffic (West Channel). Alternative F1 is preferable to the other alternatives from a navigation safety standpoint because it would not contribute to conflicts at the navigational choke point next to Ketchikan International Airport and Alaska Ship and Drydock (as would Alternatives C3(a), C3(b), C4, and D1) and it would not require additional ship maneuvers for cruise ships transiting West Channel (as would Alternative F3).

- **Aviation Impacts**: Alternative F1 would not penetrate any airspace surfaces associated with Ketchikan International Airport. Alternative F1 would not hinder any future growth or improvements to the Ketchikan International Airport. Floatplane facilities at Ketchikan International Airport and waterways designated for floatplane take-offs and landings in Tongass Narrows would not be affected by Alternative F1.

- **Consistency with the Borough's Long-Term Plans for Gravina Island**: Alternative F1 would be consistent with the Borough's plans for long-term development on Gravina Island. Projections for development on Gravina Island are highest for Alternatives F1 and F3. Alternative F1 would promote development of Gravina Island, as well as Pennock Island, thereby enhancing economic development in the Borough.

- **Access to Borough Land on Pennock Island**: Alternative F1 provides the additional benefit of access to Pennock Island, which contains a substantial amount of the Ketchikan Gateway Borough's land base.

- **Marine Habitat Impacts**: Pier placement for Alternative F1 would potentially affect kelp and/or eelgrass beds at one pier location in West Channel; however, there would be no requirements for channel modification. Alternative F1 would have the least impact of all of the alternatives on Essential Fish Habitat (EFH).

All reasonable alternatives under consideration (including the No Action Alternative) have been developed to a comparable level of detail in the EIS, and their comparative merits have been evaluated. The final selection of an alternative will not be made until **after circulation of the Final EIS and consideration of the comments received**.

2.2 COMPARISON OF IMPACTS AMONG ALTERNATIVES[4]

This section summarizes and compares the key beneficial and adverse impacts of the No Action and action alternatives for the Gravina Access Project. Numerous issues were identified by the public and responsible agencies during scoping and during review of the Draft EIS (see Chapter 7). The primary concerns that have been voiced about the Gravina Access Project are:

- **Cost of construction**
- **Impacts to cruise ship schedules and visits, and potential negative economic effects on the community due to shortened or reduced numbers of port calls**
- **Changes to aviation patterns and uses, particularly for floatplanes**
- **Impacts to wetlands and other natural resources on Gravina Island**
- **Impacts of construction in Tongass Narrows, and in creeks and streams on Gravina Island**

[4] This section is not required by the FHWA (see FHWA Technical Advisory 6640.8A, *Guidance For Preparing and Processing Environmental and Section 4(F) Documents*), but has been included at the request of one of the project's cooperating agencies, the U.S. Army Corps of Engineers.

These types of adverse impacts must be weighed against the project's projected beneficial impacts, particularly those related to meeting the need for improved access. The project's Purpose and Need (Section 1.3) states that the project is needed:

- **To provide the Ketchikan Gateway Borough and its residents more reliable, efficient, convenient, and cost-effective access for vehicles, bicycles, and pedestrians to Borough lands and other developable or recreation lands on Gravina Island in support of the Borough's adopted land use plans.**
- **To improve the convenience and reliability of access to Ketchikan International Airport for passengers, airport tenants, emergency personnel and equipment, and shipment of freight.**
- **To promote environmentally sound, planned, long-term economic development on Gravina Island.**

Analysis of these and other positive and adverse impacts resulted in the selection of Alternative F1 as DOT&PF and FHWA's Preferred Alternative.

To provide a clear comparison of the No Action and build alternatives, Table 2-2 summarizes the impact information contained in Chapter 4 for the concerns and benefits noted above. The information contained in this table also draws on the purpose and need discussion from Chapter 1. Note that Table 2-2 compares the available quantitative data regarding each of these impacts and the purpose and need issues.

TABLE 2-2
SUMMARY OF IMPACTS

IMPACT CATEGORIES	GRAVINA ACCESS PROJECT ALTERNATIVES									
		BRIDGE ALTERNATIVES						FERRY ALTERNATIVES		
	No Action	C3(a)	C3(b)	C4	D1	F1	F3	G2	G3	G4
Cost Factors										
Construction and Project Development ($ million)[1]	0	200	170	195	135	230	205	60	70	60
Life-Cycle ($ million)[1]	10	160	135	160	105	190	170	90	100	90
Purpose and Need Factors										
Efficiency & Convenience of Access										
Vehicular travel time (in minutes) to airport from:										
-Downtown Ketchikan	27	14	12	11	11	13	13	42[2]	35[2]	25[2]
-Carlanna Creek	19	6	4	3	3	21	21	34[2]	34[2]	17[2]
-Ward Cove	25	8	6	9	7	27	27	34[2]	40[2]	23[3]
Vehicular travel time (in minutes) to developable land from:										
-Downtown Ketchikan	NA[3]	17	17	15	14	7	7	34[2]	29[2]	29[2]
-Carlanna Creek	NA[3]	9	9	7	6	15	15	26[2]	28[2]	21[2]
-Ward Cove	NA[3]	11	11	13	10	21	21	26[2]	34[2]	27[2]
Economic Development										
Projected development on Gravina Island (in acres):										
-Residential	15	287	287	287	287	383	383	50	50	50
-Industrial/commercial	5	22	22	22	22	22	22	22	22	22
Projected development on Pennock Island (in acres):										
-Residential	0	0	0	0	0	75	75	0	0	0
-Industrial/commercial	0	0	0	0	0	1	1	0	0	0
Social and Economic Impacts										
-Reductions in cruise-related spending ($ million)	0	0	2.2	0	2.2	0	0	0	0	0
-User economic benefits ($ million)[4]	0	55.2	62.3	64.2	70.0	27.1	22.6	-0.2	-0.2	2.0
Transportation Impacts										
Number of floatplane flights per year potentially eliminated (assuming 2,000 SVFR operations annually)	0	1,800	1,800	1,800	1,800	200[5]	100[5]	0	0	0
Percentage of large ships diverted from Ketchikan	0	0	2	0	2	0	0	0	0	0

IMPACT CATEGORIES	GRAVINA ACCESS PROJECT ALTERNATIVES									
		BRIDGE ALTERNATIVES						FERRY ALTERNATIVES		
	No Action	C3(a)	C3(b)	C4	D1	F1	F3	G2	G3	G4
Natural Resources Impacts										
Wetland vegetation removal for construction (acres)	0.0	15.1	14.8	14.0	13.4	35.8	30.1	15.5	18.9	13.2
Temporary fill in wetlands (acres)	0.0	3.4	1.7	0.7	0.0	11.3	11.6	0.0	0.0	0.0
Temporary fill in wetlands (cy)	0.0	16,500	8,300	3,400	0.0	54,700	56,200	0.0	0.0	0.0
Permanent wetland habitat losses (acres):										
Forested	*0.0*	*15.6*	*14.2*	*10.6*	*8.0*	*23.6*	*13.0*	*14.2*	*10.0*	*7.7*
Shrub/Scrub	*0.0*	*3.1*	*3.0*	*3.1*	*3.0*	*12.9*	*14.4*	*2.9*	*6.5*	*2.9*
Muskegs	*0.0*	*25.3*	*25.1*	*25.1*	*25.1*	*60.0*	*57.7*	*25.3*	*29.4*	*24.8*
Intertidal marshes/meadows	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.1*	*1.7*	*0.0*
TOTAL	0.0	44.0	42.3	38.8	36.1	96.5	85.1	42.5	47.6	35.4
Amount of permanent fill in wetlands (cubic yards)	0.0	213,000	250,000	189,900	176,000	500,000	412,000	206,000	230,000	171,000
Number of water body crossings	0	8	8	8	8	14	14	8	10	8
Number of anadromous fish streams crossed	0	2	2	2	2	5	5	2	3	2
Essential Fish Habitat losses (acres)	0.0	6.3	7.1	6.9	4.3	0.2	16.2[2]	0.7	3.8	1.6
Uplands impacts (acres)	0.0	5.1	9.1	10.4	8.6	10.7	4.8	7.6	7.0	4.7
Number of Piers in Tongass Narrows	0	5	7	5	6	6	6	0	0	0
Amount of material to be dredged from Tongass Narrows (cubic yards)	0.0	0.0	0.0	0.0	0.0	0.0	184,000	1,400	15,200	18,600
Amount of fill in Tongass Narrows (cubic yards)	0.0	280,000	140,000	280,000	295,000	0.0	0.0	0.0	0.0	0.0
Relationship to Select Federal Laws										
Section 10/404 of the Clean Water Act – permit required (y/n)?	n	y	y	y	y	y	y	y	y	y
Section 9 of the Rivers and Harbors Act - USCG bridge permit required (y/n)?	n	y	y	y	y	y	y	n	n	n
Section 103 of the Marine Protection, Research and Sanctuaries Act – permit required (y/n)?	n	n	n	n	n	n	y	y	y	y

IMPACT CATEGORIES	GRAVINA ACCESS PROJECT ALTERNATIVES									
		BRIDGE ALTERNATIVES						FERRY ALTERNATIVES		
	No Action	C3(a)	C3(b)	C4	D1	F1	F3	G2	G3	G4

[1] Rounded to nearest $5 million due to the variable and preliminary nature of engineering. Project development costs include mobilization costs, contingency costs, mitigation costs, design engineering costs, construction management costs, and right-of-way acquisition costs.

[2] Values provided represent travel times using new ferry facility only. Travel time for the existing airport ferry would be the same as for the No Action Alternative.

[3] Not applicable – the No Action Alternative does not include access to developable land.

[4] See Section 4.26.3.8, Table 4-33, for more details. Benefits are calculated for access costs only, based on the traffic projections discussed in Section 4.26.4.3, and compared to the No Action Alternative.

[5] The Federal Aviation Administration's preliminary analysis of Alternative F3 indicated that although the alternative appears to be outside the Exemption No. 4760 boundaries, some modification of the boundaries may be required. The analysis also indicated that a Pennock Island crossing would be "less disruptive" to floatplane operations than the other bridge alternatives. For purposes of this analysis, HDR assumed 10 percent and 5 percent reductions in special visual flight rules operations for Alternatives F1 and F3, respectively.

As can be seen in Table 2-2, there are similarities across several alternatives, based on their locations. The bridge alternatives that cross Pennock Island (Alternatives F1 and F3) affect relatively few floatplane operations when compared with the other bridge alternatives (which are all near Ketchikan International Airport and its floatplane dock). Because of their longer road lengths, however, Alternatives F1 and F3 have higher construction costs and greater wetland impacts. The longer road lengths associated with Alternatives F1 and F3, and the inclusion of Pennock Island, result in a greater potential for economic growth and recreational development by providing more access to Borough and other lands—which is a primary goal of the project. The ferry alternatives have the lowest cost and have relatively fewer impacts, but they also have fewer benefits. The ferry alternatives do not achieve the purpose and need objectives of the project to the same level as the bridge alternatives.

As a supplement to the impacts comparison table, the following sections provide more detail concerning the key issues associated with each alternative. Measures to mitigate adverse impacts are discussed throughout Chapter 4 and compiled into a complete list at the end of Chapter 4.

2.2.1 No Action Alternative

Under the No Action Alternative, service to Gravina Island would continue at the current schedule and hours of operation. Under this alternative, no bridge would be constructed, and no additional ferry service would be provided between Revillagigedo Island and Gravina Island. The only public access between the islands would continue to be provided by the existing airport ferry service across Tongass Narrows, private boats and water taxis, and floatplanes.

The No Action Alternative would not affect airport property, existing airport or floatplane facilities, or Part 77 airspace in the vicinity of Ketchikan International Airport. Existing problems associated with access, convenience and reliability for passengers, airport tenants, emergency personnel and equipment, and shipment of freight, would continue (Section 4.7.1.1). Also, the No Action Alternative would have no impact on cruise ship operations, on the Ketchikan docking and berthing areas and facilities used by the cruise ships, or on those used by the AMHS ferries. There would be no traffic improvements that would change vehicular access to Ketchikan International Airport. However, the use of trails would continue to provide access to other Borough and developable lands on Gravina Island. No wetlands or EFH would be lost to the construction of new facilities. Development would continue at the existing rate, with approximately 20 acres developed on Gravina Island by 2025.

2.2.2 Bridge Alternatives near Ketchikan International Airport

2.2.2.1 Alternative C3(a)

Alternative C3(a) is estimated to have a $200 million construction and project development cost and a $160 million life-cycle cost. Project development costs include mobilization costs, contingency costs, mitigation costs, design engineering costs, construction management costs, and right-of-way acquisition costs. The bridge associated with this alternative intrudes into the Part 77 airspace for Ketchikan International Airport and is projected to reduce floatplane operations under special

visual flight rules (SVFR) by approximately 1,800 flights (90 percent) per year (see Section 4.7.1.2). Cruise ship passage would continue unhindered (see Section 4.7.2.2). Wetland habitat loss is estimated as 44 acres (Table 4-12); 6.3 acres of EFH are expected to be lost (Table 4-14). Development on Gravina Island is projected to be about 300 acres by 2025, i.e., the same level of development as the other bridge alternatives near the airport, but greater than the ferry alternatives and less than the Pennock Island bridge alternatives (see Section 4.26.1).

2.2.2.2 Alternative C3(b)

Alternative C3(b) is estimated to have a $170 million construction and project development cost and a $135 million life-cycle cost. The bridge associated with this alternative intrudes into the Part 77 airspace for Ketchikan International Airport and is projected to reduce SVFR floatplane operations by approximately 1,800 flights (90 percent) per year (see Section 4.7.1.2). The Alternative C3(b) bridge would impede the passage of cruise ships, requiring them to approach and depart the cruise ship docks from the south end of Tongass Narrows (see Section 4.7.2.2). This rerouting is projected to result in a reduction in port calls by cruise ships, which, in turn, would result in a decrease in tourism-related expenditures in the Borough (see Section 4.26.3.4). Wetland habitat loss is estimated as 42.3 acres (Table 4-12); 7.1 acres of EFH are expected to be lost (Table 4-14). Development on Gravina Island is projected to be about 300 acres by 2025, i.e., the same level of development as the other bridge alternatives near the airport, but greater than the ferry alternatives and less than the Pennock Island bridge alternatives (see Section 4.26.1).

2.2.2.3 Alternative C4

Alternative C4 is estimated to have a $195 million construction and project development cost and a $160 million life-cycle cost. The bridge associated with this alternative intrudes into the Part 77 airspace for Ketchikan International Airport and is projected to reduce SVFR floatplane operations by approximately 1,800 flights (90 percent) per year (see Section 4.7.1.2). Cruise ship passage would continue unhindered (see Section 4.7.2.2). Wetland habitat loss is estimated as 38.9 acres (Table 4-12); 6.9 acres of EFH are expected to be lost (Table 4-14). Development on Gravina Island is projected to be about 300 acres by 2025, i.e., the same level of development as the other bridge alternatives near the airport, but greater than the ferry alternatives and less than the Pennock Island bridge alternatives (see Section 4.26.1).

2.2.2.4 Alternative D1

Alternative D1 is estimated to have a $135 million construction and project development cost and a $105 million life-cycle cost, which is the lowest cost of the bridge alternatives. The bridge associated with this alternative intrudes into the Part 77 airspace for Ketchikan International Airport and is projected to reduce SVFR floatplane operations by approximately 1,800 flights (90 percent) per year (see Section 4.7.1.2). The Alternative D1 bridge would impede the passage of cruise ships, requiring them to approach and depart the cruise ship docks from the south end of Tongass Narrows (see Section 4.7.2.3). This rerouting is projected to result in a reduction in the number of port calls by cruise ships, which, in turn, would result in a decrease in tourism-related expenditures in the Borough (see Section 4.26.3.4). Wetland habitat loss is estimated as 36.2 acres (Table 4-12); 4.3 acres of EFH are expected to be lost (Table 4-14). Development on Gravina Island is

projected to be about 300 acres by 2025; i.e., the same level of development as other bridge alternatives near the airport, but greater than the ferry alternatives and less than the Pennock Island bridge alternatives (see Section 4.26.1).

2.2.3 Bridge Alternatives that Cross Pennock Island

2.2.3.1 Alternative F1 (DOT&PF and FHWA preferred)

Alternative F1 is estimated to have a $230 million construction and project development cost and a $190 million life-cycle cost, which is the highest costs of the project alternatives. The bridges would not affect the Part 77 airspace associated with Ketchikan International Airport and is projected to reduce SVFR floatplane operations by approximately 200 flights per year (see Section 4.7.1.3). Cruise ships would continue to access Ketchikan via East Channel and navigate through Tongass Narrows unimpeded (see Section 4.7.2.4). With longer roads, this alternative would have greater wetland impacts (96.5 acres; 0.2 acres of EFH) than the bridge alternatives closer to the airport and the ferry alternatives (see Section 4.14). However, the greater length of road associated with this alternative would provide access to more developable land and recreation lands on Gravina Island than the bridge alternatives closer to the airport, as well as to developable and recreation lands on Pennock Island. Development on Gravina Island with this alternative is projected to be about 500 acres by 2025 (see Section 4.26.1).

2.2.3.2 Alternative F3

Alternative F3 is estimated to have a $205 million construction and project development cost and a $170 million life-cycle cost. This alternative would not affect the Part 77 airspace associated with Ketchikan International Airport and is projected to reduce SVFR floatplane operations by approximately 100 flights per year (see Section 4.7.1.3). Cruise ships would be impeded from transiting East Channel, and would therefore have to approach and depart the cruise ship dock using north Tongass Narrows or through the West Channel of Tongass Narrows to the south. However, marine pilots and others have expressed concern over navigational hazards associated with transiting West Channel, particularly with a bridge across the channel (see Section 4.7.2.5).

Because the West Channel would be widened if Alternative F3 were selected (see Section 2.1.2.6), no reduction in cruise ship stops is anticipated. However, channel widening would mean much greater in-water habitat impact (16.2 acres of EFH) than other alternatives (see Section 4.15.4.4). Also, with longer roads, this alternative would have greater wetland impacts (85.1 acres) than the bridge alternatives closer to the airport or the ferry alternatives (see Section 4.14). The greater length of road associated with this alternative would provide access to more developable land and recreation lands on Gravina Island, as well as to developable and recreation land on Pennock Island. Development on Gravina Island is projected to be about 500 acres by 2025 (see Section 4.26.1).

2.2.4 Ferry Alternatives

Alternatives G2, G3, and G4 would have lower construction and project development costs ($60 to $70 million) and lower life-cycle costs ($90 to $100 million) than the bridge alternatives, and no impacts to aviation or marine navigation, though they would

increase the amount of cross-channel traffic. These alternatives would not, however, provide the convenience and reliability of access to the airport and other lands on Gravina Island as well as the bridge alternatives would. Wetland habitat loss with these alternatives is estimated as 42.5, 47.5, and 35.3 acres, respectively (Table 4-12); 0.7, 3.8, and 1.6 acres of EFH, respectively, are expected to be lost (Table 4-14). Projected development on Gravina Island, at approximately 70 acres by 2025, is about three times the amount of development projected under the No Action Alternative, but less than one-fourth of what any of the bridge alternatives would provide.

2.3 ALTERNATIVES PREVIOUSLY CONSIDERED BUT ELIMINATED FROM FURTHER CONSIDERATION

This section describes options for crossing Tongass Narrows that were originally considered as possible alternatives for the Gravina Access Project. These options were eliminated from further consideration based on cost and/or environmental factors. The costs for these preliminary options were developed in the late winter and early spring of 2000 and were based on preliminary engineering information (see Appendix A, page 2). These costs cannot be directly compared with the costs of the reasonable alternatives described in Section 2.1, which are based on additional engineering and environmental studies completed since the spring of 2000.

2.3.1 Bridge Options

The following paragraphs describe six bridge options that were initially developed for the Gravina Access Project, but were determined to be not reasonable and eliminated from further consideration based on cost factors. All of these bridge options assumed that the existing airport ferry service would be discontinued. Vertical and horizontal clearances indicate the dimensions of the primary navigational opening for each bridge, which would constrain the size of ships that could pass under the bridge.

2.3.1.1 Option A—High-Level Bridge from Refuge Cove Area

This bridge would start at Mile 8.5 of Tongass Avenue near Refuge Cove and touch down on Gravina Island 2.7 miles north of the airport. The bridge would be about 1.5 miles long, have a vertical clearance of 210 feet and a horizontal clearance of 750 feet, and connect to a roadway to the airport. This alternative was determined to be not reasonable based on its life-cycle cost, which was estimated to be approximately $260 million.

2.3.1.2 Option B—High-Level Bridge from Peninsula Point Area

This bridge would start at Mile 5.5 of Tongass Avenue near Murphy's Landing and touch down on Gravina Island north of the Seley Corporation timber processing plant (Pacific Log and Lumber). The bridge would be about 1.4 miles long, have a vertical clearance of 210 feet and a horizontal clearance of 750 feet, and connect to a roadway to the airport. This alternative was determined to be not reasonable based on its life-cycle cost, which was estimated to be approximately $370 million.

2.3.1.3 Option C1—High-Level Bridge to Airport Area North

This bridge would start at Tongass Avenue north of the existing airport ferry terminal, rise along the hillside behind the quarry, turn westward, cross over Tongass Avenue and Tongass

Narrows, and then turn northward just east of the airport to parallel the airport runway as it descends on Gravina Island. The bridge would be about 1.7 miles long, and have a vertical clearance of 210 feet and a horizontal clearance of 750 feet. The road would terminate north of the airport at the boundary between the Airport Reserve zone (the area immediately surrounding Ketchikan International Airport) and the Airport Development zone (the area around the Airport Reserve zone), and would include an exit to the airport terminal. This alternative was determined to be not reasonable based on its life-cycle cost, which was estimated to be approximately $235 million.

2.3.1.4 Option C2—High-Level Bridge to Airport Area South

This bridge would start at Tongass Avenue south of the existing airport ferry terminal, rise northward along the hillside behind the quarry, turn westward, cross Tongass Avenue and Tongass Narrows, and then turn southward just east of the airport to parallel the runway as it descends on Gravina Island. The bridge would be about 1.5 miles long, with a vertical clearance of 210 feet and a horizontal clearance of 750 feet. The road would terminate south of the airport, at the boundary between the Airport Reserve zone and the Airport Development zone, and would include an exit to the airport terminal. This alternative was determined to be not reasonable based on its life-cycle cost, which was estimated to be approximately $200 million (see Section 2.4.6 for the discussion regarding the increased cost ceiling).

2.3.1.5 Option D2—Low-Level Moveable Bridge to Airport Area

This bridge would start at Tongass Avenue near the existing airport ferry terminal, rise along the hillside behind the quarry, turn westward, cross over Tongass Avenue and Tongass Narrows, and then turn northward just east of the airport to parallel the airport runway as it descends on Gravina Island. The bridge would incorporate a lift span over the main channel, would be about 0.5 mile long, and would have a horizontal clearance of 750 feet. Its vertical clearance would be 120 feet in the closed position and 210 feet in the open position. The roadway would terminate at the boundary between the Airport Reserve zone and the Airport Development zone north of the airport, and would include an exit to the airport terminal. This alternative was determined to be not reasonable based on its life-cycle cost, which was estimated to be approximately $245 million.

2.3.1.6 Option F1 Cable-Stayed—High-Level, Cable-Stayed East Channel Bridge and Low-Level West Channel Bridge via Pennock Island

Under this option, the roadway would start at Tongass Avenue just north of the cemetery, rise along the hillside behind the cemetery and the USCG Station, turn westward, and cross over Tongass Avenue and the East Channel to Pennock Island. The roadway would cross Pennock Island at grade. A second bridge would then extend over the West Channel to Gravina Island. The roadway would extend northward to the airport, parallel the runway to the east of the runway, and terminate at the airport terminal. The East Channel bridge would be a high-level, cable-stayed bridge about 0.8 mile long, with a vertical clearance of 210 feet and a horizontal clearance of 750 feet. The West Channel bridge would be about 0.4 mile long, with a vertical clearance of 120 feet and a horizontal clearance of 525 feet. This alternative was determined to be not reasonable based on its life-cycle cost, which was estimated to be approximately $205 million (see Section 2.4.6 for the discussion regarding the increased cost ceiling). In addition, DOT&PF determined that the cable-stayed design is not reasonable because it would present extreme adverse risk to float plane operations in the vicinity of East Channel.

2.3.2 Tunnel Options

The following paragraphs describe the two tunnel options that were initially developed for the Gravina Access Project but were determined to be not reasonable and eliminated from further consideration based on cost factors. Both of these options assumed that the existing airport ferry service would be discontinued.

2.3.2.1 Option E—Tunnel from Jefferson Street

This option would start above ground at Tongass Avenue and Jefferson Street next to the Plaza Mall, descend below the water surface, cross Tongass Narrows via a sunken tube tunnel, resurface 0.8 mile south of the airport on Gravina Island, turn northward and parallel the airport runway on the east, and terminate at the airport terminal. The tunnel would include a pedestrian walkway and special monitoring and other safety features. The tunnel length would be about 1.3 miles; the ship channel above the tunnel would be 750 feet wide, and would provide a minimum draft of 40 feet. An airport access road would be constructed on Gravina Island from the airport terminal around the southern end of the runway, and connecting to the road north. It would be constructed at a grade low enough to allow for future planned expansion of the runway, with the runway extended as an overpass of the road. A road would be constructed from the airport terminal northward to the northern end of the Airport Reserve Zone. This alternative was determined not to be reasonable based on its life-cycle cost, which was estimated to be approximately $310 million.

After publication of the Draft EIS, DOT&PF reexamined Option E for a variation that would go underwater near the existing ferry terminal on Revillagigedo Island and resurface near the northern end of the airport runway. This variation examined the possibilities of reducing cost by using sheetpile walls and substantial fill embankments to extend the road approaches into Tongass Narrows and shorten the length of submerged precast tube tunnel to 0.5 miles. It was concluded that this variation would risk flooding of the portals, raise concerns about the ability of the portal structures to withstand a ship allision, and hinder navigation. Besides a narrower navigation channel (less than 500 feet), the navigation track line would be altered, and the constricted channel would substantially increase tidal velocity. Although the life-cycle cost of $290 million would likely be lower than the original Option E, the savings would be small. This variation was determined to be not reasonable based primarily on high life-cycle cost (initial capital cost and annual operations and maintenance expenses) and, secondarily, on the risks noted above.

2.3.2.2 Option E2—Tunnel to Airport Area North

This option would start above ground at Tongass Avenue north of the quarry, enter the hillside in a bored tunnel, curve under Tongass Avenue, and cross under Tongass Narrows via a sunken tube tunnel, curve northward, and resurface next to the runway north of the airport terminal on Gravina Island. The tunnel would include a pedestrian walkway and special monitoring and other safety features. The tunnel length would be about 0.86 mile, including a bored length of 0.45 mile. The ship channel above the tunnel would be 750 feet wide, and would provide a minimum draft of 40 feet. The roadway would terminate at the boundary between the Airport Reserve zone and the Airport Development zone north of the airport, and would include an exit (loop road) to the airport terminal. This alternative was determined to be not reasonable based on its life-cycle cost, which was estimated to be approximately $400 million.

2.3.3 Tunnel-and-Bridge Option

The following paragraph describes a tunnel-and-bridge option that was initially developed for the Gravina Access Project, but was determined to be not reasonable and eliminated from further consideration in the screening process based on cost factors. This option assumed that the existing airport ferry service would be discontinued. Vertical and horizontal clearances indicate the dimensions of the primary navigational opening for the bridge.

Option F2—Tunnel under East Channel and Low-Level West Channel Bridge via Pennock Island. This option would start at Tongass Avenue just south of the USCG Station, descend in an arc through the hillside east of Tongass Narrows, loop around to the west, and cross under the East Channel in a sunken tube. The alignment would resurface on Pennock Island, cross Pennock Island at grade, then cross West Channel with a low-level bridge to Gravina Island. The roadway would extend northward and terminate at the airport terminal. The tunnel would include a pedestrian walkway and special monitoring and other safety features. The tunnel length would be about 1.8 miles; the ship channel above the tunnel would be 750 feet wide, and would provide a minimum draft of 40 feet. The bridge would be about 0.4 mile long, with a vertical clearance of 120 feet and a horizontal clearance of 525 feet. This alternative was determined to be not reasonable based on its life-cycle cost, which was estimated to be approximately $595 million.

2.3.4 Ferry Option

The following paragraph describes a ferry option that was initially developed for the Gravina Access Project. This option assumed that the existing airport ferry service would continue to operate at its current location and under its current schedule.

Option G1—Ferry from Refuge Cove. This option would provide ferry service between Mile 8.5 of Tongass Avenue near Refuge Cove on Revillagigedo Island and about 2.8 miles north of the airport on Gravina Island. It would include two new ferry vessels, a new ferry terminal on Revillagigedo Island, and a new ferry terminal on Gravina Island. The schedule of the new ferry service would be similar to that of the existing ferry service: one vessel would operate during the winter (16 hours per day, crossing every 30 minutes), and both vessels would operate during the summer (also 16 hours per day, crossing every 15 minutes). This alternative was determined to be not reasonable based on land use constraints, potential environmental impacts, and its inability to address the need for improved access to the airport (see Section 2.3.1).

In addition to Option G1, DOT&PF considered stepwise development: a phased alternative that included the construction of a ferry option followed by—at some later date—the construction of a bridge option. Construction of any ferry option would require a substantial commitment of funds for both capital and ongoing O&M costs. The later construction of a bridge option would be effectively precluded by construction of a ferry option because of the overall magnitude of the cost of such an approach. This option is not reasonable and has not been further evaluated.

2.4 DETERMINATION OF REASONABLE ALTERNATIVES: A BRIEF HISTORY

According to the Council on Environmental Quality, the project alternatives considered reasonable under NEPA are those alternatives that are *practical or feasible from a technical and*

economic standpoint and using common sense.[5] The identification of the reasonable alternatives for the Gravina Access Project began with a screening process, developed in conjunction with state and federal resource agencies. The screening process resulted in a preliminary list of reasonable alternatives for the project. Additional technical studies and community and agency input resulted in the identification of other alternatives that were considered reasonable for the project.

2.4.1 Screening Process

During the summer and fall of 2000, the project team[6], with input from local, state, and federal agencies (including the broadly based Project Development Team [PDT]), established and conducted a screening process to evaluate the 18 initial build options (see Figure 2.1) for reasonableness. (The No Action option was to be carried forward as a project alternative in accordance with NEPA, regardless of its outcome in the screening process.) The screening process examined each option and evaluated it in terms of four categories of factors:

- Consistency with the purpose of and need for the project (as stated in Chapter 1)
- Potential environmental effects
- Potential transportation-related effects
- Estimated costs

The factors in each of these categories are listed in Table 2-3.

TABLE 2-3
FACTORS FOR SCREENING OF OPTIONS

Cost	*Purpose and Need*	*Environmental*	*Transportation*
Total project costs	Reliability of access (hours of operation, vehicle restrictions, closures)	Impacts on natural resources (subtidal habitat, anadromous streams, essential fish habitat, eelgrass beds, estuaries, wetlands) from project construction	Impacts on vehicular traffic during project construction and operation
Annual O&M costs	Efficiency and convenience of access to Gravina Island lands (travel time to developable land)	Impacts on natural resources from project operation	Impacts on marine navigation during project construction
Life-cycle costs	Convenience (travel distance)	Right-of-way within a Section 4(f) property	Impacts on marine navigation during project operation
	Convenience to airport (travel time)	Impacts on land use	Impacts on aviation during project construction
		Aesthetic impacts	Impacts on aviation during project operation
		Impacts on subsistence	

The project team used these categories of factors to quantitatively represent each option, based on the best available information, including the many extensive technical studies conducted for

[5] **Title 49 of the Code of Federal Regulations, administered by the Transportation Security Administration of the Department of Homeland Security; Subchapter C Civil Aviation Security, Part 1542 Airport Security.**

[6] **The Project Team consists of the DOT&PF, FHWA, and consultant team.**

the Gravina Access Project. The objective was to screen out those options that were not reasonable alternatives.

An important screening factor in this evaluation was cost. Based on a 50-year project life, the DOT&PF determined the original practical limit of project funding to be a life-cycle cost of $150,000,000.[7] The early cost estimates developed for the 18 initial build options are provided in Table 2-4[8].

TABLE 2-4
EARLY COST ESTIMATES FOR 18 INITIAL BUILD OPTIONS

Alternative	*Life-cycle Cost ($million)*
A	260
B	370
C1	235
C2	200
C3	140
C4	150
D1	85
D2	245
E	310
E2	400
F1	200
F1 Cable-Stayed	205
F2	595
F3	180
G1	155
G2	150
G3	130
G4	130

Eleven options were considered by DOT&PF to be not reasonable because they had life-cycle costs substantially beyond $150,000,000. The options screened out from the pool of potential reasonable alternatives based on this cost ceiling were:

- Four high-level bridges (Options A, B, C1, and C2)
- The moveable bridge (Option D2)
- The tunnels (Options E and E2)

[7] Joseph Perkins, P.E., DOT&PF Commissioner, August 29, 2000, concurrence on memorandum from Patrick Kemp, P.E., Preconstruction Engineer, DOT&PF Southeast Region, August 29, 2000. See Section 2.4.6 for revised cost ceiling.

[8] **Note that in the DEIS, life-cycle costs were characterized as 50-year life cycle costs, but in reality, are 20-year life-cycle costs.**

- The four alignments across Pennock Island (Options F1, F1 cable-stayed, F2, and F3)

Closer review of the seven remaining project options (i.e., Options C3, C4, D1, G1, G2, G3, and G4), using the environmental and transportation factors, revealed that Option G1 would not be practical or feasible from a technical standpoint. The Option G1 ferry terminal on Revillagigedo Island would be near Refuge Cove, which would require the taking of several homes and a Section 4(f) property (Refuge Cove State Park).[9] The DOT&PF investigated relocating the ferry terminal to avoid Refuge Cove State Park; however, a more acceptable location could not be identified because of land use constraints (residential, commercial, and industrial developments to the north and south), environmental constraints (reef and island areas off the Revillagigedo Island shoreline), or the impracticalities associated with increasing the over-water ferry travel time (i.e., by locating the terminal in Ward Cove). Because of the difficulties with the Option G1 ferry terminal location on Revillagigedo Island and because this option would not improve the travel time to the airport for any user, Option G1 was determined to be not a reasonable alternative and was not recommended for further study.

Following the elimination of Options A, B, C1, C2, D2, E1, E2, F1, F1 cable-stayed, F2, and F3 because they exceeded the cost ceiling, and the elimination of Option G1 because of its impacts to a Section 4(f) property, no other options were determined to be unreasonable in the screening process. Therefore, the DOT&PF recommended the following as reasonable alternatives for the Gravina Access Project: C3, C4, D1, G2, G3, G4, and No Action.

2.4.2 Local and Tribal Government and Community Input

Concurrent with the DOT&PF's screening process during the fall of 2000, the Borough and the cities of Ketchikan and Saxman were engaged in discussions pertaining to the identification of reasonable alternatives for the Gravina Access Project. The Borough's Department of Planning and Community Development (Planning Department) provided an independent evaluation of the alternatives based on the DOT&PF screening process, and based on the Planning Department's knowledge of local planning issues and constraints. The purpose of this effort was to assist the Borough Assembly and the city councils of Ketchikan and Saxman in making a recommendation (or independent recommendations) to the DOT&PF for the reasonable alternatives that should be studied further in the EIS. See also Chapter 7 regarding government to government coordination with tribal governments, and public involvement generally throughout the project.

The Planning Department's evaluation concluded that, in addition to No Action, the following options deserved further study: C3, C4, D1, a "revised" G4[10], and F3[11]. The Planning

[9] *Section 4(f) of the U.S. Department of Transportation Act of 1966 states:* The Administration may not approve the use of land from a significant publicly owned public park, recreation area or wildlife and waterfowl refuge, or any significant historic site unless a determination is made that: (1) there is no feasible and prudent alternative to the use of land from the property and (2) the action includes all possible planning to minimize harm to the property resulting from such use.

[10] Under this option, the community would expand and improve the existing ferry route as demand and availability of local financial resources made it appropriate. Improvements could include certain services such as baggage handling, improved terminal facilities and vessels, and expanded frequency of service.

[11] Stephen Reeve, Principal Planner, and John Hill, Associate Planner, Ketchikan Gateway Borough Planning Department, memorandum to Members of the Planning Commission, September 6, 2000.

Department included Option F3, even though its estimated life-cycle costs exceeded the DOT&PF's $150 million cost ceiling, because of its potential advantages:

- It would provide access to substantial amount of Borough and private lands on Gravina Island south of the airport and on Pennock Island;
- It would place bridge structures in locations that would have less of an impact on float plane and airport operations than other bridge options;
- It would enable large vessels to continue to traverse Tongass Narrows (via West Channel); and
- It would have less of an impact on the availability of developable lands adjacent to the airport than other bridge options.

[Note that Option F3 did not include modification of West Channel to improve navigational safety.]

The Planning Commission held two public work sessions in its effort to reach a recommendation to the Borough Assembly. Based on the Planning Department's evaluation, the testimonies of many individual citizens, and the contributions of the DOT&PF, the Planning Commission issued Resolution No. 2631, which recommended the following options for the Gravina Access Project: C3, C4, a "revised" G4, and No Action.[12] The Planning Commission chose not to recommend advancing Option F3 because of the possible impacts it might have on vehicular traffic through downtown Ketchikan and the resultant inconvenience of access to many Ketchikan residents. The Commission also considered the likely impacts Option F3 would cause the Pennock Island neighborhood, which has voiced opposition to roaded access.[13]

Members of the Borough Assembly, Ketchikan City Council, and Saxman City Council met at a joint work session on October 17, 2000, to discuss the Gravina Access Project options with Borough staff and representatives from the DOT&PF. The joint work session was an opportunity for these and other members of the public to participate in the local review process and provide input to the recommendations being developed by the three local governing bodies.

On November 6, 2000, the Ketchikan Gateway Borough Assembly passed Resolution No. 1578 supporting further investigation of the following options: C3, C4, D1, F3, and G4. This resolution was forwarded to the city councils of Ketchikan and Saxman for their approval. The City Council of Ketchikan concurred with the Assembly's resolution on November 16, 2000. The City Council of Saxman, in Resolution No. 01-11-232 (November 8, 2000) recommended the following options for further study: C3, C4, D1, F1, G4, and No Action. The resolution gave no explanation for the substitution of Option F1 for Option F3.

2.4.3 DOT&PF Identification of Alternatives

The DOT&PF considered the results of its screening process, as well as the input from the local governments and Ketchikan Gateway Borough community, in determining which options should be considered reasonable alternatives for the Gravina Access Project and studied further in the

[12] Stephen Reeve, Principal Planner, and John Hill, Associate Planner, through Susan Dickinson, Planning Director, and Georgianna Zimmerle, Borough Manager, Ketchikan Gateway Borough Planning Department, memorandum to Mayor Jack Shay and Members of the Borough Assembly, Mayor Dan Williams and Members of the Saxman City Council, and Mayor Bob Weinstein and Members of the Ketchikan City Council, October 10, 2000.

[13] Ibid.

EIS. Because the Borough Assembly felt strongly that Option F3 should be included, the DOT&PF increased the cost ceiling to $175 million to accommodate the Assembly and include Option F3.[14] The DOT&PF reviewed the costs of all previously considered build options that had been eliminated due to their costs and determined that, other than Option F3, none of those options would be considered reasonable with this revised cost ceiling. Therefore, the DOT&PF identified the following as reasonable project alternatives: C3, C4, D1, F3, G2, G3, and G4. The No Action option was also retained for further study as the No Action Alternative. **[Note that Alternative F3, as identified at this stage of the process, did not include modification of West Channel.]**

In December 2000, the project team presented these eight alternatives (i.e., Alternatives C3, C4, D1, F3, G2, G3, and G4, and the No Action Alternative) to the PDT as the recommended alternatives to be studied in detail in the NEPA document. In January 2001, these alternatives were forwarded to state and federal agencies for formal concurrence under the interagency NEPA and Section 404 merger agreement[15]. By March 2001, the DOT&PF received letters of concurrence from all participating agencies, with the exception of the Alaska Department of Environmental Conservation and the Alaska Division of Governmental Coordination, which selected "nonparticipation by choice." Based on the lack of any agency nonconcurrence, Alternatives C3, C4, D1, F3, G2, G3, and G4, and the No Action Alternative became the reasonable alternatives for the proposed action.

2.4.4 Additional Technical Studies

During the spring of 2001, the project team initiated a series of engineering analyses to further refine the preliminary engineering of the reasonable alternatives. These analyses were undertaken principally to:

- Refine roadway designs
- Evaluate structural requirements of bridges (including navigational clearances)
- Revise cost estimates to reflect design changes

As a result of the additional engineering work, the conceptual designs for several of the bridge alternatives were altered slightly, and a variation of one bridge alternative was added to the list of reasonable alternatives. These changes are described as follows:

[14] Patrick Kemp, P.E., Preconstruction Engineer, through Michael Dowling, P.E., Director of Design and Engineering Services, DOT&PF Southeast Region, memorandum to Joseph Perkins, P.E., DOT&PF Commissioner, November 29, 2000.

[15] In April 1997, the DOT&PF and FHWA Alaska Division entered into a "Interagency Working Agreement to Integrate Section 404 and Related Permit Requirements into the National Environmental Policy Act" with the Alaska Department of Fish and Game, Alaska Department of Environmental Conservation, Alaska Department of Natural Resources, U.S. Environmental Protection Agency, U.S. Army Corps of Engineers, National Marine Fisheries Service, and U.S. Fish and Wildlife Service. The agreement integrated the Clean Water Act Section 404(b)(1) Guidelines and other Section 404-related permitting and certification requirements with the NEPA process. Signatories of the agreement committed to ensure the earliest possible identification and consideration of environmental concerns to waters of the United States (including wetlands) in the planning, design, and construction of federal-aid highway projects.

The merged process for the Gravina Access Project was to have three concurrence points: purpose and need; reasonable alternatives to be carried forward for the NEPA document; and the preferred alternative. The agreement expired in May 2002 and was not renewed; therefore, the concurrence process is no longer applicable to the Gravina Access Project.

Vertical Clearance. The 210-foot vertical clearances of three bridges (in Alternatives C3, C4, and F3) were reconfigured as 200-foot vertical clearances. This reconfiguration is consistent with the vertical clearances of other major structures along the west coast, such as the Seymour Narrows cable crossing (185 feet) and Lion's Gate Bridge (200 feet) in Vancouver, British Columbia.

Horizontal Clearance. The horizontal clearances[16] used in early investigations were determined using the conceptual channel design methods published by the International Navigation Association (PIANC)[17]. For the initial 210-foot high bridge options, a horizontal clearance of 750 feet was assumed as a conservative width to provide for two-way traffic of the largest cruise ships potentially transiting Tongass Narrows. Further investigation of cruise ship traffic in Tongass Narrows determined that cruise ships coordinate the timing of their transits to avoid two-way traffic in Tongass Narrows. Accordingly, the horizontal clearances of the 200-foot high bridges associated with Alternatives C3, C4, and F3 were reconfigured to 550 feet, based on the PIANC conceptual method.

New Alternative—C3(b). A new bridge alternative with a vertical clearance of 120 feet was added in the same general location as Alternative C3. This alternative was added to provide a low-level bridge that, after crossing Tongass Narrows, would connect more directly to the airport terminal area than the 120-foot bridge of Alternative D1. Alternative C3 (with a 200-foot bridge) was redesignated C3(a), and the new 120-foot bridge alternative at that location was designated Alternative C3(b). The alignment of this alternative is shown in Figures 2.2 and 2.7.

D1 and G2 Changes. In their original configuration, Alternatives D1 and G2 wrapped around the northern end of the airport property. With the DOT&PF's plans to extend the airport's west taxiway to the north (which had been approved by federal and state natural resource agencies after extensive consultation and construction of the taxiway is now complete), the prism of the northern roadway alignment for Alternatives D1 and G2 would have to be pushed farther into Tongass Narrows. Preliminary engineering and environmental studies indicated that this would require placement of substantial amounts of fill in Tongass Narrows, which would result in unacceptable environmental impacts to intertidal areas and other sensitive habitat. These studies, together with input from federal and state agencies, indicated that a southern route around the airport was the only reasonable location of this roadway. Alternatives D1 and G2 were therefore reconfigured to wrap around the southern end of the airport runway, in the same alignment as the other build alternatives.

Spine Road Added to All Alternatives. In their original configuration, all build options provided access to developable land on Gravina Island either by making landfall outside of the Airport Reserve zone (i.e., access to developable land would be possible along the alignment in its approach to the airport), or with an additional road segment extending from the airport to the closest developable land. During the development of

[16] The conceptual channel width design is based upon a historical survey of ships that have passed through Tongass Narrows, projections of the type of ships anticipated to use the channel in the future, factors for channel bottom type and depth, visibility, and type of channel navigational aids.

[17] The International Navigation Association (PIANC) was formerly known as the Permanent International Association of Navigation Congresses.

Gravina Access Project alternatives, the Borough was separately planning development of a new road around the west side of the airport to the Lewis Reef development area (i.e., Proposed Ketchikan Airport Access Road identified on Figure 2.2). **However, the Borough had not yet identified an alignment.** After identification of the reasonable alternatives in preparation for this EIS, and after additional coordination with the Borough concerning their long-term plans for development on Gravina Island and the road to the Lewis Reef development area, the DOT&PF determined that all build alternatives should provide access to the developable land north of the Airport Reserve zone, consistent with the Borough's general plans for a road. Therefore, all build alternatives were revised to include construction of a road around the west side of Ketchikan International Airport. This road, located entirely on airport property, crosses Airport Reserve Land (land reserved for airport-specific uses) and ends at the intersection with Airport Development Land (land more generally available for all types of development, not necessarily airport related). The spine road provides uniform access among all build alternatives to developable property north of the airport, addressing the related portion of the purpose and need for the project.

It is important to note that the Borough continued planning for its road as the Gravina Access Project Draft EIS was produced, with the assumption that it would be built before the EIS was completed. As this Final EIS goes to press, the Borough has completed their road design and separately secured a Section 404 permit from the U.S. Army Corps of Engineers. The Gravina Access Project spine road alignment is slightly different than the Borough's alignment, which is an independent action that did not influence the development (including location) and evaluation of the Gravina Access Project alternatives.

If the Record of Decision for the Gravina Access Project selects any of the build alternatives for construction and if it were signed before construction began on the Borough road, DOT&PF would work with the Borough to construct the alignment presented in this Final EIS to avoid redundancy, consolidate costs, and minimize impact to wetlands. Should the Borough advance construction of their road prior to the Record of Decision, DOT&PF would construct the alternative selected in the Record of Decision to the point where it would connect to the Borough's spine road alignment. The Borough's spine road would connect to other developable lands north of the airport consistent with the Gravina Access Project purpose and need.

Figure 3.2 depicts the current zoning classification for lands within the project area and shows that the location of the spine road's terminus is at the Airport Development Land boundary.

The evaluation of each build alternative includes effects resulting from construction and operation of this road. The road is designed to provide vehicular and other access to the area of Gravina Island, north of the airport, where the Borough has encouraged land development such as the long-term lease to Pacific Log and Lumber.

Based on the refined engineering design of the alternatives, the project team conducted specialized technical studies of the reasonable alternatives (i.e., Alternatives C3[a], C3[b], C4, D1, F3, G2, G3, and G4) during the spring and fall of 2001 to characterize the potential environmental impacts associated with each. These studies were:

- Evaluation of Impacts to the Social Environment
- Assessment of Relocation Impacts
- Assessment of Economic Impacts
- Visual Quality Impact Assessment
- Assessment of Impacts to the Biological Environment
- Historic and Archaeological Resources Survey
- Aviation Impacts Analysis
- Assessment of Airport Impacts
- Marine Navigation Analysis
- Traffic Impact Assessment
- Hazardous Wastes Study
- Secondary and Cumulative Impacts Analysis

The results of the engineering and environmental technical studies were compiled into the *Alternatives Evaluation Summary Report.*[18] The principal impact issues identified in these analyses were navigation, aviation and the airport, project costs, economic conditions, and natural resources.

Navigation. Bridge clearances (both vertical and horizontal) and locations would affect ship passage under the bridge and maneuvers through Tongass Narrows. The bridge alternatives would introduce a greater probability of ship groundings and a higher risk of allisions (i.e., ship collisions with bridge piers).

Aviation and the Airport. Analysis indicated likely delays to floatplanes flying under SVFR, particularly for the bridge alternatives nearest the airport (C3[a], C3[b], C4, and D1). Ferry operations, bridge piers, and bridge construction would alter floatplane operations. The two highest bridge alternatives near the airport (C3[a] and C4) would penetrate the Part 77 airspace, a Federal Aviation Administration (FAA)-designated clear zone around the airport.

Costs. The life-cycle costs were estimated to be between $110,000,000 and $170,000,000 for the bridge alternatives (using a bridge life of 75 years), and between $105,000,000 and $110,000,000 for the ferry alternatives (using a ferry life of 50 years). The annual O&M costs were estimated to be between $116,000 and $270,000 for the bridge alternatives, and between $4,460,000 and $4,500,000 for the ferry alternatives.

Economics. Spending associated with project construction would raise employment in the Borough by an estimated 261 to 1,416 persons employed, depending upon the alternative. With the bridge alternatives, cruise ships may have to change their operations and might have to eliminate or shorten some port calls, which could reduce economic activity in the Borough, depending on the alternative.

Natural Resources. All build alternatives would adversely affect Tongass Narrows, streams, wetlands, and/or forests by altering or eliminating some fish and wildlife habitat.

[18] DOT&PF, prepared by HDR Alaska, January 2002.

2.4.5 Preliminary Identification of Recommended Alternative

Based on the results of the engineering and environmental technical studies, the DOT&PF identified Alternative F3, the two-bridge alternative that traverses Tongass Narrows via Pennock Island, as its recommended alternative for the Gravina Access Project. **[Note that Alternative F3, as identified at this stage of the process, did not include modification of West Channel.]** The principal reasons supporting DOT&PF's recommendation were that Alternative F3 would:

- meet the project's purpose and need
- meet the community's goal of bridge access to Gravina Island
- allow the passage of major cruise ships, thereby maintaining Ketchikan's tourism industry
- better serve Ketchikan's long-term needs for convenient and reliable transportation to the airport and developable land, compared to the ferry alternatives
- not intrude into Ketchikan International Airport airspace
- have a minimal impact on airport facilities, compared to the other bridge alternatives located at the airport
- have less potential impact on Ketchikan's floatplane industry than the other bridge alternatives (which are located at the airport)
- have bridge structures that are not as technically challenging as the other bridge alternatives
- have bridge structures that would be less visibly intrusive than the other bridge alternatives

Although DOT&PF viewed Alternative F3 as its recommended alternative, it recognized the particular challenges associated with this crossing:

- The crossing point would not be central to Ketchikan's population center.
- Traffic from north of Ketchikan would be routed through the downtown core.
- Cruise ships would be directed through the West Channel, where maneuvers to the city docks would be more inconvenient and would have more potential for risk than the current maneuvers in the East Channel.
- Some cruise lines expressed reservations about calling in Ketchikan through the West Channel. An evaluation of cruise ship operations (see Appendix K) determined that navigational safety concerns associated with West Channel could reduce cruise ship calls at Ketchikan, which would potentially reduce cruise-related spending (see Appendix D). DOT&PF determined that mitigation for this economic impact might involve moving the cruise ship docking locations. Community coordination with cruise line agencies would be essential for successfully maintaining and, if desired, growing Ketchikan's important tourist industry.
- Full funding for construction might be difficult to obtain.

2.4.6 Addition of Alternative F1 (DOT&PF and FHWA preferred)

On January 7, 2002, Governor Tony Knowles and DOT&PF Commissioner Joe Perkins publicly announced the recommendation for Alternative F3. **[Note that Alternative F3, as identified at this stage of the process, did not include modification of West Channel.]** The DOT&PF held public open house meetings in Ketchikan on February 11 and 27, 2002, to obtain public input regarding this decision. The DOT&PF also held meetings with federal, state, and local agencies and public officials in January, February, and March 2002. During this time, DOT&PF received considerable input from the community, elected officials, and representatives of local, state, and federal agencies concerning the reasonable alternatives.

Many of the commenters supported a Pennock Island crossing (such as Alternative F3). However, there was a great deal of public interest in and preference for an alternative with a 200-foot high bridge over East Channel (instead of over West Channel) to allow passage of cruise ships and a lower (120-foot-high) bridge over West Channel. Such a configuration is essentially Option F1 from the initial set of options, as described in Section 2.3.1. In the screening of initial options, Option F1 had been determined to be unreasonable solely on the basis of its cost, which would have exceeded the DOT&PF's established cost ceiling. The community support of Option F1 was based primarily on concerns for restricting cruise ship travel to West Channel under Alternative F3 and the potential impacts to the local economy as a result of fewer and shorter cruise ship port calls.

In the spring of 2002, the DOT&PF received indication from the Alaska Congressional delegation that federal funding for the Gravina Access Project was feasible at a level above $190 million, and that the $175 million cost ceiling could be increased to allow the consideration of Option F1 as a reasonable alternative.

As stated in Section 2.3, the cost estimates of the initial 18 alternatives are not directly comparable with the current estimates of the reasonable alternatives. The DOT&PF again reviewed the costs of all previously considered build options that had been eliminated due to their costs and determined that Options A, B, C1, D2, E, and E2 still had costs above the reasonable range (i.e., total project costs in excess of $240 million); therefore, based on costs, DOT&PF determined that no further investigations of Options A, B, C1, D2, E, or E2 were required. Although Option C2 could now be considered reasonable from a cost standpoint, DOT&PF did not add it to the list of reasonable alternatives because it is almost identical to Alternative C4, the primary difference being its horizontal navigational opening, which is 750 feet. Since engineering studies conducted in Spring 2001 indicated that a navigational opening of 550 feet would be adequate (see Section 2.4.4), there was no need to add Option C2 to the list of reasonable alternatives. Although Option F1 cable-stayed could now be considered reasonable from a cost standpoint, DOT&PF did not add it to the list of reasonable alternatives because it would be the same footprint as Alternative F1 and the cable-stayed design would present extreme adverse risk to float plane operations in East Channel.

Based on strong local support for Option F1, combined with federal funding assurances, the DOT&PF decided to add Alternative F1 as a reasonable alternative to be evaluated in this EIS,[19] with modification of the vertical and horizontal navigational clearances of the East Channel bridge to 200 feet and 550 feet, respectively. This brought to nine the number of build alternatives being evaluated.

[19] Joseph Perkins, P.E., DOT&PF Commissioner, April 30, 2002. Concurrence on memorandum from Patrick Kemp, P.E., Preconstruction Engineer, through Bob Doll, Regional Director, DOT&PF Southeast Region, April 22, 2002.