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Comment Due Date: May 10, 2010

Decision ID No. 40642

Draft Environmental Impact Statement

Alaska Railroad Corporation Construction and Operation of a Rail Line Extension to Port MacKenzie, Alaska

STB Finance Docket No. 35095

Volume I Main Body

Lead Agency:
Surface Transportation Board

Cooperating Agencies:
Federal Railroad Administration
U.S. Army Corps of Engineers
U.S. Coast Guard

Information Contacts:
Victoria Rutson
Chief, Section of Environmental Analysis
David Navecky
Environmental Protection Specialist

SURFACE TRANSPORTATION BOARD
Washington, DC 20423

Office of Economics, Environmental Analysis and Administration

March 16, 2010

Re: STB Finance Docket No. 35095, Alaska Railroad Corporation Construction and Operation of a Rail Line Extension to Port MacKenzie, Alaska; Issuance of Draft Environmental Impact Statement

Dear Reader:

The Board's Section of Environmental Analysis (SEA) is pleased to provide you with your copy of the Draft Environmental Impact Statement (Draft EIS) for the proposed construction and operation of the Port MacKenzie Rail Extension. This Draft EIS analyzes the environmental impacts that might occur if the Alaska Railroad Corporation (ARRC) were to construct and operate the proposed rail line, an approximately 35- to 40-mile long rail line to connect the Port MacKenzie District to a point on the existing ARRC main line between Wasilla and just north of Willow, Alaska. The Draft EIS analyzes the potential environmental impacts of the proposed action and alternatives, including the No-Action Alternative.

Three cooperating agencies assisted SEA in the preparation of the Draft EIS. The cooperating agencies include the U.S. Army Corps of Engineers, Federal Railroad Administration, and U.S. Coast Guard.

In addition to analyzing the proposed action and alternatives, the Draft EIS sets forth SEA's preliminary recommended mitigation, ARRC's voluntary mitigation measures, and encourages mutually acceptable negotiated agreements to mitigate adverse environmental impacts should the Board approve the project.

SEA and the cooperating agencies invite public comment on all aspects of the Draft EIS and are providing a 45-day public comment period, which begins upon the U.S. Environmental Protection Agency's issuance of a notice of availability in the *Federal Register* on March 26, 2010. Comments on the Draft EIS must be received or postmarked by May 10, 2010. Instructions on how to submit comments, and a list of the locations, dates, and times of public meetings are attached to this letter in a separate Fact Sheet. After your review of the Draft EIS, we appreciate your comments on ways to improve our analyses, make corrections, compliment what we have done well, and supplement what you feel needs further work. The more specific your comments are, the better we will be able to respond to them.

After the close of the public comment period on the Draft EIS, SEA and the cooperating agencies will prepare a Final EIS in response to comments on the Draft EIS. The Board will then issue a final decision, based on the entire environmental record, including the record on the transportation merits, the Draft EIS, the Final EIS, and all public and agency comments received. The Board then will decide whether to approve the proposed project, deny it, or approve it with mitigating conditions, including environmental conditions. The cooperating agencies may also issue separate decisions, approvals or denials related to the proposed project.

The Draft EIS is also available for viewing and downloading via the Board's Web site at http://www.stb.dot.gov, under "E-Library," then under "Decisions & Notices," beneath the date "03/16/10." You may also visit the Board's Web site (www.stb.dot.gov) and look for Key Cases under Environmental Matters.

SEA has distributed the Draft EIS widely for public review and comment. Approximately 6,800 copies of the Draft EIS have been distributed to parties on SEA's environmental distribution list, which includes interested Federally recognized tribes, key governmental agencies, and persons expressing an interest in receiving a copy of the Draft EIS or participating in the environmental review process for this proceeding. SEA has also distributed the Draft EIS to all parties of record (official participants), as well as made additional print copies of the Draft EIS available for review in public libraries throughout the project area.

SEA appreciates the efforts of all interested parties who have participated in this environmental review. We look forward to receiving your comments.

Sincerely,

Victoria Rutson

Victoria Rutson
Chief,
Section of Environmental Analysis

FACT SHEET

The Surface Transportation Board's Section of Environmental Analysis (SEA) is implementing a public and agency outreach effort to ensure that the public, agencies, and communities have the opportunity to actively participate and comment on the Draft EIS and the Board's environmental review process. Comments on the Draft EIS must be received or postmarked by **May 10, 2010**.

Beginning on April 6, 2010, SEA and the cooperating agencies will host six public meetings in the project area to receive public comments on the Draft EIS. At the beginning of each meeting, SEA will give a brief overview of the proposed action and environmental review process. The overview will be followed by a formal comment period during which each interested individual will be given several minutes to address the meeting participants and convey his or her oral comments. A court reporter will be present to record these oral comments. If time permits, the court reporter will be available at the conclusion of the formal segment of the meeting to record oral comments from individuals not interested in addressing the meeting as a whole. The dates, locations and times of the public meetings are shown below:

- April 6, 2010, 6:30-8:30 pm at Wilda Marston Theater, 3600 Denali Street, Anchorage, AK
- April 7, 2010, 6:30-8:30 pm at Big Lake Elementary School, 3808 South Big Lake Road, Big Lake, AK
- April 8, 2010, 6:30-8:30 pm at Menard Sports Center, 1001 S Mack Drive Wasilla, AK
- April 12, 2010, 6:30-8:30 pm at Houston Middle School, 12801 W. Hawk Lane, Houston, AK
- April 13, 2010, 6:30-8:30 pm, at Willow Community Center, Mile 70 Parks Highway, Willow, AK
- April 14, 2010, 6:30-8:30 pm, at Knik Elementary School Gym, 6350 Hollywood Boulevard, Wasilla, AK

Recorded Comments: A court reporter will be at the public meetings to transcribe the oral comments.

Written Comments: Comment forms will be provided at the public meetings and will be accepted at the meetings or the forms can be submitted later by mail. Any interested party may submit written comments on the Draft EIS regardless of whether they participate in any of the six public meetings and provide oral comments. Comment forms or written letters may be mailed to:

David Navecky
STB Finance Docket No. 35095
Surface Transportation Board
395 E Street S.W.
Washington, DC 20423-0001

Electronic Comments: Comments may also be filed electronically on the Board's Web site, www.stb.dot.gov, by clicking on the E-FILING link. Then select "Environmental Comments," which does not require a Login Account. It is not necessary to mail written comments that have been filed electronically. Please refer to STB Finance Docket No. 35095 when filing.

Library Distribution: SEA has also distributed the Draft EIS to the repositories listed below and requested that the entire Draft EIS be made publicly available in their reference sections.

Chugiak/Eagle River Branch Library
11901 Business Blvd
Eagle River, AK 99577

Moldoon Library
1251 Muldoon Rd # 158
Anchorage, AK 99504

Samson-Dimond Branch Library
800 East Dimond Blvd.
Dimond Center, 2nd floor
Anchorage, AK 99515

Z. J. Loussac Public Library - AK Collection
3600 Denali Street
Anchorage, AK 99503

Aniak Public Library
270 Riverfront Drive
PO Box 270
Aniak, AK 99557-0270

Anderson Village Library
3600 Denali Street
Anchorage, AK 99503

Tuzzy Consortium Library
P.O Box 2130
Barrow, AK 99723

Kuskokwim Consortium Library
P.O. Box 368
Bethel, AK 99559-0368

Anchor Point Public Library
72251 Milo Fritz Ave
Anchor Point, AK 99556

Cantwell Community Library
Mile 133.5 Denali Highway
Cantwell, AK 99729

Willow Public Library
23557 W Willow Cmnty Ctr Cir
Willow, AK 99688

Deadline: Written comments on the Draft EIS must be postmarked by May 10, 2010.
Electronically-filed comments must be received by May 10, 2010.

All comments received – written, e-filed, or transcribed – will carry equal weight in helping to complete the EIS process and guide the Board in its decision-making on this matter.

DRAFT ENVIRONMENTAL IMPACT STATEMENT
STB Finance Docket No. 35095
Alaska Railroad Corporation Construction and Operation of a Rail Line Extension to Port MacKenzie, Alaska

Lead Agency: Surface Transportation Board;
Cooperating Agencies: Federal Railroad Administration (FRA); U.S. Army Corps of Engineers, Alaska District (USACE); U.S. Coast Guard (USCG).

Proposed Action: The proposed action is the construction and operation of approximately 30 to 45 miles of rail line to connect the Port MacKenzie District to a point on the existing Alaska Railroad Corporation (ARRC) main line between Wasilla and just north of Willow, Alaska to provide a rail connection for freight services between Port MacKenzie and Interior Alaska.

Location: The proposed rail line's southern terminus would be approximately 2 or 3 miles from the Port MacKenzie docks in the Port MacKenzie District and the northern terminus would be at one of four locations along the existing ARRC main line between Wasilla and just north of Willow, Alaska, depending upon the alternative.

Abstract: On December 5, 2008, ARRC filed a petition with the Surface Transportation Board (STB or the Board) pursuant to 49 United States Code (U.S.C.) 10502 and 10901 for the authority to construct and operate approximately 30 to 45 miles of rail line to connect the Port MacKenzie District in Matanuska-Susitna Borough (MSB) to a point on the existing ARRC main line between Wasilla and just north of Willow, Alaska. The Applicant has stated that the purpose of the proposed rail line is to provide rail service to Port MacKenzie and connect the Port with the existing ARRC rail system, providing Port MacKenzie customers with rail transportation between Port MacKenzie and Interior Alaska. The proposed rail line would thus provide Port MacKenzie's customers with multi-modal options for the movement of freight to and from the Port similar to that offered by other ports handling large vessels. The proposed project would also support ARRC's statutory goal to foster and promote long-term economic growth and development in the State of Alaska. The Board's Section of Environmental Analysis (SEA) and the cooperating agencies have prepared this Draft EIS, which identifies and evaluates the potential environmental impacts associated with the proposed action and alternatives, including the No-Action Alternative. The proposed action and alternatives, with the exception of the No-Action Alternative, could adversely affect topography, soils, surface water, wetland, biological, subsistence, cultural, land use, and recreation resources. SEA has included recommended preliminary mitigation measures in this Draft EIS. The mitigation measures will be considered by the Board as potential conditions if the Board decides to grant ARRC authority to construct and operate the rail line. The proposed action and alternatives would cause negligible impacts on all other resource areas. The cooperating agencies' Federal actions could include an FRA decision to provide funding to ARRC for rail line construction through a grant, USCG's decision on issuing bridge permits under Section 9 of the Rivers and Harbors Act of 1899 (33 U.S.C. 401 et seq.), the General Bridge Act of 1946 (33 U.S.C. 525 et seq.), and the USACE decision to issue a discharge permit under Section 404 of the Clean Water Act of 1977 (33 U.S.C. 1251-1376) and a permit to perform work or place a structure in navigable waters under Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).

Comment Period: The public and any interested parties are encouraged to make written comments on all aspects of this Draft EIS. All comments must be submitted within the comment period, which will close May 10, 2010.

Contacts: Written comments on the Draft EIS may be submitted to:

David Navecky
Surface Transportation Board
395 E Street, S.W.
Washington, D.C. 20423-0001
ATTN:
Section of Environmental Analysis
STB Finance Docket No. 35095

Comments may also be filed electronically on the Board's Web site, www.stb.dot.gov, by clicking on the E-FILING link. Then select "Environmental Comments," which does not require a Login Account. It is not necessary to mail written comments that have been filed electronically. Please refer to STB Finance Docket No. 35095 when filing.

Further information about the project can be obtained by calling SEA's toll-free number at 1-888-257-7560 (FIRS for the hearing impaired 1-800-877-8339). This Draft EIS is also available at the Board's website at: www.stb.dot.gov.

Public Meetings: In addition to receiving written comments, SEA and the cooperating agencies will host six public meetings on the Draft EIS at the following locations, dates and times. Interested parties may submit written comments or make oral comments at these meetings.

1. April 6, 2010, 6:30-8:30 pm at Wilda Marston Theater, 3600 Denali Street, Anchorage, AK
2. April 7, 2010, 6:30-8:30 pm at Big Lake Elementary School, 3808 South Big Lake Road, Big Lake, AK
3. April 8, 2010, 6:30-8:30 pm at Menard Sports Center, 1001 S Mack Drive Wasilla, AK
4. April 12, 2010, 6:30-8:30 pm at Houston Middle School, 12801 W. Hawk Lane, Houston, AK
5. April 13, 2010, 6:30-8:30 pm, at Willow Community Center, Mile 70 Parks Highway, Willow, AK
6. April 14, 2010, 6:30-8:30 pm, at Knik Elementary School Gym, 6350 Hollywood Boulevard, Wasilla, AK

SUMMARY

On December 5, 2008, Alaska Railroad Corporation (ARRC or the Applicant) filed a petition with the Surface Transportation Board (STB or the Board) pursuant to 49 United States Code (U.S.C.) 10502 for authority to construct and operate approximately 30 to 45 miles of rail line to connect the Port MacKenzie District in Matanuska-Susitna Borough (MSB) to a point on the existing ARRC main line between Wasilla and just north of Willow, Alaska. Referred to as the Port MacKenzie Rail Extension, the proposed rail line would provide a rail connection for freight services between Port MacKenzie and Interior Alaska.

Council on Environmental Quality (CEQ) National Environmental Policy Act (NEPA) regulations at 40 Code of Federal Regulations (CFR) 1501.6 emphasize agency cooperation early in the NEPA process and allow a lead agency (in this case, the STB) to request the assistance of other agencies with either jurisdiction by law or special expertise in matters relevant to the proposed action. Three Federal agencies are cooperating in the preparation of this Environmental Impact Statement (EIS). Table S-1 lists each cooperating agency and describes its roles and responsibilities.

Table S-1
Cooperating Agency Involvement in the Port MacKenzie Rail Extension EIS

Federal Railroad Administration	Could provide funding to ARRC for rail line construction or operations.
U.S. Army Corps of Engineers	Could grant a Section 404 Clean Water Act permit and/or a Section 10 Rivers and Harbors Act permit.
U.S. Coast Guard	Could issue bridge permits.

The Board's Section of Environmental Analysis (SEA) and the cooperating agencies (collectively the Agencies) prepared this Draft EIS in accordance with NEPA, CEQ regulations, and the Board's environmental regulations (49 CFR 1105) to provide the Board; the cooperating agencies; other Federal, state, and local agencies; Alaska Natives; and the public with clear and concise information on the potential environmental impacts of the proposed action and alternatives, including the No-Action Alternative. References to SEA in this Draft EIS reflect input from all three cooperating agencies.

The Agencies also prepared this Draft EIS in accordance with Federal Railroad Administration (FRA) NEPA guidance at 64 CFR 28545; U.S. Army Corps of Engineers NEPA-implementing regulations at 33 CFR 230; and U.S. Coast Guard COMDTINST M16475.1D—NEPA-Implementing Procedures and Policy for Considering Environmental Impacts.

SEA is issuing this Draft EIS for public review and comment. SEA will consider all timely submitted comments received on this Draft EIS and respond to all substantive comments in a Final EIS. The Final EIS will include final recommended environmental mitigation conditions, as appropriate. The Board will consider the entire environmental record, the Draft and Final EISs, all public and agency comments, and SEA's final environmental recommendations in making its final decision on the application to construct and operate the proposed rail line.

The construction and operation of rail lines require prior Board authorization either through issuance of a certificate under 49 U.S.C. 10901 or, as requested here, by granting an exemption under 49 U.S.C. 10502 from the formal application procedures of section 10901. Section 10901(c) as amended by the ICC Termination Act of 1995, Pub. L. No. 104-88, 109 Stat. 803 (1995) (ICCTA) is a permissive licensing standard. It now directs the Board to grant rail line construction proposals "unless" the Board finds the proposal "inconsistent with the public convenience and necessity [PC&N]." Thus, Congress made a presumption that rail construction projects are in the public interest unless shown otherwise. See Mid States Coalition for Progress v. STB, 345 F.3d 520, 552 (8th Cir. 2003); Alaska Railroad Corporation - Construction and Operation Exemption – Rail line Between North Pole and Delta Junction, Alaska, STB Finance Docket No. 34658 (STB served January 5, 2010),[1] slip op. at 5.

Under 49 U.S.C. 10502, the Board must exempt a proposed rail line construction from the detailed application procedures of 49 U.S.C. 10901 when it finds that: (1) those procedures are not necessary to carry out the rail transportation policy (RTP) of 49 U.S.C. 10101; and (2) either (a) the proposal is of limited scope, or (b) the full application procedures are not necessary to protect shippers from an abuse of market power.

In making its final decision here, the Board will decide whether to approve, approve with conditions (which could include conditions designed to mitigate potential impacts on the environment), or deny the Applicant's request for a license to construct and operate a proposed rail line from Port MacKenzie to the existing main line to the north. The cooperating agencies that could issue individual decisions concerning the proposed action intend to use information in this Draft EIS for their decisionmaking purposes under the statutes they administer.

S.1 Purpose and Need

The Applicant has stated that the purpose of the proposed rail line is to provide rail service to Port MacKenzie and connect the Port with the existing ARRC rail system, providing Port MacKenzie customers with rail transportation between Port MacKenzie and Interior Alaska.

According to the Applicant, Port MacKenzie is the closest deep-water port to Interior Alaska and has capacity to handle bulk commodities. The Port's market includes bulk commodities (e.g., wood chips, saw logs, sand/gravel, and cement), iron or steel materials (e.g., scrap metal), vehicles and heavy equipment, and mobile or modular buildings. The nearest other port in the area is the Port of Anchorage, which is an additional 35 highway/rail miles from the Alaska interior. The Applicant notes that the Port of Anchorage currently has no capacity for dry bulk materials export. The required room for bulk rail unloading (unit train rail loop arrangements) does not exist, nor does the Port of Anchorage presently have the capacity to handle the loading

[1] Congress had first relaxed the section 10901 standard in the Staggers Rail Act of 1980, Pub. L. No. 96-448, 96 Stat. 1895 (1980). Before 1980, the Interstate Commerce Commission (ICC),our predecessor, had been directed to scrutinize rail construction proposals closely to prevent excess rail capacity. The ICC was to issue a license only if it found that the PC&N "require" the construction. See former 49 U.S.C. 10901(a) (1978); see, e.g., Chesapeake & Ohio Ry. v. United States, 283 U.S. 35, 42 (1931). In the Staggers Act, Congress made it easier to obtain agency authorization for a new line by providing that the ICC need only find that the PC&N "permit," as opposed to "require" the proposed new line. See former 49 U.S.C. 10901(a) (1995); H.R. Rep. No. 1430, 96th Cong., 2d Sess. 115-16 (1980), reprinted in 1980 U.S.C.C.A.N. 4147-48. With the ICCTA, Congress completed its policy shift, directing that the Board "shall" issue construction licenses "unless" the agency finds a proposal "inconsistent" with the PC&N. See 49 U.S.C. 10901(c).

of dry bulk materials into ships. Available space for stockpile and handling of bulk materials is also limited.

In contrast to the limited available space and bulk handling capabilities at the Port of Anchorage, Port MacKenzie is situated on nearly 9,000 acres of land, and has existing dockside bulk materials loading capacity with a conveyor system to move materials from existing stockpile staging areas to the docks. The dredge-free draft of the port is in excess of 60 feet, providing the ability to load nearly any sized vessel. Unlike similar port facilities that serve large, ocean-bound vessels, Port MacKenzie does not have rail service. At present, freight truck is the only available mode of surface transportation for bulk materials and other freight to and from Port MacKenzie. Trucks, as compared to rail, are inefficient for bulk commodity movements and generally are used for short-haul movements in that context. Bulk commodity shippers, which already have access to the existing ARRC network, utilize a combination of rail and transload to truck 30 miles away for final delivery to Port MacKenzie. However, such intermediate movements and handling requirements are not efficient and impose increased costs to the shipper and consumer due to multiple handling of materials between transportation modes. The Applicant states that the cost for intermediate transloading from rail to truck, and the additional truck ton-mile cost for final delivery, actually places Port MacKenzie at a significant disadvantage to other regional ports with rail service. For example, a railroad can move one ton of freight 457 miles on a gallon of diesel fuel, compared to 133 miles for a truck.[2] Both efficiency in handling and efficiency in fuel use translate into substantial cost savings for freight shipped via rail transport rather than transport by truck over the highway.

Because of the economics and efficiencies offered by direct rail service, the Applicant anticipates that bulk commodity movements to and from the Port would likely be by rail if such an option were available. The proposed rail line would thus provide Port MacKenzie's customers with multi-modal options for the movement of freight to and from the Port similar to that offered by other ports handling large vessels. The proposed project would also support ARRC's statutory goal to foster and promote long-term economic growth and development in the State of Alaska.

S.2 Scoping and Public Involvement

On February 12, 2008, SEA published the Notice of Intent to Prepare an EIS, Draft Scope of Study, Notice of Scoping Meetings, and Request for Comments (73 *Federal Register [FR]* 8106). SEA distributed a letter to more than 7,700 citizens, elected officials, Federal, state, and local agencies, tribal organizations, and other potentially interested organizations to introduce the proposed action; announce SEA's intent to prepare an EIS; request comments; and give notice of six public scoping meetings. The distribution encompasses the communities surrounding the proposed action and alternatives and groups outside the project area that could have an interest in the Project. SEA also posted meeting notices in public locations (such as post offices, grocery stores, and restaurants) in the project area and initiated a toll-free project hotline. SEA also provided project information on the STB Web site at www.stb.dot.gov and on an STB-sponsored project Web site at www.stbportmacraileis.com. SEA placed notices of the scoping meetings in several newspapers, including the *Frontiersman*, the *Talkeetna Times*, and the *Anchorage Daily News*.

[2] http://www.aar.org/Environment/Environment.aspx.

SEA held public scoping meetings in Knik, Big Lake, Willow, Houston, Wasilla, and Anchorage, Alaska, on March 3, 4, 5, 6, 10, and 11, 2008, respectively. SEA used a workshop format to allow attendees to provide comments and ask questions of SEA. Approximately 146 citizens, representatives of organizations, elected officials, and officials from Federal, state, and local agencies attended the meetings. Some attendees submitted written comments during the meetings, and SEA received additional scoping comment letters during the scoping comment period, which closed on March 21, 2008.

SEA considered agency and public input received during the scoping process and on July 17, 2009 issued the final scope of study for this Draft EIS. SEA published the final scope of study in the *Federal Register* (74 FR 34859), placed it on the STB and project Web sites, and mailed an announcement listing the availability of the final scope of study to approximately 8,000 individuals, agencies, and other interested parties on the SEA project mailing list. The final scope of study summarized the comments received and potential impacts to be analyzed.

In short, as part of the environmental review process to date, SEA has conducted broad public outreach activities informing the public about the proposed action and facilitating public participation. SEA consulted with and will continue to consult with Federal, State of Alaska, and local agencies, tribal organizations, affected communities, and all interested parties to gather and disseminate information about the proposed project.

S.3 Alternatives Considered in the SEA Environmental Review

Under the proposed action, ARRC would construct and operate a single-track rail line from Port MacKenzie to a point on the existing ARRC main line between Wasilla and north of Willow, Alaska. ARRC proposes a right-of-way (ROW) of approximately 200 feet for the rail line. The ROW could contain a power line, buried utility lines, and an access road (this would be determined during final design). In addition, ARRC would construct one rail line siding within the existing main line ROW at the tie-in location with the rail extension. ARRC proposes to transport freight on the rail line and would construct and maintain the rail line to Class 4 standards[3] because of its desired 60 mile-per-hour operating speed for freight service. ARRC anticipates an average of two freight trains per day, one in each direction.

In addition to the proposed rail line, ARRC would construct operations support facilities. ARRC would construct a terminal reserve area along the southern terminus of the rail line. This area would eventually consist of yard sidings, storage areas, and a terminal building to support train maintenance. The locations of some of the facilities, such as construction staging areas and communication towers, would vary depending on which alternative segments the Board authorized. ARRC would also build temporary construction support facilities and would remove them after the completion of rail line and operations support facilities construction.

[3] The Federal Railroad Administration (FRA) establishes the standards for class of track and maximum operating speed for freight on each class of track (49 Code of Federal Regulations [CFR] 213). Design and construction of the proposed Port MacKenzie Rail Extension to Class 4 standards would be required for ARRC's desired operating speed for freight service.

The build alternatives considered in this Draft EIS are composed of alternative southern and northern segments, with possible connector segments between. The southern segments, Mac West and Mac East, would run either east or west of the Point MacKenzie Agricultural Project. There are three main segments north of the Point MacKenzie Agricultural Project – Willow, Houston, and Big Lake – with Houston having north and south variants. Connector segments would link the north and south segments to create eight possible alternatives for the proposed rail line, as listed below and depicted in Figure S-1.

- Mac West, Connector 1, and Willow. This route would be the longest, 46.0 miles long.
- Mac West, Connector 1, Houston, and Houston North. This route would be 34.9 miles long.
- Mac West, Connector 1, Houston, and Houston South. This route would be 35.6 miles long.
- Mac West, Connector 2, and Big Lake. This route would be 36.8 miles long.
- Mac East, Connector 3, and Willow. This route would be 44.9 miles.
- Mac East, Connector 3, Houston, and Houston North. This route would be 33.7 miles long.
- Mac East, Connector 3, Houston, and Houston South. This route would be 34.3 miles long.
- Mac East and Big Lake. This route would be the shortest, 31.4 miles.

S.3.1 Southern Segments

S.3.1.1 Mac West

The Mac West Segment would begin in the terminal reserve area and would proceed northwest across relatively flat terrain toward the southwest corner of the Point MacKenzie Agricultural Project. The segment would continue west of the agricultural area, traversing along the eastern boundary of Susitna Flats State Game Refuge. The terminal reserve area is proposed along the south side of Mac West.

S.3.1.2 Mac East

Alternatively, the Mac East Segment would begin in the terminal reserve area and would proceed north along the side of a ridge to the east of the Point MacKenzie Agricultural Project. Near Mile Post 4.7, the segment would cross a ravine and then curve to the northeast along the top of another ridge. North of Mile Post 6.0, the segment would follow the alignment of Point MacKenzie Road, offset 200 feet or more to the west. The segment would continue along undulating terrain before reaching its junction with the Big Lake Segment or Connector 3 Segment. The terminal reserve area is proposed along the north side of Mac East.

See Figure S-2 for a detailed map of the southern segments and the terminal reserve area.

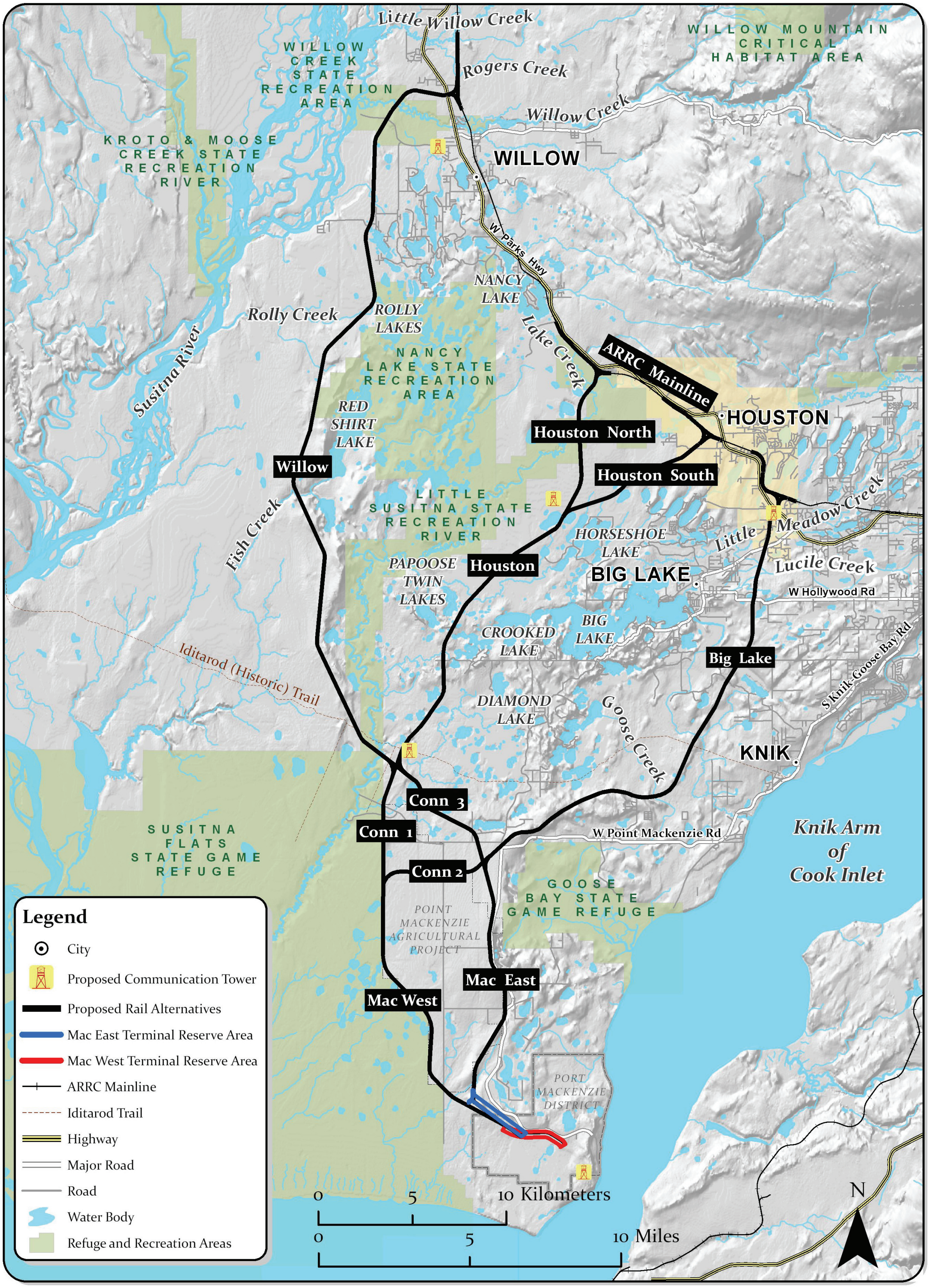

Figure S-1. Overview of Proposed Port MacKenzie Rail Extension Route Alternatives

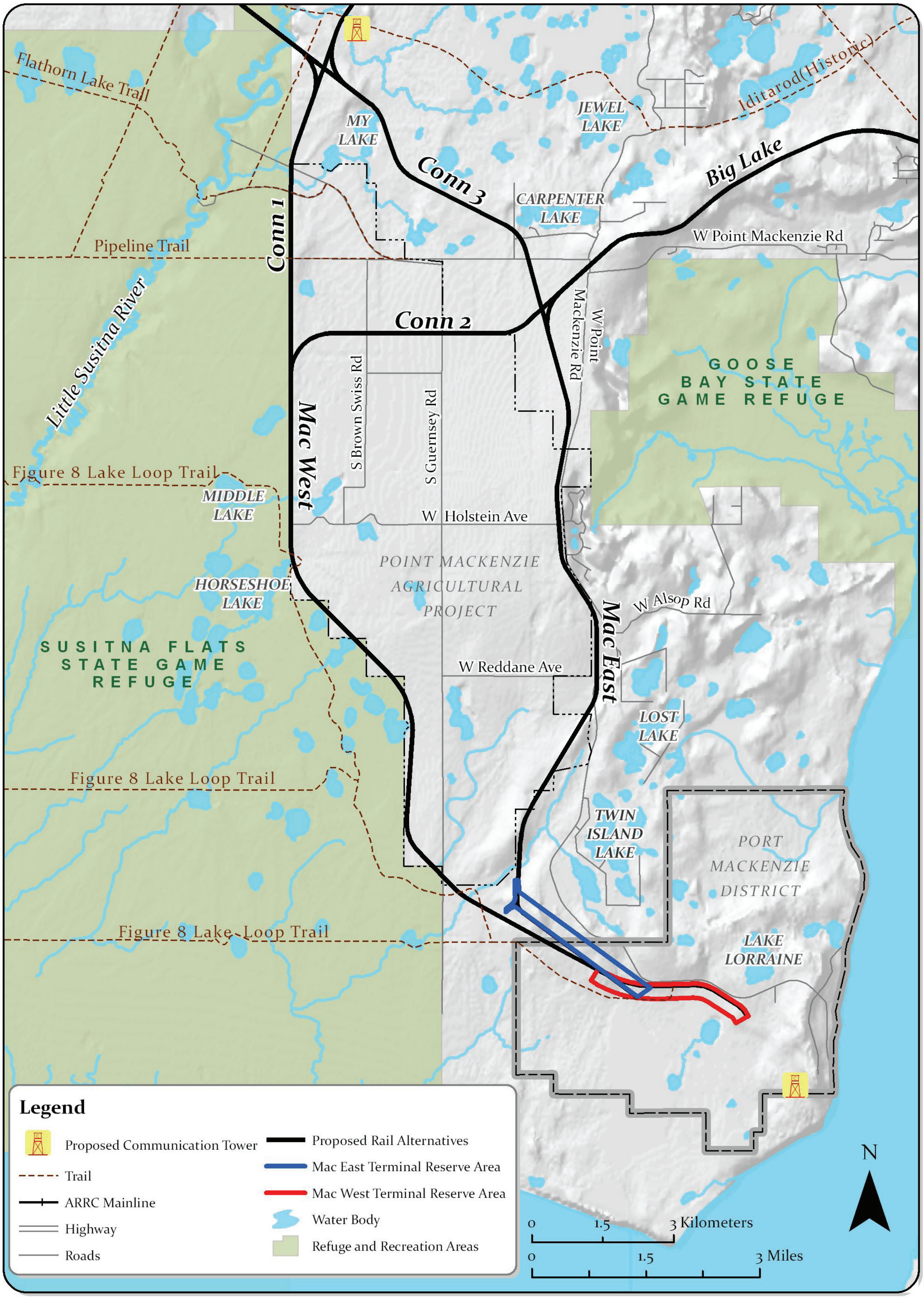

Figure S-2. Mac East, Mac West, and Connector Segments

S.3.2 Connector Segments

S.3.2.1 Connector 1

This 4.8-mile-long segment would connect the Mac West Segment to the Willow or Houston segment. From Mac West, this connector segment would continue north along the eastern boundary of Susitna Flats State Game Refuge on level terrain. The segment would cross a tributary of the Little Susitna River.

S.3.2.2 Connector 2

This 3.7-mile-long segment would connect the Mac West Segment to the Big Lake Segment. At the northwestern end of the Point MacKenzie Agricultural Project, this connector segment would turn due east and travel along the southern boundary of the Point MacKenzie Correctional Farm.

S.3.2.3 Connector 3

This 5.2-mile-long segment would connect the Mac East Segment to the Willow or Houston segment. At the northeastern end of the Point MacKenzie Agricultural Project, this connector segment would shift to the northwest and cross Ayrshire Avenue and Farmers Road. The segment would continue north of My Lake and cross an adjacent ravine. The remaining mile of the segment would be nearly level.

See Figure S-2 for a detailed map of the connector segments.

S.3.3 Northern Segments

S.3.3.1 Willow

From Connector 1 or 3 segments, the Willow Segment would continue northwest where it would cross a corner of Susitna Flats State Game Refuge, Little Susitna State Recreation River, and the Little Susitna River (see Figure S-3). Over the next 7 miles, the segment would continue north through rolling terrain. The segment would cross Fish Creek, the outlet for Red Shirt and Cow Lakes. It would then proceed north, generally following the west-facing slope of a glacial moraine west of Red Shirt Lake. It would continue north through Nancy Lake State Recreation Area for approximately 0.5 mile. The Willow Segment would cross the outlet for Vera Lake, continue over rolling terrain, and cross Willow Landing Road. The segment would then continue through Willow Creek State Recreation Area, where it would cross Willow Creek. The segment would curve to the east and cross Parks Highway with a grade separation, before connecting to the existing ARRC main line near Mile Post 188.9.

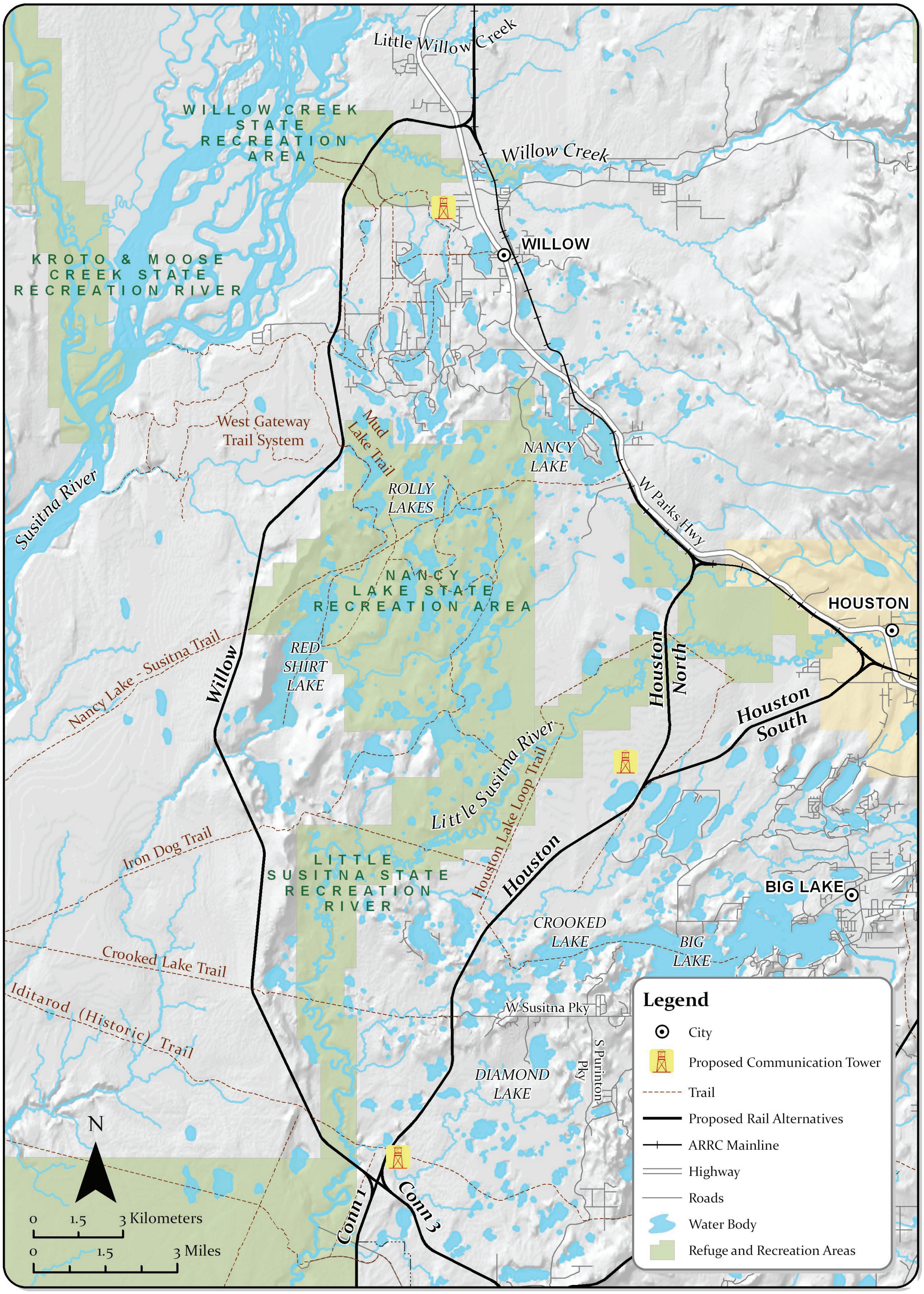

Figure S-3. Willow, Houston, Houston North, and Houston South Segments

S.3.3.2 Houston

From Connector 1 or 3 segments, the Houston Segment would proceed northeast, traveling through slightly undulating terrain with areas of wetland (see Figure S-3). The segment would pass between Papoose Twins Lakes and Crooked Lake, crossing an area of hilly terrain. The remaining 4 miles of the Houston Segment would be in a gradually rising wetland area to a point near Muleshoe Lake and Little Horseshoe Lake, where it would connect to either the Houston North Segment or the Houston South Segment.

S.3.3.3 Houston North

From the Houston Segment, the Houston North Segment would continue north (see Figure S-3), crossing over Castle Mountain Fault. The segment would cross Cow Lake Trail, which is part of Houston Lake Loop Trail. It would continue through Little Susitna State Recreation River, where it would cross the Little Susitna River. The segment would continue north on rolling terrain along the east side of Houston and Little Houston Lakes, descending gradually to lower terrain adjacent to Lake Creek. The Houston North Segment would tie into the existing ARRC main line near Mile Post 178.0 along the proposed rail line without crossing Parks Highway.

S.3.3.4 Houston South

Also beginning between Muleshoe Lake and Little Horseshoe Lake, this proposed segment would traverse northeast, passing just west of Pear Lake (Figure S-3). The segment would cross several gravel ridges that parallel the lakes in this area. The segment would tie into the existing main line near Mile Post 174.0 without crossing the Parks Highway.

S.3.3.5 Big Lake

From the Mac East Segment or Connector 2 Segment, the Big Lake Segment would run northeast for approximately 3 miles, crossing Burma Road (See Figure S-4). It would continue on rolling terrain, crossing over Goose Creek, Fish Creek, Lucile Creek, and tributaries of Lucile Creek and Little Meadow Creek. The segment would cross Burma Road and Big Lake Road, where it would be grade-separated above Big Lake Road. The Big Lake Segment would continue north through a residential area before crossing under Parks Highway with a grade-separated crossing.

See Figures S-3 and S-4 for a detailed map of the northern segments.

S.3.3.6 No-Action Alternative

The Draft EIS also considers a No-Action Alternative. Under the No-Action Alternative, ARRC would not construct an extension of the existing rail line to transport commercial freight, and freight truck would remain the only available mode of surface transportation to and from Port MacKenzie.

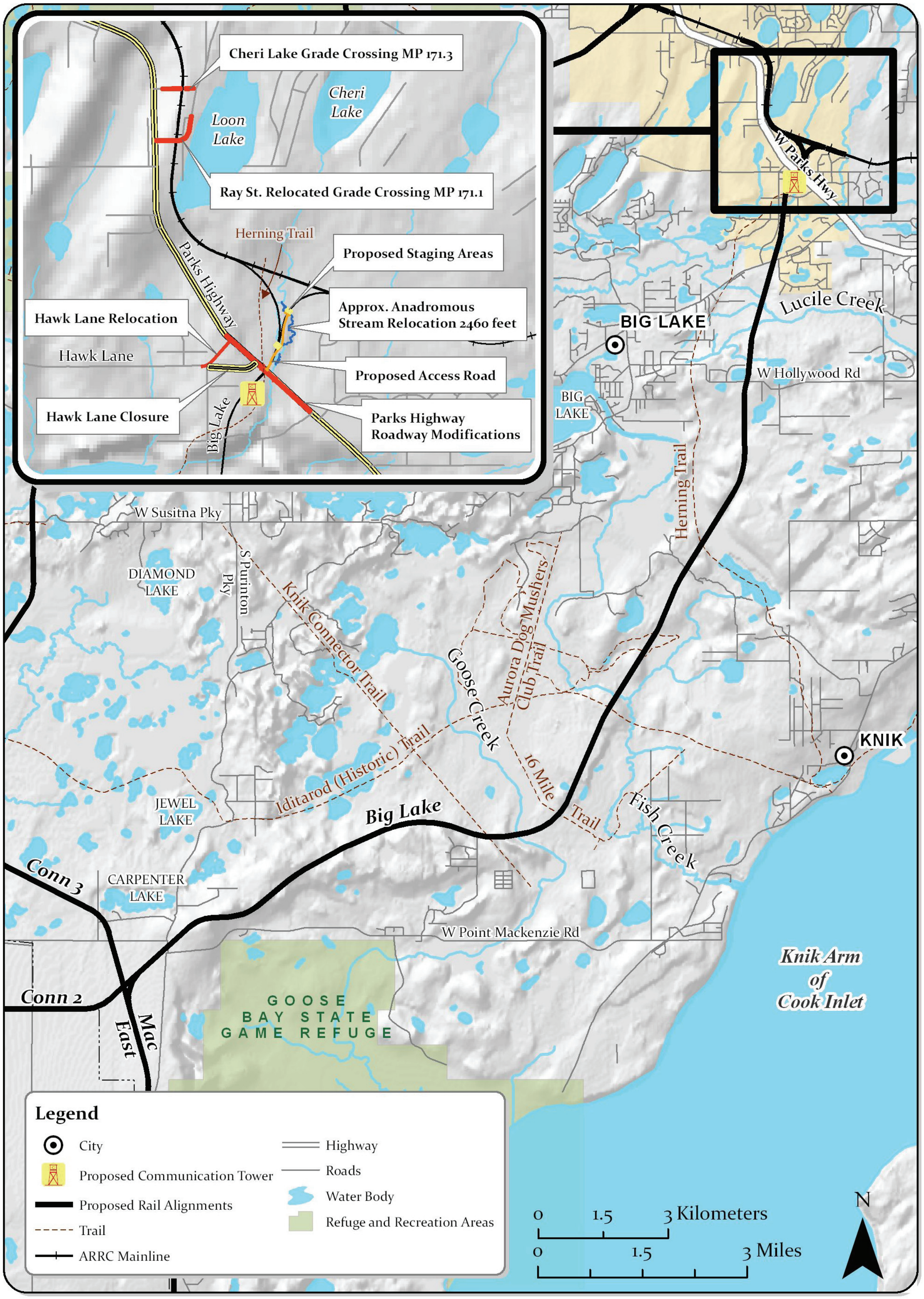

Figure S-4. Big Lake Segment

S.4 Alternatives Considered But Not Included for Detailed Study

SEA reviewed the alignments ARRC developed and analyzed in its Preliminary Environmental and Alternatives Report (ARRC, 2008) and reviewed the potential rail corridors identified in the previous MSB Rail Corridor Study (MSB, 2003). In April 2008, SEA asked ARRC to consider the feasibility of making adjustments to the Willow, Big Lake, Mac West, and Houston North segments, and to consider a new segment to reduce potential environmental impacts. ARRC responded that SEA's proposed refinements were infeasible or would result in increased environmental impacts. SEA reviewed the Applicant's responses to the suggested refinements and to the new segment SEA identified for consideration and concurred with the Applicant's findings. Based on the purpose and need for the proposed action and a review of ARRC's initial alignments and alignments proposed in scoping comments, SEA and the cooperating agencies determined that the alignments described in S.3 provided a reasonable set of feasible alternatives for detailed study.

S.5 Overview of Affected Environment

The project area is generally located north of Anchorage, Alaska, on the opposite side of the Knik Arm of the Cook Inlet. The proposed rail line would connect the Port MacKenzie District in the MSB to a point on the existing ARRC mainline between Wasilla and north of Willow, Alaska. The area is relatively rural, with a few recreational areas managed by the State of Alaska and the MSB located nearby. The area is within the MSB and Susitna River valley, bounded by the Susitna River on the west, Knik Arm of Cook Inlet on the south and east, and Parks Highway and the existing ARRC main line on the north. The project area would lie within Susitna Lowland, which is the landward extension of the Cook Inlet Depression. The depression is a structural basin that contains the lowland basins of the Susitna River, its tributaries, and several other rivers that flow directly into the head of Cook Inlet. The project area is located in the Cook Inlet Basin Ecoregion, a gently sloping lowland basin characterized by a variety of wetland and woodland habitats including evergreen, deciduous, and mixed forest stands. The area provides habitat for wildlife such as bear, moose, wolf, furbearers (like squirrels and wolverines), fish, and birds. Cultural and historic resources are found within the project area including cabins and trails. The study area includes several designated recreation areas, including Willow Creek State Recreation Area, Nancy Lake State Recreation Area, Little Susitna State Recreation River, and two state recreation sites on the northern and southern shores of Big Lake. The study area also includes the Susitna Flats and Goose Bay state game refuges.

S.6 Summary of Environmental Consequences

SEA performed an in-depth review of the Applicant's proposal, which included independent environmental analysis of potential project impacts and evaluation of issues raised by government agencies and the public. The following discussion provides an overview and comparison of the potential impacts of the alternative segments that have been considered. Table S-2 at the end of this Summary compares noteworthy impact variations among the alternatives.

S.6.1 Topography, Geology and Soils

Steeper terrain would require a greater amount of either fill or cut and fill during rail line construction than flatter terrain and would therefore have a greater impact on topography. With one exception, the Big Lake Segment, the existing terrain for all segments and segment combinations that have been considered would be relatively flat. The Big Lake Segment, however, would have approximately 20 percent of its length crossing ground with slope greater than 1 percent, with the remaining 80 percent relatively flat. This segment would cross the highest percentage of slopes between one and five percent, slopes greater than five percent, and would cross ground with the highest maximum slope (27 percent). The Mac East Segment has the second steepest conditions.

Although the construction of the proposed rail line would not result in any potential impacts to geological resources, construction activities would affect soils unsuitable for rail line construction, and these soils would need to be removed and replaced with imported, well-draining soils. In some locations, the railroad would be constructed on soils the MSB considers locally important for agricultural purposes, though some of these soils may not be in use for agricultural purposes. The Mac East-Connector 3-Willow Alternative would have the greatest impact to soils the MSB considers locally important for agricultural purposes. The Mac West-Connector 1-Houston-Houston North Alternative would have the least impact to soils the MSB considers locally important for agriculture. However, the Mac West-Connector 1-Houston-Houston North Alternative would contain both the greatest percentage of poor soils for construction and the greatest length of peat and organic soils. Soft, compressible organic and peat soils, present in wetland areas, would have to be compacted or removed and replaced.

The MSB is subject to seismic activity. The most likely impact on the rail line from seismic activity would be misalignment or damage to the tracks, railbed, or access road. This could be caused by ground shaking, offset lateral movement, or soil subsidence. If strong enough, ground shaking could also cause trains to derail. With the segments and segment combinations being relatively close to one another, the minor differences in distance between a segment and a seismic event would not have an appreciably different effect on the segments and segment combinations.

S.6.2 Water Resources

Potential impacts to water resources could result from clearing and grading; the excavation of fill material; construction of an unpaved access road, bridges, and culverts; and use of transportation and staging areas. The following paragraphs summarize the relevant effects of such project-related activities on surface water, groundwater, floodplains, and wetlands.

S.6.2.1 Surface Water

Construction of the proposed rail line and the unpaved access road could result in potential adverse impacts to water quality in areas were the rail line and access road would be near, adjacent to, or span waterbodies. In these areas, ROW clearing, grading, and construction of the rail line, staging areas, and access road could lead to impacts on surface waters from increased erosion and nutrient loading. If subballast and fill materials are obtained from borrow areas, this could disrupt shallow-water areas (former borrow areas), including disturbing sediment, increasing turbidity, and generally degrading water quality; however, SEA expects no long-term water quality impacts from borrow areas located near shallow water areas because turbidity levels would return to normal after the disturbance ceased. New borrow areas might also be identified in surface-water areas. Depending on the annual and seasonal variation of flood stage and hydraulics of the waterbodies at the borrow areas, there could be impacts to water quality.

In areas where the proposed rail line and access road would be near waterbodies, the potential consequences to water quality during spring ice break-up, snowmelt, or rainstorms could include increased transport of fine-grained sediments that could alter waterbody chemistry and pH.

The Applicant would construct bridges and culverts to convey water under the proposed rail line and the access road. Potential impacts that could result from the culvert and bridge construction and installation along the ROW would include: degradation of steambanks and riparian areas; increased stages and velocities of floodwater; increased channel scour and downstream sedimentation; and changes to natural drainage. The presence of bridges and culverts in or over a channel could alter channel hydraulics, which could increase channel scour and erosion processes which could subsequently lead to an increase in sediment transport loads and downstream sedimentation. This impact, however, would generally be short-term and would end after ARRC finished construction.

In general, the more bridges or culverts that occur along a given segment, the greater the likelihood of potential impacts. However, the magnitude of potential effects at individual crossings also depends on site-specific factors. Bridges would generally be expected to result in fewer hydrologic impacts than culverts due to their ability to maintain stream structure and flow characteristics. The Mac East-Connector 3-Houston-Houston South Alternative would require the fewest crossings with the smallest number of drainage structures and culvert extensions, and one of the smallest numbers of culverts. The Mac West-Connector 1-Houston-Houston North Alternative would require the most crossings.

S.6.2.2 Groundwater

Construction of the proposed rail line, sidings, power lines, buried communications cables, access road, and other facilities could affect groundwater movement and quality. Groundwater movement could be altered by changes in infiltration and recharge rates due to compaction of the overlying soil. These effects would be limited to the footprint of the proposed rail line, facilities, access road, and staging areas, which represents a small fraction of the total area where water enters the ground and infiltrates to the water table. The extraction of materials from the borrow areas[4] could affect groundwater due to the changes in local hydrogeology that would result from the removal of saturated materials and the creation of new ponds that would serve as sources of groundwater discharge through evaporation during the summer and sources of groundwater during major rainstorms and the break-up of ice.

[4] Areas from which materials such as soil, rock, or gravel are excavated for a specific purpose.

S.6.2.3 Floodplains

Within the study area, there are 100-year floodplains along Willow Creek, Little Willow Creek, Lake Creek, Deception Creek, Lucile Creek, and the Little Susitna River. With the exception of the floodplain along Little Willow Creek, all of the proposed alternative rail line segments would cross all of these floodplains. The rail line and access road placed within the 100-year floodplain would require fill placement and could reduce floodplain volume, constrict flood flow paths, and increase floodwater elevation upstream of the restricted floodplain area. However, affected areas would be small compared to the total floodplain storage available, and SEA expects minimal impacts to floodplain storage from the placement of the proposed rail line and the access road. ARRC would size all water crossings to convey the 100-year flow event associated with local drainages as part of their voluntary mitigation measures. For larger stream and river crossings, ARRC would construct bridges as single- or multiple-span structures that would either completely or partially span (or clear) the existing active river channel. The Mac West-Connector 1-Willow and Mac East-Connector 3-Willow alternatives would impact the greatest amount of FEMA-designated floodplains, with approximately 8,065 feet (about 1.5 miles) of rail line crossing 37 acres of 100-year floodplain. The Mac West-Connector 1-Willow Alternative would also cross an additional eight streams, two more than the Mac East-Connector 3-Willow Alternative, that have a high potential for floodplains. The Mac West-Connector 2-Big Lake and the Mac East-Big Lake alternatives would impact the least acreage of floodplains with approximately 460 feet of rail line crossing 2.1 acres of 100-year floodplain; both of these alternatives would require only one waterbody crossing within a FEMA-designated floodplain.

S.6.2.4 Wetlands

Several wetland types were found within the wetland study area (500 feet on either side of the rail centerline). These include forested wetlands, scrub/shrub wetlands, emergent wetlands, and other waters and riverine wetlands. Rail line construction would directly affect wetlands within the 200-foot ROW and could also indirectly affect wetlands adjacent to the ROW by fragmenting wetland vegetation and hydrology. Rail line construction would require clearing, excavation, and placement of fill material in wetlands. The placement of fill would cause a permanent loss of wetland functions within the fill area and could result in additional impacts to adjacent wetland areas inside and outside the ROW. Because many wetland functions depend on the size of the wetland or the contiguous nature of the wetland with other habitats, clearing and filling a wetland could lower the ability of adjacent wetlands to perform functions that depend on size or an unfragmented connection to a waterbody.

Potential impacts to wetlands within the ROW from proposed rail line construction would vary by project alternative. Construction of the Mac East-Connector 3-Willow Alternative would impact 188 acres of wetlands, (comprising 15 percent of the ROW), the lowest impact to wetlands of all the alternatives. The Mac East-Connector 3-Willow Alternative would also have the lowest proportion of high-functioning wetlands. Construction of the Mac West-Connector 1-Houston-Houston North Alternative would impact 478 acres of wetlands; the greatest overall acreage of wetlands that would be affected by any of the alternatives. Although this alternative would occupy less overall acreage compared to the other alternatives, 45 percent of the alignment comprises wetlands, the highest of the alternatives. Many wetlands along this alternative consist of bog wetlands that have diverse vegetation communities and are considered high-functioning wetlands.

Of the remaining alternatives, Mac West-Connector 1-Houston-Houston South would impact 424 acres, Mac West-Connector 1-Willow would affect 363 acres of wetlands and waters, Mac West-Connector 2-Big Lake would impact 347 acres, Mac East-Connector 3-Houston-Houston North would impact 301 acres, Mac East-Connector 3-Houston-Houston South would impact 248 acres, and Mac East-Big Lake would impact 209 acres. The Big Lake Segment would also impact 25 acres of a wetland mitigation bank[5], primarily composed of riverine wetlands (wetlands situated in a river channel that contain moving water, either continuously or periodically) and riparian wetlands (wetlands situated alongside a river), but also including scrub/shrub wetlands and uplands. Within this mitigation bank is the Goose Creek Fen, a floating mat fen system. A floating fen is an important ecological feature supporting diverse plant communities and providing high value rearing habitat for anadromous fish species. Goose Creek Fen would require draining or filling for construction of the Big Lake Segment. The wetlands in the mitigation bank are locally important to MSB and are highly valued. The impact would reach beyond the 200-foot ROW because, for the purposes of the mitigation bank, the value of the wetlands is based on their contiguous, unfragmented state.

S.6.3 Biological Resources

The proposed rail line and facilities construction and operations would impact biological resources. The following paragraphs summarize the relevant effects of this project on vegetation, fisheries, wildlife, birds, and threatened and endangered species.

S.6.3.1 Vegetation Resources

The primary impacts of the proposed rail line construction and operation to vegetation would be the destruction of vegetation cover and the replacement of some cover with gravel fill. Permanent impacts would include vegetation loss due to placement of gravel fill for the railbed, excavation of gravel, and construction of rail line support facilities. Other potential impacts would include the loss or alteration of forested habitat due to the removal of vegetation at temporary workplaces that would be restored after project construction. Potential operations impacts would include vegetation removal and control within the 200-foot ROW where necessary for safe operations. In addition, potential impacts to vegetation resources could include altered vegetation communities due to soil compaction and the spread of invasive plant species and altered vegetation succession caused by the interruption of natural wildland fire ecology. There are no known Federal- or state-protected threatened, endangered, or candidate plants species within the study area.

Of the build alternatives, the Mac West-Connector 1-Willow Alternative would result in the clearing of 1,272 acres of vegetation from the 200-foot ROW, the most of any alternative. The alternative with the second highest area of vegetation loss would be the Mac East-Connector 3-Willow Alternative, with 1,249 acres of vegetation cleared. Following in descending order of

[5] A mitigation bank is a wetland, stream, or other aquatic resource area that has been restored, established, enhanced, or (in certain circumstances) preserved for the purpose of providing compensation for unavoidable impacts to aquatic resources permitted under Section 404 Clean Water Act or a similar state or local wetland regulation.

area of vegetation cleared would be: Mac West-Connector 2-Big Lake Alternative (1,056 acres); Mac West-Connector 1-Houston-Houston North Alternative (1,038 acres); Mac West-Connector 1-Houston-Houston South Alternative (1,032 acres); Mac East-Connector 3-Houston-Houston North Alternative (1,010 acres); and Mac East-Connector 3-Houston-Houston South Alternative (1,003 acres). The Mac East-Big Lake Alternative would result in the fewest acres of vegetation loss of all the possible alternatives; 930 acres. Vegetation clearing would result in a long-term impact for forest communities, even with restoration, especially for late-succession forests and wetlands that would be slow to recover. Some cleared areas would likely be restored after construction; other areas would be covered by fill.

S.6.3.2 Wildlife Resources

A variety of wildlife species are known to inhabit the project area. These include: bears, moose, wolves, beaver, mink, muskrat, river otter, ermine, martens, wolverines, red fox, coyote, lynx, hares, mice, squirrels, bats, shrews, voles, lemmings, porcupine, and numerous avian species including 42 birds of conservation concern.[6] The potential impacts of the proposed rail line construction and operation to wildlife would be influenced by the animals' dependence on specific habitats, the availability of preferred and used habitats, the amount of preferred habitat the project would affect, ecology and life history, and past and present population trends. Because game mammal populations are managed for sustainable human harvest, project-related effects to population abundance and distribution, available habitat, and predator-prey relationships can also affect management of these game mammals. Potential construction impacts common to all segment combinations and alternatives could include habitat alteration and loss, disturbance and displacement of wildlife, and direct mortality from construction vehicles and equipment. Common potential impacts related to the operation of the proposed rail line could include moose-train collision mortality, bird-power line and communications tower collision mortality, habitat fragmentation, disturbances leading to reduced wildlife survival and productivity, potential exposure to spills of toxic materials, and potential changes in human disturbance and harvest patterns resulting from unauthorized access to the remote portions of the project area facilitated by the access road along the ROW.

The proposed rail line would result in the loss of wildlife habitat ranging from 930 acres to 1,272 acres depending on the alternative, which is less than one percent of the 435,895 acres of available habitat in the study area. The Mac West-Connector 1-Willow Alternative would result in the greatest amount of habitat loss and the Mac East-Big Lake Alternative would result in the least. Of the remaining alternatives, the Mac East-Connector 3-Willow Alternative would result in the greatest loss of wildlife habitat (1,249 acres) followed in descending order by Mac West-Connector 2-Big Lake Alternative (1,056 acres); Mac West-Connector 1-Houston-Houston North Alternative (1,038 acres); Mac West-Connector 1-Houston-Houston South Alternative (1,032 acres); Mac East-Connector 3-Houston-Houston North Alternative (1,010 acres); and Mac East-Connector 3-Houston-Houston South Alternative (1,003 acres). SEA's review and analysis indicates that the rail line would reduce the amount of available habitat, although across all alternatives, rail line construction would result in the loss of less than one percent of the total

[6] Birds of conservation concern include migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) that represent the highest conservation priorities of the U.S. Fish and Wildlife Service.

forested habitat available in the project area, as well as less than one percent of the total wetland habitat available in the project area.

The proposed rail line would also contribute to habitat fragmentation of core forested and wetland habitats. Habitat fragmentation occurs when large areas of contiguous core habitat are split into smaller pieces, thereby increasing the amount of habitat edge or the area where one habitat is bordered by a differing habitat. This can adversely affect wildlife by creating barriers to movement, leading to edge effects, reducing core areas of available habitats, facilitating predator movements, and by increasing the intrusion of invasive species and humans. The southern segments and segment combinations would contribute to fragmentation by crossing primarily agricultural and woody wetland core habitats, while the northern segments and segment combinations would contribute to fragmentation by crossing primarily forested and emergent wetland habitats. Of the rail line alternatives, the Mac West-Connector 1-Houston-Houston South Alternative would result in fragmentation by crossing the largest area of forest and wetland habitat (3,210 acres). Of the remaining alternatives, the Mac East-Connector 3-Houston-Houston South Alternative would result in fragmentation by crossing the second largest amount of forest and wetland habitat (3,038 acres) followed in descending order by Mac West-Connector 1-Willow (2,847 acres), Mac East-Connector 3-Willow (2,675 acres), Mac West-Connector 2-Big Lake (2,631 acres), Mac West-Connector 1-Houston-Houston North (2,592 acres), Mac East-Connector 3-Houston-Houston North (2,419 acres), and Mac East-Big Lake (1,725 acres).

S.6.3.3 Fisheries Resources

A variety of both resident and anadromous fish species are present in the project area. Resident fish species are those whose life cycle does not include migration into marine waters, and include lake trout, burbot, northern pike, sculpins, sticklebacks, suckers, and pond smelt in the project area. Anadromous fish species are those whose life cycle include migration into marine waters, and include all five Pacific salmon: Chinook (king), chum (dog), coho (silver), pink (humpy), and sockeye (red), as well as rainbow trout, Dolly Varden, and eulachon in the project area. Of the species that are present, Cook Inlet Salmon (Chinook (king), chum (dog), coho (silver), pink (humpy), and sockeye (red)) are federally-regulated and, as a result, the Federal resources these species use are protected under the Magnuson-Stevens Fishery Management and Conservation Act. Rail line construction would require multiple stream crossings at locations that have fish or fish habitat. Project construction methods and timing, the type of stream crossing structure installed, and daily operations procedures would influence the severity and types of potential impacts to fish and fish habitat at each stream crossing. The primary potential impacts of crossing structures to fish and fish habitat would be loss and degradation of instream habitats due to placement of structures, alteration of stream hydrology and water quality, and blockage of fish movements. Potential rail construction impacts common to all alternatives would include loss or alteration of instream and riparian habitats, mortality from instream construction, blockage of fish movement, degradation of water quality, alteration of stream hydrology and ice breakup, and noise and vibration impacts. Potential rail operations impacts common to all alternatives would include loss or alteration of instream and riparian habitats, blockage of fish movements, and degradation of water quality through sedimentation and turbidity.

All of the build alternatives would cross streams or waterbodies that provide habitat for fish and this habitat could be affected by rail line construction and operations. All crossings of fish-bearing streams would result in some loss or alteration of stream and riparian habitats. Bridged crossings would likely result in a smaller area of instream habitat loss compared to closed-bottomed culverts. In general, clear-span bridges (those without instream supports) would have less potential to create conditions that would cause loss of spawning habitats, blockage of fish movements, alteration of stream hydrology, and increased erosion and sedimentation. The proposed project alternatives would require a minimum of 10 and a maximum of 18 crossings of streams that have been documented to contain either fish or fish habitat. The alternatives requiring the minimum number of fish-bearing stream crossings (10) are Mac East-Big Lake and Mac East-Connector 3-Houston-Houston South. The alternative requiring the maximum number of crossings (18) is Mac West-Connector 1-Houston-Houston North. Of the remaining alternatives, the Mac West-Connector 1-Willow Alternative would cross the greatest number of fish-bearing waterbodies (16), followed by Mac East-Connector 3-Houston-Houston North (15) Mac West-Connector 1-Houston-Houston South and Mac East-Connector 3-Willow (13 crossing for each), and Mac West-Connector 2-Big Lake (12).

All of the build alternatives would cross waters important for sustaining recreational and commercial salmon fisheries, with the greatest number of important waters crossed by alternatives that include the Willow Segment and the smallest number crossed by alternatives that include the Houston-Houston South Segment Combination. The Houston-Houston South Segment Combination and the Willow Segment crossings of the Little Susitna River would require instream pilings and would affect spawning habitat for salmon species. Alternatives that include the Big Lake Segment would cross Goose Creek, a large unique fen system that would likely have to be drained or filled to provide an area for construction, resulting in the loss of about 4 acres within the 200-foot ROW and likely extending outward within the 19-acre high-value wetland and juvenile rearing habitat. Of the total 43 proposed fish-bearing stream crossings, 18 contain either sticklebacks, Pacific lamprey, or both. These two species are considered Species of Conservation Concern by ADF&G.

S.6.3.4 Threatened and Endangered Species

Through consultations with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service on potential threatened or endangered species that could be affected by the proposed project, SEA determined that the proposed project could indirectly affect the federally endangered Cook Inlet beluga whale (*Delphinapterus leucas*). SEA identified and evaluated potential indirect effects on beluga whale that included: 1) beluga whale forage fish in freshwater streams that support anadromous salmon and smelt and would be crossed by the proposed rail line and 2) induced noise and disturbance effects in the immediate vicinity of Port MacKenzie at the entrance of the Knik Arm, as a result of induced increases in vessel traffic to and from Port MacKenzie. SEA, in consultation with National Marine Fisheries Service, did not identify any direct impacts from the proposed project to the beluga whale or beluga whale habitats.

SEA completed a Biological Assessment (Appendix H) and determined that the proposed action, if authorized, may affect, but is not likely to adversely affect the Cook Inlet beluga whale. NMFS has stated they will review and comment on the Biological Assessment after the public comment period for the designation of critical habitat for the Cook Inlet beluga whale closes on March 3, 2010.

S.6.4 Cultural and Historic Resources

Archaeological sites, historic sites (including historic trails), cultural landscapes (geographic areas, including both natural and cultural resources, associated with a historic event, activity, or person), and traditional cultural properties are likely to be found or have been found within the project area.

Archaeological sites that could not be avoided in the ROW could be inadvertently or purposefully destroyed through surface and subsurface disturbances, primarily during construction. Historic and potentially historic trails would be blocked in the case of unofficial trails. Officially recognized trails would be grade-separated or relocated, facilitating free passage; however, the integrity of any historic trails would still be adversely affected through the introduction of auditory and visual effects. The dog sledding cultural landscape would be adversely affected to varying degrees through loss of visual integrity.

The Mac East-Connector 3-Willow Alternative would potentially affect the most known cultural resources (51) and pass through areas with a high probability of having large numbers of undocumented cultural resources. The Mac West-Connector 1-Houston-Houston South Alternative would affect the fewest known cultural resources (20) and pass through areas with a low probability of having large numbers of undocumented cultural resources. Of the remaining alternatives, the Mac West-Connector 1-Willow alternative would potentially affect 46 cultural resources, followed in descending order by Mac East-Big Lake (39), Mac West-Connector 2-Big Lake (36), Mac East-Connector 3-Houston-Houston North (26), Mac East-Connector 3-Houston-Houston South (24), and Mac West-Connector 1-Houston-Houston North (22).

Adverse effects to cultural resources could be mitigated by minor rerouting of any alternative that may be authorized by the Board to avoid cultural resources identified within the ROW. If avoidance is not possible, mitigation could include data recovery for archaeological sites, maintaining accessibility of historic trail crossings, implementing noise and vibration reduction measures, and minimizing visual impacts.

Cultural resources listed on or determined eligible for listing on the National Register of Historic Places (NRHP) are subject to compliance with Section 106 of the National Historic Preservation Act (NHPA). Through the Section 106 process, the NHPA requires that agencies consult with the State Historic Preservation Office (SHPO) and other relevant consulting parties to develop a determination of the project's affect on cultural resources. Several consultation meetings to date regarding Section 106 and cultural resource issues have occurred with the SHPO, Matanuska-Susitna Borough Historic Preservation Commission and Knik Tribal Council. As a result, four potential cultural landscapes have been evaluated for eligibility to the NRHP and potential effects from the proposed action on eligible landscapes have been assessed for the EIS. A fifth potential cultural landscape has also been identified and an assessment of effects is ongoing.

Because all effects on historic properties cannot be fully determined prior to approval of this type of undertaking, SEA has developed a Draft Programmatic Agreement (PA) for the proposed action that would govern the completion of the Section 106 process if the proposal before the Board is authorized and the rail line is built. The Draft PA provides for the completion of the Level 2 identification survey,[7] if the Board authorizes the project and the locations of associated facilities have been established. Additionally, the Draft PA establishes responsibilities for the treatment of historic properties, the implementation of mitigation measures, and ongoing consultation efforts. The draft PA is included as Appendix J to the Draft EIS and will be published for public review and comment with the Draft EIS.

S.6.5 Subsistence

Subsistence uses are customary and traditional uses of wild renewable resources for food, shelter, fuel, clothing, and other uses. The evaluation of potential subsistence impacts associated with the proposed action includes analyzing the impacts on the areas used for subsistence activities, access to those areas, availability of resources used for subsistence and changes in the degree of competition among harvesters for subsistence resources.

Because the entire project would be outside areas designated by the state as subject to subsistence regulations, and because there are no Federal public lands in the project area, there would be no direct impacts to subsistence in the project area; however, potential indirect impacts could occur. Certain subsistence resources that use Game Management Unit (GMU)[8] 16B, such as moose, bear and waterfowl, could migrate through the project area. Train-animal collisions could result in changes in distribution, abundance and health of resources migrating to and from GMU 16B. Migratory moose could experience a disproportionate level of mortality due to movements across the proposed rail line.

Construction activities in the proposed rail line ROW and operations of the rail line could reroute subsistence user access across project area lands into areas west of the Susitna River. Construction of the Mac East-Big Lake Alternative would affect the fewest users because all residents in the study area to the west of the alternative would have continued unobstructed access to lands west of the Susitna River. The Mac West-Connector 1-Willow Alternative could change access for the greatest number of subsistence users; the Mac East-Big Lake Alternative could change access for the fewest number of subsistence users. The farther west the alternative, the more users would be potentially affected; more communities would have to use rail line crossings to reach GMU 16B. Competition could be affected because changes in access created by the rail line could cause harvesters to begin using other communities' subsistence use areas, subsequently increasing the number of harvesters competing for resources in those places. Impacts to resource availability could most affect Beluga, Skwentna, and Tyonek because members of those communities harvest most of their subsistence resources in GMU 16B.

S.6.6 Climate and Air Quality

The U.S. Environmental Protection Agency (USEPA) national ambient air quality standards (NAAQS) regulations specify the maximum acceptable ambient concentration level for six

[7] Level of investigation required to evaluate the eligibility of a resource for the National Register.
[8] A Game Management Unit (GMU) is one of 26 geographical areas listed under game management units in the codified State of Alaska hunting and trapping regulations and the GMU maps of Alaska shown in the Alaska State Hunting Regulation book.

primary or "criteria" air pollutants – ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), respirable particulate matter (PM), and lead (Pb) – and ADEC has adopted the same standards for Alaska. MSB is currently in attainment of the standards for these six criteria pollutants. To evaluate the potential impacts of increased emissions of NAAQS air pollutants plus greenhouse gas emissions, SEA developed emissions estimates for the proposed rail line construction and operation. To be conservative, SEA estimated construction and operations emissions for the longest potential alternative, the 46-mile Mac West-Connector 1-Willow Alternative, and for the maximum average train length of 80 cars. SEA found that the estimated emissions of all criteria pollutants from construction and operation would be below the *de minimis* conformity thresholds established for each pollutant and, thus, the increase would be minimal in the context of existing conditions for all of the alternatives evaluated. To the extent that commodities that would be transported by truck were shifted to rail, and to the extent that commodities transported between the Interior of Alaska and the Ports of Anchorage or Seward were shifted to Port Mackenzie, at a shorter rail haul distance, reductions in air pollutant emissions from truck traffic or from rail to and from the Ports of Anchorage and Seward would decrease.

Greenhouse gas emissions associated with the proposed action would be primarily carbon dioxide (CO_2) emissions. SEA also estimated that operation of the proposed rail line would represent a two percent increase in Alaska rail CO_2 emissions and an increase in CO_2 emissions of less than 0.01 percent for the state as a whole. SEA concluded that estimated increases from proposed rail line construction or operations would be minimal and that any direct project-related impacts to climate would be low under any of the alternatives evaluated.

S.6.7 Noise and Vibration

SEA evaluated whether operation of the proposed rail line alternatives would result in noise levels (attributable to wayside noise and the locomotive warning horn) that would equal or exceed a 65 decibel day-night average noise level (DNL) or result in an increase of at least 3 decibels (dBA) or greater (SEA's noise analysis thresholds). SEA found no receptors for which both thresholds would be exceeded and, therefore, concluded that there would be no adverse noise impacts associated with operation of any of the build alternatives. SEA compared estimated noise levels during construction to Federal Transit Administration (FTA) construction noise criteria and found that the criteria would not be exceeded unless impact pile driving for bridge construction occurs during the nighttime hours. If nighttime pile driving would occur, SEA found that estimated noise levels from pile driving would exceed the criteria at three locations on the Big Lake Segment.

On behalf of FRA, SEA also analyzed the potential noise impacts on Section 4(f) properties using FRA/FTA methods.[9] All project alternatives that include the Willow Segment would result in potential noise impacts to the Little Susitna State Recreation River, the Susitna Flats State Game Refuge, the Willow Creek State Recreation Area, and the Nancy Lake State Recreation Area. None of these refuges and recreation areas are anticipated to experience noise impacts as a result of either the Mac East-Connector 3-Houston-Houston South or Mac East-Big Lake alternative. The estimated acreage of potential noise impacts within the Willow Creek

[9] Federal Railroad Administration. 2005. High-Speed Ground Transportation Noise and Vibration Impact Assessment

State Recreation Area is approximately 9 percent of the total acreage of the state recreation area, while the acreage of potential noise impacts within the Little Susitna Recreation River would range from 3 percent (for alternatives that include the Willow Segment) to 4 percent (for alternatives that include the Houston North Segment) of the recreation river. All other estimated potential noise impacts would affect less than 1 percent of the total acreage of the Nancy Lake State Recreation Area and the Susitna Flats State Game Refuge, although the total acreage potentially affected would be greatest within the Susitna Flats State Game Refuge, ranging from approximately 992 to 1762 acres, depending on the alternative.

SEA also evaluated whether vibration during construction and operation would exceed FTA fragile building damage criterion and found that estimated vibration levels would not exceed the criterion at any receptor locations. Similarly, SEA found that estimated vibration levels could be perceptible during construction activities such as pile driving, but would be temporary, and that vibration from operations at levels that could be annoying would not occur outside the ROW. Therefore, SEA anticipates no vibration impacts resulting from the proposed rail line.

S.6.8 Energy

Energy consumption during the construction period would be temporary and would place minimal additional demand on the local energy supply. During rail line operations, energy requirements would primarily be for operation of trains. The total demand for diesel generated by the proposed action would be a very small share of the annual statewide consumption of distillate fuel. SEA anticipates that there would be a diversion of freight from truck to rail transport, which is more fuel-efficient, decreasing fuel consumption.

S.6.9 Transportation Safety and Delay

S.6.9.1 Grade Crossing Safety

To enable comparison of alternatives between Port MacKenzie and the existing ARRC mainline at the point north of Willow where the Willow Segment would connect to the main line, SEA estimated predicted accident frequency for the existing at-grade crossings along the ARRC mainline between this connection point and the point where the Big Lake Segment would connect to the main line. SEA found that the added rail traffic (two trains per day) would have a small effect on the predicted accident frequency at the existing at-grade crossings. At the at-grade crossing with the highest predicted accident frequency for existing conditions, the predicted interval between individual accidents would decrease from 54 to 51 years (i.e., accidents would be predicted to occur slightly more often). To provide an approximate upper bound of predicted accident frequency for the new at-grade crossings, SEA estimated predicted accident frequency for the crossings with the highest annual average daily traffic (AADT) in two categories – those above 500 AADT and those below 500 AADT – and found that the predicted interval between accidents would be more than 100 years for all new at-grade crossings. The Mac West-Connector 1-Houston-Houston South alternative has the highest hazard index which is about 80 percent higher than the alternative with the lowest index, the Mac East-Connector 3-Willow.

SEA anticipates that the increased rail traffic for transport of equipment and materials during the construction period would be less than during operations (that is, less than 2 trains per day), and potential impacts on safety also would be less during construction.

S.6.9.2 Traffic Delay

Vehicle delay at grade crossings varies depending on roadway and rail traffic volumes, the number of roadway lanes, train length, and train speed. SEA anticipates that the effect of the proposed action on grade crossing delay would be minimal. All alternatives would have a very small impact on road delay at grade crossings, with a maximum increase of about 7 minutes of delay per day (total for all vehicles) for any of the alternatives. SEA anticipates that the increased rail traffic during the construction period, due to transport of construction material, would be less than during operations, and potential delay impacts would also be less.

S.6.9.3 Rail Safety

ARRC anticipates transporting bulk materials and containers on the proposed rail line and has not indicated any plans to carry hazardous materials. SEA has analyzed rail transport of hazardous materials in situations involving transportation of flammable and/or toxic materials in areas with relatively high population densities and overall train traffic, and found the potential impacts to be low. Thus, SEA concludes that potential impacts of transporting hazardous materials, even if it were it to occur, would be minimal.

S.6.10 Navigation

The proposed rail line alternatives include a total of 30 stream crossings that have been determined to be or that might be considered navigable waterways. Where an alternative would cross a navigable waterway, as designated by the U.S. Coast Guard and Alaska Department of Natural Resources, there could be small temporary effects to navigability due to temporary bridges and normal bridge construction activities. Impacts to navigation from each potential crossing would be negligible because structures crossing navigable streams are required to provide vertical and horizontal clearances adequate for watercraft to pass unimpeded.

Depending on the alternative, the proposed rail line ROW would intersect from 0 to 3 navigable waterways and from 5 to 12 possible navigable waterways. The Mac West-Connector 2-Big Lake and Mac East-Big Lake alternatives could be constructed without crossing a navigable stream. However, the Mac West-Connector 2-Big Lake Alternative would cross 12 possible navigable waterways and the Mac East-Big Lake Alternative would cross 11 possible navigable waterways. The Mac West-Connector 1-Willow Alternative and Mac East-Connector 3-Willow Alternative would each cross three navigable streams. The Mac West-Connector 1-Willow Alternative would also cross eight possible navigable waterways, and the Mac East-Connector 3-Willow Alternative would cross six possible navigable waterways.

S.6.11 Land Use

S.6.11.1 Land Use

Land owners in the study area include the State of Alaska, the Federal Government, the MSB, the Alaska Mental Health Trust, the University of Alaska, private citizens, and Native Alaskans/Native Alaskan Corporations. Land in the area is commonly used for sport hunting and fishing and for traditional hunting, fishing, and gathering. Recreational use of land in the area by MSB and Anchorage residents and tourists is high, and wildlife habitat and water features are extensive. Forestry and timber harvesting are some of the designated uses of state land. ARRC would acquire the land within the proposed rail line ROW from existing land owners.

The area in the ROW cleared for construction but not needed for permanent structures would be restored to conditions consistent with rail line maintenance requirements. Construction support facilities would be sited, where possible, within the 200-foot ROW. Potential impacts to land use from these staging and construction areas would be temporary because ARRC would remove them and rehabilitate the areas after completing construction of the rail line and operations support facilities. Operations of the new freight rail service as part of the proposed project are not expected to stimulate changes in existing land uses or shift development patterns along the rail line.

The Mac West-Connector 1-Houston-Houston North Alternative would impact the least amount of private land (210 acres). Overall, this alternative would impact the fourth lowest total number of acres (1,054 acres) after the Mac East-Big Lake Alternative (990 acres), the Mac East-Connector 3-Houston-Houston North Alternative (1,040 acres), and the Mac East-Connector 3-Houston-Houston South Alternative (1,053 acres). Of these four alternatives, Mac East-Big Lake Alternative would impact the most acres of private land (422 acres) and is the second highest of all alternatives. In comparison, the Mac West-Connector 1-Houston-Houston North Alternative would cross mostly undeveloped land. The Mac West-Connector 2-Big Lake Alternative would impact the greatest amount of private land (487 acres) and the sixth total number of acres overall (1,105 acres). The Mac East-Connector 3-Houston-Houston North Alternative would impact 228 acres of private land; Mac West-Connector 1-Willow would impact 244 acres of private property; Mac East-Connector 3-Willow would impact 262 acres; Mac West- Connector 1- Houston- Houston South would impact 317 acres; and Mac East-Connector 3-Houston-Houston South alternatives would impact 335 acres of private land. Alternatives with the Mac East Segment would affect fewer acres of land in agricultural use than alternatives with the Mac West Segment. The Mac West-Connector 2-Big Lake Alternative would affect the most acres of land in agricultural use. In the area of the Big Lake Segment, the proposed rail line extension would require taking 17 residences and three structures. The Connector 3 Segment would displace two non-residential structures and the Mac East Segment would displace one residential structure.

S.6.11.2 Parks and Recreational Resources

The project area includes several designated recreation areas, including Willow Creek State Recreation Area, Nancy Lake State Recreation Area, Little Susitna State Recreation River, and two state recreation sites on the northern and southern shores of Big Lake. Many recreational trails cross the area, and there are varied recreation opportunities available to the public. The area is well suited for both winter and non-winter outdoor recreation activities.

Potential construction impacts common to all build alternatives would be temporary. These include: the obstruction of trails and waterways used to access recreation areas and resources; the generation of noise affecting hikers, boaters, and campers; increased dust and discordant visual elements in the landscape; impacts to water quality affecting recreational fishing; and alteration of local distribution of wildlife, which could affect the experience of users engaging in recreational hunting and wildlife viewing. Potential operations impacts common to all alternatives would include: loss of connectivity of unofficial trails crossed by the proposed rail line; the presence of communication towers that could permanently alter the localized movement of private aircraft; change in recreational access patterns to and along certain recreational waters; visual intrusion on the landscape that could affect the experience of recreationists. Where the proposed rail line would cross an officially recognized trail, ARRC proposed to provide public access by a grade-separated crossing. Alternatively, the trail could be relocated to avoid crossing the rail line. ARRC does not propose to provide crossings for unofficial trails. Unofficial trails would be blocked and ARRC's trespassing regulations would prohibit the public from crossing of the ROW without first obtaining approval from ARRC.

All of the alternatives would intersect the Iditarod National Historic Trail and all alternatives that include the Mac West Segment (four of the eight alternatives) would cross the Point MacKenzie Trailhead and Parking Area and the Figure 8 Lake Loop Trail. The Mac East-Connector 3-Houston-Houston South Alternative would not impact any recreation areas or refuges and would have the least effect on trails – intersecting four officially recognized trails. The Mac East-Big Lake Alternative also would not impact any recreation areas or refuges and would intersect five officially recognized trails. The Mac-West-Connector 1-Willow Alternative would impact four recreation areas/facilities and eleven named trails. The other six alternatives would result in impacts greater than the Mac East-Connector 3- Houston-Houston SouthBig Lake Alternative and less than the Mac West-Connector 1-Willow Alternative.

The U.S. Department of Transportation (USDOT) regulation known as "Section 4(f)" (see 23 CFR 774) mandates that the Secretary of Transportation shall not approve any transportation project requiring the use of publicly owned parks, recreation areas or wildlife and waterfowl refuges, or significant public or private historic sites, regardless of ownership, unless the impact would be *de minimis* or there is no prudent and feasible alternative to using that land, and the program or project includes all possible planning to minimize harm to the public park, recreation area, wildlife or waterfowl refuge, or significant site, resulting from that use. Section 4(f) resources affected by one or more alternatives include three recreation areas, one game refuge, and 13 officially recognized trails within the project area. A Programmatic Agreement (a draft is provided in Appendix J of this Draft EIS) would guide future efforts during final design and construction to identify and evaluate cultural resources including those that could be protected under Section 4(f) and would establish procedures for avoiding and mitigating impacts. There are only two alternatives that FRA and STB anticipate would result in *de minimis* impacts on Section 4(f) resources: the Mac East-Big Lake Alternative and the Mac East-Connector 3-Houston-Houston South Alternative. Of these two alternatives, the Mac East-Connector 3-Houston-Houston South Alternative would affect the fewest number (1) and length (204 feet) of

Section 4(f) trails, while the Mac East-Big Lake Alternative would affect the greatest number (4) and length (2,408 feet) of Section 4(f) trails. Neither of these alternatives would require use of or cause severe noise impacts, as defined by FRA, on the Susitna Flats State Game Refuge, the Little Susitna State Recreation River, the Nancy Lakes State Recreation Area, or the Willow Creek State Recreation Area. Additionally neither alternative would result in severe noise impacts, as defined by the FRA, to Section 4(f) properties. Of the remaining alternatives that would require the use of Section 4(f) resources, the Mac West-Connector 1-Willow Alternative would potentially affect the greatest number of recreational trails (10), the longest length of recreational trails (4,187 feet), and the ROW for this alternative would affect the greatest acreage of parks and recreation areas and the wildlife refuge (217 acres). The operation of trains along this alternative would result in severe noise impacts, as defined by the FRA, to approximately 2,765 acres of Section 4(f) properties. Of these remaining alternatives, the Mac East-Connector 3-Houston-Houston North would have the lowest impacts on number of trails (1), acreage of parks and recreational areas and the wildlife refuge affected by the ROW (69 acres), and length of trail crossed (204 feet). It would result in severe noise impacts, as defined by the FRA, to approximately 769 acres of Section 4(f) properties.

S.6.11.3 Hazardous Materials and Waste Sites

Potential safety or environmental impacts could result from proposed rail line construction activities as grubbing (clearing stumps and roots), filling, excavating, or related dewatering operations (removal of water from solid materials or removal of groundwater) in areas of contaminated soils or groundwater within the rail line ROW and other work areas during rail line construction. The Mac West, Mac East, Connector 1, Connector 2, Connector 3, and Big Lake segments would be located within the former Susitna Gunnery Range, a Formerly Used Defense site that could potentially contain munitions and explosives of concern. There are three known low-risk sites along the Houston South Segment that contain contaminated soils. There are no known sites of concern that present a potential for environmental consequences along the Willow, Houston, and Houston North segments. One low-risk site with petroleum-contaminated soil is known along the Connector 2 Segment. During construction, the Applicant would use information regarding the location of these sites to minimize any risks, and would follow applicable regulations to address sites identified. Routine rail line operations would not be expected to result in adverse impacts to hazardous waste sites.

S.6.12 Socioeconomics

As of 2007, the MSB had an estimated population of 82,668 and a labor force of 39,308 people. The southern segments of the proposed rail line are 36 miles away from the most populous area of the MSB, the area between Wasilla and Sutton. The MSB is part of the Anchorage Metropolitan Area and about a third of the employed residents of the Borough commute to Anchorage. Tourism and recreation are important economic sectors in the Borough and trails are often the main access available to recreational cabins and facilities.

Most socioeconomic impacts to the affected area are expected to be the same under all alternatives. The proposed action would result in a temporary stimulus to the Borough's economy and labor market. ARRC estimates it would employ 66 to 100 workers in the various phases of the 2-year construction period; however, the positive impact to employment would be temporary because it would be limited to the construction period. The impact from direct expenditures in the project area and local employment would increase from local expenditures by employees and providers of services during the rail construction period. The operation of the proposed rail line is expected to provide Port MacKenzie with a transportation alternative to the existing truck access to the Port for the movement of bulk materials and to support the use of the Port as a general cargo port. The extent of the socioeconomic impact would depend on the extent to which the rail line was used and generated demand for services at the Port. Additionally, access to resources such as coal could attract new industries to the Port MacKenzie District.

Potential socioeconomic impacts that would differ by segment include displacement of residences, businesses, and agricultural land and potential impacts to economic activities related to the use of unofficial trails. Unofficial trails would be blocked, and ARRC's trespassing regulations would prohibit crossing of the ROW. While recreation and tourism activities that use unofficial trails would be blocked by the proposed rail line, they could potentially be diverted to officially recognized trails. This could have a potentially adverse effect on economic activities directly or indirectly related to the use of such trails. The southern rail line segments would cross agricultural parcels with the Mac West-Connector 2-Big Lake Alternative affecting the greatest number of acres. Alternatives with the Mac East Segment would affect the least number of acres of agricultural land. Some agricultural production would likely be lost. Given the small number of residential displacements, no difficulties in identifying and providing comparable nearby housing is expected.

S.6.13 Environmental Justice

SEA assessed whether any high and adverse impacts to human health or the environment would occur as a result of the proposed action. SEA expects no high and adverse human health or environmental effects from the proposed action. Therefore there would be no high and adverse impacts to environmental justice populations in the project area.

S.6.14 Cumulative Effects

SEA collected and reviewed information on relevant past, present, and reasonably foreseeable future projects and actions that could have effects that coincide in time and space with the potential effects from the proposed action. For those identified relevant projects, SEA identified where there could be cumulative impacts. Reasonably foreseeable activities within the project area could include: Cook Inlet Areawide Oil and Gas Lease Sale; Cook Inlet Ferry; Cook Inlet OCGen™ Power Project; Knik Arm Crossing; Knik-Willow Transmission; Goose Creek Correctional Center; MSB Regional Aviation System Plan; Natural Gas Pipeline: Beluga to Fairbanks; a suite of Port MacKenzie Development Projects;[10] Port of Anchorage (POA) Marine Terminal Redevelopment Project; a host of road projects in the MSB; South Wasilla Rail Line Relocation; the Su-Kink Wetland Bank – Umbrella Mitigation Bank Instrument – Big Lake South Individual Bank Plan; and the West Mat-Su Access Project. The effects of these projects in combination with the impacts of the proposed action could result in cumulative adverse effects

[10] These include the development of a bulk materials facility, gravel mining operations, deep draft dock expansion, and barge dock expansion.

to geology and soils, water resources, biological resources, cultural and historic resources, subsistence, climate and air quality, noise, energy, transportation safety and delay, and land use.

S.6.15 Comparison of Potential Impacts

Table S-2 highlights potential impacts for resource areas and topics for which there are noteworthy differences among the build alternatives. The largest impacts would occur to water, cultural and recreational resources. Alternatives that include the Mac West Segment would tend to require a greater number of water body crossings and impact a greater amount of floodplains and wetlands when compared with alternatives containing the Mac East Segment. Alternatives including the Big Lake Segment would impact 25 acres of a wetland mitigation bank. The dog sledding cultural landscape would be adversely affected by all build alternatives. Alternatives including the Big Lake and Willow segments would tend to impact a greater number of known cultural resources and have many medium to high level probability areas for encountering cultural resources. Alternatives including the Mac West – Connector 1 Segment Combination or the Willow Segment would tend to cross a greater number of trails and recreational areas. Although all of the proposed rail line segments are technically feasible to build, and any combination of the segments that would connect the existing main line to Port MacKenzie would satisfy the project's purpose and need, there are only two alternatives that FRA and STB anticipate would result in *de minimis* impacts on Section 4(f) resources: the Mac East-Big Lake Alternative and the Mac East-Connector 3-Houston-Houston South Alternative. Based on Section 4(f) provisions, the FRA would not be permitted to provide funding for any STB authorized alternative that would involve the use of a Section 4(f) property, unless the impacts would be *de minimis*, or there were no prudent and feasible alternatives that avoided Section 4(f) properties. Under the No-Action Alternative there would be no impacts from the proposed project.

S.7 Summary of SEA's Preliminary Recommended Mitigation Measures

Based on the information available to date, consultations with appropriate agencies, and the environmental analysis presented in this document, SEA has developed preliminary mitigation measures to address the environmental impact of the proposed action.

SEA encourages applicants in rail construction cases to propose voluntary mitigation to address concerns in ways that go beyond what the Board could unilaterally require. In this case, based on consultations with local communities and interested agencies, the Applicant has developed voluntary mitigation in an effort to address many of the concerns that have been raised. SEA intends to recommend that the Board impose the Applicant's proposed voluntary mitigation measures as a condition of petition approval.

Table S-2
Summary and Comparison of Potential Impacts (page 1 of 3)

	Mac West-Conn 1-Willow	Mac West-Conn 1-Houston-Houston North	Mac West-Conn 1-Houston-Houston South	Mac West-Conn 2- Big Lake	Mac East-Conn 3-Willow	Mac East-Conn 3-Houston-Houston North	Mac East-Conn 3-Houston-Houston South	Mac East- Big Lake
Topography, Geology, Soils	Topography relatively flat, little need for cutting and filling expected	Topography relatively flat, little need for cutting and filling expected	Topography relatively flat, little need for cutting and filling expected	Topography relatively flat, with some areas of rolling hills, greater need for cutting and filling expected	Topography relatively flat, little need for cutting and filling expected	Topography relatively flat, little need for cutting and filling expected	Topography relatively flat, little need for cutting and filling expected	Topography relatively flat, with some areas of rolling hills, greater need for cutting and filling expected
	Locally important soil acres lost: 510	Locally important soil acres lost: 297	Locally important soil acres lost: 312	Locally important soil acres lost: 317	Locally important soil acres lost: 608	Locally important soil acres lost: 390	Locally important soil acres lost: 406	Locally important soil acres lost: 322
Water Resources	Crossings include 34 culverts, 3 culvert extensions, 4 drainage structures,[11] and 4 bridges	Crossings include 33 culverts, 13 culvert extensions, 4 drainage structures, and 1 bridge	Crossings include 34 culverts, 2 culvert extensions, 3 drainage structures, and 1 bridge	Crossings include 32 culverts, 3 culvert extensions, and 7 drainage structures	Crossings include 20 culverts, 3 culvert extensions, 3 drainage structures, and 4 bridges	Crossings include 19 culverts, 13 culvert extensions, 3 drainage structures, and 1 bridge	Crossings include 20 culverts, 2 culvert extensions, 2 drainage structures, and 1 bridge	Crossings include 16 culverts, 3 culvert extensions, and 7 drainage structures
	11 identified floodplain crossings and potential floodplain crossings	10 identified floodplain crossings and potential floodplain crossings	9 identified floodplain crossings and potential floodplain crossings	6 identified floodplain crossings and potential floodplain crossings	9 identified floodplain crossings and potential floodplain crossings	8 identified floodplain crossings and potential floodplain crossings	7 identified floodplain crossings and potential floodplain crossings	5 identified floodplain crossings and potential floodplain crossings
	Total wetland acres: 363 (Forested 148, Scrub/shrub 179, Emergent 32, Other waters 4)	Total wetland acres: 478 (Forested 169, Scrub/shrub 253, Emergent 50, Other waters 6)	Total wetland acres: 424 (Forested 153, Scrub/shrub 226, Emergent 41, Other waters 4)	Total wetland acres: 347 (Forested 135, Scrub/shrub 187, Emergent 24, Other waters 1)	Total wetland acres: 188 (Forested 94, Scrub/shrub 78, Emergent 13 Other waters 3)	Total wetland acres: 301 (Forested 116, Scrub/shrub 151, Emergent 30 Other waters 4)	Total wetland acres: 248 (Forested 100, Scrub/shrub 124, Emergent 21 Other waters 3)	Total wetland acres: 209 (Forested 88, Scrub/shrub 112, Emergent 8, Other waters 1)

[11] Drainage structures are defined as crossing structures whose structure would be determined by the Applicant during the final design process and could include multi-plate culverts, pre-cast arches, and single or multiple short-span bridges.

Table S-2
Summary and Comparison of Potential Impacts (page 2 of 3)

	Mac West-Conn 1-Willow	Mac West-Conn 1-Houston-Houston North	Mac West-Conn 1-Houston-Houston South	Mac West-Conn 2- Big Lake	Mac East-Conn 3-Willow	Mac East-Conn 3-Houston-Houston North	Mac East-Conn 3-Houston-Houston South	Mac East-Big Lake
Biological Resources	Total habitat acres lost: 1,272	Total habitat acres lost: 1,038	Total habitat acres lost: 1,032	Total habitat acres lost: 1,056	Total habitat acres lost: 1,249	Total habitat acres lost: 1,010	Total habitat acres lost: 1,003	Total habitat acres lost: 930
	Fragmentation of core habitats: 2,847 acres of forested and woody wetland habitat	Fragmentation of core habitats: 2,592 acres of primarily woody wetland and emergent wetland habitat	Fragmentation of core habitats: 3,210 acres of primarily woody wetland and emergent wetland habitat	Fragmentation of core habitats: 2,631 acres of forested and wetland habitat	Fragmentation of core habitats: 2,675 acres of forested and woody wetland habitat	Fragmentation of core habitats: 2,419 acres of emergent wetland, woody wetland, and forested habitat	Fragmentation of core habitats: 3,038 acres of emergent wetland, woody wetland, and forested habitat	Fragmentation of core habitats: 1,725 acres of forested and woody wetland habitat
	Moose foraging habitat acres lost: 326	Moose foraging habitat acres lost: 451	Moose foraging habitat acres lost: 506	Moose foraging habitat acres lost: 408	Moose foraging habitat acres lost: 224	Moose foraging habitat acres lost: 348	Moose foraging habitat acres lost: 403	Moose foraging habitat acres lost: 315
	Fish-bearing streams crossings: 16	Fish-bearing stream crossings: 18	Fish-bearing stream crossings: 13	Fish-bearing stream crossings: 12	Fish-bearing stream crossings: 13	Fish-bearing stream crossings: 15	Fish-bearing stream crossings: 10	Fish-bearing stream crossings: 10
	Anadromous Stream crossings: 7	Anadromous Stream crossings: 9	Anadromous Stream crossings: 6	Anadromous Stream crossings: 8	Anadromous Stream crossings: 6	Anadromous Stream crossings: 8	Anadromous Stream crossings: 5	Anadromous Stream crossings: 8
Cultural Resources	Total number of known cultural resources potentially affected: 46	Total number of known cultural resources potentially affected: 22	Total number of known cultural resources potentially affected: 20	Total number of known cultural resources potentially affected: 36	Total number of known cultural resources potentially affected: 51	Total number of known cultural resources potentially affected: 26	Total number of known cultural resources potentially affected: 24	Total number of known cultural resources potentially affected: 39
	Probability for cultural resources: low, medium and high level areas	Probability for cultural resources: low	Probability for cultural resources: low	Probability for cultural resources: low, medium and high level areas	Probability for cultural resources: many medium to high level areas	Probability for cultural resources: low, medium and high level areas	Probability for cultural resources: low, medium and high level areas	Probability for cultural resources: many medium to high level areas

Table S-2
Summary and Comparison of Potential Impacts (page 3 of 3)

	Mac West-Conn 1-Willow	Mac West-Conn 1-Houston-Houston North	Mac West-Conn 1-Houston-Houston South	Mac West-Conn 2- Big Lake	Mac East-Conn 3-Willow	Mac East-Conn 3-Houston-Houston North	Mac East-Conn 3-Houston-Houston South	Mac East-Big Lake
Land Use	244 acres private land	210 acres private land	317 acres private land	487 acres private land	262 acres private land	228 acres private land	335 acres private land	422 acres private land
	Structures in the 200-foot ROW: 0	Structures in the 200-foot ROW: 0	Structures in the 200-foot ROW: 0	Structures in the 200-foot ROW: 20 displaced most of which are residences	Structures in the 200-foot ROW: 3 (1 residence)	Structures in the 200-foot ROW: 3 (1 residence)	Structures in the 200-foot ROW: 3 (1 residence)	Structures in the 200-foot ROW: 21 displaced most of which are residences
	Acres in agricultural use lost: 66	Acres in agricultural use lost: 64	Acres in agricultural use lost: 64	Acres in agricultural use lost: 94	Acres in agricultural use lost: 94	Acres in agricultural use lost: 7	Acres in agricultural use lost: 5	Acres in agricultural use lost: 5
	Official trails crossed: 11	Official trails crossed: 8	Official trails crossed: 8	Official trails crossed: 6	Official trails crossed: 8	Official trails crossed: 4	Official trails crossed: 4	Official trails crossed: 5
	4 state recreation or refuge areas crossed	2 state recreation or refuge areas crossed	2 state recreation or refuge areas crossed	1 state recreation or refuge area crossed	4 state recreation or refuge areas crossed	1 state recreation or refuge area crossed	0 state recreation or refuge area crossed	0 state recreation or refuge areas crossed
	Adverse noise impact to 2,765 acres of Section 4(f) properties	Adverse noise impact to 2,258 acres of Section 4(f) properties	Adverse noise impact to 1,489 acres of Section 4(f) properties	Adverse noise impact to 992 acres of Section 4(f) properties	Adverse noise impact to 1,276 acres of Section 4(f) properties	Adverse noise impact to 769 acres of Section 4(f) properties	Adverse noise impact to 0 acres of Section 4(f) properties	Adverse noise impact to 0 acres of Section 4(f) properties

SEA specifically requests meaningful comments on the preliminary recommended mitigation identified in the Draft EIS (both the Applicant's voluntary mitigation and SEA's preliminary mitigation) and suggestions for potential additional mitigation measures. SEA will make its final recommendations on mitigation to the Board in the Final EIS after considering all public comments on the Draft EIS. The Board will then make its final decision regarding this project and any conditions it might impose.

S.8 Request for Comments on Draft EIS

SEA encourages the public and any interested parties to submit written comments on all aspects of this Draft EIS. SEA will consider all comments in preparing the Final EIS, which will include responses to all substantive comments, SEA's final conclusions on potential impacts, and SEA's final recommendations. All comments on the Draft EIS must be submitted within the prescribed comment period, which closes on May 10, 2010. When submitting comments on the Draft EIS, SEA encourages commenters to be as specific as possible and substantiate concerns and recommendations.

Mail written comments on the Draft EIS to:

David Navecky
Surface Transportation Board
395 E Street, SW
Washington, DC 20423
Attention: Environmental Filing
STB Finance Docket No. 35095

Commenters also may submit comments electronically. Comments submitted electronically will be given the same attention as mailed comments. Persons who submit comments electronically do not have to also send those comments by mail. Environmental comments may be filed electronically on the STB Web site at www.stb.dot.gov by clicking on the "E-FILING" link. By selecting "Environmental Comments" after the link, individuals will not be required to log in to submit their comments. Comments can be typed into the online form provided, or attached as Microsoft Word,® Corel Word Perfect,® or Adobe® Acrobat® files. Written comments on the Draft EIS, which was served March 16, 2010, must be postmarked by May 10, 2010. Electronically-filed comments must be received by May 10, 2010.

Please refer to STB Finance Docket No. 35095 in all correspondence addressed to the Board, including e-filings.

Additional information about the project can be obtained by calling the SEA toll-free number at 1-888-257-7560 (telecommunications device [TDD] for the hearing impaired is 1-800-877-8339).

This Draft EIS is also available on the STB Web site at www.stb.dot.gov and on the project Web site at www.stbportmacraileis.com.

S.9 Public Meetings

In addition to receiving written comments on the Draft EIS, SEA will host public meetings. SEA and the cooperating agencies are holding six public meetings on the Draft EIS during which interested parties may make oral comments in a formal setting and/or submit written comments. SEA will begin each meeting with a brief overview of the proposed action and environmental review process. The overview will be followed by a formal comment period during which each interested individual will be given several minutes to address the meeting participants and convey his or her oral comments. A court reporter will be present to record these oral comments. If time permits, the court reporter will be available at the conclusion of the formal segment of the meeting to record oral comments from individuals not interested in addressing the meeting as a whole. Meetings will be held at the following dates, times, and locations:

- April 6, 2010, 6:30-8:30 pm at Wilda Marston Theater, 3600 Denali Street, Anchorage, AK
- April 7, 2010, 6:30-8:30 pm at Big Lake Elementary School, 3808 South Big Lake Road, Big Lake, AK
- April 8, 2010, 6:30-8:30 pm at Menard Sports Center, 1001 S Mack Drive Wasilla, AK
- April 12, 2010, 6:30-8:30 pm at Houston Middle School, 12801 W. Hawk Lane, Houston, AK
- April 13, 2010, 6:30-8:30 pm, at Willow Community Center, Mile 70 Parks Highway, Willow, AK
- April 14, 2010, 6:30-8:30 pm, at Knik Elementary School Gym, 6350 Hollywood Boulevard, Wasilla, AK

Following the close of the comment period on the Draft EIS (May 10, 2010), SEA and the cooperating agencies will issue a Final Environmental Impact Statement (Final EIS) that considers comments on the Draft EIS. The Board will then issue a final decision based on the Draft and Final EISs and all public and agency comments in the public record for this proceeding. The final decision will address the transportation merits of the proposed project and the entire environmental record. That final decision will take one of three actions: approve the proposed project, deny it, or approve it with mitigation conditions, including environmental conditions.

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ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Full Spelling
AAC	Alaska Administrative Code
AADT	annual average daily traffic
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish & Game
ADNR	Alaska Department of Natural Resources
ADOT&PF	Alaska Department of Transportation & Public Facilities
ARRC	Alaska Railroad Corporation
AS	Alaska Statute
BLM	Bureau of Land Management
BMP	Best Management Practices
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2	carbon dioxide
dBA	A-weighted decibels
DNL	day-night average noise level
DOT Act	Department of Transportation Act of 1966
DPOR	Division of Parks and Outdoor Recreation
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FR	Federal Register
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
GMU	Game Management Unit
ICC	Interstate Commerce Commission
LEPC	Local Emergency Planning Commission
L_{eq}	equivalent sound level
MSB	Matanuska-Susitna Borough
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NIPs	Nonnative Invasive Plants

Acronym/Abbreviation	Full Spelling
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRCS	U.S. Department of Agriculture Natural Resources Conservation Service
O_3	Ozone
ºC	degrees Celsius
ºF	degrees Fahrenheit
OSHA	Occupational Safety and Health Administration
PA	Programmatic Agreement
Pb	lead
pH	potential for hydrogen
PM	particulate matter
PM_{10}	particulate matter with an aerodynamic diameter of 10 microns or less
PM_{25}	particulate matter with an aerodynamic diameter of 25 microns or less
PPV	peak particle velocity
RI/FS	Remedial Investigation and Feasibility Study
ROW	right-of-way
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users of 2005
SEA	Section on Environmental Analysis, Surface Transportation Board
SHPO	State Historic Preservation Office(r)
SO_2	sulfur dioxide
SRA	State Recreation Area
STB	Surface Transportation Board
STIP	State Transportation Improvement Program
SWPPP	Stormwater Pollution Prevention Plan
TDD	telecommunications device
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UXO	Unexploded Ordnance
VdB	vibration decibels
VOC	volatile organic compound

GLOSSARY

100-year flood A flood event of such magnitude that it occurs, on average, every 100 years; this equates to a 1-percent chance of its occurring in a given year. A base flood might also be referred to as a 100-year storm. The area inundated during the base flood is sometimes called the 100-year floodplain.

Abandonment A discontinuance of service on a rail line segment, with no intention of resuming that service. The abandonment of a rail line removes that line from the jurisdiction of the Surface Transportation Board, and enables the railroad to salvage or discard track materials, and dispose of the right-of-way.

Air quality A measure of the concentrations of pollutants, measured individually, in the air.

Alluvial fan A fan-shaped deposit formed where a fast-flowing stream flattens, slows, and spreads, typically at the exit of a canyon onto a flatter plain.

Alluvium Sediment such as clay, silt, and sand deposited by flowing water, as in a riverbed, floodplain, or delta.

Ambient (1) Undisturbed, natural conditions such as ambient temperature caused by climate or natural subsurface thermal gradients. (2) Surrounding conditions.

Ambient air quality standards Federal or state standards that define the limits for airborne concentrations of designated criteria pollutants (nitrogen dioxide, sulfur dioxide, carbon monoxide, particulate matter with aerodynamic diameters equal to or less than 10 microns and 2.5 microns, ozone, and lead) to protect public health with an adequate margin of safety (primary standards) and to protect public welfare, including plant and animal life, visibility, and materials (secondary standards).

Ambient noise The existing noise, or the sum of all noise (from human and naturally occurring sources), at a specific location over a specific time.

Anadromous Anadromous fish reproduce in freshwater and the offspring migrate to the ocean to grow and mature, and return to freshwater to reproduce.

Associated facilities Facilities that are part of the proposed action and that would be constructed to support rail activities such as communications towers, a passenger facility, and sidings and are necessary for operation of the rail line.

Applicant Any person or entity seeking Surface Transportation Board action whether by application, petition, Notice of Exemption, or any other means that initiates a formal Board proceeding.

Area of Potential Effects	The geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of the undertaking and may be different for different kinds of effects caused by the undertaking. (36 CFR 800.16(d))
At-grade crossing	The location where a local street or highway crosses rail line tracks at the same level or elevation.
Attainment area	An area the U.S. Environmental Protection Agency has classified as complying with National Ambient Air Quality Standards specified under the Clean Air Act.
A-weighted decibels	Adjusted decibel level. A measure of noise used to compare noise from various sources. A-weighting approximates the frequency response of the human ear.
Ballast	Crushed stone that forms the railbed upon which railroad ties are laid. It is packed between, below, and around the ties and is used to facilitate water drainage and to distribute the load from the railroad ties.
Balls or flappers	Brightly colored balls are attached to transmission lines to provide greater visibility. Flappers are used to deter birds and other wildlife from landing on transmission lines.
Bear interaction plan	A plan to minimize the interaction between humans and bears; often details garbage management.
Best management practices	Techniques that various parties (e.g., the construction industry) use to minimize impacts to the environment.
Bioaccumulation	Gradual build up of chemicals (e.g., pesticides or other toxic substances) in an organism.
Biological assessment	Information prepared by, or under the direction of, a Federal agency to determine whether a proposed action would be likely to (1) adversely affect listed species or designated critical habitat, (2) jeopardize the continued existence of species that are proposed for listing, or (3) adversely modify proposed critical habitat. Biological assessments must be prepared for “major construction activities.”
Blazed section lines	Section lines marked (usually using paint on trees) by a surveyor.

Block group	The smallest geographic unit for which the U.S. Census provides information on racial background, ethnic heritage, and household income. The population of a block group typically ranges from 600 to 3,000 and is designated to reflect homogeneous living conditions, economic status, and population characteristics. Block-group boundaries follow visible and identifiable features, such as roads, canals, railroads, and above-ground high-tension power lines.
Borrow area/pit	Site from which earthen material is excavated and used at a different site, usually as fill to create the proper grade.
Braided river	A river consisting of a network of small channels separated by small, often temporary, islands.
Branch line	A secondary line of rail line usually handling light volumes of traffic.
Brush layering	A revegetation technique that combines layers of dormant (living woody plants that are not actively growing) or rooted cuttings with soil to revegetate and stabilize streambanks and slopes; branches are placed to provide reinforcement to the soil.
Brush mattressing	A revegetation technique that provides a protective vegetative covering (in the form of a brush mat of dormant branches that will root and grow) to a slope.
Camp layout	The configuration for temporary housing facilities.
Census block group	*See* block group.
Channel aggradation	Deposition and accumulation of sediments in a stream channel.
Channel plug	A natural or manmade plug that blocks the flow of water through a riverbed or culvert.
Channel reorientation	Lateral or downstream shifting of a river channel.
Class 4 Standards	For Class 4 track, the maximum allowable operating speed is 60 miles per hour for freight trains and 80 miles per hour for passenger trains. Track class designation between 1 and 9 is determined by the Federal Railroad Administration and characterizes the quality and condition of track. The track geometry and type of track structure govern the allowable speed over the track and the level of upkeep to maintain the track.
Closed forest	A forest with tree canopy coverage of 60 to 100 percent.
Coir logs	Interwoven coconut fibers that are bound together with biodegradable netting and provide temporary physical protection to a site while vegetation becomes established; often used to secure the base or toe of a slope in low velocity areas.

Condition	As used in this Environmental Impact Statement, a provision the Surface Transportation Board imposes as part of a final decision that requires action by an Applicant.
Conductors	Part of a transmission line through which electricity passes.
Construction camp	A facility designed and intended for temporary use to house construction workers.
Construction staging area	A designated area where vehicles, supplies, and construction equipment are positioned for access and use at a construction site.
Conveyance structure	A structure to convey water (e.g., a pipe, culvert, or bridge).
Core-and-blade technology	Use of core tools, made by the removal of flakes from a core, and blade tools.
Criteria air pollutant	Any of six pollutants (lead, carbon dioxide, sulfur dioxide, nitrogen dioxide, ozone, and particulate matter) regulated under the Clean Air Act, and for which areas must meet National Ambient Air Quality Standards.
Criteria of significance	The criteria the Surface Transportation Board's Section of Environmental Analysis has developed to determine whether a potential adverse environmental impact would be significant and could warrant mitigation.
Critical habitat	The specific site within the geographical area occupied by species listed as threatened or endangered that includes the physical or biological features essential to conservation of the species. These areas might require special management considerations or protection. These areas can include specific sites outside the geographical areas occupied by the species at the time of listing that are essential for the conservation of the species.
Cumulative effects/ impacts	Impacts to the environment that result from the incremental impact of a proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of which agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.
Cut	Cutting away from the top of a slope to fill in at the bottom, thereby providing a suitable grade for the rail roadbed. *See* fill.
Day-night average noise level	The energy average of A-weighted decibels sound level over 24-hours; includes a 10-decibel adjustment factor for noise between 10 p.m. and 7 a.m. to account for the greater sensitivity of most people to noise during the night. The effect of nighttime adjustment is that one nighttime event, such as a train passing by between 10 p.m. and 7 a.m., is equivalent to 10 similar events during the daytime.

Decibel	A standard unit for measuring sound pressure levels based on a reference sound pressure of 0.0002 dyne per square centimeter. This is nominally the lowest sound pressure people can hear.
Deck girder bridge	A bridge with its deck built on top of girders (support beams), which are placed on bridge abutments and foundation piers.
Dedicated easement	An easement upon which there is established a legal right-of-way or formal landowner permission for public access along its entire length.
Deep-draft	Pertaining to water-going vessels with drafts greater than 15 feet.
Direct impact	An effect that results solely from implementation of an action without intermediate steps or processes. Examples include habitat destruction, soil disturbance, air-pollutant emissions, and water use.
Dispersed-use access	A management concept that encourages use over an entire area, rather than concentrated in a particular area.
Drumlin fields	A cluster of drumlins (elongated hills formed by glaciers) that have the same size, shape, and orientation.
Early stages of egg incubation	Could occur any time between spring and late fall depending on the fish species and location.
Effects	For an Environmental Impact Statement, the positive or negative (adverse) consequence of an action (past, present, or future) on the natural environment (land use, air quality, water resources, geological resources, ecological resources, aesthetic and scenic resources) and the human environment (infrastructure, economics, social, and cultural).
Emergent vegetation	Aquatic plants with growth that emerges above the water.
Emissions	Air pollutants that enter the atmosphere.
Endangered species	A species of plant or animal that is in danger of extinction throughout all or a significant portion of its range and is protected under Federal and/or state regulations.
Equalization culvert	A culvert placed under the rail bed to allow for water flow at a location other than a waterbody.
Equipment	For a railroad, a term used to refer to the mobile assets of the railroad, such as locomotives, freight cars, and on-track maintenance machines. This term is also used more narrowly as a collective term for freight cars operated by this railroad. Also known as rolling stock.

Equivalent sound levels	A single value of sound level for any desired duration (such as 1 hour), which includes all of the time-varying sound energy in the measurement period. Equivalent sound levels correlates reasonably well with the effects of noise on people, even for wide variations in environmental sound levels and time patterns. It is used when only the durations and levels of sound, and not their times of occurrence (day or night), are relevant.
Essential Fish Habitat	The waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (Magnuson-Stevens Act, 16 U.S.C. 1801 *et seq*). Waters include aquatic areas and their associated physical, chemical, and biological properties and can include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and spawning, breeding, feeding, or growth to maturity covers a species' full life cycle.
Fault	A fracture or a fracture zone in crustal rocks along which there has been movement of the fracture's two sides in relation to one another, separating one continuous rock stratum or vein into parts.
Fill	(1) The term the U.S. Army Corps of Engineers uses to refer to the placement of materials (e.g., soils, aggregates, concrete structures) within water resources under Corps of Engineers jurisdiction. (2) General term for materials (e.g., soils, aggregates) deposited in an area for construction purposes, such as to modify a grade.
Final Scope of Study	Serves as the work plan for preparing a Draft Environmental Impact Statement. Developed by reviewing scoping comments after scoping meetings are held to determine what issues will need to be assessed in the Environmental Impact Statement.
Flood Insurance Rate Maps	Maps available from the Federal Emergency Management Agency that delineate the flood insurance rates of an area. The maps are based on the potential for 100-year and 500-year flooding in the area.
Floodplain	The lowlands adjoining inland and coastal waters and relatively flat areas and flood-prone offshore islands, including, at a minimum, those areas that have a 1 percent or greater chance of flood in any given year (also known as a 100-year or a Zone A floodplain).
Floodway	The portion of the available flow cross section that cannot be obstructed without causing an increase in the water-surface elevations resulting from a flood with a 100-year average return period of more than a given amount.
Footprint	The area that would be covered by the rail line or rail line construction and operations support facilities. For certain of these facilities (for example, quarry sites), this would be the area inside the site fence line.

Fugitive dust	Particulate matter discharged to the atmosphere from the mechanical disturbance of granular material exposed to the air, but not discharge to the atmosphere in a confined flow stream.
Geographic Information System	A computer system designed to store, retrieve, manipulate, analyze, and display geographic data. The Geographic Information System combines mapping and databases.
Geotechnical borehole	A narrow shaft drilled into the ground to obtain information on the physical properties of the rock and soil below the ground surface.
Glacial moraine	Material, ranging from silt to boulders, deposited by the movement and melting of glaciers.
Glaciofluvial	Pertaining to streams fed by melting glaciers, or to the deposits and landforms produced by such streams.
Grade (related to a rail line)	The ratio of elevation change to the distance traveled by a train, expressed as a percent. For example, a 1-meter (3.28-foot) change in elevation over 100 meters (328 feet) of track is a 1-percent grade.
Grade crossing	*See* at-grade crossing.
Grade separation	*See* grade-separated crossing.
Grade-separated crossing	The site where a local street or highway crosses rail line tracks at a different level or elevation, either as an overpass or as an underpass.
Graminoid	Grasses and grass-like plants such as sedges.
Greenhouse gas	Atmospheric gases that absorb and emit thermal infrared radiation. Water vapor, carbon dioxide, methane, nitrous oxide, ozone, and chlorofluorocarbons are common greenhouse gases in Earth's atmosphere.
Ground vibration	The rapid linear motion of a compression wave in the ground caused by a single or repeated force or impact to the ground, as in the action of a pile driver or a tire hitting a bump or pothole in a road.
Grounded hardware	Hardware used on or in conjunction with transmission lines that is connected to the ground so as to prevent an electrical short.
Groundwater	Water contained in pores or fractures in either the unsaturated zone or saturated zone below ground level.
Grubbing	First order of work on most construction projects. Clearing and grubbing includes removal of trees, stumps, roots, and other matter resting on the surface of the ground.
Guy line	A rope or cable used to provide support and stability to a structure.

Habitat	The place(s) where plants or animal species generally occur(s) including specific vegetation types, geologic features, and hydrologic features. The continued survival of the species depends on the intrinsic resources of the habitat.
Hazardous chemical	As defined under the Occupational Safety and Health Act (Public Law 91-956) and the Emergency Planning and Community Right-to-Know Act (42 U.S.C. 116), a chemical that is a physical or health hazard.
Hazardous materials	Substances or materials the Secretary of Transportation has determined are capable of posing an unreasonable risk to human health, safety, and property when transported in commerce, as designated under 49 CFR Parts 172 and 173.
Hazardous wastes	Waste materials that, by their nature, are inherently dangerous to handle or dispose of (e.g., old explosives, radioactive materials, some chemicals, some biological wastes), as designated under 40 CFR Part 261. Usually, industrial operations produce these waste materials.
Hertz	A unit of frequency equal to one cycle per second.
Horn noise (train)	Noise that occurs when locomotives sound warning horns in the vicinity of highway/rail at-grade crossings.
Hydric soils	Soils that formed under condition of saturation, flooding, or ponding long enough during the growing season to develop anaerobic or oxygen-free conditions in the upper part.
Hydrology	Study of the movement, distribution, and quality of water throughout Earth.
Hydrophytic vegetation	Plants adapted to living in or on an aquatic environment.
Hyporheic zone	A region beneath and lateral to a stream bed, where there is mixing of shallow groundwater and surface water.
Ice jam	The build-up of ice chunks resulting from rapid breakup of frozen waterbodies. Occurs when the combination of warm temperatures and heavy rain cause snow to melt rapidly, which then can cause frozen waterbodies to swell and experience multiple ice breaks. Ice jams can cause flooding in areas by blocking the flow of water.
Impact	*See* effects.
Impaired waterbody	Any waterbody that is too polluted to maintain its beneficial uses as defined by state and tribal water quality standards.
In attainment	The U.S. Environmental Protection Agency designates an area as being in attainment for a particular pollutant if ambient concentrations of that pollutant are below the National Ambient Air Quality Standards.

Indirect impact	An effect that is related to but removed from a proposed action by an intermediate step or process. Examples include surface-water quality changes resulting from soil erosion at construction sites, and reductions in productivity resulting from changes in soil temperature.
Industrial spurs	A railroad siding industries use to store freight cars for loading and unloading.
Intermodal	Involving the use of more than one mode of transport.
Interstitial spaces	The open spaces in a rock or soil, considered collectively.
Invasive plant species	An alien species, the introduction of which does or is likely to cause economic or environmental harm or harm to human health (Executive Order 13112, *Invasive Species*, February 3, 1999).
Jurisdictional wetland	A wetland that the U.S. Army Corps of Engineers regulates under Section 404 of the Clean Water Act (33 U.S.C. 1344).
Jute matting	An organic geotextile that forms a mulch that suppresses weed growth and increases moisture retention in the soil to promote revegetation.
Kames	Geologic features formed by retreating glaciers. Hills or mounds composed of sand, gravel, and till and are irregularly shaped.
Lateral migration	Erosional process in which the side to side movement of the stream undercuts the bank causing lateral growth of the stream channel and increased meander bend amplitude.
Late-succession forests	A forest that includes mostly mature and old-growth trees.
Leachate	The liquid than drains from a landfill.
L_{eq}	Level equivalent, which is the energy-averaged sound pressure level over a specified time interval.
Level of service	A degree of peak congestion experienced by roadway vehicle traffic that considers factors such as vehicle delay, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. Traffic analysts express level of service as letter grades, ranging from A (free flowing) to F (severely congested); they measure level of service by the average for all vehicles.
Locomotive, road	A locomotive (or engine) designed to move trains between yards or other designated points.
Locomotive, switching	A locomotive (or engine) used to switch rail cars in a yard, between industries, or in other areas where rail cars are sorted, spotted (placed at a shipper's facility), pulled (removed from a shipper's facility), and moved within a local area.

Long-term impact	In this Environmental Impact Statement, these potential impacts would result from permanent changes to the landscape or community due to the introduction of the physical presence of the proposed rail line and associated facilities. These impacts remain long after construction of the facility has ended.
Low ground pressure construction vehicles	Construction equipment that is either lighter-weight than normal, or has a higher surface area to distribute its weight, either by using tracks instead of tires or larger or a greater number of tires.
Low-income population	A population composed of persons whose median household income is below the Department of Health and Human Services poverty guidelines.
Main line	Railroad line used by through trains traveling between terminals.
Mean high water line	The point on a streambank at which surface water is so continuous that the streambank is marked by erosion, absence of woody terrestrial vegetation, or predominance of aquatic vegetation.
Mineral fines	A generic term given to a range of primary mineral materials that have been ground into fine powder.
Minority population	A population composed of persons who are Black (non-Hispanic), Hispanic, Asian American, American Indian, or Alaska Native.
Mitigation	In an Environmental Impact Statement, an action taken to prevent, reduce, or eliminate adverse environmental effects.
Moraine	A deposit of earthen material left on the ground by receding glaciers. The deposits are often composed of boulders, stones, gravel, sand, and other debris deposited on the landscape in the form of ridges, mounds, and irregular masses.
Morphology	The structure of landforms and processes that shape them. Processes that mold natural water bodies include erosion, transport, and deposition of sediment.
Motive power	Locomotives operated by the railroad.
Munitions and explosives of concern	Military munitions that might pose unique safety risks. These include unexploded ordnance, discarded military munitions, or munitions constituents present in high enough concentrations to pose an explosives or other health hazard
Munitions constituents	Any materials originating from unexploded ordnance, discarded military munitions, or other military munitions, including explosive and nonexplosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions.
Muskegs	An acidic soil type found in Arctic and boreal areas composed of decomposing plants and surface-level water tables.

National Ambient Air Quality Standards Air pollutant concentration limits established by the U.S. Environmental Protection Agency for the protection of human health, structures, and the natural environment.

National Flood Insurance Plan A Federal program administered by the Federal Emergency Management Agency that enables property owners to purchase insurance as protection against flood losses in exchange for state and community floodplain management regulations that reduce future flood damages.

National Register of Historic Places Administered by the National Park Service, the *National Register of Historic Places* is the Nation's master inventory of known historic properties, including buildings, structures, sites, objects, and districts that possess historic, architectural, engineering, archaeological, or cultural significance at the Federal, state, or local levels.

National Wetlands Inventory An inventory of wetland types in the United States compiled by the U.S. Fish and Wildlife Service.

Native American Of or relating to a tribe, people, or culture indigenous to the United States (25 U.S.C. 3001 *et seq.*; Public Law 101-601).

Navigable waters Any body of water that may be publicly used for business or transportation; in the United States, each state determines what private uses may occur in intrastate navigable waters, but the Federal Government has authority over navigable interstate and international waters.

Nephalometric turbidity units The standard unit of measurement used to measure turbidity in water. It makes use of a light-scattering effect of fine suspended particles in a light beam.

Noise Any undesired or unwanted sound.

Noise contour Line plotted on a map or drawing connecting points of equal sound levels.

Noise-sensitive receptor Location where noise can interrupt ongoing activities and can result in community annoyance, especially in residential areas. The Surface Transportation Board's environmental regulations include schools, libraries, hospitals, residences, retirement communities, and nursing homes as examples of noise-sensitive areas.

Nonattainment area An area that the U.S. Environmental Protection Agency has classified as not complying with the National Ambient Air Quality Standards promulgated under the Clean Air Act.

Nonnative invasive plants Plants that are not native to an area, have few or no natural predators and, therefore, proliferate easily in an area which adversely affects the ecology of the areas they invade, often resulting in the loss of native plant life due to overwhelming competitive pressures.

Nonpoint source pollution Water pollution coming from non-specific, dispersed sources, such as agricultural area runoff draining into a river.

Noxious weed	Non-native plants that spread quickly and are difficult to control, invading a variety of habitats and causing ecological and economical damage.
Official trail	A recreational trail that has been specifically established within currently adopted plans by ADNR and/or MSB or is established within these plans at the time of construction or ROW conveyance (whichever occurs first), and is located on state, MSB property, or whose location is provided for by recorded ROW or easement. ARRC proposed to provide public access by a grade-separated crossing where practicable, or the trail could be relocated to avoid crossing the rail line. The design of the crossing would accommodate existing trail users at the time of construction or ROW conveyance (whichever occurs first). ARRC would coordinate with the trail owner and consult with user groups as appropriate where the crossing location may have to be relocated to accommodate a grade-separation, or multiple crossings within one mile might be consolidated.
Open forest	An open forest has tree canopy coverage of 25 to 60 percent.
Open water period	Period of time during which a waterbody is not frozen.
Organic soil	A soil with a high percentage of fresh, partially, or well decomposed matter.
Outwash deposit	Deposits left by transported rock debris that are typically low density, and are composed of relatively clean sand and gravel.
Overburden	Surface soil that must be moved away during excavation.
Overly constricting active channels	Excessive narrowing of stream channels through which water current flows (as distinct from channels that currently do not convey water).
Overpressures	A pressure shock wave, usually resulting from the detonation of an explosive, which measures over and above normal air or water pressure.
Oxbow	A U-shaped body of water formed from a meandering river.
Palliatives	A variety of products applied to roadways to control dust and reduce erosion and dust emissions.
Palustrine wetland	A non-tidal wetland dominated by trees, shrubs, or persistent emergent vegetation. Includes wetlands traditionally classified as marshes, swamps, or bogs.
Particulate matter (PM)	Airborne dust or aerosols.

Peak particle velocity	The measure of ground movements. Technically, the maximum instantaneous positive or negative peak of the vibration signal, measured as a distance per unit of time (such as millimeters or inches per second). Peak particle velocity is typically used to evaluate shock-wave type vibrations from actions like blasting, pile driving, and mining activities, and their relationship to building damage.
Peat	Formed when plant material is exposed to acidic and anaerobic conditions and thereby prevented from decaying fully. Peat is the accumulation of this partially decayed vegetation generally found in wetlands.
Permafrost	Ground (soil or rock and included ice and organic material) that remains at or below zero degrees Celsius for at least two consecutive years.
pH	A measure of the relative acidity or alkalinity of a solution, expressed on scale from 0 to 14, with the neutral point at 7.0. Acid solutions have pH values lower than 7.0, and basic (that is, alkaline) solutions have pH values higher than 7.0.
Platting	Mapping, at scale, divisions of a piece of land. Platting occasionally shows topographic or vegetative information as well. After platting, legal descriptions can refer to blocks and lot-numbers as opposed to portions of sections.
PM_{10}	All particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers. Particles less than this diameter are small enough to be breathable and could be deposited in lungs.
$PM_{2.5}$	All particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.
Point source	A distinct stationary source of air or water pollution such as a factory or sewer pipe.
Potlatch site	The locations where the potlatch festival ceremony of indigenous people of the Pacific Northwest Coast in North America is practiced. The main purpose of the ceremony is to redistribute and reciprocate wealth.
Prime farmland	According to the Natural Resources Conservation Service, land having the best combination of physical and chemical characteristics for producing food, feed forage, fiber, and oilseed crops.
Qualitative	With regard to a variable, a parameter, or data, an expression or description of an aspect in terms of non-numeric qualities or attributes. *See* quantitative.
Quantitative	A numeric expression of a variable. *See* qualitative.

Quiet zone	An area in which locomotive warning horns are not sounded at at-grade highway-rail crossings. The Federal Railroad Administration has primary authority over quiet zones which can be established pursuant to the process in 49 CFR Parts 222 and 229, Use of Locomotive Horns at Highway-Rail Grade Crossings, Final Rule.
Rail line segment	For the purposes of this Environmental Impact Statement, portions of rail line alternatives that extend between two junction points.
Rail string	A continuous steel-reinforced beam outfitted with a rail head and reinforced with multiple pre-stressed steel wire ropes.
Rail yard	A location or facility with multiple tracks where rail operators switch and store railcars.
Rare species	Species that have small total populations that presently are not in danger or vulnerable, but are at risk for extinction.
Receptor	*See* noise-sensitive receptor.
Recharge	A hydrologic process whereby water moves downward from surface water to groundwater.
Redd	A depression created by the upstroke of a female salmon's body and tail, vacuuming up the gravel at the river bottom and using the river's current to drift it downstream. Hundreds of eggs are deposited in redds by the female during the 2 days she is spawning. Redds are highly visible in streams and are marked by clean exposed white gravel.
Resident fish streams	Streams that support fish that do not migrate and remain year-round.
Revetment	A structure installed on river banks that functions as a protective shoreline barrier by absorbing energy from incoming water.
Right-of-way	The strip of land for which an entity (e.g., a railroad) has a property right (e.g., by fee simple ownership or easement) to build, operate, and maintain a linear structure, such as a road, rail line, or pipeline.
Rill	A shallow slit into soil caused by erosion from overland flow that is concentrated into a thin path because of soil surface roughness.
Riparian	Generally describes vegetative communities located on the banks of natural waterbodies such as rivers, lakes, and tidewater areas.
Riprap	Hard rock used to protect sensitive areas, such as a shoreline, from erosion.
Riverine	All wetlands and deepwater habitats contained with in a channel, either naturally or artificially created.

Roadbed, rail	The earthwork foundation upon which the track, ties, ballast, and subballast of a rail line are laid.
Root-mean-square velocity	A measure of ground vibration in decibels used to compare vibration from various sources.
Root-mean-square vibration velocity	An average of smoothed vibration amplitude, commonly measured over 1-second intervals. It is expressed on a log scale in decibels referenced to 0.000001 inch per second and is not to be confused with noise decibels.
Salmonid	Belonging to the family Salmonidae, which includes the salmon, trout, and whitefish.
Scarify	To break up or loosen surface soil, generally to facilitate revegetation.
Scarp	Topographic faulting caused by the displacement of the land surface by movement along a fault due to erosion along an old inactive geologic fault with hard and weak rock, or by movement on an active fault.
Scoping	Scoping is a process designed to examine a proposed project early in the environmental analysis/review process, and is intended to identify the range of issues raised by the proposed project and to outline feasible alternatives or mitigation measures to avoid potentially significant environmental effects. The scoping process inherently stresses early consultation with responsible agencies, trustee agencies, tribal governments, and any Federal agency whose approval or funding of the proposed project would be required for completion of the project. Scoping is considered an effective way to bring together and resolve the concerns of other agencies potentially affected by the project and other stakeholders such as businesses and the general public.
Scour	The destructive effect that flowing water has on a submerged object over time.
Sedges	A family of flowering plants that resemble grasses or rushes, often associated with wetlands or areas with poor soils.
Seismic	Pertaining to, characteristic of, or produced by, earthquakes or earth vibrations.
Seismic source	Tool that generates controlled seismic energy used in both reflection and refraction seismic surveys.
Seismicity	The production of seismic waves, either intentionally to gather subsurface images for exploration purposes, or unintentionally (earthquakes and tremors).
Sensitive habitat areas	Areas containing or supporting organisms that are rare or valuable; these areas are often designated by a governmental entity.
Sensitive receptor	*See* noise-sensitive receptor.

Short-term impact	In this Environmental Impact Statement, these are impacts that result from construction operations or some other temporary physical change to the environment.
Siding	A railroad track parallel to a main track that is connected to the main track at each end. A siding is used for the passing and/or storage of trains.
Sole source aquifer	The U.S. Environmental Protection Agency defines a sole or principal source aquifer as one that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer. These areas have no alternative drinking water source(s) that could physically, legally, and economically supply all those who depend on the aquifer for drinking water.
Spans	A section between two intermediate supports of a beam or bridge, for example, made of a solid beam or of a rope.
Statutory easements	An agreement, either temporary or permanent, that allows access to a piece of property for a specific use.
Strike-slip	A form of tectonics associated with the structures and processes linked to zones of lateral displacement within plates. Strike-slip earthquakes are associated with the surficial transformation boundaries between plates. Areas of strike-slip tectonics are furthermore associated with oceanic transform boundaries, continental transform boundaries, lateral ramps in areas of extensional/contractional tectonics, zones of oblique collision, or the foreland of continent-continent collision zones.
Subballast	A layer of crushed gravel that is used to separate the ballast and roadbed for the purpose of load distribution and drainage.
Subduction	The act of two plates of crust colliding, where the more dense crust dives beneath the less dense continental plate.
Subsidence	The movement of the Earth’s surface as it shifts downward, induced by mining, faulting, isostatic rebound, dissolution of limestone, groundwater-related, or natural gas extraction.
Substrate	The material resting at the bottom of a stream that impacts the stream life. Substrate types include mud, sand, granule, pebble, cobble, and boulder.
Succession	The gradual and orderly process of ecosystem development brought about by changes in community composition.
Successional stages	A natural progression of plant inhabitation of bare ground, often occurring in different stages; e.g., initially annuals and perennials, then small woody plants, then trees.
Surface organic mat	A dense clump of vegetative matter, usually found floating on the surface of a waterbody.

Switch	The portion of the track structure used to direct rail cars and locomotives from one track to another.
Switching	The activity of moving rail cars from one track to another in a yard or where tracks go into a railroad customer's facility.
Take or taking	Refers to the removal of property, an acquisition of right-of-way, or a loss and/or degradation of species' habitat.
Tank car	A type of freight car that shippers use to ship liquids and liquefied gasses in bulk.
Thaw-unstable permafrost	Permafrost in poorly drained, fine grained soils, especially silts and clays that contain more ice than water; unstable because thawing can result in loss of strength, excessive settlement, and soil containing so much moisture that it flows.
Thermal erosion	The erosion of ice-bearing permafrost through warming.
Thermoregulation	An organism's ability to maintain its body temperature within certain boundaries regardless of external environment temperatures. This is a function of homeostasis.
Threatened species	A species likely to become endangered within the foreseeable future throughout all or part of its range and is protected by state and/or Federal law.
Threshold for environmental analysis	A level of proposed change in rail line activities that determines the need for an environmental review by the Surface Transportation Board's Section of Environmental Analysis. The Section of Environmental Analysis first applies the Board's thresholds for environmental analysis at 49 CFR Part 1105. The Board thresholds apply specifically to air quality and noise. For other issue areas, the Section of Environmental Analysis has developed appropriate thresholds to guide its environmental review.
Till	Glacial drift made of an unconsolidated mixture of sediment such as clay, sand, pebbles, cobbles, and boulders. As a glacier melts, till is washed downstream and deposited as outwash in sandars by rivers flowing from the glacier.
Ton-mile	The movement of 1 ton of cargo or equipment over a distance of 1 mile.
Track class	Designation between one and nine by the Federal Railroad Administration to characterize the quality and condition of track. Track geometry and type govern the allowable speed over the track and the level of upkeep to maintain the track. For Class II track, the maximum allowable operating speed for freight trains is 25 miles per hour and for passenger trains is 30 miles per hour.
Trophic	The feeding levels in a food chain, with green plants forming the first trophic level – the producers. Herbivores comprise the second trophic level, while carnivores form the third and fourth.

Turnout The portion of rail line structure where a single track divides into two tracks.

Underfit streams A stream too small to have eroded the valley in which it is found; it is typically expected for a valley to be in proportion with the stream that flows through it. Underfit streams are generally caused by the modification of the landscape by glaciation, thus creating glacial troughs and causing the river to be disproportionate with the valley size after the ice retreats.

Unofficial trail A trail that is not specifically established within currently adopted plans by ADNR and/or MSB or is established within these plans at the time of construction or ROW conveyance (whichever occurs first), and whose location is not provided for by recorded ROW or easement. ARRC does not propose to provide crossings for unofficial trails. Unofficial trails would be blocked, and ARRC's trespassing regulations would prohibit the public from crossing of the ROW without first obtaining approval from ARRC.

Water-bar An erosion control structure, such as a log or timber installed across a trail; used to intercept flowing water and divert it into a stable drainage way or vegetated area.

Watercourse A natural or artificial channel through which water flows.

Waters of the U.S. Streams, drainages, or washes under the jurisdiction of the U.S. Army Corps of Engineers under the Clean Water Act as defined at 33 CFR Part 328.3a. The Army Corps of Engineers and the U.S. Environmental Protection Agency regulate the placement of dredged or fill material into these waters. The definition incorporates channels with ephemeral and intermittent flow that exhibit specific physical features, including channel shape and surrounding vegetation, that would provide indications of an ordinary high-water mark.

Wayside Adjacent to the rail line, as in "wayside signals" or "wayside defect detectors."

Wayside noise Train noise adjacent to the right-of-way that comes from sources other than the horn, such as engine noise, exhaust noise, and noise from steel train wheels rolling on steel rails.

Wetlands According to 40 CFR Part 230.41, those "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions," generally including swamps, marshes, bogs, and similar areas.

Wye connection A triangular shaped arrangement of tracks with a switch at each corner. With a sufficiently long track leading away from each corner, a train of any length can be turned.

1. PURPOSE AND NEED FOR AGENCY ACTION

1.1 Introduction

On December 5, 2008, Alaska Railroad Corporation (ARRC or the Applicant) filed a petition with the Surface Transportation Board (STB or the Board) pursuant to 49 U.S. Code (U.S.C.) 10502 and 10901 for the authority to construct and operate approximately 30 to 45 miles of rail line to connect the Port MacKenzie District in Matanuska-Susitna Borough (MSB) to a point on the existing ARRC main line between Wasilla and just north of Willow, Alaska (See Section 1.5.1 for more information on the Board's authority). Referred to as the Port MacKenzie Rail Extension, the proposed rail line would provide a rail connection for freight services between Port MacKenzie and Interior Alaska. The port facility is owned and operated by MSB and MSB is a co-sponsor of the proposed rail line.

As shown in Figure 1-1, which presents various routing alternatives, the southern terminus of the proposed rail line extension would be in the Port MacKenzie District, and the northern terminus would be at one of four locations along the existing ARRC main line, depending on alternative. The southern terminus would be approximately 2 or 3 miles from the Port MacKenzie docks, depending on alternative. In addition to constructing the rail line, the Applicant would construct other structures (such as access roads, sidings, and communications towers) to support rail line operations. The anticipated train traffic would be two trains daily – one train traveling in each direction.

1.1.1 Existing Port Facilities and Activity

Port MacKenzie is an existing deepwater port on the north side of Knik Arm. It lies approximately 30 miles southwest of Wasilla and 5 miles north of Anchorage across Knik Arm. Port Mackenzie's deep-draft dock has a depth of 60 feet at the mean lower low water (tidal measurement that represents the 19-year average of the lower low water height of each tidal day) (NOAA, 2009). With this water depth, it can serve some of the largest vessels in the world including Capesize and Panamax vessels, which can have approximately 40- to 90-foot drafts. Capesize vessels are too large to pass through the Panama Canal and only a small number of deep-water ports can accommodate them. Panamax vessels, the largest vessels that can pass through the Panama Canal, are over 1,000 feet long, over 100 feet wide, and have a maximum cargo tonnage of approximately 50,000. In addition, the port is surrounded by 8,940 upland acres,[1] which are available for commercial or industrial development, and 1,300 tideland acres (collectively called the Port MacKenzie District).

To address its market opportunities, Port MacKenzie has published tariff rates for a variety of materials including bulk commodities, containers, iron or steel materials, vehicles and heavy equipment, and mobile or modular buildings. The Port's current customers include shippers of wood chips, saw logs, sand/gravel, cement, and scrap metal. Ship traffic was irregular at Port MacKenzie from 2005 through 2008, ranging from no ships to six ships per year. In August of

[1] Upland refers to all non-tidal areas and can include features such as wetlands.

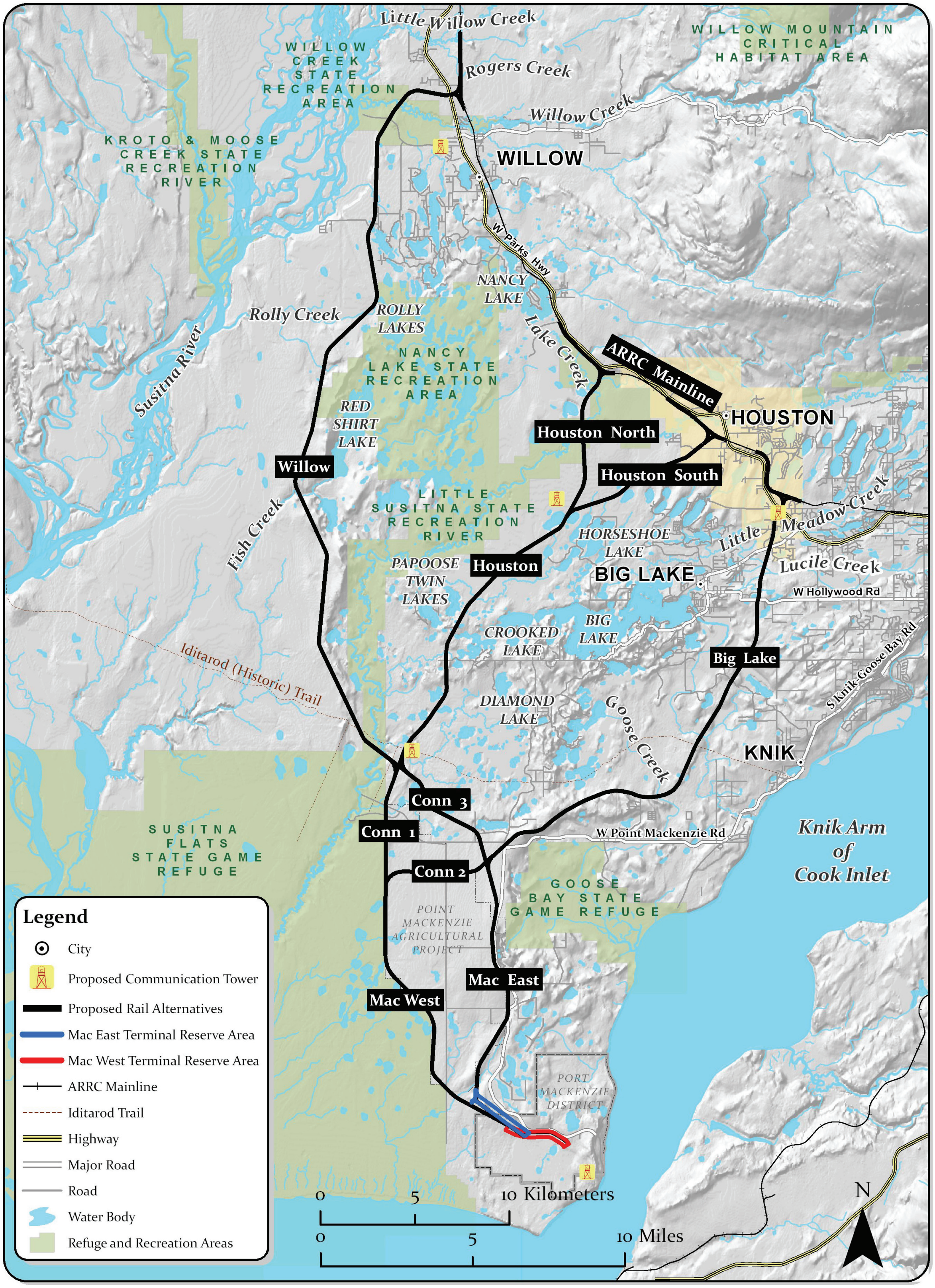

Figure 1-1. Overview of Proposed Port MacKenzie Rail Extension Route Alternatives

2008, there were also 185 barges associated with gravel transportation for ongoing development at the Port of Anchorage (Van Dongen, 2009b).

1.1.2 Previous Port and Rail Planning Studies

MSB began investigating the development of Port MacKenzie and supporting infrastructure, including a rail line, in the 1970s. In 1993, MSB established the port district area and designated the land for development, including development of Port MacKenzie, in the MSB Coastal Management Plan. A rail extension to Port MacKenzie has always been part of previous planning studies, which have noted that good surface transportation access would be necessary to accommodate growth at Port MacKenzie and to develop it as a strong economic driver in MSB. At present, Port MacKenzie is only connected to the transportation network via roads.

The 1997 MSB Long Range Transportation Plan (MSB, 1997) described the need for rail and improved road access to Port MacKenzie. In 2003, MSB completed a preliminary study of road and rail corridor alternatives that would connect Port MacKenzie to the Alaska Railroad (MSB, 2003). In 2007, the State of Alaska granted MSB an appropriation to perform conceptual engineering and environmental documentation for the Port MacKenzie Rail Extension, which resulted in publication of the Preliminary Environmental and Alternatives Report (ARRC, 2008). Subsequently, MSB requested ARRC to investigate providing rail service to Port MacKenzie. MSB intends to secure additional state funding for the proposed rail line.

1.2 Purpose and Need

The Applicant has stated that the purpose of the proposed rail line is to provide rail service to Port MacKenzie and connect the Port with the existing ARRC rail system, providing Port MacKenzie customers with rail transportation between Port MacKenzie and Interior Alaska.

According to the Applicant, Port MacKenzie is the closest deep-water port to Interior Alaska and has capacity to handle bulk commodities. The Port's market includes bulk commodities (e.g., wood chips, saw logs, sand/gravel, and cement), iron or steel materials (e.g., scrap metal), vehicles and heavy equipment, and mobile or modular buildings. The nearest other port in the area is the Port of Anchorage, which is an additional 35 highway/rail miles from the Alaska interior. The Applicant notes that the Port of Anchorage currently has no capacity for dry bulk materials export. The required room for bulk rail unloading (unit train rail loop arrangements) does not exist, nor does the Port of Anchorage presently have the capacity to handle the loading of dry bulk materials into ships. Available space for stockpile and handling of bulk materials is also limited.

In contrast to the limited available space and bulk handling capabilities at the Port of Anchorage, Port MacKenzie is situated on nearly 9,000 acres of land, and has existing dockside bulk materials loading capacity with a conveyor system to move materials from existing stockpile staging areas to the docks. The dredge-free draft of the port is in excess of 60 feet, providing the ability to load nearly any sized vessel. Unlike similar port facilities that serve Panamax and Capesize vessels, Port MacKenzie does not have rail service. At present, freight truck is the only available mode of surface transportation for bulk materials and other freight to and from Port MacKenzie. Trucks, as compared to rail, are inefficient for bulk commodity movements and generally are used for short-haul movements in that context. Bulk commodity shippers, which already have access to the existing ARRC network, utilize a combination of rail and transload to truck 30 miles away for final delivery to Port MacKenzie. However, such intermediate movements and handling requirements are not efficient and impose increased costs to the shipper and consumer due to multiple handling of materials between transportation modes. The Applicant states that the cost for intermediate transloading from rail to truck, and the additional truck ton-mile cost for final delivery, actually places Port MacKenzie at a significant disadvantage to other regional ports with rail service.

For example, a railroad can move one ton of freight 457 miles on a gallon of diesel fuel, compared to 133 miles for a truck.[2] The Federal Railroad Administration compared overall fuel efficiency of rail and truck transport on 23 competitive corridors throughout the nation and concluded that, in all cases, moving freight by railroad was more fuel efficient than by truck.[3] The report concluded that, "rail fuel efficiency varies from 156 to 512 ton-miles per gallon, truck fuel efficiency ranges from 68 to 133 ton-miles per gallon." Both efficiency in handling and efficiency in fuel use translate into substantial cost savings for freight shipped via rail transport rather than transport by truck over the highway.

Because of the economics and efficiencies offered by direct rail service, the Applicant anticipates that bulk commodity movements to and from the Port would likely be by rail if such an option were available. The proposed rail line would thus provide Port MacKenzie's customers with multi-modal options for the movement of freight to and from the Port similar to that offered by other ports handling large vessels. The proposed project would also support ARRC's statutory goal to foster and promote long-term economic growth and development in the State of Alaska.

1.3 Project Context

The proposed rail line would end at a terminal reserve (rail yard) approximately 2 or 3 miles, depending on the route that is authorized, from the existing Port MacKenzie docks. Rail facilities that Port MacKenzie might construct to connect to the rail line extension would depend on specific traffic needs and would be expected to be generally consistent with Port MacKenzie master planning documents. These facilities might include buildings, roads, industrial spurs, sidings, loading/unloading tracks, and other associated facilities throughout the upland portions of the Port MacKenzie District.

According to MSB, it will develop additional facilities to support Port MacKenzie’s growth, with or without the proposed rail line. At present, MSB is constructing a bulk materials facility at Port MacKenzie to provide expanded facilities to handle bulk material cargo to be transported to Port MacKenzie by truck, independent of the proposed rail line. The facilities include upgrades to truck roads, staging, and storage areas.

ARRC expects the proposed rail line to result in the diversion of some bulk materials from truck to rail. However, a portion of bulk materials going to or from Port MacKenzie would continue to travel by truck regardless of the proposed rail line because of the short distances involved or

[2] http://www.aar.org/Environment/Environment.aspx.
[3] Federal Railroad Administration, Comparative Evaluation of Rail and Truck Fuel Efficiency on Competitive Corridors, Final Report November 19, 2009.

logistics (e.g., shippers lacking access to or transload facilities with the existing rail line). MSB has stated that as it continues to plan for the bulk materials facility and future Port MacKenzie development, it will consider the location of ARRC's proposed rail line in its decisionmaking.

1.4 National Environmental Policy Act Process

The Board is the agency responsible for granting the authority to construct and operate proposed rail lines and associated facilities (see Section 1.5.1 for more detail). Accordingly, the Board, through its Section of Environmental Analysis (SEA), is the lead agency responsible under the National Environmental Policy Act (NEPA) for preparing this Environmental Impact Statement (EIS) to identify and evaluate potential environmental impacts associated with the proposed action and alternatives. The proposed action is to construct and operate a rail line extension from Port MacKenzie to the existing ARRC main line between Wasilla and just north of Willow, Alaska. Under the build alternatives, the proposed rail line would follow one of several routes. Under the No-Action Alternative, ARRC would not construct the proposed rail line.

Three Federal agencies are cooperating in the preparation of this Draft EIS pursuant to Council on Environmental Quality (CEQ) NEPA implementing regulations at 40 Code of Federal Regulations (CFR) 1501.6. CEQ regulations emphasize agency cooperation early in the NEPA process and allow a lead agency (in this case, the Board) to request the assistance of the other agencies with either jurisdiction by law or special expertise in matters relevant to preparing this Draft EIS. Table 1-1 lists each cooperating agency and describes its roles and responsibilities.

Table 1-1
Cooperating Agency Involvement in the Port MacKenzie Rail Extension EIS

Federal Railroad Administration	Could provide funding to ARRC for rail line construction or operations.
U.S. Army Corps of Engineers	Could issue a Section 404 Clean Water Act permit and/or a Section 10 Rivers and Harbors Act permit.
U.S. Coast Guard	Could issue bridge permits.

SEA and the cooperating agencies (collectively the Agencies) prepared this Draft EIS in accordance with NEPA, CEQ regulations, and the Board's environmental regulations (49 CFR 1105) to provide the Board; the cooperating agencies; other Federal, state, and local agencies; Alaska Natives; and the public with information on the potential environmental impacts of the proposed action and alternatives, including the No-Action Alternative. While much of this Draft EIS generally refers only to SEA, the document reflects input from all three cooperating agencies.

The Agencies also prepared this Draft EIS in accordance with Federal Railroad Administration (FRA) NEPA guidance at 64 CFR 28545; U.S. Army Corps of Engineers NEPA-implementing regulations at 33 CFR 230; and U.S. Coast Guard COMDTINST M16475.1D—NEPA-Implementing Procedures and Policy for Considering Environmental Impacts.

SEA is issuing this Draft EIS for public review and comment. SEA will consider all comments received on this Draft EIS and respond to all substantive comments in a Final EIS. The Final EIS will include final recommended environmental mitigation conditions, as applicable. The

Board will consider the entire environmental record, the Draft and Final EISs, all public and agency comments, and SEA's environmental recommendations in making its final decision on whether to authorize the construction and operation of the proposed Port MacKenzie Rail Extension.

The Board will decide whether to approve, approve with conditions (which could include conditions designed to mitigate impacts on the environment), or deny the Applicant's request for a license to construct and operate a proposed rail line from the Port MacKenzie District to the existing main line to the north. The cooperating agencies that could issue individual decisions concerning the proposed action could use information in the EIS for decisionmaking purposes.

1.5 Agency Responsibilities

This Draft EIS is intended to give the STB, FRA, U.S. Army Corps of Engineers, and U.S. Coast Guard the information they would need to exercise their statutory responsibilities related to the proposed action. These agencies could make decisions concerning the proposed action and alternatives and could use this Draft EIS for the disclosure and analysis of potential environmental impacts related to those decisions. Sections 1.5.1 and 1.5.2 describe the roles of the lead and cooperating agencies. Additional Federal agencies have environmental review and oversight responsibilities for the proposed rail line. Section 1.5.3 briefly describes these agencies and their responsibilities. Appendix A contains correspondence between the lead agency and other Federal, state, and local agencies.

1.5.1 Lead Agency

The STB, pursuant to 49 U.S.C. 10901 and 10502, is the agency responsible for authorizing the construction of proposed rail line and associated facilities and their subsequent operation. The STB is a bipartisan, decisionally independent adjudicatory body, organizationally housed within the U.S. Department of Transportation (USDOT). The ICC [Interstate Commerce Commission] Termination Act of 1995 (49 U.S.C. 10101 *et seq.*; Public Law 104-88, December 29, 1995) established the STB to assume some (but not all) functions of the ICC, particularly those related to the regulation of freight rail lines.

The construction and operation of rail lines require prior Board authorization either through issuance of a certificate under 49 U.S.C. 10901 or, as requested here, by granting an exemption under 49 U.S.C. 10502 from the formal application procedures of section 10901. Section 10901(c) as amended by the ICC Termination Act of 1995, Pub. L. No. 104-88, 109 Stat. 803 (1995) (ICCTA) is a permissive licensing standard. It now directs the Board to grant rail line construction proposals "unless" the Board finds the proposal "inconsistent with the public convenience and necessity [PC&N]." Thus, Congress made a presumption that rail construction projects are in the public interest unless shown otherwise. See Mid States Coalition for Progress v. STB, 345 F.3d 520, 552 (8th Cir. 2003); Alaska Railroad Corporation - Construction and

Operation Exemption – Rail line Between North Pole and Delta Junction, Alaska, STB Finance Docket No. 34658 (STB served January 5, 2010),[4] slip op. at 5.

Under 49 U.S.C. 10502, the Board must exempt a proposed rail line construction from the detailed application procedures of 49 U.S.C. 10901 when it finds that: (1) those procedures are not necessary to carry out the rail transportation policy (RTP) of 49 U.S.C. 10101; and (2) either (a) the proposal is of limited scope, or (b) the full application procedures are not necessary to protect shippers from an abuse of market power.

The STB has jurisdiction over rail line rate and service issues, and rail structuring transactions, such as proposed line construction, line sales, line abandonments, and rail line mergers. Accordingly, the STB, through SEA, is the lead agency responsible for preparing this Draft EIS.

1.5.2 Cooperating Agencies

1.5.2.1 Federal Railroad Administration

The FRA administers rail line assistance programs and consolidates government support of rail transportation activities. The FRA develops and enforces rail line safety regulations and would enforce these regulations on ARRC's proposed rail line. Although no funding requests have been submitted to date, the FRA anticipates that ARRC might apply for a grant to help fund the Port MacKenzie Rail Extension project; and therefore, has become a cooperating agency. The USDOT regulation known as "Section 4(f)" (23 CFR 774) applies to this proceeding because of a potential grant request and the involvement of the FRA as a cooperating agency. Based on the provisions of this regulation, the FRA would not be permitted to provide funding for any STB authorized alternative that would involve the use of a Section 4(f) property, unless the impacts would be *de minimus*, or there were no prudent and feasible alternatives that avoided Section 4(f) properties. FRA intends to use this EIS to fulfill its NEPA requirements associated with a potential decision to fund the project. See Appendix M of this Draft EIS for more detail about Section 4(f) resources.

1.5.2.2 U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers, under Section 404 of the Clean Water Act of 1977 (33 U.S.C. 1251 *et seq.*), has jurisdiction over activities that would result in the discharge of dredge or fill material into waters of the U.S., including lakes, rivers, streams, oxbows, ponds, and wetlands. Activities that affect these systems require a Section 404 permit from the Corps of Engineers. Construction of the proposed rail line would impact waters of the U.S.; therefore, the Applicant would have to obtain a Section 404 permit prior to commencing project construction.

[4] Congress had first relaxed the section 10901 standard in the Staggers Rail Act of 1980, Pub. L. No. 96-448, 96 Stat. 1895 (1980). Before 1980, the Interstate Commerce Commission (ICC), our predecessor, had been directed to scrutinize rail construction proposals closely to prevent excess rail capacity. The ICC was to issue a license only if it found that the PC&N "require" the construction. See former 49 U.S.C. 10901(a) (1978); see, e.g., Chesapeake & Ohio Ry. v. United States, 283 U.S. 35, 42 (1931). In the Staggers Act, Congress made it easier to obtain agency authorization for a new line by providing that the ICC need only find that the PC&N "permit," as opposed to "require" the proposed new line. See former 49 U.S.C. 10901(a) (1995); H.R. Rep. No. 1430, 96th Cong., 2d Sess. 115-16 (1980), reprinted in 1980 U.S.C.C.A.N. 4147-48. With the ICCTA, Congress completed its policy shift, directing that the Board "shall" issue construction licenses "unless" the agency finds a proposal "inconsistent" with the PC&N. See 49 U.S.C. 10901(c).

In addition, the Corps of Engineers is responsible for activities that could affect navigable waters of the U.S., pursuant to Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403). Section 10 requires any entity proposing to perform work or place a structure in, over, or under a navigable water to obtain a Section 10 permit from the Corps of Engineers prior to commencing the activity. Construction of the proposed rail line would involve crossing navigable waters of the U.S.; therefore, the Applicant would have to obtain a Section 10 permit prior to commencing project construction.

The Army Corps of Engineers could use this EIS to fulfill its NEPA requirements associated with permit evaluation under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act.

1.5.2.3 U.S. Coast Guard

The Coast Guard, under Section 9 of the Rivers and Harbors Act of 1899 (33 U.S.C. 401 *et seq*.), the General Bridge Act of 1946, as amended (60 Stat. 847; 33 U.S.C. 525 *et seq*.), and the Department of Transportation Act of 1966 (Public Law 89-670, 80 Stat. 931–950; 49 U.S.C. 1651–1659), has authority for approval of bridges over navigable waters of the U.S. The Coast Guard is responsible for assessing the navigational and environmental impacts of constructing, maintaining, and operating the proposed bridges associated with the Port MacKenzie Rail Extension. This assessment would be a component of the Coast Guard review of whether to issue bridge permits under Section 9 of the Rivers and Harbors Act. The Coast Guard intends to use this EIS to fulfill its NEPA requirements associated with any decision to grant bridge permits.

1.5.3 Other Federal Agencies

1.5.3.1 U.S. Environmental Protection Agency

The U.S. Environmental Protection Agency (USEPA) has broad oversight and implementing responsibility for many Federal environmental laws, including the:

- Clean Air Act
- Clean Water Act
- Comprehensive Environmental Response, Compensation, and Liability Act
- Toxic Substances Control Act
- Resource Conservation and Recovery Act

The USEPA also provides guidance on compliance with certain Executive Orders, including Executive Order 12898, *Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations*; 11990, *Protection of Wetlands*; and 11988, *Floodplain Management*. Under Section 309 of the Clean Air Act (42 U.S.C. 7609), the USEPA reviews and comments on the environmental impacts of major Federal actions for which an agency prepares an EIS under NEPA. The USEPA Office of Federal Activities, which is responsible for reviewing EISs, evaluates and comments on the quality of analysis in this Draft EIS and the extent of the proposal's impact on the environment. The USEPA also announces the availability of any Draft EIS for public comment in the *Federal Register*. SEA will consider the USEPA evaluations and comments on this Draft EIS in the Final EIS.

1.5.3.2 Advisory Council on Historic Preservation

The Advisory Council on Historic Preservation administers the National Historic Preservation Act (Public Law 89-665, October 15, 1966; 16 U.S.C. 470 *et seq.*), which requires Federal agencies to consider the effects of their actions on historic and cultural resources. Under the National Historic Preservation Act, the STB consults with the appropriate State Historic Preservation Officer. For the proposed action and alternatives, the STB has consulted and will continue to consult with the State Historic Preservation Officer at the Alaska Office of History and Archaeology, a part of the Alaska Department of Natural Resources (ADNR).

The Advisory Council is an independent Federal agency created under the authority of the National Historic Preservation Act. It is responsible for advocating consideration of historic values in agency decision making, issuing regulations to implement Section 106 of the National Historic Preservation Act, and reviewing Federal programs and policies to further historic preservation. SEA will consult with the Advisory Council as necessary.

SEA has developed a draft Programmatic Agreement (PA) for the proposed action that would govern the completion of the Section 106 process if the proposed rail line is authorized by the Board and the rail line is built. SEA has provided the draft PA for review as Appendix J of the Draft EIS.

The Advisory Council on Historic Preservation also is responsible for ensuring that projects are in compliance with other requirements concerning historic and cultural resources. These include the Archaeological Resource Protection Act, the Native American Graves Protection and Repatriation Act, the American Indian Religious Freedom Act, and Executive Orders requiring consultation with Native American Tribes.

1.5.3.3 U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service is the Federal agency with primary expertise in fish, wildlife, and natural resources issues. The Fish and Wildlife Service is responsible for implementation of the Endangered Species Act (7 U.S.C. 136; 16 U.S.C. 1531 *et seq.*) and, through its field offices, for consulting with other Federal agencies on potential impacts to threatened and endangered species.

Under Section 7 of the Endangered Species Act, the Fish and Wildlife Service is responsible for the review of Federal agency actions and potential impacts to terrestrial and freshwater threatened and endangered species, and could issue a determination, in the form of a biological opinion, that details projected impacts to threatened and endangered species in the area of a proposed agency action. The STB is responsible for initiating Section 7 consultation with the Fish and Wildlife Service. SEA has consulted and will continue to consult with the Fish and Wildlife Service as necessary during the EIS process, and is providing the Fish and Wildlife Service this Draft EIS for review and comment.

1.5.3.4 National Marine Fisheries Service

Under Section 7 of the Endangered Species Act, the National Marine Fisheries Service is responsible for the review of Federal agency actions and potential impacts to threatened and endangered marine and anadromous fish species, and could issue a determination, in the form of a biological opinion, that details projected impacts to threatened and endangered species in the area of a proposed agency action. The STB is responsible for initiating Section 7 consultation with the National Marine Fisheries Service. SEA has consulted and will continue to consult with the National Marine Fisheries Service as necessary during the EIS process. The National Marine Fisheries Service has requested an assessment of the potential impacts of the proposed Port MacKenzie Rail Extension on the Cook Inlet beluga whale. SEA has completed a draft Biological Assessment and has included the draft as Appendix H of this Draft EIS.

Under the Marine Mammals Protection Act (16 U.S.C. 1361 *et seq.*), the National Marine Fisheries Service is responsible for the review of Federal agency actions that may cause “take” of marine mammals protected under the act.

The Magnuson-Stevens Fishery Conservation and Management Act (Public Law 94-265) requires that Federal agencies consult with the National Marine Fisheries Service on Federal actions that could adversely affect Essential Fish Habitat (50 CFR 600.905–930). The Act requires coordination between the STB and the National Marine Fisheries Service to protect, conserve, and enhance Essential Fish Habitat. The National Marine Fisheries Service has requested an assessment of the potential effect of the Port MacKenzie Rail Extension on Essential Fish Habitat in the area of the proposed action and alternatives. SEA has completed a draft Essential Fish Habitat Assessment and has included the draft assessment as Appendix G of the Draft EIS. SEA will continue to consult with the National Marine Fisheries Service as necessary and is providing it this Draft EIS for review.

1.6 Scoping and Public Involvement

1.6.1 Scoping Notice and Public Meetings

On February 12, 2008, SEA published the Notice of Intent to Prepare an EIS, Draft Scope of Study, Notice of Scoping Meetings, and Request for Comments (73 *Federal Register* [*FR*] 8106). SEA distributed a letter to more than 7,700 citizens; elected officials; Federal, state, and local agencies; tribal organizations; and other potentially interested stakeholders to introduce the Port MacKenzie Rail Extension Project; announce SEA’s intent to prepare an EIS; request comments; and give notice of six public scoping meetings. The distribution encompassed the communities surrounding the proposed action and alternatives and groups outside the project area that could have an interest in the Project. SEA also posted meeting notices in public locations (such as post offices, grocery stores, and restaurants) in the project area and initiated a toll-free project hotline. SEA also provided project information on the STB Web site at www.stb.dot.gov and on an STB-sponsored project Web site at www.stbportmacraileis.com. SEA placed notices of the scoping meetings in several newspapers, including the *Frontiersman*, the *Talkeetna Times*, and the *Anchorage Daily News*.

SEA held public scoping meetings in Knik, Big Lake, Willow, Houston, Wasilla, and Anchorage, Alaska, on March 3, 4, 5, 6, 10, and 11, 2008, respectively. SEA used a workshop format to allow attendees to provide comments to and ask questions of SEA. Approximately 146 citizens, representatives of organizations, elected officials, and officials from Federal, state, and local agencies attended the meetings. Some attendees submitted written comments during the meetings, and SEA received additional scoping comment letters during the scoping comment period, which closed on March 21, 2008.

SEA considered agency and public input received during the scoping process and on July 17, 2009 issued the final scope of study for this Draft EIS. SEA published the final scope of study in the *Federal Register*, placed it on the STB and project Web sites, and mailed an announcement of the availability of the final scope of study to approximately 8,000 individuals, agencies, and other interested parties on the SEA project mailing list. The final scope of study summarized the comments received and potential impacts to be analyzed.

In short, as part of the environmental review process to date, SEA has conducted broad public outreach activities to inform the public about the proposed action and to facilitate public participation. SEA consulted with and will continue to consult with Federal, State of Alaska, and local agencies, tribal organizations, affected communities, and all interested parties to gather and disseminate information about the proposed project.

1.6.2 Tribal and Government-To-Government Consultation

SEA consulted with Federally Recognized Tribes and other tribal organizations during the preparation of this Draft EIS (see Appendix B). Prior to issuing the Notice of Intent to Prepare an EIS, SEA informed tribal organizations of the proposed Port MacKenzie Rail Extension and requested comments on the project. SEA also contacted the following Federally Recognized Tribes, tribal groups, and Alaska Native Regional Corporations for input in the development of the Government-to-Government Consultation and Coordination Plan:

- Chickaloon Village Traditional Council
- Chickaloon-Moose Creek Native Association, Incorporated
- Cook Inlet Region, Incorporated
- Eklutna, Incorporated
- Knik Tribal Council
- Knikatnu, Incorporated
- Native Village of Eklutna
- Native Village of Tyonek
- Tyonek Native Corporation

The plan describes the objectives and approach to the consultation process and provided an opportunity for the recipients to indicate how they wanted to participate further in government-to-government coordination for the proposed project.

After sending consultation letters and following up with phone calls, SEA received completed questionnaires from Knikatnu, Incorporated and the Native Village of Eklutna. Both organizations asked to continue to receive project information by mail and to participate in the public involvement process.

1.6.3 Request for Comments on the Draft EIS

SEA encourages the public and any interested parties to submit written comments on all aspects of this Draft EIS. SEA will consider all comments in preparing the Final EIS, which will include responses to all substantive comments, SEA's final conclusions on potential impacts, and SEA's final recommendations. All comments on the Draft EIS must be submitted within the prescribed comment period, which closes on May 10, 2010. When submitting comments on the Draft EIS, SEA encourages commenters to be as specific as possible and substantiate concerns and recommendations.

Mail written comments on the Draft EIS to:

David Navecky
Surface Transportation Board
395 E Street, SW
Washington, DC 20423
Attention: Environmental Filing
STB Finance Docket No. 35095

Commenters also may submit comments electronically. Comments submitted electronically will be given the same attention as mailed comments. Persons who submit comments electronically do not have to also send those comments by mail. Environmental comments may be filed electronically on the STB Web site at www.stb.dot.gov by clicking on the "E-FILING" link. By selecting "Environmental Comments" after the link, individuals will not be required to log in to submit their comments. Comments can be typed into the online form provided, or attached as Microsoft Word®, Corel Word Perfect®, or Adobe® Acrobat® files. Written comments on the Draft EIS, which was served March 16, 2010, must be postmarked by May 10, 2010. Electronically-filed comments must be received by May 10, 2010.

Please refer to STB Finance Docket No. 35095 in all correspondence addressed to the Board, including e-filings.

Additional information about the project can be obtained by calling the SEA toll-free number at 1-888-257-7560 (telecommunications device [TDD] for the hearing impaired is 1-800-877-8339).

This Draft EIS is also available on the STB Web site at www.stb.dot.gov and on the project Web site at www.stbportmacraileis.com.

1.6.4 Public Comment Meetings

In addition to receiving written comments on the Draft EIS, SEA will host public meetings. SEA involved the cooperating agencies in planning and conducting the public meetings. SEA and the cooperating agencies are holding six public meetings on the Draft EIS during which interested parties may make oral comments in a formal setting and/or submit written comments. SEA will begin each meeting with a brief overview of the proposed action and environmental review process. The overview will be followed by a formal comment period during which each interested individual will be given several minutes to address the meeting participants and convey his or her oral comments. A court reporter will be present to record these oral comments. If time permits, the court reporter will be available at the conclusion of the formal segment of the meeting to record oral comments from individuals not interested in addressing the meeting as a whole. Meetings will be held at the following dates, times, and locations:

- April 6, 2010, 6:30-8:30 pm at Wilda Marston Theater, 3600 Denali Street, Anchorage, AK
- April 7, 2010, 6:30-8:30 pm at Big Lake Elementary School, 3808 South Big Lake Road, Big Lake, AK
- April 8, 2010, 6:30-8:30 pm at Menard Sports Center, 1001 S Mack Drive Wasilla, AK
- April 12, 2010, 6:30-8:30 pm at Houston Middle School, 12801 W. Hawk Lane, Houston, AK
- April 13, 2010, 6:30-8:30 pm, at Willow Community Center, Mile 70 Parks Highway, Willow, AK
- April 14, 2010, 6:30-8:30 pm, at Knik Elementary School Gym, 6350 Hollywood Boulevard, Wasilla, AK

Following the close of the comment period on the Draft EIS (May 10, 2010), SEA and the cooperating agencies will issue a Final Environmental Impact Statement (Final EIS) that considers comments on the Draft EIS. The Board will then issue a final decision based on the Draft and Final EISs and all public and agency comments in the public record for this proceeding. The final decision will address the transportation merits of the proposed project and the entire environmental record. That final decision will take one of three actions: approve the proposed project, deny it, or approve it with mitigation conditions, including environmental conditions.

1.7 Draft EIS Organization and Format

This Draft EIS is organized in a manner consistent with NEPA and CEQ NEPA implementing regulations at 40 CFR 1502.10. It is intended to provide clear and concise information on the proposed action and alternatives to agency decisionmakers and the public. This Draft EIS describes the proposed action and alternatives, existing environmental conditions, and potential environmental impacts associated with the proposed action and alternatives. The Table of Contents lists chapters and specific topics within chapters to help readers find topics of interest. The Table of Contents lists tables and figures numerically by the chapter in which they appear. The Index at the end of the main body of this Draft EIS more specifically identifies the locations of topics of interest. Appendices are lettered and are provided in alphabetical order after the main body of this Draft EIS.

Analyses in this document address proposed activities associated with construction and operation of proposed rail line and associated facilities and their potential environmental impacts, as appropriate. This Draft EIS reports potential direct and indirect impacts from construction and operation of the proposed rail line and associated facilities, and for the No-Action Alternative, the potential direct and indirect impacts of not implementing the proposed action. Impact areas addressed include geology and soils, water resources, biological resources, cultural and historic resources, subsistence, air quality, noise and vibration, energy, transportation safety and delay, navigation, land use, socioeconomics, and environmental justice.

This Draft EIS also addresses potential cumulative impacts to the environment that would result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such actions.

2. Proposed Action and Alternatives

This chapter describes the Alaska Railroad Corporation (ARRC or the Applicant) proposed action for the Port MacKenzie Rail Extension; the development of potential rail line alignments; a reasonable range of alternatives for analysis in this Draft Environmental Impact Statement (EIS), including the No-Action Alternative (no new rail construction); and alternatives considered but not included for detailed study.

2.1 Proposed Action

Under the proposed action, ARRC would construct and operate a single-track rail line from Port MacKenzie to a point on the existing ARRC main line between Wasilla and just north of Willow, Alaska. The Federal Railroad Administration (FRA) establishes the standards for class of track and maximum operating speed for passenger and freight on each class of track (49 Code of Federal Regulations [CFR] 213). ARRC proposes to transport commercial freight on the rail line, and would construct and maintain the rail line to Class 4 standards[1] because of its desired operating speed for freight service. ARRC proposes a right-of-way (ROW) of approximately 200 feet for the rail line. Unless otherwise noted, this Draft EIS assumes that all construction activities would occur within this 200-foot-wide ROW. ARRC might reduce the width of the ROW, as necessary, to minimize impacts to sensitive resources or accommodate the terrain. The ROW could contain an above-ground power line, buried utility lines, and an access road (see Figure 2-1). In addition, ARRC would construct one rail line siding within the existing main line ROW at the tie-in location with the rail extension. The area in the ROW that is cleared of vegetation for construction, but not needed for permanent structures, would be restored to natural conditions, to the extent practicable, consistent with rail line operating requirements. ARRC would need to acquire public and private lands to establish the linear ROW.

In addition to the proposed rail line, ARRC would construct associated facilities to support rail line operations. The locations of some of the associated facilities, such as construction staging areas and communication towers, would vary depending on which alternative segments, if any, the Board authorizes for construction. ARRC would also build temporary associated facilities to support rail construction and would remove them after the completion of construction of the proposed rail line and associated facilities. Most associated facilities would require permanent or temporary access roads. Locations for communications towers and terminal reserve areas (rail yards and maintenance facility at the southern terminus of the proposed rail line) have been identified. The locations of other associated facilities would be determined during final design. Where practicable, ARRC would site construction staging areas inside the 200-foot ROW.

2.1.1 Proposed Rail Line Construction

This section describes proposed rail line construction, including ROW needs, construction components and materials, roadways, bridges, and permanent and temporary facilities. This section also describes the general construction process and schedule.

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[1] The Federal Railroad Administration (FRA) establishes the standards for class of track and maximum operating speed for passenger and freight on each class of track (49 Code of Federal Regulations [CFR] 213). Compliance with Class 4 standards would provide for ARRC's anticipated operating speed of 40 miles per hour.

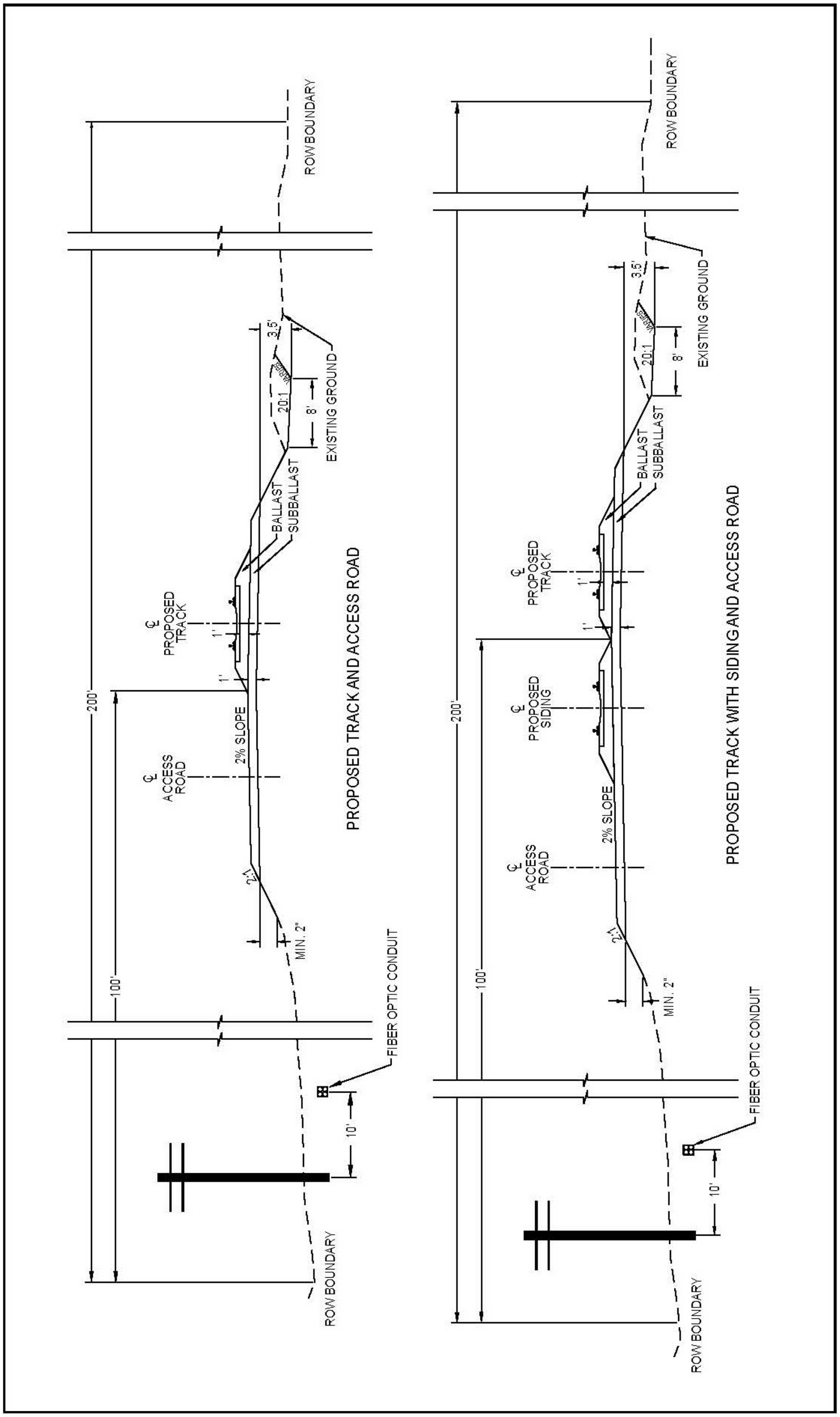

Figure 2-1. Cross-Sections of Rail Line Right-of-Way

2.1.1.1 Right-of-Way

Unless otherwise indicated, construction activities would occur within the 200-foot ROW. For purposes of analysis, SEA assumes that the entire ROW would be permanently cleared of vegetation for construction and then operations. However, some areas might not require full use of the ROW, and those areas would be restored after construction or left undisturbed if not needed.

2.1.1.2 Rail Line Access Road

For rail line construction and post-construction operations, ARRC would build a permanent access road parallel to the rail alignment and within the 200-foot ROW. ARRC would construct the access road before the rail line and would use the access road for construction of the proposed rail line. ARRC would not maintain the access road as a public road.

Based on conceptual engineering information, ARRC does not anticipate additional access roads. However, final engineering for the selected alignment could identify the need for new roads in certain areas to shorten haul distances for fill or track material.

2.1.1.3 Railbed Construction

Before any track could be placed, ARRC would construct a suitable railbed. The railbed would form the base upon which ARRC would lay the ballast, rail ties, and rail. Railbed construction would require clearing, excavating earth and rock on previously undisturbed land, and removing and stockpiling topsoil, where needed. Construction would require both cuts and fills. To the extent practicable, ARRC would adjust the design profile grade to balance cut and fill quantities. ARRC would remove excess fill material created during railbed construction and would transport and deposit it in an appropriate location. ARRC would store unsuitable railbed material on site for application to finished slopes and to facilitate revegetation and provide erosion control, or would remove unsuitable material from the area and dispose of it in an acceptable manner.

2.1.1.4 Track Construction

ARRC would place ties and rail using conventional construction and track-mounted equipment in successive application. In-place track construction would consist of placing ties, rail, and ballast on top of the railbed. First, ARRC would place the ties on the subballast. ARRC would weld rails together to form rail strings and then use special equipment to unload and secure the rail onto the ties, unload ballast from rail ballast cars or trucks, and dump ballast evenly along the skeleton track. ARRC would then use equipment to raise the rail line to achieve the proper ballast depth.

Alternatively, ARRC could decide to construct skeleton track panels at several of its facilities. These 40- to 80-foot-long panels would consist of rails, ties, and fastening systems constructed and loaded onto railcars for delivery to the construction site. At the construction site, the panels would be lifted from the railcars and placed in their final location. The panels would be fastened together to form the skeleton track.

2.1.1.5 Acquisition of Materials for Rail Line Construction

Ballast, subballast, fill material, rail ties, and rail would be required for construction of the proposed rail line. This section briefly describes the acquisition and use of these materials.

ARRC would obtain ballast from existing commercial quarries or its existing quarry in Curry, Alaska. ARRC would transport ballast from Curry to the project area by rail or by a combination of rail and truck, and anticipates that ballast from other sources would likely be trucked directly to the construction site.

ARRC would obtain subballast primarily from materials excavated during railbed construction, from existing commercial sources, and from borrow areas established along the rail line ROW. As part of the final design and permitting process, ARRC would perform geotechnical testing to identify borrow locations with suitable material. Consistent with other construction requirements, ARRC would maintain short intervals between borrow sites to minimize average haul distance. Any excess material (overburden) from these activities would be distributed evenly along the railbed as nonstructural fill to support revegetation.

ARRC would obtain fill material from cut-and-fill activities during railbed construction, and to the extent practicable, would adjust the design profile grade to balance cut and fill quantities. If needed, ARRC would obtain additional fill material from borrow sources within the ROW or off site.

ARRC would obtain rail ties and steel rail from commercial sources to create rail strings, and anticipates that these materials likely would be shipped to the project area by ship, rail, and truck. The rail would be delivered in short lengths individually, or as preconstructed track panels.

2.1.1.6 Construction Staging Areas

The proposed rail line might require construction staging areas to store material, weld sections of the rail line, and otherwise support rail line construction activities. The staging areas would be identified before construction began. ARRC has stated that it would attempt to locate staging areas within the proposed ROW at relatively flat, previously disturbed areas with established access to existing public roads. The project would either consume all stockpiled materials or ARRC would remove them from the staging areas following construction.

2.1.1.7 Bridges and Culverts

Rail and access road bridges and culverts would be required for crossing streams, rivers, and some wetlands. New culverts would extend across the combined width of both the railbed and access–road bed. Crossing structures the Applicant has identified as “drainage structures” would be determined during the final design process and could include culverts, pre-cast arches, and single or multiple short-span bridges. Existing culverts would also be extended and new bridges constructed for the new rail siding proposed along the existing ARRC main line where any of the alternatives would connect to the main line. The locations, types, and sizes of all proposed bridges and culverts are approximate and preliminary; the exact locations, types, and sizes would be determined during the final design and permitting process. In addition, the Applicant could add culverts to maintain drainage and add equalization culverts through wetland areas. The need for, locations, types, and sizes of these additional culverts would be determined during the final design and permitting process.

Where it has not proposed bridges, the Applicant proposes to build culverts into the railbed and vehicle roadbed to allow water to flow under the rail line and access road. ARRC proposes to construct between 16 and 34 single culverts and between 2 and 7 drainage structures, depending on alternative. The Applicant would design and construct culverts with a width greater than or equal to 125 percent of the width of the stream at the mean high water line of anadromous fish habitat. The Applicant would design and construct culverts so as not to impede fish passage. Culverts used for anadromous stream crossings would be designed and constructed in accordance with the National Marine Fisheries Service 2008 publication, "Anadromous Salmonid Passage Facility Design," ADF&G Title 16 fish habitat permit requirements, or as otherwise specified in permit conditions.

In addition, the Applicant proposes to construct up to four rail bridge crossings along the rail line, depending on alternative. Waterbodies that these bridges would cross include the Little Susitna River, Willow Creek, Rogers Creek, and a tributary to Little Willow Creek. With the exception of the tributary to Little Willow Creek, these crossings would likely consist of multiple spans of 28-foot standard ARRC deck girder bridges because the widths of the channels exceed the length of a single 28-foot span. The smaller crossing at the tributary to Little Willow Creek would likely consist of a single 28-foot standard-span ARRC deck girder bridge.

At a minimum, ARRC would design rail bridges to pass the mapped 100-year flood. ARRC would also design culverts for the 100-year flood event.

ARRC would start constructing bridges and large culverts before other infrastructure because they would take longer to construct and would be needed for construction activity. Each bridge would require a bridge construction staging area that could be within the 200-foot ROW.

2.1.1.8 Construction Schedule

Construction would be conducted throughout the year, although severe weather would limit winter-time construction to land-clearing activities, material and equipment staging, most bridge construction, and interior work associated with facility buildings. The specific timeframe and sequence of construction would depend on funding, final design, and permit conditions, such as requirements to avoid sensitive breeding periods for migratory birds and raptors and when salmon are spawning, incubating, or rearing in specific areas.

ARRC anticipates that construction of the Port MacKenzie Rail Extension would be completed in 24 months. To meet a 24-month construction schedule, there could be construction activities 24 hours a day (up to three crews working 8-hour shifts) along some portions of the rail line. However, there would not be construction activities 24 hours a day along significant portions of the project length because of environmental and human constraints. ARRC anticipates that the construction work force would vary from 66 persons during grading and embankment construction to 100 during ballast and track installation.

2.1.1.9 Grade Crossings

To maintain access to existing public and private roads across the rail line, ARRC would install grade crossings where the rail line would cross a roadway. In places where the rail line would cross Parks Highway, Big Lake Road, Baker Farm Road, Holstein Avenue, or Hollywood Road, depending on the alternative, ARRC proposes grade-separated crossings. In other locations, where the rail line would cross public roadways with usage levels of 500 or more vehicles per day, the routes would cross at grade and the Applicant proposes active warning devices, such as flashing lights and gates. Where the rail line would cross public roadways with usage levels less than 500 vehicles per day, the routes would cross at-grade and the Applicant proposes passive warning devices, such as crossbucks and stop signs. Where the proposed rail line would cross a trail that is officially recognized, meaning specifically established within currently-adopted plans by ADNR and/or MSB or are established within these plans at the time of construction or ROW conveyance (whichever occurs first), and are located on state, MSB property, or whose locations are provided for by recorded ROW or easement, ARRC proposed to provide public access by a grade-separated crossing where practicable, or the trail could be relocated to avoid crossing the rail line. The design of the crossing would accommodate existing trail users at the time of construction or ROW conveyance (whichever occurs first). ARRC would coordinate with the trail owner and consult with user groups as appropriate where the crossing location could have to be relocated to accommodate a grade-separation, or where multiple crossings within one mile might be consolidated. ARRC does not propose to provide crossings for unofficial trails. Unofficial trails would be blocked, and ARRC's trespassing regulations would prohibit crossing of the ROW. The following trails have been identified by ARRC for grade-separated crossings and/or relocation.

- Aurora Dog Mushers Club Trail
- Crooked Lake Trail
- Figure 8 Lake Loop Trail
- Flat Lake Connector
- Flathorn Lake Trail
- Herning Trail
- Houston Lake Loop Trail
- Iditarod Link Trail
- Iditarod National Historic Trail
- Iron Dog Trail
- Lucky Shot Trail
- Mud Lake Trail
- Pipeline Trail
- West Gateway Trail
- Nancy Lake – Susitna Trail
- 16 Mile Trail

2.1.1.10 Associated Facilities

The proposed action includes the construction and operation of several associated facilities. These permanent facilities would include a terminal reserve area, communications towers, and a track siding along the existing main line. ARRC would construct these facilities at the same time as the proposed rail line. While offloading facilities could be constructed along the proposed rail line, none have been proposed.

Terminal Reserve Area

ARRC would construct a terminal reserve area along the southern terminus of the rail line. This area would consist of yard sidings, storage areas, and a terminal building to support train maintenance. ARRC has proposed two terminal reserve areas, but would build only one depending on which alternative the Board authorized, if any. The terminal reserve area would be approximately 1,000 feet wide and approximately 9,800 feet long. The terminal reserve area for the Mac East Segment would also include relocation of a portion of Baker Farm Road, including construction of a grade-separated crossing of the proposed rail line, to provide vehicle access to the northern end of the terminal reserve area; construction of a road within the terminal reserve area; and construction of an approximately 1,500 foot access road, with a grade-separated crossing, between the terminal reserve area and Point MacKenzie Road along the northern edge of the Chugach Electrical Association transmission line ROW.

Communications Towers

ARRC has identified five locations for communications towers throughout the project area; two or three new towers, depending on the alternative, are anticipated to be constructed to support rail line operations. Tower locations would depend on which alternative the Board authorized, if any. The tower locations include one near Port MacKenzie, one in the central area of the proposed project, and three in the northern portion of the proposed project area near the existing ARRC main line track. Tower sites could require new access roads if they would not be accessible via existing roads.

Track Sidings

ARRC would construct one 8,000-foot double-ended siding to the north of the proposed tie-in point with the main line. The siding would allow train passage and access to rail services. The arrangement of the track siding and tie-in would be a “wye” connection. The siding would be placed, where possible, on tangent sections of the alignment and would be in the 200-foot ROW.

2.1.2 Proposed Rail Line Operations

After rail line construction, trains would transport freight providing Port MacKenzie customers with rail transportation between Port MacKenzie and Interior Alaska. The Port’s market includes bulk commodities (e.g., wood chips, saw logs, sand/gravel, cement), vans or containers, iron or steel materials (e.g., scrap metal), vehicles and heavy equipment, and mobile or modular buildings. ARRC anticipates an average of approximately 2 freight trains per day (1 in each direction) with an average of 40 to 80 freight cars each.[2] Train speeds would be a maximum 60 miles per hour.

ARRC would perform periodic maintenance and inspections to ensure safe and reliable rail line operations. Primary maintenance activities would include signal testing and inspection; minor rail, tie, and turnout replacement; and routine ballasting and surfacing tasks. Additional maintenance activities would be performed on an as-needed basis and would include vegetation control, snow removal, and vehicle and equipment maintenance.

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[2] This estimated level of train traffic would be sufficient to fill approximately 13 Panamax class ships per year with bulk materials. Based on current market opportunities, ARRC estimates ship traffic for export of bulk commodities from the Port MacKenzie Rail Terminal would include five Panamax class ships per year. As the estimated average of two trains per day, with an average of 40 to 80 freight cars each, represents an upper bound of potential ship traffic, all impacts presented in this EIS would be encompassed in an analysis based on this volume of ship traffic.

2.2 Alternatives Development

Prior to filing its request to construct and operate a 30 to 45 mile proposed rail line with the STB, ARRC identified and considered several potential alignments for this rail line extension. This section summarizes the process ARRC used to develop various alignments and SEA's review and consideration of those alignments as EIS alternatives.

2.2.1 Alignment Development Process

More than 10 years ago, Matanuska-Susitna Borough (MSB or the Borough) identified a potential need for rail transport from Port MacKenzie (which was not constructed at that time) to the ARRC main line north of Port MacKenzie. In 2003, MSB commissioned a study of rail and road access to Port MacKenzie to determine feasibility and potential impacts. The study identified 11 potential rail and road corridors (MSB, 2003).

MSB consulted the U.S. Army Corps of Engineers regarding potential impacts to wetlands, the Alaska Department of Natural Resources (ADNR) regarding potential impacts to state lands and coastal resources, and the Alaska Department of Fish and Game (ADF&G) regarding potential impacts to fisheries and other wildlife. Based on these agency consultations and potential impacts to private property and wetlands, ARRC eliminated 9 of the 11 potential corridors from further consideration for construction of a rail line.

In 2007, the State of Alaska granted MSB an appropriation to perform conceptual engineering and environmental documentation for the Port MacKenzie Rail Extension. From September to December 2007, MSB and ARRC jointly conducted a constraints analysis based on engineering requirements and available environmental data to re-evaluate the alignments from the 2003 MSB study and develop alignments that could minimize potential impacts to the environment. MSB and ARRC then conducted public open houses and agency overview meetings to provide information about and receive comments on the proposed project. ARRC used feedback from stakeholders to refine potential rail alignments to reduce potential impacts and develop preliminary voluntary mitigation measures. Based on this information, in January 2008 ARRC issued the Preliminary Environmental and Alternatives Report (ARRC, 2008), which presented eight possible alignment configurations. Compared to the eleven corridors presented in the 2003 report, these eight alignments are considered new alignments that are different from the eleven corridors.

In early 2008, ARRC submitted the Preliminary Environmental and Alternatives Report to SEA. Since then, ARRC has refined some of the potential alignments and SEA has evaluated those and other potential alignments during this environmental review process.

2.2.2 Alternatives Considered but Eliminated from Detailed Study

SEA reviewed the alignments ARRC developed and analyzed in their Preliminary Environmental and Alternatives Report (ARRC, 2008) and reviewed the potential rail/road corridors identified in the previous MSB Rail Corridor Study (MSB, 2003). In April 2008, SEA asked ARRC to consider the feasibility of making adjustments to the Willow, Big Lake, Mac West, and Houston North segments, and to consider a new segment to reduce potential environmental impacts. Table 2-1 lists the adjustments, the new segment SEA identified for consideration, and ARRC responses. The Applicant found that the refinements listed in Table 2-1 would be infeasible or would result in increased environmental impacts. SEA reviewed the Applicant's responses to the suggested refinements and concurred with the Applicant's findings.

Table 2-1
SEA Questions on Port MacKenzie Rail Extension Alignments and ARRC Responses (page 1 of 2)

Potential Change	ARRC Response
Shift the Willow Segment to further avoid the Willow Creek State Recreation Area (SRA) by following the southern boundary of the Recreation Area.	ARRC considered this route during investigations in 2003 and 2007 but rejected it due to impacts to the Willow Airport and the Willow commercial area. Also, construction of a grade-separated crossing of the Parks Highway would require a major profile adjustment to the highway, resulting in impacts to adjacent properties.
Shift the Willow Segment to the west to avoid the Nancy Lake SRA between approximately Mile Posts W12.8 and W13.8.	Relocating the alignment as suggested would involve construction in an area with compressible soils and would likely impact between 3 and 4 acres of additional wetlands. ARRC would propose to adjust the Nancy Lake SRA boundary so that the SRA land area would not be reduced or degraded and the rail extension alignment would be outside the SRA. This boundary adjustment would be subject to Alaska State Legislature approval as well as other agencies.
Shift the Big Lake Segment to the east to avoid a proposed grade-separated crossing of Big Lake Road and development in the area.	ARRC's constraints analysis determined this route to be infeasible because of impacts to Blodgett Lake, an unnamed lake, and two Native American allotments near the tie-in to the existing rail line. Also, the Parks Highway corridor near Pittman Road is highly developed and a rail connection would further increase congestion in this area. The junction of Big Lake Road and the Parks Highway is one of the busiest intersections between Wasilla and Talkeetna, and a grade-separated crossing at this location would result in a substantially larger footprint to accommodate traffic volumes.
Straighten the Big Lake Segment, especially between Mile Posts B5.9 and B8.4, with the objective of reducing impacts with a shorter segment.	The rail alignment was located to minimize impacts to wetlands and reduce construction on compressible soils by using higher and drier ground. The curve between Mile Posts B5.9 and B8.4 would be necessary because of Goose Creek and its associated floodplain. The Goose Creek crossing is at a narrow point in the creek, which also has a more stable streambed. To relocate this crossing upstream would be more difficult because Goose Creek spreads out into wider or multiple channels.

Table 2-1
SEA Questions on Port MacKenzie Rail Extension Alignments and ARRC Responses (page 2 of 2)

Potential Change	ARRC Response
Shift the northern portion of the Houston North Segment to the west to reduce impacts on the Little Susitna State Recreation River	Such a shift would have two major disadvantages: (1) the Nancy Lake Creek crossing location would contribute to greater stream impacts due to the meandering nature of the creek in the proposed location and (2) the siding along the existing main line could impact numerous private lakeshore and commercial properties when rail cars occupy the siding track and block driveways and would likely require that the affected properties be purchased and the buildings razed.
Adjust the portion of the Mac West Segment from Mile Post MW5.2 north to the end of the segment to avoid the Susitna Flats State Game Refuge.	Moving the alignment into the agricultural area to avoid the game refuge would bisect farmland and increase potential impacts to property owners. ARRC would suggest mitigation that could include land swaps between the Susitna Flats State Game Refuge and private agricultural landowners so that agricultural lands isolated south and west of the rail line could become part of the Game Refuge, while refuge lands isolated north and east of the rail line could become agricultural lands. This land swap would require approval from state agencies.
Add an alignment in the eastern portion of the study area, east of the Big Lake Segment, that would be in part or all of the existing Port MacKenzie Road and Knik-Goose Bay Road corridors.	An alignment in this location would draw additional freight traffic into Wasilla and increase an already difficult congestion problem. In addition, the east-west portion of the road is unsuitable for railroad construction due to undulating terrain in the western portion and large stretches of wetlands and compressible soils in the eastern portion. In addition, constructing a rail line in the Knik-Goose Bay Road corridor would impact numerous residential properties and require a railroad junction in downtown Wasilla. The Knik-Goose Bay Road corridor serves as a primary transportation artery, and this proposal would introduce transportation conflicts between rail, road, and routes for all-terrain vehicles, cycling, and dog sledding, requiring frequent grade crossings or grade separations. Also of concern would be noise impacts and safety issues related to illegal crossing of the track.

Based on the purpose and need for the proposed action (see Chapter 1), SEA and the cooperating agencies reviewed the ARRC initial alignments and alignments proposed in scoping comments to determine appropriate build alternatives. Through this review, SEA and the cooperating agencies determined that the alignments described in Section 2.3 provided a reasonable set of feasible alternatives for detailed study.

SEA also notes that rail across the proposed Knik Arm crossing connecting Port MacKenzie to the ARRC main line in Anchorage was considered, but determined impractical for several reasons. The Federal Highway Administration (FHWA) determined this option to be financially infeasible in the Knik Arm Crossing Final Environmental Impact Statement. The nearly $1 billion cost (in 2005 dollars) estimated for constructing this rail crossing would have exceeded the $600 million limit for the Knik Arm Crossing project. In addition, a route from Port

MacKenzie to Interior Alaska using a Knik Arm crossing and the existing ARRC main line that travels east and north around the Knik Arm, would have been considerably longer for operating trains (i.e., in miles operated) than the alternatives being analyzed. Such a routing also would not meet the Applicant's stated purpose of providing a rail connection suitable for shipment of bulk materials from Interior Alaska to Port MacKenzie.

Similarly, upgrades to the existing road to Port MacKenzie and construction of a new road also were not analyzed in detail because they would not meet the Applicant's stated purpose of providing Port MacKenzie customers with rail transportation between Port MacKenzie and Interior Alaska. As discussed in Section 1.2 of this Draft EIS, trucks, as compared to rail, are inefficient for bulk commodity movements and are generally used for short-haul movements in that context. Bulk commodity shippers, which already have access to the existing ARRC network, utilize a combination of rail and transload to truck 30 miles away for final delivery to Port MacKenzie. However, such intermediate movements and handling requirements are not efficient and impose increased costs to the shipper and consumer due to multiple transfers of materials between transportation modes. The Applicant states that the cost for intermediate transloading from rail to truck, and the additional truck ton-mile cost for final delivery, actually places Port MacKenzie at a significant disadvantage to other regional ports with rail service.

For example, a railroad can move one ton of freight 457 miles on a gallon of diesel fuel, compared to 133 miles for a truck.[3] FRA compared overall fuel efficiency of rail and truck transport on 23 competitive corridors throughout the nation and concluded that, in all cases, moving freight by railroad was more fuel efficient than by truck.[4] The report concluded that, "rail fuel efficiency varies from 156 to 512 ton-miles per gallon, truck fuel efficiency ranges from 68 to 133 ton-miles per gallon." Both efficiency in handling and efficiency in fuel use translate into substantial cost savings for freight shipped via rail transport rather than transport by truck over the highway.

Because of the economics and efficiencies offered by direct rail service, the Applicant states that the use of freight trucks alone to provide bulk commodity movements to and from the Port would deprive Port MacKenzie's customers of the multi-modal options for the movement of freight that are offered by other ports handling large vessels and would limit the competitive position of the Port.

2.3 Alternatives Selected for Detailed Study

SEA independently reviewed the Applicant's Preliminary Environmental and Alternatives Report, conducted field studies, consulted various Federal and state agencies, reviewed scoping comments, and worked with cooperating agencies to determine a reasonable range of alternatives. Through this process, SEA and the cooperating agencies determined that the alignments described below are a reasonable range of alternatives for detailed study.

The alternatives are composed of southern and northern segments, with possible connector segments between. The southern segments, Mac West and Mac East, would run either east or

[3] http://www.aar.org/Environment/Environment.aspx.
[4] Federal Railroad Administration, Comparative Evaluation of Rail and Truck Fuel Efficiency on Competitive Corridors, Final Report November 19, 2009.

west of the Point MacKenzie Agricultural Project.[5] There are three main sections north of the Point MacKenzie Agricultural Project – Willow, Houston, and Big Lake – with Houston having north and south variants. Connector segments link the north and south segments to create eight possible routes for the proposed rail line, as listed below and shown in Figure 2-2.

- Mac West, Connector 1, and Willow. This route would be the longest, 46.0 miles long.
- Mac West, Connector 1, Houston, and Houston North. This route would be 34.9 miles long.
- Mac West, Connector 1, Houston, and Houston South. This route would be 35.6 miles long.
- Mac West, Connector 2, and Big Lake. This route would be 36.8 miles long.
- Mac East, Connector 3, and Willow. This route would be 44.9 miles.
- Mac East, Connector 3, Houston, and Houston North. This route would be 33.7 miles long.
- Mac East, Connector 3, Houston, and Houston South. This alternative would be 34.3 miles long.
- Mac East and Big Lake. This alternative would be the shortest, 31.4 miles.

Although SEA and the cooperating agencies have examined the eight alternatives listed above in detail, the agencies note that some of these alternatives may not be eligible for federal funding from USDOT agencies such as the FRA. Publicly-owned parks, recreation areas, wildlife and waterfowl refuges, and public and private historical sites are protected under Section 4(f) of the Department of Transportation Act (DOT Act) of 1966, codified at 49 U.S.C. § 303. The DOT Act, as amended by Section 6009(a) of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) of 2005, provides that some USDOT agencies[6] such as the FRA cannot approve the use of land from publicly owned parks, recreational areas, wildlife and waterfowl refuges, or public and private historical sites – referred to as Section 4(f) resources – unless:

- There is no "prudent and feasible alternative" to the use of the land, and the project includes "all possible planning to minimize harm" to the protected property resulting from use, or
- The use would result in *de minimis* impacts to Section 4(f) resources.

The Willow, Mac West and Houston North segments would traverse the Willow Creek State Recreation Area, Nancy Lake State Recreation Area, Little Susitna State Recreation River, and/or Susitna Flats State Game Refuge. These recreation and refuge areas are all Section 4(f) resources. FRA or any other USDOT agencies subject to Section 4(f) could not provide funding for the project if the Board authorizes construction and operation of an alternative that includes any of these three segments unless impacts would be *de minimis* because there are prudent and feasible alternatives that do not use Section 4(f) resources. This Draft EIS provides the information necessary for any decisions required under Section 4(f). Appendix M provides additional detail about Section 4(f).

[5] The State of Alaska initiated the Point MacKenzie Agricultural Project in the 1980s. The Agricultural Project is an area of agricultural land sold or leased by the state with agricultural covenants. Owners are required to submit conservation plans for each parcel to the ADNR Division of Agriculture to ensure that the agricultural resources in the area are preserved. While the area's designation as an agricultural project does not confer special status on these parcels beyond the parcel's agricultural restrictions, the area is the largest contiguous agricultural area in Alaska. There are easements specifically reserved for railroad development throughout the agricultural area; however, these easements are discontiguous and generally cut through the middle of the arable land.

[6] Section 4(f) does not apply to the STB, an independent agency organizationally housed within DOT.

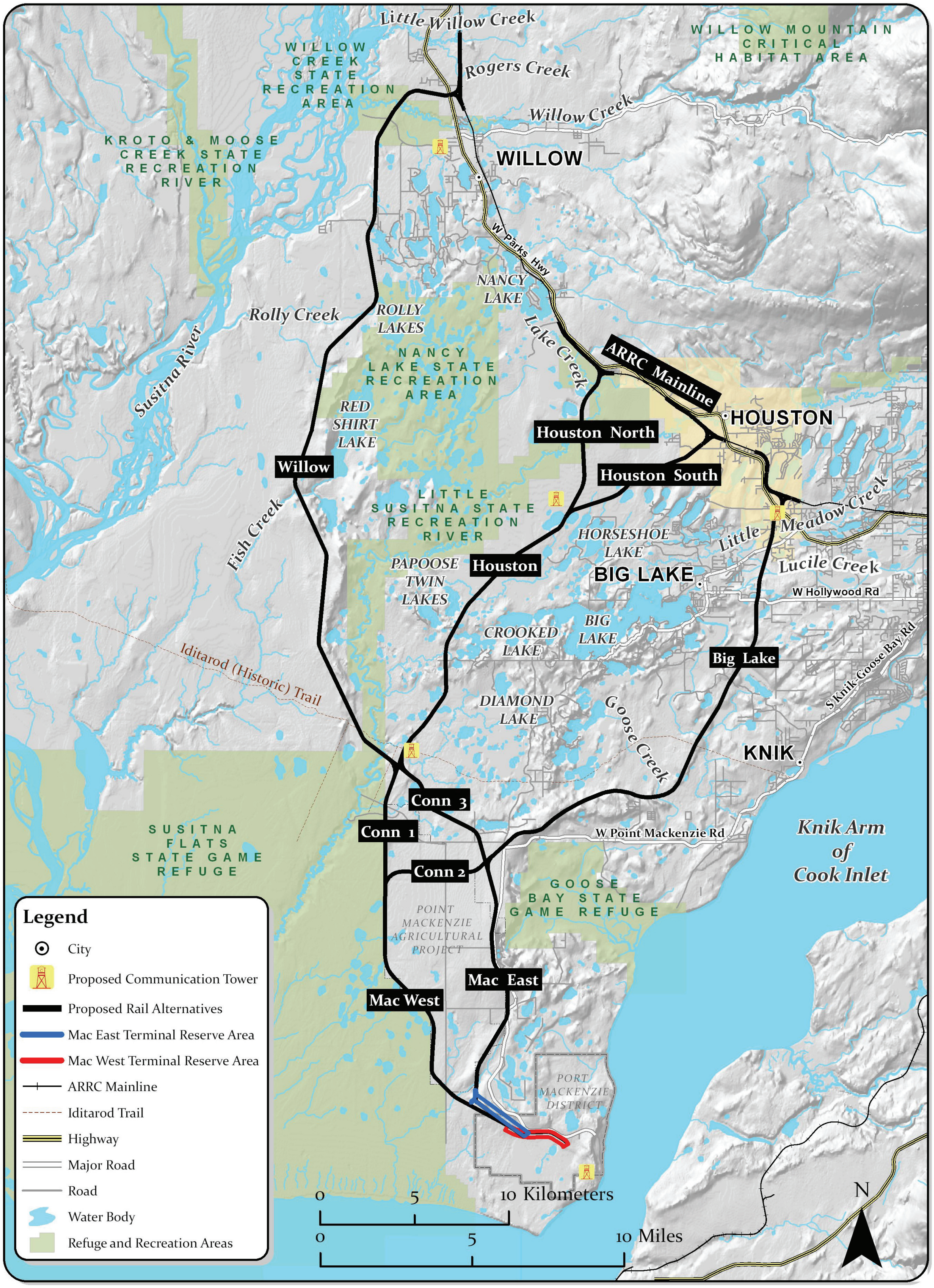

Figure 2-2. Alternatives Considered for the Port MacKenzie Rail Extension

2.3.1 Southern Segments

2.3.1.1 Mac West

The Mac West Segment would begin in the terminal reserve area and would proceed northwest across relatively flat terrain toward the southwest corner of the Point MacKenzie Agricultural Project. The segment would continue west of the agricultural area, traversing along the eastern boundary of Susitna Flats State Game Refuge. The terminal reserve area is proposed along the south side of Mac West.

2.3.1.2 Mac East

The Mac East Segment would begin in the terminal reserve area and would proceed north along the side of a ridge along the east side of the Point MacKenzie Agricultural Project. Near Mile Post 4.7, the segment would cross a ravine and then curve to the northeast along the top of another ridge. North of Mile Post 6, the segment would follow the alignment of Port MacKenzie Road, offset 200 feet or more to the west. The segment would continue along undulating terrain before reaching its junction with the Big Lake Segment or Connector 3 Segment. The terminal reserve area is proposed along the north side of Mac East.[7]

See Figure 2-3 for a detailed map of the southern segments and terminal reserve areas.

2.3.2 Connector Segments

2.3.2.1 Connector 1

This 4.8-mile-long segment would connect the Mac West Segment to the Willow or Houston segment. From Mac West, this connector segment would continue north along the eastern boundary of the Susitna Flats State Game Refuge on level terrain. The segment would cross a tributary of the Little Susitna River.

2.3.2.2 Connector 2

This 3.7-mile-long segment would connect the Mac West Segment to the Big Lake Segment. At the northwestern end of the Point MacKenzie Agricultural Project, this connector segment would turn due east and travel along the southern boundary of the Point MacKenzie Correctional Farm.

2.3.2.3 Connector 3

This 5.2-mile-long segment would connect the Mac East Segment to the Willow or Houston segment. At the northeastern end of the Point MacKenzie Agricultural Project, this connector segment would shift to the northwest and cross Ayrshire Avenue and Farmers Road. The

[7] Based on Port MacKenzie planning and development information and additional field data collected during the summer of 2008, ARRC revised the proposed location for the terminal reserve area for the Mac East Segment. This terminal reserve area is shifted to the west in relation to its previous location. This change occurred after issuance of ARRC's Preliminary Environmental and Alternatives Report. ARRC also considered relocating the terminal reserve area for the Mac West Segment to this revised location as well, but found that topography and safety considerations made it impractical, so the location presented in the Preliminary Environmental and Alternatives Report was retained.

segment would continue north of My Lake and cross an adjacent ravine. The remaining mile of the segment would be nearly level.

See Figure 2-3 for a detailed map of the connector segments.

2.3.3 Northern Segments

2.3.3.1 Willow

From Connector 1 Segment or Connector 3 Segment, the Willow Segment would continue northwest where it would cross a corner of Susitna Flats State Game Refuge, Little Susitna State Recreation River, and the Little Susitna River (see Figure 2-4). Over the next 7 miles, the segment would continue north through rolling terrain. The segment would cross Fish Creek, the outlet for Red Shirt and Cow Lakes. It would then proceed north, generally following the west-facing slope of a glacial moraine west of Red Shirt Lake. It would continue north through the Nancy Lake State Recreation Area for approximately 0.5 mile. The Willow Segment would cross the outlet for Vera Lake, continue over rolling terrain, and cross Willow Landing Road. The segment would then continue through the Willow Creek State Recreation Area, where it would cross Willow Creek. The segment would curve to the east and cross Parks Highway with a grade separation, before connecting to the existing ARRC main line near Mile Post 188.9.

2.3.3.2 Houston

From Connector 1 Segment or Connector 3 Segment, the Houston Segment would proceed northeast, traveling through slightly undulating terrain with areas of wetland (see Figure 2-4). The segment would pass between Papoose Twins Lakes and Crooked Lake, crossing an area of hilly terrain. The remaining 4 miles of the Houston Segment would be in a gradually rising wetland area to a point near Muleshoe Lake and Little Horseshoe Lake, where it would connect to either the Houston North Segment or the Houston South Segment.

2.3.3.3 Houston North[8]

From the Houston Segment, the Houston North Segment would continue north (see Figure 2-4), crossing over the Castle Mountain Fault. The Houston North Segment would cross Cow Lake Trail, which is part of Houston Lake Loop Trail. It would continue through the Little Susitna State Recreation River, where it would cross the Little Susitna River. The segment would continue north on rolling terrain along the east side of Houston and Little Houston Lakes, descending gradually to lower terrain adjacent to Lake Creek. The Houston North Segment would tie into the existing ARRC main line near Mile Post 178 along the proposed rail line without crossing Parks Highway.

[8] Based on environmental impacts associated with the original proposed connection with the main line as presented in the Preliminary Environmental and Alternatives Report, ARRC shifted the connection point south approximately 1 mile southeast to its present location.

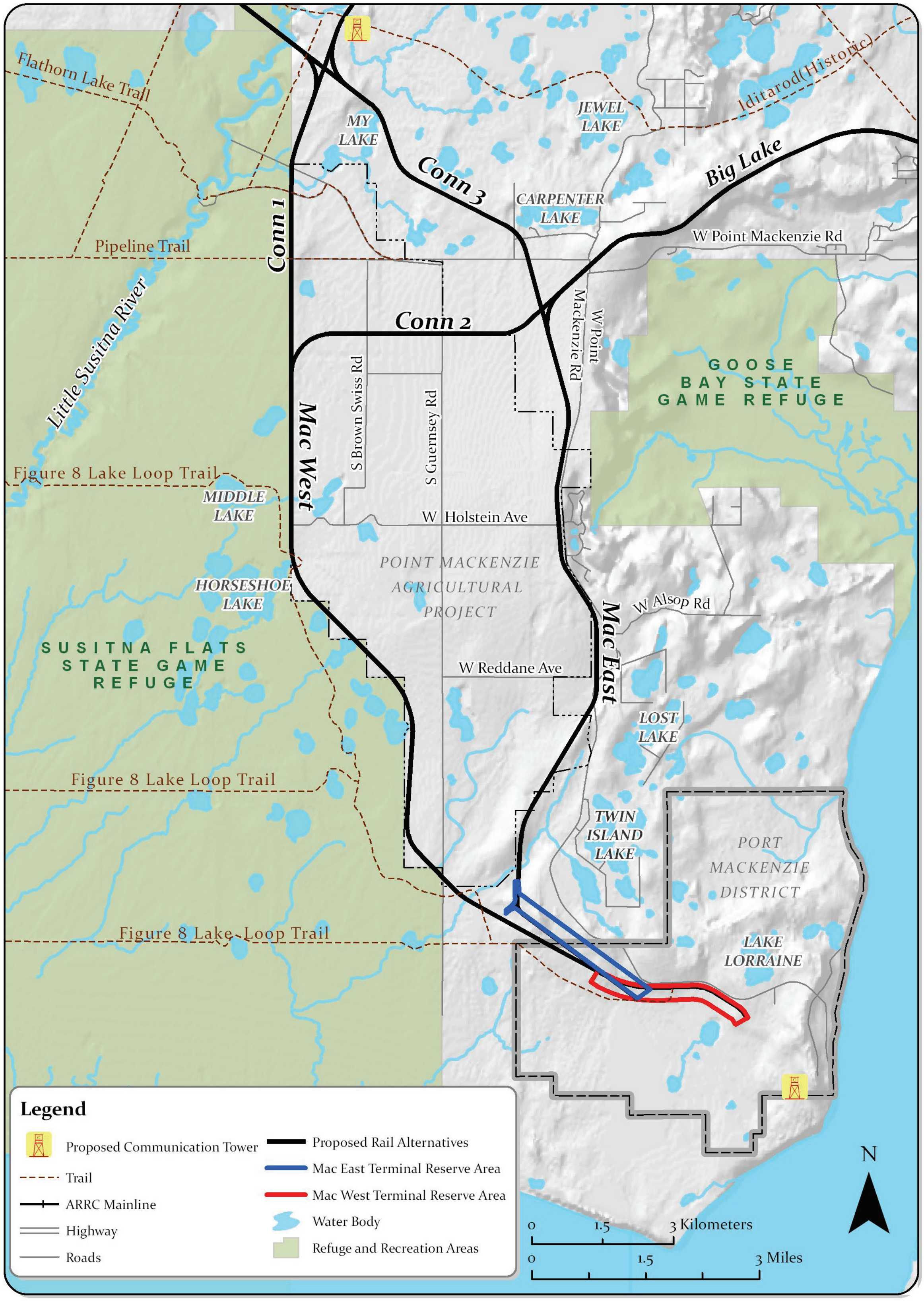

Figure 2-3. Mac East, Mac West, and Connector Segments

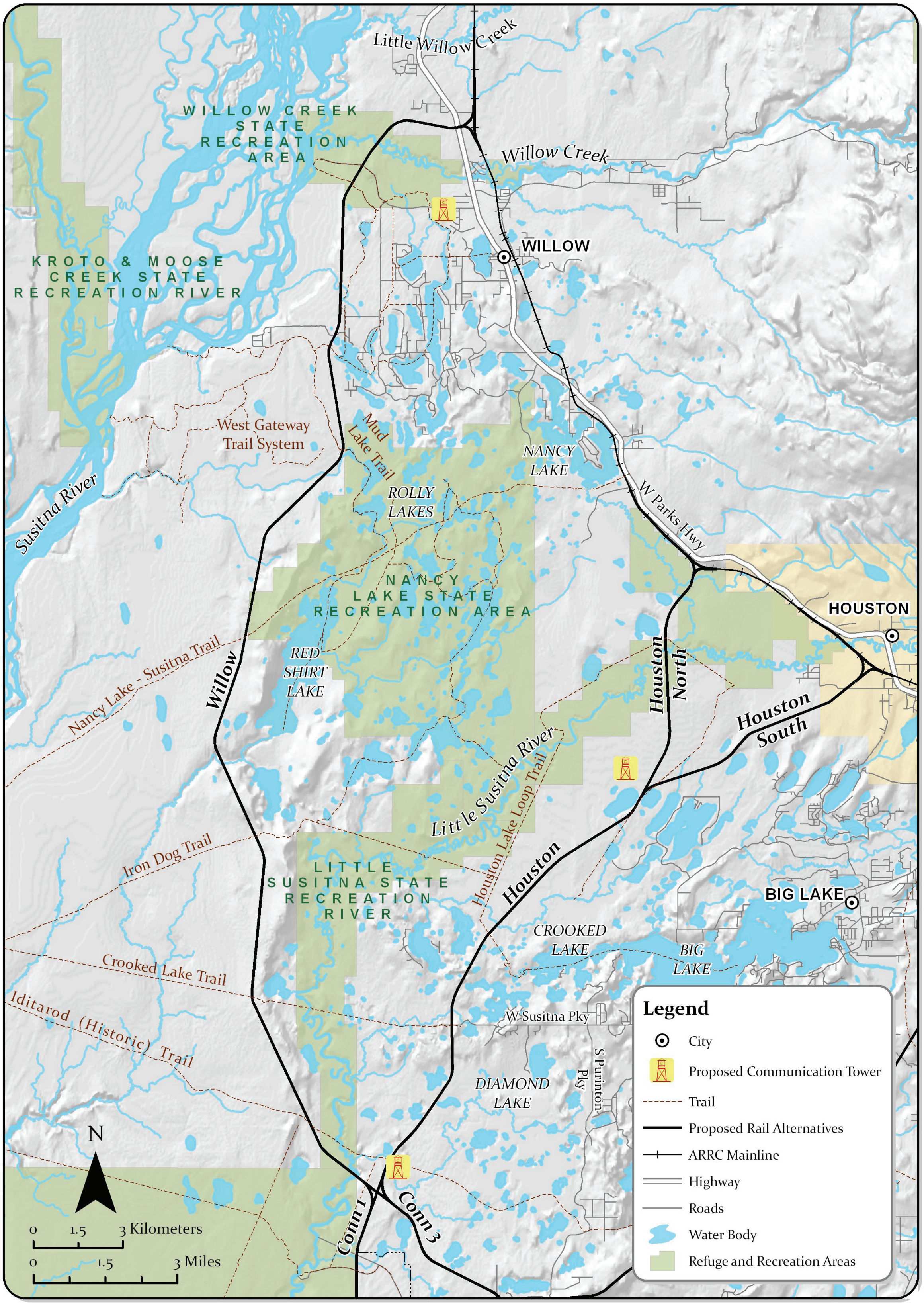

Figure 2-4. Willow and Houston Segments

2.3.3.4 Houston South

Also beginning between Muleshoe Lake and Little Horseshoe Lake, this proposed segment would traverse northeast, passing just west of Pear Lake (Figure 2-4). The segment would cross several gravel ridges that parallel the lakes in this area. The segment would tie into the existing main line near Mile Post 174.0 without crossing the Parks Highway.

The proposed track siding for Houston South would include reconfiguration of the main line to construct the new siding. ARRC would construct 1.5 miles of new main line within the existing ROW and would convert 7,000 feet of existing main line to use as a new siding. ARRC would construct an additional 6,800 feet of new siding in the main line ROW to create a 13,800-foot siding.

2.3.3.5 Big Lake

From the Mac East Segment or Connector 2 Segment, the Big Lake Segment would run northeast for approximately 3 miles (See Figure 2-5). It would continue on rolling terrain, crossing over Goose Creek, Fish Creek, Lucile Creek, and tributaries of Lucile Creek and Little Meadow Creek. The segment would cross Burma Road and Big Lake Road, where it would be grade-separated over Big Lake Road. The Big Lake Segment would continue north through a residential area before crossing under Parks Highway with a grade-separated crossing.

The Big Lake Segment would connect with the existing ARRC main line near Mile Post 170.3 along the proposed rail line in a wetland area surrounding a stream that feeds into Long Lake.

Additional information ARRC collected during the 2008 summer field season provided the Applicant with better data to consider the tie-in location for the Big Lake Segment. The following ARRC-supplied information supplements the Preliminary Environmental and Alternatives Report (Figure 2-5):

- Construct an approximately 430-foot bridge on Parks Highway over the proposed rail line and an unnamed anadromous fish stream.
- Relocate two sections of approximately 2,440 feet of unnamed anadromous fish stream adjacent to the proposed rail line.
- Relocate approximately 1,000 feet of Hawk Lane on the south side of Parks Highway (because of the new Parks Highway bridge).
- Close approximately 865 feet of Cheri Lake Drive where it crosses the existing main line and intersects with Parks Highway.
- Extend Ray Street approximately 1,405 feet from Loon Street to Parks Highway, which would include an at-grade crossing of the existing ARRC main line.

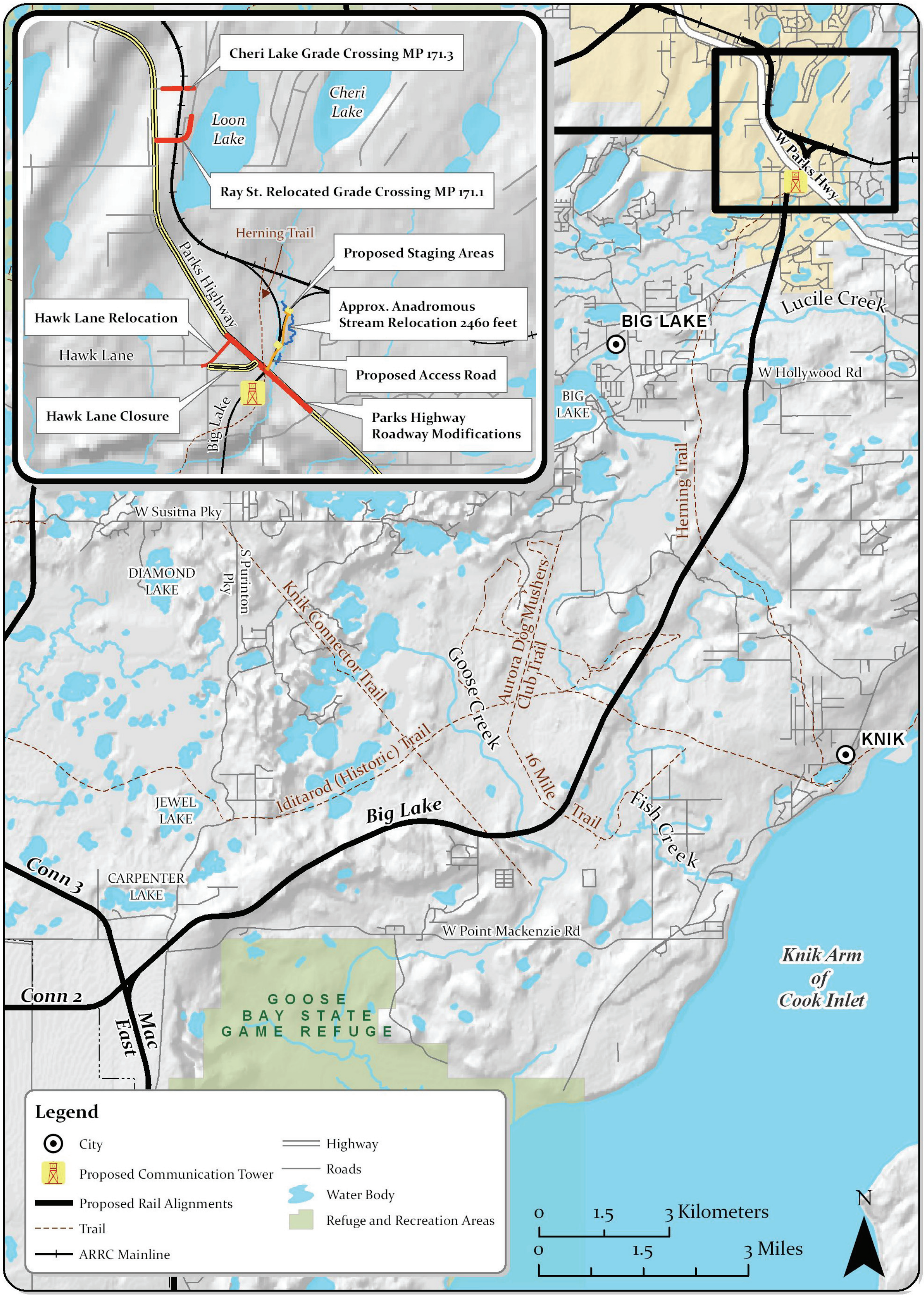

Figure 2-5. Big Lake Segment

- Acquire eight recreational/residential parcels along Loon Lake because access to the parcels would be permanently blocked due to lack of access from the relocated road crossing (Cheri Lake Drive) and the new siding.
- Relocate the business on the southwest corner of Parks Highway and Cheri Lake Drive due to the Hawk Lane relocation.

The Big Lake Segment also would cross two wetland mitigation bank parcels that are part of the Su-Knik Mitigation Bank. Use of these two mitigation bank parcels for the proposed rail line could require concurrence from the entities that created the mitigation bank or ARRC ROW acquisition through eminent domain.

2.3.4 No-Action Alternative

Under the No-Action Alternative, ARRC would not construct an extension of the existing rail line to transport commercial freight, and freight truck would remain the only available mode of surface transportation to and from Port MacKenzie.

2.4 Comparison of Alternatives

2.4.1 Topography, Geology and Soils

Steeper terrain would require a greater amount of either fill or cut and fill during rail line construction than flatter terrain and would therefore have a greater impact on topography. With one exception, the Big Lake Segment, the existing terrain for all segments and segment combinations that have been considered would be relatively flat. The Big Lake Segment, however, would have approximately 20 percent of its length crossing ground with slope greater than 1 percent, with the remaining 80 percent relatively flat. This segment would cross the highest percentage of slopes between one and five percent, slopes greater than five percent, and would cross ground with the highest maximum slope (27 percent). The Mac East Segment has the second steepest conditions.

Although the construction of the proposed rail line would not result in any potential impacts to geological resources, construction activities would affect soils unsuitable for rail line construction, and these soils would need to be removed and replaced with imported, well-draining soils. In some locations, the railroad would be constructed on soils the MSB considers locally important for agricultural purposes, though some of these soils may not be in use for agricultural purposes. The Mac East-Connector 3-Willow Alternative would have the greatest impact to soils the MSB considers locally important for agricultural purposes. The Mac West-Connector 1-Houston-Houston North Alternative would have the least impact to soils the MSB considers locally important for agriculture. However, the Mac West-Connector 1-Houston-Houston North Alternative would contain both the greatest percentage of poor soils for construction and the greatest length of peat and organic soils. Soft, compressible organic and peat soils, present in wetland areas, would have to be compacted or removed and replaced.

The MSB is subject to seismic activity. The most likely impact on the rail line from seismic activity would be misalignment or damage to the tracks, railbed, or access road. This could be caused by ground shaking, offset lateral movement, or soil subsidence. If strong enough, ground shaking could also cause trains to derail. With the segments and segment combinations being relatively close to one another, the minor differences in distance between a segment and a seismic event would not have an appreciably different effect on the segments and segment combinations.

2.4.2 Water Resources

Potential impacts to water resources could result from clearing and grading; the excavation of fill material; construction of an unpaved access road, bridges, and culverts; and use of transportation and staging areas. The following paragraphs summarize the relevant effects of such project-related activities on surface water, groundwater, floodplains, and wetlands.

2.4.2.1 Surface Water

Construction of the proposed rail line and the unpaved access road could result in potential adverse impacts to water quality in areas were the rail line and access road would be near, adjacent to, or span waterbodies. In these areas, ROW clearing, grading, and construction of the rail line, staging areas, and access road could lead to impacts on surface waters from increased erosion and nutrient loading. If subballast and fill materials are obtained from borrow areas, this could disrupt shallow-water areas (former borrow areas), including disturbing sediment, increasing turbidity, and generally degrading water quality; however, SEA expects no long-term water quality impacts from borrow areas located near shallow water areas because turbidity levels would return to normal after the disturbance ceased. New borrow areas might also be identified in surface-water areas. Depending on the annual and seasonal variation of flood stage and hydraulics of the waterbodies at the borrow areas, there could be impacts to water quality.

In areas where the proposed rail line and access road would be near waterbodies, the potential consequences to water quality during spring ice break-up, snowmelt, or rainstorms could include increased transport of fine-grained sediments that could alter waterbody chemistry and pH.

The Applicant would construct bridges and culverts to convey water under the proposed rail line and the access road. Potential impacts that could result from the culvert and bridge construction and installation along the ROW would include: degradation of steambanks and riparian areas; increased stages and velocities of floodwater; increased channel scour and downstream sedimentation; and changes to natural drainage. The presence of bridges and culverts in or over a channel could alter channel hydraulics, which could increase channel scour and erosion processes which could subsequently lead to an increase in sediment transport loads and downstream sedimentation. This impact, however, would generally be short-term and would end after ARRC finished construction.

In general, the more bridges or culverts that occur along a given segment, the greater the likelihood of potential impacts. However, the magnitude of potential effects at individual crossings also depends on site-specific factors. Bridges would generally be expected to result in fewer hydrologic impacts than culverts due to their ability to maintain stream structure and flow characteristics. The Mac East-Connector 3-Houston-Houston South Alternative would require the fewest crossings with the smallest number of drainage structures and culvert extensions, and one of the smallest numbers of culverts. The Mac West-Connector 1-Houston-Houston North Alternative would require the most crossings.

2.4.2.2 Groundwater

Construction of the proposed rail line, sidings, power lines, buried communications cables, access road, and other facilities could affect groundwater movement and quality. Groundwater movement could be altered by changes in infiltration and recharge rates due to compaction of the overlying soil. These effects would be limited to the footprint of the proposed rail line, facilities, access road, and staging areas, which represents a small fraction of the total area where water enters the ground and infiltrates to the water table. The extraction of materials from the borrow areas[9] could affect groundwater due to the changes in local hydrogeology that would result from the removal of saturated materials and the creation of new ponds that would serve as sources of groundwater discharge through evaporation during the summer and sources of groundwater during major rainstorms and the break-up of ice.

2.4.2.3 Floodplains

Within the study area, there are 100-year floodplains along Willow Creek, Little Willow Creek, Lake Creek, Deception Creek, Lucile Creek, and the Little Susitna River. With the exception of the floodplain along Little Willow Creek, all of the proposed alternative rail line segments would cross all of these floodplains. The rail line and access road placed within the 100-year floodplain would require fill placement and could reduce floodplain volume, constrict flood flow paths, and increase floodwater elevation upstream of the restricted floodplain area. However, affected areas would be small compared to the total floodplain storage available, and SEA expects minimal impacts to floodplain storage from the placement of the proposed rail line and the access road. ARRC would size all water crossings to convey the 100-year flow event associated with local drainages as part of their voluntary mitigation measures. For larger stream and river crossings, ARRC would construct bridges as single- or multiple-span structures that would either completely or partially span (or clear) the existing active river channel. The Mac West-Connector 1-Willow and Mac East-Connector 3-Willow alternatives would impact the greatest amount of FEMA-designated floodplains, with approximately 8,065 feet (about 1.5 miles) of rail line crossing 37 acres of 100-year floodplain. The Mac West-Connector 1-Willow Alternative would also cross an additional eight streams, two more than the Mac East-Connector 3-Willow Alternative, that have a high potential for floodplains. The Mac West-Connector 2-Big Lake and the Mac East-Big Lake alternatives would impact the least acreage of floodplains with approximately 460 feet of rail line crossing 2.1 acres of 100-year floodplain; both of these alternatives would require only one waterbody crossing within a FEMA-designated floodplain.

2.4.2.4 Wetlands

Several wetland types were found within the wetland study area (500 feet on either side of the rail centerline). These include forested wetlands, scrub/shrub wetlands, emergent wetlands, and other waters and riverine wetlands. Rail line construction would directly affect wetlands within the 200-foot ROW and could also indirectly affect wetlands adjacent to the ROW by fragmenting

[9] Areas from which materials such as soil, rock, or gravel are excavated for a specific purpose.

wetland vegetation and hydrology. Rail line construction would require clearing, excavation, and placement of fill material in wetlands. The placement of fill would cause a permanent loss of wetland functions within the fill area and could result in additional impacts to adjacent wetland areas inside and outside the ROW. Because many wetland functions depend on the size of the wetland or the contiguous nature of the wetland with other habitats, clearing and filling a wetland could lower the ability of adjacent wetlands to perform functions that depend on size or an unfragmented connection to a waterbody.

Potential impacts to wetlands within the ROW from proposed rail line construction would vary by project alternative. Construction of the Mac East-Connector 3-Willow Alternative would impact 188 acres of wetlands, (comprising 15 percent of the ROW), the lowest impact to wetlands of all the alternatives. The Mac East-Connector 3-Willow Alternative would also have the lowest proportion of high-functioning wetlands. Construction of the Mac West-Connector 1-Houston-Houston North Alternative would impact 478 acres of wetlands; the greatest overall acreage of wetlands that would be affected by any of the alternatives. Although this alternative would occupy less overall acreage compared to the other alternatives, 45 percent of the alignment comprises wetlands, the highest of the alternatives. Many wetlands along this alternative consist of bog wetlands that have diverse vegetation communities and are considered high-functioning wetlands.

Of the remaining alternatives, Mac West-Connector 1-Houston-Houston South would impact 424 acres, Mac West-Connector 1-Willow would affect 363 acres of wetlands and waters, Mac West-Connector 2-Big Lake would impact 347 acres, Mac East-Connector 3-Houston-Houston North would impact 301 acres, Mac East-Connector 3-Houston-Houston South would impact 248 acres, and Mac East-Big Lake would impact 209 acres. The Big Lake Segment would also impact 25 acres of a wetland mitigation bank,[10] primarily composed of riverine wetlands (wetlands situated in a river channel that contain moving water, either continuously or periodically) and riparian wetlands (wetlands situated alongside a river), but also including scrub/shrub wetlands and uplands. Within this mitigation bank is the Goose Creek Fen, a floating mat fen system. A floating fen is an important ecological feature supporting diverse plant communities and providing high value rearing habitat for anadromous fish species. Goose Creek Fen would require draining or filling for construction of the Big Lake Segment. The wetlands in the mitigation bank are locally important to MSB and are highly valued. The impact would reach beyond the 200-foot ROW because, for the purposes of the mitigation bank, the value of the wetlands is based on their contiguous, unfragmented state.

2.4.3 Biological Resources

The proposed rail line and facilities construction and operations would impact biological resources. The following paragraphs summarize the relevant effects of this project on vegetation, fisheries, wildlife, birds, and threatened and endangered species.

[10] A mitigation bank is a wetland, stream, or other aquatic resource area that has been restored, established, enhanced, or (in certain circumstances) preserved for the purpose of providing compensation for unavoidable impacts to aquatic resources permitted under Section 404 Clean Water Act or a similar state or local wetland regulation.

2.4.3.1 Vegetation Resources

The primary impacts of the proposed rail line construction and operation to vegetation would be the destruction of vegetation cover and the replacement of some cover with gravel fill. Permanent impacts would include vegetation loss due to placement of gravel fill for the railbed, excavation of gravel, and construction of rail line support facilities. Other potential impacts would include the loss or alteration of forested habitat due to the removal of vegetation at temporary workplaces that would be restored after project construction. Potential operations impacts would include vegetation removal and control within the 200-foot ROW where necessary for safe operations. In addition, potential impacts to vegetation resources could include altered vegetation communities due to soil compaction and the spread of invasive plant species and altered vegetation succession caused by the interruption of natural wildland fire ecology. There are no known Federal- or state-protected threatened, endangered, or candidate plants species within the study area.

Of the build alternatives, the Mac West-Connector 1-Willow Alternative would result in the clearing of 1,272 acres of vegetation from the 200-foot ROW, the most of any alternative. The alternative with the second highest area of vegetation loss would be the Mac East-Connector 3-Willow Alternative, with 1,249 acres of vegetation cleared. Following in descending order of area of vegetation cleared would be: Mac West-Connector 2-Big Lake Alternative (1,056 acres); Mac West-Connector 1-Houston-Houston North Alternative (1,038 acres); Mac West-Connector 1-Houston-Houston South Alternative (1,032 acres); Mac East-Connector 3-Houston-Houston North Alternative (1,010 acres); and Mac East-Connector 3-Houston-Houston South Alternative (1,003 acres). The Mac East-Big Lake Alternative would result in the fewest acres of vegetation loss of all the possible alternatives; 930 acres. Vegetation clearing would result in a long-term impact for forest communities, even with restoration, especially for late-succession forests and wetlands that would be slow to recover. Some cleared areas would likely be restored after construction; other areas would be covered by fill.

2.4.3.2 Wildlife Resources

A variety of wildlife species are known to inhabit the project area. These include: bears, moose, wolves, beaver, mink, muskrat, river otter, ermine, martens, wolverines, red fox, coyote, lynx, hares, mice, squirrels, bats, shrews, voles, lemmings, porcupine, and numerous avian species including 42 birds of conservation concern.[11] The potential impacts of the proposed rail line construction and operation to wildlife would be influenced by the animals' dependence on specific habitats, the availability of preferred and used habitats, the amount of preferred habitat the project would affect, ecology and life history, and past and present population trends. Because game mammal populations are managed for sustainable human harvest, project-related effects to population abundance and distribution, available habitat, and predator-prey relationships can also affect management of these game mammals. Potential construction impacts common to all segment combinations and alternatives could include habitat alteration and loss, disturbance and displacement of wildlife, and direct mortality from construction vehicles and equipment. Common potential impacts related to the operation of the proposed rail

[11] Birds of conservation concern include migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) that represent the highest conservation priorities of the U.S. Fish and Wildlife Service.

line could include moose-train collision mortality, bird-power line and communications tower collision mortality, habitat fragmentation, disturbances leading to reduced wildlife survival and productivity, potential exposure to spills of toxic materials, and potential changes in human disturbance and harvest patterns resulting from unauthorized access to the remote portions of the project area facilitated by the access road along the ROW.

The proposed rail line would result in the loss of wildlife habitat ranging from 930 acres to 1,272 acres depending on the alternative, which is less than one percent of the 435,895 acres of available habitat in the study area. The Mac West-Connector 1-Willow Alternative would result in the greatest amount of habitat loss and the Mac East-Big Lake Alternative would result in the least. Of the remaining alternatives, the Mac East-Connector 3-Willow Alternative would result in the greatest loss of wildlife habitat (1,249 acres) followed in descending order by Mac West-Connector 2-Big Lake Alternative (1,056 acres); Mac West-Connector 1-Houston-Houston North Alternative (1,038 acres); Mac West-Connector 1-Houston-Houston South Alternative (1,032 acres); Mac East-Connector 3-Houston-Houston North Alternative (1,010 acres); and Mac East-Connector 3-Houston-Houston South Alternative (1,003 acres). SEA's review and analysis indicates that the rail line would reduce the amount of available habitat, although across all alternatives, rail line construction would result in the loss of less than one percent of the total forested habitat available in the project area, as well as less than one percent of the total wetland habitat available in the project area.

The proposed rail line would also contribute to habitat fragmentation of core forested and wetland habitats. Habitat fragmentation occurs when large areas of contiguous core habitat are split into smaller pieces, thereby increasing the amount of habitat edge or the area where one habitat is bordered by a differing habitat. This can adversely affect wildlife by creating barriers to movement, leading to edge effects, reducing core areas of available habitats, facilitating predator movements, and by increasing the intrusion of invasive species and humans. The southern segments and segment combinations would contribute to fragmentation by crossing primarily agricultural and woody wetland core habitats, while the northern segments and segment combinations would contribute to fragmentation by crossing primarily forested and emergent wetland habitats. Of the rail line alternatives, the Mac West-Connector 1-Houston-Houston South Alternative would result in fragmentation by crossing the largest area of forest and wetland habitat (3,210 acres). Of the remaining alternatives, the Mac East-Connector 3-Houston-Houston South Alternative would result in fragmentation by crossing the second largest amount of forest and wetland habitat (3,038 acres) followed in descending order by Mac West-Connector 1-Willow (2,847 acres), Mac East-Connector 3-Willow (2,675 acres), Mac West-Connector 2-Big Lake (2,631 acres), Mac West-Connector 1-Houston-Houston North (2,592 acres), Mac East-Connector 3-Houston-Houston North (2,419 acres), and Mac East-Big Lake (1,725 acres).

2.4.3.3 Fisheries Resources

A variety of both resident and anadromous fish species are present in the project area. Resident fish species are those whose life cycle does not include migration into marine waters, and include lake trout, burbot, northern pike, sculpins, sticklebacks, suckers, and pond smelt in the project area. Anadromous fish species are those whose life cycle include migration into marine waters, and include all five Pacific salmon: Chinook (king), chum (dog), coho (silver), pink (humpy), and sockeye (red), as well as rainbow trout, Dolly Varden, and eulachon in the project area. Of the species that are present, Cook Inlet Salmon (Chinook (king), chum (dog), coho (silver), pink (humpy), and sockeye (red)) are federally-regulated and, as a result, the Federal resources these species use are protected under the Magnuson-Stevens Fishery Management and Conservation Act. Rail line construction would require multiple stream crossings at locations that have fish or fish habitat. Project construction methods and timing, the type of stream crossing structure installed, and daily operations procedures would influence the severity and types of potential impacts to fish and fish habitat at each stream crossing. The primary potential impacts of crossing structures to fish and fish habitat would be loss and degradation of instream habitats due to placement of structures, alteration of stream hydrology and water quality, and blockage of fish movements. Potential rail construction impacts common to all alternatives would include loss or alteration of instream and riparian habitats, mortality from instream construction, blockage of fish movement, degradation of water quality, alteration of stream hydrology and ice breakup, and noise and vibration impacts. Potential rail operations impacts common to all alternatives would include loss or alteration of instream and riparian habitats, blockage of fish movements, and degradation of water quality through sedimentation and turbidity.

All of the build alternatives would cross streams or waterbodies that provide habitat for fish and this habitat could be affected by rail line construction and operations. All crossings of fish-bearing streams would result in some loss or alteration of stream and riparian habitats. Bridged crossings would likely result in a smaller area of instream habitat loss compared to closed-bottomed culverts. In general, clear-span bridges (those without instream supports) would have less potential to create conditions that would cause loss of spawning habitats, blockage of fish movements, alteration of stream hydrology, and increased erosion and sedimentation. The proposed project alternatives would require a minimum of 10 and a maximum of 18 crossings of streams that have been documented to contain either fish or fish habitat. The alternatives requiring the minimum number of fish-bearing stream crossings (10) are Mac East-Big Lake and Mac East-Connector 3-Houston-Houston South. The alternative requiring the maximum number of crossings (18) is Mac West-Connector 1-Houston-Houston North. Of the remaining alternatives, the Mac West-Connector 1-Willow Alternative would cross the greatest number of fish-bearing waterbodies (16), followed by Mac East-Connector 3-Houston-Houston North (15) Mac West-Connector 1-Houston-Houston South and Mac East-Connector 3-Willow (13 crossing for each), and Mac West-Connector 2-Big Lake (12).

All of the build alternatives would cross waters important for sustaining recreational and commercial salmon fisheries, with the greatest number of important waters crossed by alternatives that include the Willow Segment and the smallest number crossed by alternatives that include the Houston-Houston South Segment Combination. The Houston-Houston South Segment Combination and the Willow Segment crossings of the Little Susitna River would require instream pilings and would affect spawning habitat for salmon species. Alternatives that include the Big Lake Segment would cross Goose Creek, a large unique fen system that would likely have to be drained or filled to provide an area for construction, resulting in the loss of about 4 acres within the 200-foot ROW and likely extending outward within the 19-acre high-value wetland and juvenile rearing habitat. Of the total 43 proposed fish-bearing stream crossings, 18 contain either sticklebacks, Pacific lamprey, or both. These two species are considered Species of Conservation Concern by ADF&G.

2.4.3.4 Threatened and Endangered Species

Through consultations with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service on potential threatened or endangered species that could be affected by the proposed project, SEA determined that the proposed project could indirectly affect the federally endangered Cook Inlet beluga whale (*Delphinapterus leucas*). SEA identified and evaluated potential indirect effects on beluga whale that included: 1) beluga whale forage fish in freshwater streams that support anadromous salmon and smelt and would be crossed by the proposed rail line and 2) induced noise and disturbance effects in the immediate vicinity of Port MacKenzie at the entrance of the Knik Arm, as a result of induced increases in vessel traffic to and from Port MacKenzie. SEA, in consultation with National Marine Fisheries Service, did not identify any direct impacts from the proposed project to the beluga whale or beluga whale habitats.

SEA completed a Biological Assessment (Appendix H) and determined that the proposed action, if authorized, may affect, but is not likely to adversely affect the Cook Inlet beluga whale. NMFS has stated they will review and comment on the Biological Assessment after the public comment period for the designation of critical habitat for the Cook Inlet beluga whale closes on March 3, 2010.

2.4.4 Cultural and Historic Resources

Archaeological sites, historic sites (including historic trails), cultural landscapes (geographic areas, including both natural and cultural resources, associated with a historic event, activity, or person), and traditional cultural properties are likely to be found or have been found within the project area.

Archaeological sites that could not be avoided in the ROW could be inadvertently or purposefully destroyed through surface and subsurface disturbances, primarily during construction. Historic and potentially historic trails would be blocked in the case of unofficial trails. Officially recognized trails would be grade-separated or relocated, facilitating free passage; however, the integrity of any historic trails would still be adversely affected through the introduction of auditory and visual effects. The dog sledding cultural landscape would be adversely affected to varying degrees through loss of visual integrity.

The Mac East-Connector 3-Willow Alternative would potentially affect the most known cultural resources (51) and pass through areas with a high probability of having large numbers of undocumented cultural resources. The Mac West-Connector 1-Houston-Houston South Alternative would affect the fewest known cultural resources (20) and pass through areas with a low probability of having large numbers of undocumented cultural resources. Of the remaining alternatives, the Mac West-Connector 1-Willow alternative would potentially affect 46 cultural resources, followed in descending order by Mac East-Big Lake (39), Mac West-Connector 2-Big Lake (36), Mac East-Connector 3-Houston-Houston North (26), Mac East-Connector 3-Houston-Houston South (24), and Mac West-Connector 1-Houston-Houston North (22).

Adverse effects to cultural resources could be mitigated by minor rerouting of any alternative that may be authorized by the Board to avoid cultural resources identified within the ROW. If avoidance is not possible, mitigation could include data recovery for archaeological sites, maintaining accessibility of historic trail crossings, implementing noise and vibration reduction measures, and minimizing visual impacts.

Cultural resources listed on or determined eligible for listing on the National Register of Historic Places (NRHP) are subject to compliance with Section 106 of the National Historic Preservation Act (NHPA). Through the Section 106 process, the NHPA requires that agencies consult with the State Historic Preservation Office (SHPO) and other relevant consulting parties to develop a determination of the project's affect on cultural resources. Several consultation meetings to date regarding Section 106 and cultural resource issues have occurred with the SHPO, Matanuska-Susitna Borough Historic Preservation Commission and Knik Tribal Council. As a result, four potential cultural landscapes have been evaluated for eligibility to the NRHP and potential effects from the proposed action on eligible landscapes have been assessed for the EIS. A fifth potential cultural landscape has also been identified and an assessment of effects is ongoing.

Because all effects on historic properties cannot be fully determined prior to approval of this type of undertaking, SEA has developed a Draft Programmatic Agreement (PA) for the proposed action that would govern the completion of the Section 106 process if the proposal before the Board is authorized and the rail line is built. The Draft PA provides for the completion of the Level 2 identification survey,[12] if the Board authorizes the project and the locations of associated facilities have been established. Additionally, the Draft PA establishes responsibilities for the treatment of historic properties, the implementation of mitigation measures, and ongoing consultation efforts. The draft PA is included as Appendix J to the Draft EIS and will be published for public review and comment with the Draft EIS.

2.4.5 Subsistence

Subsistence uses are customary and traditional uses of wild renewable resources for food, shelter, fuel, clothing, and other uses. The evaluation of potential subsistence impacts associated with the proposed action includes analyzing the impacts on the areas used for subsistence activities, access to those areas, availability of resources used for subsistence and changes in the degree of competition among harvesters for subsistence resources.

Because the entire project would be outside areas designated by the state as subject to subsistence regulations, and because there are no Federal public lands in the project area, there would be no direct impacts to subsistence in the project area; however, potential indirect impacts could occur. Certain subsistence resources that use Game Management Unit (GMU)[13] 16B, such as moose, bear and waterfowl, could migrate through the project area. Train-animal collisions could result in changes in distribution, abundance and health of resources migrating to and from GMU 16B. Migratory moose could experience a disproportionate level of mortality due to movements across the proposed rail line.

Construction activities in the proposed rail line ROW and operations of the rail line could reroute subsistence user access across project area lands into areas west of the Susitna River.

[12] Level of investigation required to evaluate the eligibility of a resource for the National Register.
[13] A Game Management Unit (GMU) is one of 26 geographical areas listed under game management units in the codified State of Alaska hunting and trapping regulations and the GMU maps of Alaska shown in the Alaska State Hunting Regulation book.

Construction of the Mac East-Big Lake Alternative would affect the fewest users because all residents in the study area to the west of the alternative would have continued unobstructed access to lands west of the Susitna River. The Mac West-Connector 1-Willow Alternative could change access for the greatest number of subsistence users; the Mac East-Big Lake Alternative could change access for the fewest number of subsistence users. The farther west the alternative, the more users would be potentially affected; more communities would have to use rail line crossings to reach GMU 16B. Competition could be affected because changes in access created by the rail line could cause harvesters to begin using other communities' subsistence use areas, subsequently increasing the number of harvesters competing for resources in those places. Impacts to resource availability could most affect Beluga, Skwentna, and Tyonek because members of those communities harvest most of their subsistence resources in GMU 16B.

2.4.6 Climate and Air Quality

The U.S. Environmental Protection Agency (USEPA) national ambient air quality standards (NAAQS) regulations specify the maximum acceptable ambient concentration level for six primary or "criteria" air pollutants – ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), respirable particulate matter (PM), and lead (Pb) – and ADEC has adopted the same standards for Alaska. MSB is currently in attainment of the standards for these six criteria pollutants. To evaluate the potential impacts of increased emissions of NAAQS air pollutants plus greenhouse gas emissions, SEA developed emissions estimates for the proposed rail line construction and operation. To be conservative, SEA estimated construction and operations emissions for the longest potential alternative, the 46-mile Mac West-Connector 1-Willow Alternative, and for the maximum average train length of 80 cars. SEA found that the estimated emissions of all criteria pollutants from construction and operation would be below the *de minimis* conformity thresholds established for each pollutant and, thus, the increase would be minimal in the context of existing conditions for all of the alternatives evaluated. To the extent that commodities that would be transported by truck were shifted to rail, and to the extent that commodities transported between the Interior of Alaska and the Ports of Anchorage or Seward were shifted to Port Mackenzie, at a shorter rail haul distance, reductions in air pollutant emissions from truck traffic or from rail to and from the Ports of Anchorage and Seward would decrease.

Greenhouse gas emissions associated with the proposed action would be primarily carbon dioxide (CO_2) emissions. SEA also estimated that operation of the proposed rail line would represent a two percent increase in Alaska rail CO_2 emissions and an increase in CO_2 emissions of less than 0.01 percent for the state as a whole. SEA concluded that estimated increases from proposed rail line construction or operations would be minimal and that any direct project-related impacts to climate would be low under any of the alternatives evaluated.

2.4.7 Noise and Vibration

SEA evaluated whether operation of the proposed rail line alternatives would result in noise levels (attributable to wayside noise and the locomotive warning horn) that would equal or exceed a 65 decibel day-night average noise level (DNL) or result in an increase of at least 3 decibels (dBA) or greater (SEA's noise analysis thresholds). SEA found no receptors for which both thresholds would be exceeded and, therefore, concluded that there would be no adverse noise impacts associated with operation of any of the build alternatives. SEA compared estimated noise levels during construction to Federal Transit Administration (FTA) construction noise criteria and found that the criteria would not be exceeded unless impact pile driving for bridge construction occurs during the nighttime hours. If nighttime pile driving would occur, SEA found that estimated noise levels from pile driving would exceed the criteria at three locations on the Big Lake Segment.

On behalf of FRA, SEA also analyzed the potential noise impacts on Section 4(f) properties using FRA/FTA methods.[14] All project alternatives that include the Willow Segment would result in potential noise impacts to the Little Susitna State Recreation River, the Susitna Flats State Game Refuge, the Willow Creek State Recreation Area, and the Nancy Lake State Recreation Area. None of these refuges and recreation areas are anticipated to experience noise impacts as a result of either the Mac East-Connector 3-Houston-Houston South or Mac East-Big Lake alternative. The estimated acreage of potential noise impacts within the Willow Creek State Recreation Area is approximately 9 percent of the total acreage of the state recreation area, while the acreage of potential noise impacts within the Little Susitna Recreation River would range from 3 percent (for alternatives that include the Willow Segment) to 4 percent (for alternatives that include the Houston North Segment) of the recreation river. All other estimated potential noise impacts would affect less than 1 percent of the total acreage of the Nancy Lake State Recreation Area and the Susitna Flats State Game Refuge, although the total acreage potentially affected would be greatest within the Susitna Flats State Game Refuge, ranging from approximately 992 to 1762 acres, depending on the alternative.

SEA also evaluated whether vibration during construction and operation would exceed FTA fragile building damage criterion and found that estimated vibration levels would not exceed the criterion at any receptor locations. Similarly, SEA found that estimated vibration levels could be perceptible during construction activities such as pile driving, but would be temporary, and that vibration from operations at levels that could be annoying would not occur outside the ROW. Therefore, SEA anticipates no vibration impacts resulting from the proposed rail line.

2.4.8 Energy Resources

Energy consumption during the construction period would be temporary and would place minimal additional demand on the local energy supply. During rail line operations, energy requirements would primarily be for operation of trains. The total demand for diesel generated by the proposed action would be a very small share of the annual statewide consumption of distillate fuel. SEA anticipates that there would be a diversion of freight from truck to rail transport, which is more fuel-efficient, decreasing fuel consumption.

2.4.9 Transportation Safety and Delay

2.4.9.1 Grade Crossing Safety

To enable comparison of alternatives between Port MacKenzie and the existing ARRC mainline at the point north of Willow where the Willow Segment would connect to the main line, SEA

[14] Federal Railroad Administration. 2005. High-Speed Ground Transportation Noise and Vibration Impact Assessment.

estimated predicted accident frequency for the existing at-grade crossings along the ARRC mainline between this connection point and the point where the Big Lake Segment would connect to the main line. SEA found that the added rail traffic (two trains per day) would have a small effect on the predicted accident frequency at the existing at-grade crossings. At the at-grade crossing with the highest predicted accident frequency for existing conditions, the predicted interval between individual accidents would decrease from 54 to 51 years (i.e., accidents would be predicted to occur slightly more often). To provide an approximate upper bound of predicted accident frequency for the new at-grade crossings, SEA estimated predicted accident frequency for the crossings with the highest annual average daily traffic (AADT) in two categories – those above 500 AADT and those below 500 AADT – and found that the predicted interval between accidents would be more than 100 years for all new at-grade crossings. The Mac West-Connector 1-Houston-Houston South alternative has the highest hazard index which is about 80 percent higher than the alternative with the lowest index, the Mac East-Connector 3-Willow.

SEA anticipates that the increased rail traffic for transport of equipment and materials during the construction period would be less than during operations (that is, less than 2 trains per day), and potential impacts on safety also would be less during construction.

2.4.9.2 Traffic Delay

Vehicle delay at grade crossings varies depending on roadway and rail traffic volumes, the number of roadway lanes, train length, and train speed. SEA anticipates that the effect of the proposed action on grade crossing delay would be minimal. All alternatives would have a very small impact on road delay at grade crossings, with a maximum increase of about 7 minutes of delay per day (total for all vehicles) for any of the alternatives. SEA anticipates that the increased rail traffic during the construction period, due to transport of construction material, would be less than during operations, and potential delay impacts would also be less.

2.4.9.3 Rail Safety

ARRC anticipates transporting bulk materials and containers on the proposed rail line and has not indicated any plans to carry hazardous materials. SEA has analyzed rail transport of hazardous materials in situations involving transportation of flammable and/or toxic materials in areas with relatively high population densities and overall train traffic, and found the potential impacts to be low. Thus, SEA concludes that potential impacts of transporting hazardous materials, even if it were it to occur, would be minimal.

2.4.10 Navigation

The proposed rail line alternatives include a total of 30 stream crossings that have been determined to be or that might be considered navigable waterways. Where an alternative would cross a navigable waterway, as designated by the U.S. Coast Guard and Alaska Department of Natural Resources, there could be small temporary effects to navigability due to temporary bridges and normal bridge construction activities. Impacts to navigation from each potential crossing would be negligible because structures crossing navigable streams are required to provide vertical and horizontal clearances adequate for watercraft to pass unimpeded.

Depending on the alternative, the proposed rail line ROW would intersect from 0 to 3 navigable waterways and from 5 to 12 possible navigable waterways. The Mac West-Connector 2-Big Lake and Mac East-Big Lake alternatives could be constructed without crossing a navigable stream. However, the Mac West-Connector 2-Big Lake Alternative would cross 12 possible navigable waterways and the Mac East-Big Lake Alternative would cross 11 possible navigable waterways. The Mac West-Connector 1-Willow Alternative and Mac East-Connector 3-Willow Alternative would each cross three navigable streams. The Mac West-Connector 1-Willow Alternative would also cross eight possible navigable waterways, and the Mac East-Connector 3-Willow Alternative would cross six possible navigable waterways.

2.4.11 Land Use

2.4.11.1 Land Use

Land owners in the study area include the State of Alaska, the Federal Government, the MSB, the Alaska Mental Health Trust, the University of Alaska, private citizens, and Native Alaskans/Native Alaskan Corporations. Land in the area is commonly used for sport hunting and fishing and for traditional hunting, fishing, and gathering. Recreational use of land in the area by MSB and Anchorage residents and tourists is high, and wildlife habitat and water features are extensive. Forestry and timber harvesting are some of the designated uses of state land. ARRC would acquire the land within the proposed rail line ROW from existing land owners.

The area in the ROW cleared for construction but not needed for permanent structures would be restored to conditions consistent with rail line maintenance requirements. Construction support facilities would be sited, where possible, within the 200-foot ROW. Potential impacts to land use from these staging and construction areas would be temporary because ARRC would remove them and rehabilitate the areas after completing construction of the rail line and operations support facilities. Operations of the new freight rail service as part of the proposed project are not expected to stimulate changes in existing land uses or shift development patterns along the rail line.

The Mac West-Connector 1-Houston-Houston North Alternative would impact the least amount of private land (210 acres). Overall, this alternative would impact the fourth lowest total number of acres (1,054 acres) after the Mac East-Big Lake Alternative (990 acres), the Mac East-Connector 3-Houston-Houston North Alternative (1,040 acres), and the Mac East-Connector 3-Houston-Houston South Alternative (1,053 acres). Of these four alternatives, Mac East-Big Lake Alternative would impact the most acres of private land (422 acres) and is the second highest of all alternatives. In comparison, the Mac West-Connector 1-Houston-Houston North Alternative would cross mostly undeveloped land. The Mac West-Connector 2-Big Lake Alternative would impact the greatest amount of private land (487 acres) and the sixth total number of acres overall (1,105 acres). The Mac East-Connector 3-Houston-Houston North Alternative would impact 228 acres of private land; Mac West-Connector 1-Willow would impact 244 acres of private property; Mac East-Connector 3-Willow would impact 262 acres; Mac West- Connector 1- Houston- Houston South would impact 317 acres; and Mac East-Connector 3-Houston-Houston South alternatives would impact 335 acres of private land. Alternatives with the Mac East Segment would affect fewer acres of land in agricultural use than alternatives with the Mac West Segment. The Mac West-Connector 2-Big Lake Alternative would affect the most acres of land in agricultural use. In the area of the Big Lake Segment, the proposed rail line extension would require taking 17 residences and three structures. The Connector 3 Segment would displace two non-residential structures and the Mac East Segment would displace one residential structure.

2.4.11.2 Parks and Recreational Resources

The project area includes several designated recreation areas, including Willow Creek State Recreation Area, Nancy Lake State Recreation Area, Little Susitna State Recreation River, and two state recreation sites on the northern and southern shores of Big Lake. Many recreational trails cross the area, and there are varied recreation opportunities available to the public. The area is well suited for both winter and non-winter outdoor recreation activities.

Potential construction impacts common to all build alternatives would be temporary. These include: the obstruction of trails and waterways used to access recreation areas and resources; the generation of noise affecting hikers, boaters, and campers; increased dust and discordant visual elements in the landscape; impacts to water quality affecting recreational fishing; and alteration of local distribution of wildlife, which could affect the experience of users engaging in recreational hunting and wildlife viewing. Potential operations impacts common to all alternatives would include: loss of connectivity of unofficial trails crossed by the proposed rail line; the presence of communication towers that could permanently alter the localized movement of private aircraft; change in recreational access patterns to and along certain recreational waters; visual intrusion on the landscape that could affect the experience of recreationists. Where the proposed rail line would cross an officially recognized trail, ARRC proposed to provide public access by a grade-separated crossing. Alternatively, the trail could be relocated to avoid crossing the rail line. ARRC does not propose to provide crossings for unofficial trails. Unofficial trails would be blocked and ARRC's trespassing regulations would prohibit the public from crossing of the ROW without first obtaining approval from ARRC.

All of the alternatives would intersect the Iditarod National Historic Trail and all alternatives that include the Mac West Segment (four of the eight alternatives) would cross the Point MacKenzie Trailhead and Parking Area and the Figure 8 Lake Loop Trail. The Mac East-Connector 3-Houston-Houston South Alternative would not impact any recreation areas or refuges and would have the least effect on trails – intersecting four officially recognized trails. The Mac East-Big Lake Alternative also would not impact any recreation areas or refuges and would intersect five officially recognized trails. The Mac-West-Connector 1-Willow Alternative would impact four recreation areas/facilities and eleven named trails. The other six alternatives would result in impacts greater than the Mac East-Connector 3- Houston-Houston South-Big Lake Alternative and less than the Mac West-Connector 1-Willow Alternative.

The U.S. Department of Transportation (USDOT) regulation known as "Section 4(f)" (see 23 CFR 774) mandates that the Secretary of Transportation shall not approve any transportation project requiring the use of publicly owned parks, recreation areas or wildlife and waterfowl refuges, or significant public or private historic sites, regardless of ownership, unless the impact would be *de minimis* or there is no prudent and feasible alternative to using that land, and the program or project includes all possible planning to minimize harm to the public park, recreation area, wildlife or waterfowl refuge, or significant site, resulting from that use. Section 4(f) resources affected by one or more alternatives include three recreation areas, one game refuge, and 13 officially recognized trails within the project area. A Programmatic Agreement (a draft is provided in Appendix J of this Draft EIS) would guide future efforts during final design and construction to identify and evaluate cultural resources including those that could be protected under Section 4(f) and would establish procedures for avoiding and mitigating impacts. There are only two alternatives that FRA and STB anticipate would result in *de minimis* impacts on Section 4(f) resources: the Mac East-Big Lake Alternative and the Mac East-Connector 3-Houston-Houston South Alternative. Of these two alternatives, the Mac East-Connector 3-Houston-Houston South Alternative would affect the fewest number (1) and length (204 feet) of Section 4(f) trails, while the Mac East-Big Lake Alternative would affect the greatest number (4) and length (2,408 feet) of Section 4(f) trails. Neither of these alternatives would require use of or cause severe noise impacts, as defined by FRA, on the Susitna Flats State Game Refuge, the Little Susitna State Recreation River, the Nancy Lakes State Recreation Area, or the Willow Creek State Recreation Area. Additionally neither alternative would result in severe noise impacts, as defined by the FRA, to Section 4(f) properties. Of the remaining alternatives that would require the use of Section 4(f) resources, the Mac West-Connector 1-Willow Alternative would potentially affect the greatest number of recreational trails (10), the longest length of recreational trails (4,187 feet), and the ROW for this alternative would affect the greatest acreage of parks and recreation areas and the wildlife refuge (217 acres). The operation of trains along this alternative would result in severe noise impacts, as defined by the FRA, to approximately 2,765 acres of Section 4(f) properties. Of these remaining alternatives, the Mac East-Connector 3-Houston-Houston North would have the lowest impacts on number of trails (1), acreage of parks and recreational areas and the wildlife refuge affected by the ROW (69 acres), and length of trail crossed (204 feet). It would result in severe noise impacts, as defined by the FRA, to approximately 769 acres of Section 4(f) properties.

2.4.11.3 Hazardous Materials and Waste Sites

Potential safety or environmental impacts could result from proposed rail line construction activities as grubbing (clearing stumps and roots), filling, excavating, or related dewatering operations (removal of water from solid materials or removal of groundwater) in areas of contaminated soils or groundwater within the rail line ROW and other work areas during rail line construction. The Mac West, Mac East, Connector 1, Connector 2, Connector 3, and Big Lake segments would be located within the former Susitna Gunnery Range, a Formerly Used Defense site that could potentially contain munitions and explosives of concern. There are three known low-risk sites along the Houston South Segment that contain contaminated soils. There are no known sites of concern that present a potential for environmental consequences along the Willow, Houston, and Houston North segments. One low-risk site with petroleum-contaminated soil is known along the Connector 2 Segment. During construction, the Applicant would use information regarding the location of these sites to minimize any risks, and would follow applicable regulations to address sites identified. Routine rail line operations would not be expected to result in adverse impacts to hazardous waste sites.

2.4.12 Socioeconomics

As of 2007, the MSB had an estimated population of 82,668 and a labor force of 39,308 people. The southern segments of the proposed rail line are 36 miles away from the most populous area of the MSB, the area between Wasilla and Sutton. The MSB is part of the Anchorage Metropolitan Area and about a third of the employed residents of the Borough commute to Anchorage. Tourism and recreation are important economic sectors in the Borough and trails are often the main access available to recreational cabins and facilities.

Most socioeconomic impacts to the affected area are expected to be the same under all alternatives. The proposed action would result in a temporary stimulus to the Borough's economy and labor market. ARRC estimates it would employ 66 to 100 workers in the various phases of the 2-year construction period; however, the positive impact to employment would be temporary because it would be limited to the construction period. The impact from direct expenditures in the project area and local employment would increase from local expenditures by employees and providers of services during the rail construction period. The operation of the proposed rail line is expected to provide Port MacKenzie with a transportation alternative to the existing truck access to the Port for the movement of bulk materials and to support the use of the Port as a general cargo port. The extent of the socioeconomic impact would depend on the extent to which the rail line was used and generated demand for services at the Port. Additionally, access to resources such as coal could attract new industries to the Port MacKenzie District.

Potential socioeconomic impacts that would differ by segment include displacement of residences, businesses, and agricultural land and potential impacts to economic activities related to the use of unofficial trails. Unofficial trails would be blocked, and ARRC's trespassing regulations would prohibit crossing of the ROW. While recreation and tourism activities that use unofficial trails would be blocked by the proposed rail line, they could potentially be diverted to officially recognized trails. This could have a potentially adverse effect on economic activities directly or indirectly related to the use of such trails. The southern rail line segments would cross agricultural parcels with the Mac West-Connector 2-Big Lake Alternative affecting the greatest number of acres. Alternatives with the Mac East Segment would affect the least number of acres of agricultural land. Some agricultural production would likely be lost. Given the small number of residential displacements, no difficulties in identifying and providing comparable nearby housing is expected.

2.4.13 Environmental Justice

SEA assessed whether any high and adverse impacts to human health or the environment would occur as a result of the proposed action. SEA expects no high and adverse human health or environmental effects from the proposed action. Therefore there would be no high and adverse impacts to environmental justice populations in the project area.

2.4.14 Cumulative Effects

SEA collected and reviewed information on relevant past, present, and reasonably foreseeable future projects and actions that could have effects that coincide in time and space with the potential effects from the proposed action. For those identified relevant projects, SEA identified where there could be cumulative impacts. Reasonably foreseeable activities within the project area could include: Cook Inlet Areawide Oil and Gas Lease Sale; Cook Inlet Ferry; Cook Inlet OCGen™ Power Project; Knik Arm Crossing; Knik-Willow Transmission; Goose Creek Correctional Center; MSB Regional Aviation System Plan; Natural Gas Pipeline: Beluga to Fairbanks; a suite of Port MacKenzie Development Projects;[15] Port of Anchorage (POA) Marine Terminal Redevelopment Project; a host of road projects in the MSB; South Wasilla Rail Line Relocation; the Su-Kink Wetland Bank – Umbrella Mitigation Bank Instrument – Big Lake South Individual Bank Plan; and the West Mat-Su Access Project. The effects of these projects in combination with the impacts of the proposed action could result in cumulative adverse effects to geology and soils, water resources, biological resources, cultural and historic resources, subsistence, climate and air quality, noise, energy, transportation safety and delay, and land use.

2.4.15 Comparison of Potential Impacts

Table 2-2 highlights potential impacts for resource areas and topics for which there are noteworthy differences among the build alternatives. The largest impacts would occur to water, cultural and recreational resources. Alternatives that include the Mac West Segment would tend to require a greater number of water body crossings and impact a greater amount of floodplains and wetlands when compared with alternatives containing the Mac East Segment. Alternatives including the Big Lake Segment would impact 25 acres of a wetland mitigation bank. The dog sledding cultural landscape would be adversely affected by all build alternatives. Alternatives including the Big Lake and Willow segments would tend to impact a greater number of known cultural resources and have many medium to high level probability areas for encountering cultural resources. Alternatives including the Mac West – Connector 1 Segment Combination or the Willow Segment would tend to cross a greater number of trails and recreational areas. Although all of the proposed rail line segments are technically feasible to build, and any combination of the segments that would connect the existing main line to Port MacKenzie would satisfy the project's purpose and need, there are only two alternatives that FRA and STB anticipate would result in *de minimis* impacts on Section 4(f) resources: the Mac East-Big Lake Alternative and the Mac East-Connector 3-Houston-Houston South Alternative. Based on Section 4(f) provisions, the FRA would not be permitted to provide funding for any STB authorized alternative that would involve the use of a Section 4(f) property, unless the impacts would be *de minimis*, or there were no prudent and feasible alternatives that avoided Section 4(f) properties. Under the No-Action Alternative there would be no impacts from the proposed project.

[15] These include the development of a bulk materials facility, gravel mining operations, deep draft dock expansion, and barge dock expansion.

Table 2-2
Summary and Comparison of Potential Impacts (page 1 of 3)

	Mac West-Conn 1-Willow	Mac West-Conn 1-Houston-Houston North	Mac West-Conn 1-Houston-Houston South	Mac West-Conn 2- Big Lake	Mac East-Conn 3-Willow	Mac East-Conn 3-Houston-Houston North	Mac East-Conn 3-Houston-Houston South	Mac East- Big Lake
Topography, Geology, Soils	Topography relatively flat, little need for cutting and filling expected	Topography relatively flat, little need for cutting and filling expected	Topography relatively flat, little need for cutting and filling expected	Topography relatively flat, with some areas of rolling hills, greater need for cutting and filling expected	Topography relatively flat, little need for cutting and filling expected	Topography relatively flat, little need for cutting and filling expected	Topography relatively flat, little need for cutting and filling expected	Topography relatively flat, with some areas of rolling hills, greater need for cutting and filling expected
	Locally important soil acres lost: 510	Locally important soil acres lost: 297	Locally important soil acres lost: 312	Locally important soil acres lost: 317	Locally important soil acres lost: 608	Locally important soil acres lost: 390	Locally important soil acres lost: 406	Locally important soil acres lost: 322
Water Resources	Crossings include 34 culverts, 3 culvert extensions, 4 drainage structures,[16] and 4 bridges	Crossings include 33 culverts, 13 culvert extensions, 4 drainage structures, and 1 bridge	Crossings include 34 culverts, 2 culvert extensions, 3 drainage structures, and 1 bridge	Crossings include 32 culverts, 3 culvert extensions, and 7 drainage structures	Crossings include 20 culverts, 3 culvert extensions, 3 drainage structures, and 4 bridges	Crossings include 19 culverts, 13 culvert extensions, 3 drainage structures, and 1 bridge	Crossings include 20 culverts, 2 culvert extensions, 2 drainage structures, and 1 bridge	Crossings include 16 culverts, 3 culvert extensions, and 7 drainage structures
	11 identified floodplain crossings and potential floodplain crossings	10 identified floodplain crossings and potential floodplain crossings	9 identified floodplain crossings and potential floodplain crossings	6 identified floodplain crossings and potential floodplain crossings	9 identified floodplain crossings and potential floodplain crossings	8 identified floodplain crossings and potential floodplain crossings	7 identified floodplain crossings and potential floodplain crossings	5 identified floodplain crossings and potential floodplain crossings
	Total wetland acres: 363 (Forested 148, Scrub/shrub 179, Emergent 32, Other waters 4)	Total wetland acres: 478 (Forested 169, Scrub/shrub 253, Emergent 50, Other waters 6)	Total wetland acres: 424 (Forested 153, Scrub/shrub 226, Emergent 41, Other waters 4)	Total wetland acres: 347 (Forested 135, Scrub/shrub 187, Emergent 24, Other waters 1)	Total wetland acres: 188 (Forested 94, Scrub/shrub 78, Emergent 13 Other waters 3)	Total wetland acres: 301 (Forested 116, Scrub/shrub 151, Emergent 30 Other waters 4)	Total wetland acres: 248 (Forested 100, Scrub/shrub 124, Emergent 21 Other waters 3)	Total wetland acres: 209 (Forested 88, Scrub/shrub 112, Emergent 8, Other waters 1)

[16] Drainage structures are defined as crossing structures whose structure would be determined by the Applicant during the final design process and could include multi-plate culverts, pre-cast arches, and single or multiple short-span bridges.

Table 2-2
Summary and Comparison of Potential Impacts (page 2 of 3)

	Mac West-Conn 1-Willow	Mac West-Conn 1-Houston-Houston North	Mac West-Conn 1-Houston-Houston South	Mac West-Conn 2- Big Lake	Mac East-Conn 3-Willow	Mac East-Conn 3-Houston-Houston North	Mac East-Conn 3-Houston-Houston South	Mac East-Big Lake
Biological Resources	Total habitat acres lost: 1,272	Total habitat acres lost: 1,038	Total habitat acres lost: 1,032	Total habitat acres lost: 1,056	Total habitat acres lost: 1,249	Total habitat acres lost: 1,010	Total habitat acres lost: 1,003	Total habitat acres lost: 930
	Fragmentation of core habitats: 2,847 acres of forested and woody wetland habitat	Fragmentation of core habitats: 2,592 acres of primarily woody wetland and emergent wetland habitat	Fragmentation of core habitats: 3,210 acres of primarily woody wetland and emergent wetland habitat	Fragmentation of core habitats: 2,631 acres of forested and wetland habitat	Fragmentation of core habitats: 2,675 acres of forested and woody wetland habitat	Fragmentation of core habitats: 2,419 acres of emergent wetland, woody wetland, and forested habitat	Fragmentation of core habitats: 3,038 acres of emergent wetland, woody wetland, and forested habitat	Fragmentation of core habitats: 1,725 acres of forested and woody wetland habitat
	Moose foraging habitat acres lost: 326	Moose foraging habitat acres lost: 451	Moose foraging habitat acres lost: 506	Moose foraging habitat acres lost: 408	Moose foraging habitat acres lost: 224	Moose foraging habitat acres lost: 348	Moose foraging habitat acres lost: 403	Moose foraging habitat acres lost: 315
	Fish-bearing streams crossings: 16	Fish-bearing stream crossings: 18	Fish-bearing stream crossings: 13	Fish-bearing stream crossings: 12	Fish-bearing stream crossings: 13	Fish-bearing stream crossings: 15	Fish-bearing stream crossings: 10	Fish-bearing stream crossings: 10
	Anadromous Stream crossings: 7	Anadromous Stream crossings: 9	Anadromous Stream crossings: 6	Anadromous Stream crossings: 8	Anadromous Stream crossings: 6	Anadromous Stream crossings: 8	Anadromous Stream crossings: 5	Anadromous Stream crossings: 8
Cultural Resources	Total number of known cultural resources potentially affected: 46	Total number of known cultural resources potentially affected: 22	Total number of known cultural resources potentially affected: 20	Total number of known cultural resources potentially affected: 36	Total number of known cultural resources potentially affected: 51	Total number of known cultural resources potentially affected: 26	Total number of known cultural resources potentially affected: 24	Total number of known cultural resources potentially affected: 39
	Probability for cultural resources: low, medium and high level areas	Probability for cultural resources: low	Probability for cultural resources: low	Probability for cultural resources: low, medium and high level areas	Probability for cultural resources: many medium to high level areas	Probability for cultural resources: low, medium and high level areas	Probability for cultural resources: low, medium and high level areas	Probability for cultural resources: many medium to high level areas

Table 2-2
Summary and Comparison of Potential Impacts (page 3 of 3)

	Mac West-Conn 1-Willow	Mac West-Conn 1-Houston-Houston North	Mac West-Conn 1-Houston-Houston South	Mac West-Conn 2- Big Lake	Mac East-Conn 3-Willow	Mac East-Conn 3-Houston-Houston North	Mac East-Conn 3-Houston-Houston South	Mac East-Big Lake
Land Use	244 acres private land	210 acres private land	317 acres private land	487 acres private land	262 acres private land	228 acres private land	335 acres private land	422 acres private land
	Structures in the 200-foot ROW: 0	Structures in the 200-foot ROW: 0	Structures in the 200-foot ROW: 0	Structures in the 200-foot ROW: 20 displaced most of which are residences	Structures in the 200-foot ROW: 3 (1 residence)	Structures in the 200-foot ROW: 3 (1 residence)	Structures in the 200-foot ROW: 3 (1 residence)	Structures in the 200-foot ROW: 21 displaced most of which are residences
	Acres in agricultural use lost: 66	Acres in agricultural use lost: 64	Acres in agricultural use lost: 64	Acres in agricultural use lost: 94	Acres in agricultural use lost: 94	Acres in agricultural use lost: 7	Acres in agricultural use lost: 5	Acres in agricultural use lost: 5
	Official trails crossed: 11	Official trails crossed: 8	Official trails crossed: 8	Official trails crossed: 6	Official trails crossed: 8	Official trails crossed: 4	Official trails crossed: 4	Official trails crossed: 5
	4 state recreation or refuge areas crossed	2 state recreation or refuge areas crossed	2 state recreation or refuge areas crossed	1 state recreation or refuge area crossed	4 state recreation or refuge areas crossed	1 state recreation or refuge area crossed	0 state recreation or refuge area crossed	0 state recreation or refuge areas crossed
	Adverse noise impact to 2,765 acres of Section 4(f) properties	Adverse noise impact to 2,258 acres of Section 4(f) properties	Adverse noise impact to 1,489 acres of Section 4(f) properties	Adverse noise impact to 992 acres of Section 4(f) properties	Adverse noise impact to 1,276 acres of Section 4(f) properties	Adverse noise impact to 769 acres of Section 4(f) properties	Adverse noise impact to 0 acres of Section 4(f) properties	Adverse noise impact to 0 acres of Section 4(f) properties

3. TOPOGRAPHY, GEOLOGY, AND SOILS

This chapter describes topography, geology, soils, permafrost and seismic hazards anticipated to be encountered during construction and operation of the proposed Port MacKenzie Rail Extension. Section 3.1 describes the regulatory setting and Section 3.2 describes the study area. Sections 3.3 through 3.6 describe analysis methods, the affected environment (existing conditions), and potential environmental consequences (impacts) related to topography, geology and soils, permafrost, and seismic hazards.

3.1 Regulatory Setting

There are no Federal, State of Alaska, or Matanuska-Susitna Borough (MSB) regulations regarding the protection of or minimization of impacts to topography, geology, or permafrost that either exist or would apply to the proposed rail line extension. Federal codes and design guidelines, such as the Uniform Building Code, which the MSB has adopted under the Borough Code for buildings and structures, address structure earthquake resistance. The American Association of State Highway Transportation Officials provides guidelines for the seismic design of highway bridges, which could apply to the construction of bridge crossings along the proposed rail line extension. The American Railway Engineering and Maintenance-of-Way Association has developed recommended guidelines and standards for the seismic design of new railroad structures and embankments.

Regarding the protection of soils, Congress enacted the Farmland Protection Policy Act of 1981 in response to substantial decreases in the amount of open farmland resulting from the high rate of conversion to other uses. The Act's purpose is to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses. The Act addresses prime and unique farmland and farmland of statewide or local importance (7 U.S. Code [U.S.C.] 4201(c)(1)(A), (B), and (C)). However, there are no prime farmlands in Alaska because soil temperatures do not meet the prime farmland threshold established by Congress. No unique farmlands or farmlands of statewide importance have been designated in Alaska, however, the MSB has adopted criteria for Farmlands of Local Importance for lands within its boundaries (USDA, undated).

3.2 Study Area

The proposed Port MacKenzie Rail Extension would be between the Susitna River to the west, the Knik Arm to the south and east, and the Talkeetna Mountains to the north. It would lie within the Susitna Lowland, which is the landward extension of the Cook Inlet Depression. The depression is a structural basin that contains the lowland basins of the Susitna River, its tributaries, and several other rivers that flow directly into the head of Cook Inlet. This area has been subjected to several glacial advance and retreat cycles, and the resulting gently undulating landforms consist primarily of glacial moraines, outwash deposits, and organic and bog soils.

3.3 Topography

3.3.1 Analysis Methodology

The objective of the topographic analysis was to identify and compare the extent to which the proposed rail line alternatives would require modifications to the current topography to meet project design objectives. The proposed rail line would be designed to meet Federal Railroad Administration Class 4 track standards to facilitate 60-mile-per-hour freight operations. Grade changes are typically kept to a minimum to maximize fuel efficiency and lessen long-term maintenance costs. ARRC's design objectives for the proposed rail line alternatives would limit grades to a maximum of 1 percent to maintain consistency in train components and reduce the need for additional facilities for helper locomotives. The topographic analysis study area consists of the 200-foot-wide right-of-way (ROW) corridor of the individual proposed rail line segments and segment combinations.

3.3.2 Affected Environment

The terrain in the study area is relatively flat. Most of the area lies between 150 and 200 feet in elevation, with a few locations having elevations as high as 450 feet. Topographic relief is present in the form of scattered gently rolling landforms. There is no extreme or rugged topography in the study area.

There are several topographic sub-areas in the study area. The Point MacKenzie Agricultural Area is a flat, gently sloping plain at the southern end of the study area. To the north and east of Big Lake, the land undulates significantly more than other areas. North and west of Big Lake, to the ridge west of Red Shirt Lake, the terrain is flat and has relatively persistent marshy areas. Terrain to the north and west of this ridge is relatively flat, with isolated areas of high ground.

3.3.3 Environmental Consequences

3.3.3.1 Proposed Action

Common Impacts

Spatial analysis of topography was completed using 50-foot contours available on U.S. Geological Survey 1:63,360 scale series topographic maps encompassing the entire study area. Slopes were determined using Geographic Information System software. Each proposed alternative was bisected at the intersection of a contour line to create numerous segments and segment combinations. A "from" and "to" elevation was recorded for the end points of each segment. The difference between these two elevations was calculated and divided into the length of each segment to obtain percent slope. Because ARRC's geometric design goals include grades limited to 1 percent, the software was used to identify slopes by band widths (less than or equal to 1 percent, greater than 1 percent to 5 percent, and greater than 5 percent) to identify areas where topography would be a concern and associate a relative degree of concern. Table 3-1 lists this information.

Table 3-1
Slope Analysis of Alternative Segments and Segment Combinations

Segment/Segment Combination	Percent Slope Less Than or Equal to 1 Percent (linear feet)	Percent Slope Greater Than 1 to 5 Percent (linear feet)	Percent Slope Greater than 5 Percent (linear feet)
Mac West-Connector 1	93.3 (82,300)	6.7 (5,900)	0.0 (0)
Mac West-Connector 2	94.4 (77,900)	5.6 (4,600)	0.0 (0)
Mac East-Connector 3	91.2 (77,600)	8.3 (7,100)	0.5 (400)
Mac East	86.9 (50,100)	12.3 (7,100)	0.7 (400)
Willow	93.7 (148,300)	5.9 (9,300)	0.4 (700)
Big Lake	79.4 (88,400)	15.3 (17,000)	5.4 (6,000)
Houston-Houston North	94.6 (94,600)	3.8 (3,800)	1.6 (1,600)
Houston-Houston South	93.1 (95,900)	5.3 (5,500)	1.6 (1,600)

Steeper terrain would require a greater amount of either fill or cut and fill during rail line construction than flatter terrain, and would therefore have a greater impact on topography. Normally, the steeper the terrain is, the greater the impact.

From Table 3-1 it can be seen that all segments and segment combinations would be relatively flat, with most having approximately 90 to 95 percent of their total lengths on ground with a slope of less than or equal to 1 percent, and approximately 4 to 12 percent of their lengths on ground with a slope between 1 and 5 percent. A notable exception is the Big Lake Segment, which would cross ground with a slope of 1 percent or less along only about 80 percent of its length. This segment would also cross the highest percentage of slopes between 1 and 5 percent (15.3 percent of its length), slopes greater than 5 percent (5.4 percent of its length), and would cross ground with the highest maximum slope (27 percent). The Mac East Segment has the second steepest conditions, with 12.3 percent of its length crossing ground with slopes between 1 and 5 percent, and 0.7 percent of its length crossing ground with slopes greater than 5 percent.

Construction Impacts

Temporary impacts would consist of cuts for the construction of railroads that would be needed for construction access or for temporary facilities such as construction staging areas, material laydown/stockpile areas and temporary camp/emergency facilities. If such areas were regraded to match the original topography after they were no longer needed, there would be no permanent impact.

There would be permanent physical impacts to topography wherever the terrain would be reshaped during construction to meet railroad design objectives. With ARRC's objective to construct the rail line with a grade of 1 percent or less, fill or cut and fill earthwork would be needed along most of the alternatives. Ditches and other drainage structures would also be cut into the terrain along the proposed rail line to prevent storm water or snow melt runoff from damaging the railbed. Other construction activities, such as those for associated facilities, bridge approaches, communication towers, access roads, and drainage structures, would also permanently alter topography. In areas of temporary construction activities, impacts would be permanent if restoration did not occur.

Operations Impacts

Proposed rail line operations would not result in impacts to topography. Any excavation or filling required for maintenance activities would be temporary.

Summary of Impacts to Topography by Alternative

Table 3-2 summarizes the potential topographical impacts of each proposed rail line alternative.

Table 3-2
Slope Analysis of Proposed Port MacKenzie Rail Extension Alternatives

Alternative	Length (linear feet) with Slope Less Than or Equal to 1 Percent	Length (linear feet) with Slope Greater Than 1 to 5 Percent	Length (linear feet) with Slope Greater than 5 Percent
Mac West-Connector 1-Willow	230,600	15,200	700
Mac West-Connector 1-Houston-Houston North	176,900	9,700	1,600
Mac West-Connector 1-Houston-Houston South	178,200	11,400	1,600
Mac West-Connector 2-Big Lake	166,300	21,600	6,000
Mac East-Connector 3-Willow	225,900	16,400	1,100
Mac East-Connector 3-Houston-Houston North	172,200	10,900	2,000
Mac East-Connector 3-Houston-Houston South	173,500	12,600	2,000
Mac East-Big Lake	138,500	24,100	6,400

From Table 3-2 it can be seen that, except for the two alternatives that include the Big Lake Segment, most alternatives would be relatively flat, which minimize cut and fill requirements. The two alternatives with the Big Lake Segment (i.e. Mac West-Connector 2-Big Lake and Mac East-Big Lake) would also cross the greatest lengths of ground sloping at more than 5 percent.

3.3.3.2 No-Action Alternative

Absent the proposed rail extension, there could be other, non-project-related impacts to topography. Natural processes such as erosion and seismic activity would continue to shape the topography of the area.

3.4 Geology and Soils

3.4.1 Analysis Methodology

The objective of the geology analysis was to identify areas of bedrock that would need to be removed to construct the proposed rail line. Existing project geotechnical reconnaissance reports (Shannon & Wilson, 2003; 2007a; 2007b; 2007c) include information regarding geological conditions in the study area.

The objectives of the soils analyses included identification of: soils that would be unsuitable for construction and would need to be compacted or removed and replaced with suitable imported materials; highly erodible soils; and soils that MSB considers to be of local importance for agricultural uses and that would no longer be available if the rail line were constructed. The geology and soils analysis study area consists of the 200-foot-wide ROW of the individual proposed rail line segments and segment combinations.

The U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) has classified and mapped soils in the Matanuska-Susitna Valley (USDA, 1998). Forty-one separate soil units, exclusive of organic and peat soils, have been identified along proposed rail line alternatives (USDA, 1998). Based on soils mapping data, soils within the 200-foot-wide ROW were classified as either good, moderate, or poor regarding their usability for construction of the rail line. The soils mapping data were also used to determine the susceptibility of soils to wind erosion or to sheet and rill erosion by water. Soils classification is based on information regarding the drainage characteristics of individual soil units, the amount of gravel and sand present, and frost susceptibility (USDA, 1998). Unsuitable soils were further identified based on data from peat probes (Shannon & Wilson, 2007a) in delineated bog sections along each proposed rail line segment.

The Point MacKenzie Agricultural District and some parcels along the Willow Segment contain soils the MSB has designated as Farmlands of Local Importance, protected under the Farmland Protection Policy Act. The Board's Section of Environmental Analysis (SEA) has coordinated with NRCS to determine the potential acres of impact to farmland soils, as required by the Farmland Protection Policy Act. Section 3.4.3.1 describes the results of this consultation.

3.4.2 Affected Environment

The alternatives would cross areas dominated by glacially-derived landforms. The area has been subject to several glacial advance and retreat cycles that have completely or partially covered the landscape with glacial ice (Shannon & Wilson, 2007a). The most recent glacial advance, known as the Naptowne Glaciation, created and shaped many of the landforms visible today. This advance transported rock debris from the Chugach and Talkeetna Mountains, and left behind unconsolidated moraine and glaciofluvial outwash deposits. In the project vicinity, these glacial and glaciofluvial deposits are overlain by soils consisting largely of well-drained silt loams and poorly drained mucky silt loams and peats (Shannon & Wilson, 2003).

Moraine deposits in the study area tend to be dense, unstratified, and composed of material ranging in size from clay and silt to boulders. These moraine deposits are commonly found in and beneath topographically high areas. Outwash deposits are typically less dense than moraine deposits, are composed of relatively clean sand and gravel, and can be found in broad, low-lying areas at the southwestern end of the study area. In addition to the moraine and outwash deposits, there is a region of low-lying bogs with indeterminate underlying geology within the study area (Shannon & Wilson, 2007b, 2007c). This region abuts the moraine deposits, is roughly triangular, and is in the northeastern portion of the study area. Figure 3-1 shows the approximate extents of these three general deposit types in the vicinity of the project alternatives.

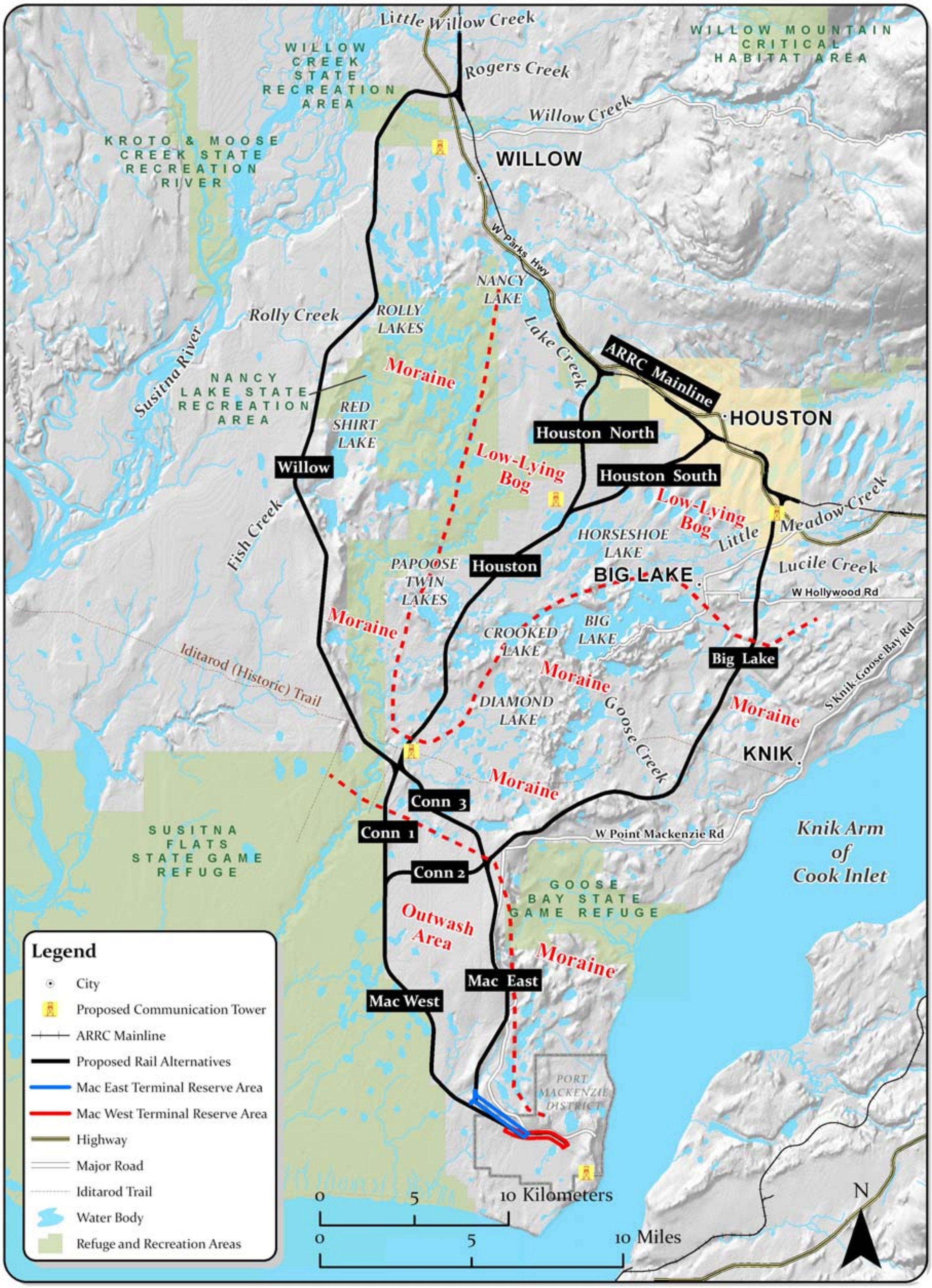

Figure 3-1. Terrain Along the Proposed Port MacKenzie Rail Extension Segments

Surface soils in the study area consist of reworked glacial and glaciofluvial deposits, and soils deposited by wind and volcanic activity. These soils consist of silt loams, gravels, and sands.

Soft, compressible organic and peat soils are common in low-lying areas, along the margins of streams, and within closed depressions. These deposits can be dozens of feet thick (Shannon & Wilson, 2003). The amount of fine-grained particles influences the susceptibility of a soil to erosion, with finer-grained soils having a higher susceptibility to wind and water erosion (USDA, 1998). Table 3-3 summarizes the soil units in the soils analysis study area.

Table 3-4 lists the soils the MSB considers locally important for agricultural uses and protected under the Farmland Protection Policy Act explained in Section 3.1.

3.4.3 Environmental Consequences

3.4.3.1 Proposed Action

Common Impacts

Construction Impacts

Outcroppings of bedrock are rare or absent throughout the study area, and bedrock should not be encountered in any cuts required for rail line construction. Therefore, there would be no impacts to geologic resources.

Construction activities would affect soils unsuitable for rail line construction because these soils would need to be removed and replaced with imported, well-draining soils. Soft, compressible organic and peat soils, present in wetland areas, would also have to be compacted or removed and replaced. At some locations along the proposed rail line, a segment could encounter hills or slopes where soils would need to be cut away, potentially affecting the stability of the slope. Furthermore, wind and water erosion would be a concern where slopes were cut in erodible soils. Larger cut slopes would have greater potential for erosion.

In some locations, the railroad would be constructed on soils the MSB considers locally important for agricultural purposes. This loss of soil use would apply to the full width of the rail line ROW. SEA coordinated with NRCS to determine the potential acres of impact to these locally important farmland soils, as required by the Farmland Protection Policy Act. SEA, in coordination with NRCS, assessed non-soil-related criteria, such as the potential for impacts to the local agricultural economy if the land were converted to non-farm use and compatibility with existing agricultural use. In conjunction with NRCS, SEA made scoring decisions in the context of each proposed alternative by examining the alternative, the surrounding area, and the programs and policies of the state or local unit of government in which the alternative would be located. The computed score enabled SEA to identify the effects of the proposed project on farmland. All of the alternatives received a score of less than 160; therefore, according to the Farmland Protection Policy Act, they do not need to be given further consideration for protection and no additional alternatives need to be evaluated. Chapter 13, Land Use, describes potential impacts to agricultural lands.

Table 3-3
Natural Resources Conservation Service Mapped Soils Units in the Study Area[a]

Soil Unit	Description	Usability for Construction	Erodibility
101, 103	Benka Silt Loam	Moderate	Not Highly
114	Chilligan	Poor	Not Highly
116	Cryaquepts	Poor	Not Highly
120	Cryods	Poor	Highly
122	Deception Silt Loam	Poor	Potentially Highly
123, 124	Deception Silt Loam	Poor	Highly
125	Deception Silt Loam	Poor	Not Highly
126	Delyndia Silt Loam	Good	Not Highly
128	Disappoint Very Cobbly Mucky Silt Loam	Poor	Not Highly
131, 132, 133, 134	Estelle Silt Loam	Poor	Highly
135, 136	Estelle	Poor	Highly
141	Histosols	Poor	Not Highly
147, 148, 149	Kashwitna Silt Loam	Good	Highly
150	Keba Silt Loam	Poor	Not Highly
151	Kichatna Silt Loam	Good	Not Highly
152, 153	Kichatna Silt Loam	Good	Highly
154	Kichatna Silt Loam	Good	Potentially Highly
155	Kichatna-Deception Complex	Good	Highly
156	Kichatna-Deception Complex	Moderate	Highly
157	Kichatna-Deception Complex	Good	Potentially Highly
158	Kichatna-Delyndia Silt Loams	Good	Not Highly
163	Killey and Moose River Soils	Good	Not Highly
169	Liten Silt Loam	Moderate	Potentially Highly
171	Nancy Silt Loam	Good	Not Highly
172	Nancy Silt Loam	Good	Highly
185	Susitna Silt Loam	Good	Not Highly
186	Susvivar-Moose River Complex	Poor	Not Highly
203	Typic Cryaquents	Poor	Not Highly
208	Whitsol Silt Loam, Silty Substratum	Poor	Not Highly
209	Whitsol Silt Loam, Silty Substratum	Poor	Potentially Highly
216	Yohn Silt Loam	Poor	Potentially Highly
218	Yohn-Delyndia Complex	Poor	Potentially Highly

[a] Source: USDA, 1998.

Table 3-4
Locally Important Agricultural Soils in the Study Area[a]

Soil Unit	Description
101	Benka Silt Loam, 0- to 3-Percent Slopes
103	Benka Silt Loam, Undulating
114	Chilligan, Undulating-Cryaquepts Complex
134	Estelle Silt Loam, Undulating
147	Kashwitna Silt Loam, 0- to 3-Percent Slopes
149	Kashwitna Silt Loam, Undulating
150	Keba Silt Loam, Undulating
171	Nancy Silt Loam, 0- to 3-Percent Slopes
185	Sustina Silt Loam, 0- to 2-Percent Slopes
208	Whitsol Silt Loam, Silty Substratum, 0- to 7-Percent Slopes

[a] Source: USDA, undated.

Operations Impacts

There would be no impacts to geology or soils from proposed rail line operations as long as erodible soils were stabilized and revegetated following construction.

Impacts to Soils by Alternative Segment and Segment Combination

Table 3-5 lists the percentages of soils classified as good, moderate, and poor (NRCS classifications for usability for construction, see Section 3.4.1), and percentages of soils the MSB considers locally important for agricultural purposes by segment or segment combination. Table 3-6 lists the percentages of highly or potentially highly erodible soils.

From Table 3-5 it can be seen that southern segment and segment combinations (Mac West-Connector 1, Mac West-Connector 2, Mac East-Connector 3, and Mac East) would cross a higher percentage of good soils and much shorter lengths of peat and organic soils than northern segments, but would cross a much higher percentage of soils considered to be of local importance for agricultural purposes.

From Table 3-6 it can be seen that all segments and segment combinations have soils classified as highly or potentially highly erodible along more than a quarter of their lengths, with the greatest (64 percent) being present along the Big Lake Segment.

Table 3-5
Construction Impacts to Soils by Segment and Segment Combination

Segment/Segment Combination	Good (percent)	Moderate (percent)	Poor (percent)	Agricultural Soils (percent)	Peat and Organic Soils along the Segment (of ROW feet)	Peat and Organic Soils along the Segment (acres)
Mac West-Connector 1	28	0	72	41	20,400	94
Mac West-Connector 2	33	0	67	49	12,600	58
Mac East-Connector 3	46	0	54	59	9,100	42
Mac East	32	0	68	62	4,900	23
Willow	25	15	60	38	25,300	116
Big Lake	28	4	68	6	16,900	78
Houston-Houston North	26	3	71	13	52,400	241
Houston-Houston South	33	3	64	16	34,600	159

Table 3-6
Erodibility of Soils by Segment and Segment Combination

Segment/Segment Combination	Not Highly Erodible Soils (percent)	Highly or Potentially Highly Erodible Soils (percent)
Mac West-Connector 1	73	27
Mac West-Connector 2	67	33
Mac East-Connector 3	55	45
Mac East	68	32
Willow	58	42
Big Lake	36	64
Houston-Houston North	63	37
Houston-Houston South	64	36

Southern Segments/Segment Combinations

Mac West-Connector 1 Segment Combination

This segment combination would primarily cross outwash deposits, but would also cross moraine deposits on the northern 1 to 2 miles of its length. Table 3-5 lists the percentages of soils classified as good, moderate, and poor, and percentages of soils the MSB considers locally important for agricultural purposes along this segment. Peat and organic soils, which range from 3 to 10 feet thick, would be encountered along this segment, as listed in Table 3-5. Highly or potentially highly erodible soils are present along 27 percent of this segment, as listed in Table 3-6. This segment has the lowest erosion potential of all segments and segment combinations.

Mac West-Connector 2 Segment Combination

This segment combination would cross outwash deposits along its entire length. Table 3-5 lists the percentages of soils classified as good, moderate, and poor, and percentages of soils the MSB considers locally important for agricultural purposes along this segment. This segment combination would cross agricultural soils of local importance along 49 percent of its length, which is the second highest percentage among all segments and segment combinations. Peat and organic soils, which range from 3 to10 feet thick, would be encountered along this segment, as listed in Table 3-5. Table 3-6 lists the percentage of highly or potentially highly erodible soils along this segment.

Mac East-Connector 3 Segment Combination

The Mac East portion of this segment combination would cross outwash deposits and the Connector 3 Segment portion would cross moraine deposits. Table 3-5 lists the percentages of soils classified as good, moderate, and poor, and percentages of soils the MSB considers locally important for agricultural purposes along this segment. This segment combination would cross good soils along 46 percent of its length, which is the highest percentage among all segments and segment combinations. The Mac East-Connector 3 Segment Combination would cross agricultural soils of local importance along 59 percent of its length, the second highest percentage among all segments and segment combinations. Peat and organic soils, which range from 3 to 15 feet thick, would be encountered along this segment combination, as listed in Table 3-5. With the exception of the Mac East Segment, this segment combination would cross the shortest length (9,100 feet) of peat and organic soils. Highly or potentially highly erodible soils are present along 45 percent of this segment combination, as listed in Table 3-6. This segment combination has the second highest erosion potential of all segments and segment combinations.

Mac East

The Mac East Segment would cross outwash deposits along its entire length. Table 3-5 lists the percentages of soils classified as good, moderate, and poor, and percentages of soils the MSB considers locally important for agricultural purposes along this segment. This segment would cross good soils along 32 percent of its length. Mac East would also cross agricultural soils of local importance along 62 percent of its length, the highest percentage among all segments and segment combinations. Peat and organic soils, which range from 3 to 15 feet thick, would be encountered along this segment, as listed in Table 3-5. This segment would cross the shortest length (4,900 feet) of peat and organic soils among all segments and segment combinations. Highly or potentially highly erodible soils are present along 32 percent of this segment, as listed in Table 3-6.

Northern Segments and Segment Combinations

Willow Segment

This segment would cross moraine deposits for its entire length. Table 3-5 lists the percentages of soils classified as good, moderate, and poor, and percentages of soils the MSB considers locally important for agricultural purposes along this segment. Peat and organic soils, which range from 3 to 15 feet thick, would be encountered along this segment, as listed in Table 3-5. Table 3-6 lists the percentage of highly or potentially highly erodible soils along this segment.

Big Lake Segment

This segment would cross moraine deposits along much of its length, but would cross low-lying bog deposits along the northern 5 to 6 miles of the segment. Table 3-5 lists the percentages of soils classified as good, moderate, and poor, and percentages of soils the MSB considers locally important for agricultural purposes along this segment. This segment would cross poor soils along 68 percent of its length, the second highest percentage among all segments and segment combinations. The segment would cross agricultural soils of local importance along 6 percent of its length, the lowest percentage among all segments and segment combinations. Peat and organic soils, which range from 3 to 15 feet thick, would be encountered along this segment, as listed in Table 3-5. Highly or potentially highly erodible soils are present along 64 percent of this segment, as listed in Table 3-6. This segment has the highest erosion potential of all segments and segment combinations.

Houston-Houston North Segment Combination

This segment would cross low-lying bog deposits except the southern 1 to 2 miles of this segment, which would cross moraine deposits. Table 3-5 lists the percentages of soils classified as good, moderate, and poor, and percentages of soils the MSB considers locally important for agricultural purposes along this segment. This segment would cross poor soils along 71 percent of its length, the second highest percentage among all segments and segment combinations. Peat and organic soils, which range from 3 to more than 20 feet thick, would be encountered along this segment, as listed in Table 3-5. This segment would cross the greatest length (52,400 feet) of peat and organic soils among all segments and segment combinations. Table 3-6 lists the percentage of highly or potentially highly erodible soils along this segment.

Houston-Houston South Segment Combination

Like the Houston-Houston North Segment Combination, most of this segment combination would cross low-lying bog deposits, except for the southern 1 to 2 miles, which would cross moraine deposits. Table 3-5 lists the percentages of soils classified as good, moderate, and poor, and percentages of soils the MSB considers locally important for agricultural purposes along this segment. Peat and organic soils, which range from 3 to 15 feet thick, would be encountered along this segment, as listed in Table 3-5. This segment would cross the second greatest length (34,600 feet) of peat and organic soils among all segments and segment combinations. Table 3-6 lists the percentage of highly or potentially highly erodible soils along this segment.

Impacts to Soils by Alternative

Table 3-7 lists the percentages of soils classified as good, moderate, and poor, and percentages of peat and organic soils the MSB considers locally important for agricultural purposes along each rail line alternative. Table 3-8 lists highly or potentially highly erodible soils along each alternative.

Table 3-7
Construction Impacts to Soils by Rail Line Alternative

Alternative	Classification (percent) Good	Classification (percent) Moderate	Classification (percent) Poor	Agricultural Soils (percent)	Agricultural Soils (acres)	Peat and Organic Soils along the Alternative (feet)	Peat and Organic Soils along the Alternative (acres)
Mac West-Connector 1-Willow	27	8	65	40	510	45,600	209
Mac West-Connector 1-Houston-Houston North	28	1	71	29	297	72,800	334
Mac West-Connector 1-Houston-Houston South	30	1	69	30	312	54,900	252
Mac West-Connector 2-Big Lake	30	2	68	29	317	29,500	135
Mac East-Connector 3-Willow	33	8	59	47	608	34,300	157
Mac East-Connector 3-Houston-Houston North	35	1	64	39	390	61,500	282
Mac East-Connector 3-Houston-Houston South	38	1	61	40	406	43,600	200
Mac East-Big Lake	28	2	70	33	322	21,800	100

Table 3-8
Erodibility of Soils by Rail Line Alternative

Alternatives	Classification: Highly Erodible or Potentially Highly Erodible Soils (percent)
Mac West-Connector 1-Willow	35
Mac West-Connector 1-Houston-Houston North	31
Mac West-Connector 1-Houston-Houston South	31
Mac West-Connector 2-Big Lake	47
Mac East-Connector 3-Willow	41
Mac East-Connector 3-Houston-Houston North	39
Mac East-Connector 3-Houston-Houston South	38
Mac East-Big Lake	47

Table 3-7 shows that the Mac West-Connector 1-Houston-Houston North Alternative would contain both the greatest percentage of poor soils and the greatest length of peat and organic soils. The table also shows that the Mac East-Connector 3-Willow Alternative would have the greatest impact to soils the MSB considers locally important for agricultural purposes. Table 3-8 shows that the greatest amount of highly erodible or potentially highly erodible soils would be found along the Mac East-Big Lake and Mac West-Connector 2-Big Lake alternatives, because both these alternatives would include the Big Lake Segment.

3.4.3.2 No-Action Alternative

Absent the proposed rail extension, there could be other, non-project-related impacts to geology and soils. Natural processes such as erosion and seismic activity would continue to shape the geology and soils of the area.

3.5 Permafrost

Permafrost is defined as earth (soil) materials that remain continuously frozen (temperature lower than 32 degrees Fahrenheit) for at least 2 years. Permafrost zonation in the northern hemisphere is defined by the percentage of surface underlain by permafrost. The four defined zones are Continuous (90 to 100 percent), Discontinuous (50 to 90 percent), Sporadic (10 to 50 percent), and Isolated Patches (0 to 10 percent) (U.S. Arctic Research Commission Permafrost Task Force, 2003).

3.5.1 Analysis Methodology

No formal field investigations have been performed to determine the presence or absence of permafrost along the proposed rail alternatives. Geotechnical investigations completed to date consist only of surface observations and subsurface probing to determine the depth of soft surficial soils. No permafrost was identified during these investigations. Using available Geographic Information System data, analyses were performed by SEA to infer the presence of permafrost through identification of physical surface features that are typically indicative of frozen ground, specifically, scrub black spruce forests and steep north-facing terrain that limits ground exposure to sun and its warming effects. The permafrost analysis study area consists of the 200-foot-wide ROW of the individual proposed rail line segments and segment combinations. The analyses consisted of the determination of areas within the ROW of each alignment where evergreen forests are present on north-facing slopes steeper than 20 percent.

3.5.2 Affected Environment

Various permafrost studies and references classify the area of the Susitna Lowland plain (the location of the proposed rail line) as either isolated patch permafrost, or as an area that is generally free of permafrost. There have been no formal field investigations to specifically identify permafrost along the proposed rail line segments and segment combinations, however, the presence of permafrost has been documented in the study area.

The degree to which permafrost affects the physical environment depends on its type, depth, and extent. Massive permafrost influences overlying vegetation and soil characteristics, runoff, and to a limited extent, topography. Left undisturbed and in a stable state, permafrost has little effect on the physical environment. However, environmental or human disturbances can cause irreversible thawing and degradation of permafrost, which can produce changes to the ground surface and disruption of infrastructure.

The maintenance of permafrost depends on climate and disturbance activities. Mean annual temperatures throughout Alaska have shown a warming trend that, if it continues, would reduce the extent of permafrost. A reversal in this trend could cause an increase in the extent of permafrost. Human disturbance has much more immediate effects.

For areas within the ROW of each alternative where evergreen forests are present on north-facing slopes steeper than 20 percent, the Geographic Information System analyses identified only two very small areas where this combination exists (<1 acre along the Houston Segment and <1 acre along the Big Lake Segment). This analysis was conservative because slopes providing shade to harbor permafrost generally need to be much steeper, and the evergreen forest Geographic Information System data represent a much more diverse community of vegetation than the scrub black spruce forest of concern. With the exception of the small areas noted above, there are essentially no areas along the proposed rail alternatives that have a combination of the two conditions that would indicate a high probability of underlying permafrost. Although permafrost could be present in the study area, the physical characteristics of the area (gently rolling terrain with mixed deciduous and evergreen forests) are indicative of sporadic to nonexistent permafrost zonation.

3.5.3 Environmental Consequences

3.5.3.1 Proposed Action

In the absence of identified locations or types of permafrost in the study area, it is not possible to correlate impacts to individual rail line segments or segment combinations. Therefore, the following discussion of impacts to permafrost is common to all segments and segment combinations.

Construction Impacts

Any disturbances during construction activities that cause permafrost to degrade would result in a permanent change. Upon completion of construction, the condition of the affected permafrost would either not change or continue to degrade with the passage of time until it reached thermal equilibrium.

Although permafrost is the predominant and most serious cause of engineering problems that affect the Alaska Railroad in Interior Alaska, it is not reported to be a problem along the portions of the existing railroad system south of the Alaska Range. Clearing, disruption of vegetative cover, placement of fill materials, and other construction activities would disturb thermal equilibrium in the subgrade. If permafrost was present, these activities would induce thawing, which could result in subsidence of the ground surface. Significant amounts of subsidence could severely disrupt infrastructure such as roads, bridges, buildings, culverts, and utilities. The extent of settlement and resulting damage would be directly related to the amount of ice present in the permafrost that melted before thermal equilibrium was reached.

Construction of the railbed would remove or reduce the insulating vegetative layer and also reduce the surface albedo (reflectance of solar energy), which would cause an increase in ground surface temperature in summer. These conditions would increase thaw penetration below the natural depth of thaw. If the soils were thaw-unstable (high ice content in combination with silty soils), the embankment and its shoulders would settle as the ice melted and the water drained out of the soil. If the railbed was constructed on permafrost with a high potential for subsidence, the rate of thaw could be slowed by the use of insulating mats and gravel embankments of increased thickness to keep frozen substrates frozen, and therefore load bearing.

Specific construction methods that would be employed in areas of permafrost, if present, would greatly depend on the permafrost and site conditions encountered. Because areas of permafrost in the study area are expected to be few and small, minor shifts of the rail alignment could avoid or minimize impacts to permafrost. Therefore, impacts to permafrost during rail line construction would be expected to be low.

Operations Impacts

During rail line operations, temperature changes in the railbed related to compaction and friction produced by equipment using the railbed could cause impacts to permafrost, if present; however, these impacts would be expected to be low.

3.5.3.2 No-Action Alternative

Because permafrost was not identified as likely to be present in the project area, any potential impacts would be limited. Nevertheless, natural processes such as climate change and any potential alternative development activities that could occur in place of the proposed rail extension could impact permafrost if it was present.

3.6 Seismic Hazards

3.6.1 Analysis Methodology

Seismic hazard analyses were performed by reviewing scientific and engineering literature regarding seismicity in Southcentral Alaska, and reviewing maps of probabilistic seismic hazards in the study area. Assessments of seismic potential and hazard can be evaluated to estimate the probabilities that various levels of earthquake ground motion would be exceeded at a site in a period of time. Such evaluations use three inputs – seismic source, seismicity, and a ground motion attenuation function (a function of earthquake magnitude and distance) (DOI, 2002). The resulting evaluation of seismic hazard can be used to produce maps of probabilistic seismic hazard.

Probabilistic seismic hazard maps of Alaska were prepared in 1999 (Wesson, 2007). In 2005, an effort to revise and extend the maps was initiated, taking into account new and improved information about the earthquake hazard in the region and improvements in methodology. The most significant development since preparation of the 1999 maps was the occurrence of the November 3, 2002, Denali earthquake (moment magnitude 7.9), the epicenter of which was about 50 miles south of Donnelly, Alaska, approximately 150 miles north-northeast of the project area. Ground motion was felt most strongly north of the Alaska Range. This was the largest earthquake recorded in Interior Alaska (USGS, 2006; Trans-Alaska Pipeline System Owners, 2001). Because of high seismic activity in the proposed Port MacKenzie Rail Extension study area, seismic events could affect all alternatives. Due to the regional nature of seismic hazards, the seismic hazards study area covers a broad geographic area including essentially all of Southcentral Alaska and the Alaska Range.

3.6.2 Affected Environment

The Upper Cook Inlet Basin is a very tectonically active region, characterized by numerous potentially active fault-cored folds (folded layers of rock with faults that run through the center of the folds) between two major linear faults and underlain by the subduction zone (the area where one plate is forced beneath another) between the North American and Pacific Plates. Seismicity in the region comes from three sources (see Figure 3-2) – megathrust earthquakes associated with the subduction zone, strike-slip earthquakes associated with the surficial transformation boundary (the area at the Earth's surface where one plate moves against another) between plates, and shallow crust earthquakes within the North American Plate (PND Engineering Inc., 2006).

The megathrust subduction zone is the dominant source of seismicity capable of producing earthquakes of magnitude 9 or greater. Earthquakes of this magnitude are capable of lasting for minutes and having an extreme number of ground motion cycles; thus, they have a greater probability of causing damage. Shallow crustal earthquakes and strike-slip fault earthquakes have much shorter durations and less extreme motion cycles.

The Castle Mountain Fault is an active strike-slip (horizontal movement of plates along a fault line) fault, the western part of which runs through the vicinity of the project. This western part of the fault has a 38-mile-long Holocene fault scarp (surface feature that has occurred within the last 12,000 years). Two earthquakes have been recorded on this fault – a magnitude 5.7 earthquake in 1983 and a magnitude 4.5 earthquake in 1996. Both earthquakes occurred on the eastern part of the fault (not within the study area) and neither resulted in surface displacement. Characteristics of the Castle Mountain Fault were recently revised in USGS Report 2007-1043 (Wesson *et al.*, 2007). New data and analysis suggest slip rates higher than those previously determined, and earthquakes of a reduced magnitude (7.1 versus 7.5) with a recurrence interval of 730 years.

3.6.3 Environmental Consequences

3.6.3.1 Proposed Action

Seismic impacts on the study area would most likely be common to all segments and segment combinations. Seismic impacts would be the same during rail line operation and maintenance, and proportionally less during rail line construction, depending on when a seismic event occurred. The most likely impact on the rail line from seismic activity would be misalignment or damage to the tracks, railbed, or access road. This could be caused by ground shaking, offset lateral movement, or soil subsidence. If strong enough, ground shaking could also cause trains to derail.

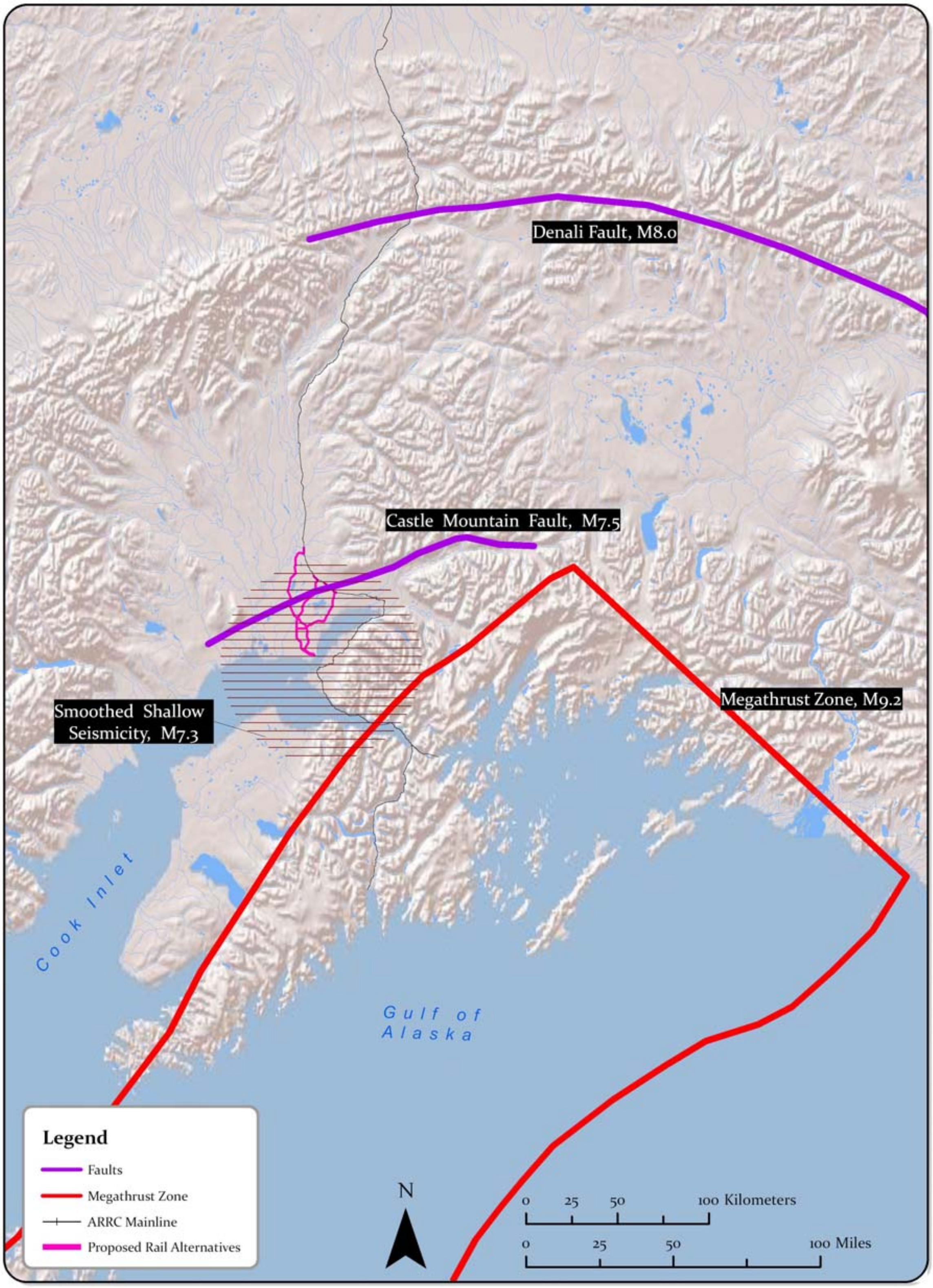

Figure 3-2. Seismicity in the Region of the Proposed Port MacKenzie Rail Extension

The greatest likelihood of potential damage is a loss of subgrade strength by water-laden unconsolidated granular sediments (liquefaction) that would cause embankments to move laterally or settle. Soil liquefaction describes the behavior of loose saturated unconsolidated soils that go from solid state to liquid as a consequence of increasing pore water pressures, decreasing in volume when subject to earthquake loading (Yould and Idriss, 2001). Liquefaction is most likely to occur in loose to moderate granular soils with poor drainage, such as silty sands or sands and gravels capped or containing seams of impermeable sediments. Subsidence and movement of subsurface deposits beneath the railbed could result. The term land-spreading is used to describe the lateral displacement of the soils as it occurs even in flat-lying areas due to liquefaction. Deposits of sands and silts along riverbeds are known to be particularly susceptible to liquefaction. The damage at stream crossings where the railbed and bridge components were constructed over saturated soils was the predominant source of damage to railroad bridges as a result of the 1964 earthquake (McCulloch and Bonilla, 1970). Because topographic relief along the proposed rail line segments and segment combinations consists of scattered gently rolling landforms, the threat of earthquake-induced mass wasting events such as landslides, rockslides, or slumping would be low.

With the segments and segment combinations being relatively close to each other, the minor differences in distance between a segment and a seismic event would not have an appreciably different effect on the segments and segment combinations. Even though the Willow Segment would cross the Castle Mountain Fault, the chances of damage occurring at that location are insignificantly different than damage occurring along other segments and segment combinations due to the regional nature of seismically induced ground motion. This would also be the case for the Houston South Segment and a portion of the Houston Segment that run parallel to and within a mile of the Castle Mountain fault.

3.6.3.2 No-Action Alternative

Under the No-Action Alternative, ARRC would not construct and operate the proposed Port MacKenzie Rail Extension and there would be no impact on the rail line from seismic activity.

4. WATER RESOURCES

This chapter describes potential direct and indirect impacts to water resources that would result from proposed Port MacKenzie Rail Extension construction and operations. Section 4.1 describes regulations governing water resources, and Sections 4.2, 4.3, 4.4, and 4.5 describe the study area, affected environment (existing conditions), and environmental consequences (impacts) to surface water, groundwater, floodplains, and wetlands, respectively.

4.1 Regulatory Setting

Table 4.1-1 summarizes relevant Federal, state, and local agency water resources laws, regulations, and Executive Orders.

Table 4.1-1
Water Resources Laws, Regulations, and Executive Orders (page 1 of 4)

Agency	Authority	Description
Federal		
U.S. Environmental Protection Agency (USEPA)	Safe Drinking Water Act [42 United States Code (U.S.C.) 300 *et seq.*] – Sole Source Aquifer Protection Program (Section 1424(e))	The Safe Drinking Water Act protects drinking water and its sources (rivers, lakes, reservoirs, springs, and groundwater). Federally funded or partially federally funded projects with the potential to contaminate designated sole-source aquifers require USEPA review. Sole-source aquifers are defined as supplying at least 50 percent of the drinking water consumed for the area overlying the aquifer.
	Section 402, Clean Water Act (22 U.S.C. 1251 *et seq.*) – National Pollutant Discharge Elimination System (NPDES): Point Source and Storm water Discharges	The NPDES program controls discharges into waters of the U.S. Direct discharges or "point source" discharges are from sources such as pipes and sewers. NPDES permits, issued by either the USEPA or an authorized state/tribe, contain industry-specific, technology-based, and/or water-quality-based limits, and establish pollutant monitoring and reporting requirements. A facility that intends to discharge into the Nation's waters must obtain a permit before initiating a discharge. In 1987, the Clean Water Act was amended to require the USEPA to establish a program to address storm water discharges. In response, the USEPA promulgated the NPDES storm water permit application regulations. Storm water discharge associated with industrial activity means the discharge from any conveyance used for collecting and conveying storm water and is directly related to manufacturing, processing, or raw materials storage areas at an industrial plant. These regulations require that facilities with the following storm water discharges apply for an NPDES permit: (1) a discharge associated with industrial activity, (2) a discharge from a large or medium municipal storm sewer system, or (3) a discharge that the USEPA or state/tribe determines to contribute to a violation of a water quality standard or that is a significant contributor of pollutants to waters of the United States. The USEPA is in the process of delegating administration of the NPDES program in Alaska to the Alaska Department of Environmental Conservation. Upon delegation, the USEPA will provide program oversight. See state regulations, Alaska Pollutant Discharge Elimination System, for more information. On October 31, 2008, the USEPA formally approved the Alaska Pollutant Discharge Elimination System Program. Authority over Federal permitting and compliance and enforcement programs will transfer to the Alaska Department of Environmental Conservation

Table 4.1-1
Water Resources Laws, Regulations, and Executive Orders (page 2 of 4)

Agency	Authority	Description
Federal (continued)		
U.S. Environmental Protection Agency (USEPA) (continued)	Water Act (22 U.S.C. 1251 *et seq.*) – National Pollutant Discharge Elimination System (NPDES): Point Source and Storm water Discharges (continued)	(ADEC) over 3 years beginning at program approval. Until authority over a facility transfers to ADEC, the USEPA will remain the permitting, compliance, and enforcement authority for that facility. The USEPA will still regulate storm water discharges from construction activities within Alaska until October 31, 2009. Until which time as the state takes over the storm water program, the construction contractor would apply for coverage under the NPDES Construction General Permit by creating a Storm Water Pollution Prevention Plan and issuing a Notice of Intent to the USEPA prior to commencement of ground-disturbing activities. Once ADEC takes over the program in late 2009, the existing NPDES coverage will serve as an Alaska Pollutant Discharge Elimination System authorization until ADEC reissues their version of general permits. ADEC will then transmit a cover letter to all permit holders to inform them that ADEC has assumed responsibility for permitting, compliance, and enforcement authority over the construction activity.
	Section 404, Clean Water Act: (33 U.S.C. 1251 *et seq.*) – Discharge of Fill Material to Waters of the U.S.	In 1972, Section 404 of the Clean Water Act established a program to regulate the discharge of dredged or fill material into waters of the U.S. The Rivers and Harbors Act of 1899 defined navigable waters of the U.S. as "those waters that are subject to the ebb and flow of the tides and/or are presently used, or have been used in the past, or may be susceptible to use to transport interstate or foreign commerce." The Clean Water Act built on this definition and defined waters of the United States to include tributaries to navigable waters, interstate wetlands, wetlands that could affect interstate or foreign commerce, and wetlands adjacent to other waters of the U.S. The USEPA and the U.S. Army Corps of Engineers jointly administer the program. The USEPA provides program oversight. The fundamental rationale of the program is that no discharge of dredged or fill material should be permitted if there is a practicable alternative that would be less damaging to aquatic resources or if significant degradation would occur to the Nation's waters. To comply with Section 404, it is necessary to avoid impacts to wetlands wherever practicable, minimize impacts where impacts are unavoidable, and compensate for impacts in some cases. The USEPA reviews and comments on Section 404 permit applications received by the U.S. Army Corps of Engineers for compliance with Section 404(b)(1) guidelines and other statutes and authorities within its jurisdiction (40 Code of Federal Regulations [CFR] 230).
Federal Emergency Management Agency (FEMA)	National Flood Insurance Act of 1968	The U.S. Congress established the National Flood Insurance Program with passage of the National Flood Insurance Act of 1968. The Flood Insurance Program is a pre-disaster flood mitigation and insurance program designed to reduce the exorbitant costs of disasters. It is a voluntary program that provides a *quid pro quo* approach to floodplain management and makes federally backed flood insurance available to residents and business owners in communities that agree to adopt and adhere to sound flood mitigation measures that guide development in their floodplains. FEMA is responsible for administering the National Flood Insurance Program and programs that provide assistance for mitigating future damages from natural hazards. In addition, FEMA is required by statute to identify and map the Nation's flood-prone areas and to establish flood-risk zones in such areas.

Table 4.1-1
Water Resources Laws, Regulations, and Executive Orders (page 3 of 4)

Agency	Regulation	Description
Federal (continued)		
U.S. Army Corps of Engineers	Section 404, Clean Water Act (33 U.S.C. 1251 *et seq.*) – Discharge of Fill Material to Waters of the U.S.	The Corps of Engineers is responsible for the day-to-day administration and permit review. Permit review and issuance follows a sequenced process that encourages avoidance of impacts, followed by minimizing impacts, and finally, requiring mitigation for unavoidable impacts to the aquatic environment.
	Section 10 of the Rivers and Harbors Act (33 U.S.C. 403) – Navigable Waters of U.S. Dredge and Fill Permit	Section 10 requires authorization from the Corps of Engineers for the construction of any structure in or over any navigable water of the U.S., the excavation/dredging or deposition of material in this water, or any obstruction or alteration in navigable water. Structure or work outside the limits defined for navigable waters of the U.S. requires a permit if the structure or work affects the course, location, condition, or capacity of the water body.
	Executive Order 11990, *Protection of Wetlands*	The purpose of this Executive Order is to “minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands.” To meet these objectives, Federal agencies, in planning their actions, are required to consider alternatives to wetland sites and limit potential damage if an activity affecting a wetland cannot be avoided. The order applies to acquisition, management, and disposition of Federal lands and facilities construction and improvement projects undertaken, financed, or assisted by Federal agencies; and Federal activities and programs affecting land use, including but not limited to, water and related land resources planning, regulation, and licensing activities. Wetlands not located on Federal property are still considered under the Executive Order when they are hydrologically connected to a water of the U.S. The Corps of Engineers administers this Executive Order.
	Executive Order 11988, *Floodplain Management*	This Executive Order requires Federal agencies to avoid, to the extent possible, long- and short-term adverse impacts associated with occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. In accomplishing this objective, “each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities” for the following actions: acquiring, managing, and disposing of Federal lands and facilities; providing federally undertaken, financed, or assisted construction and improvements; and conducting Federal activities and programs affecting land use, including but not limited to, water and related land resources planning, regulation, and licensing activities.
U.S. Coast Guard	Section 9 of the Rivers and Harbors Act (22 U.S.C. 403) – Bridge Permit	Section 9 requires authorization from the U.S. Army Corps of Engineers to construct any dam or dike in a navigable water of the U.S. Construction of bridges and causeways requires permits under Section 9 from the Coast Guard. Corps of Engineers authorization is required for the discharge of dredged or fill material into waters of the U.S. associated with dams, dikes, bridges, and causeways under Section 404 of the Clean Water Act.

Table 4.1-1
Water Resources Laws, Regulations, and Executive Orders (page 4 of 4)

Agency	Regulation	Description
State		
Alaska Department of Natural Resources (ADNR)	Alaska Coastal Management Act (Alaska Statute 46.40)	The Alaska Coastal Management Program improves stewardship of Alaska's coastal land and water uses, and natural resources and involves local, state, Federal, and applicants in the project approval process. The Program requires that projects in Alaska's coastal zone be reviewed by coastal resource management professionals and found consistent with the statewide standards of the Program.
	Temporary Water Use Permit (Alaska Statute 46.15)	This permit may be issued if the amount of water to be used would be significant, the use would continue for less than 5 consecutive years, and the water to be used is not appropriated.
Alaska Department of Environmental Conservation (ADEC)	Section 401 of the Clean Water Act – Section 401 Certification	Pursuant to Section 401 of the Clean Water Act, the State of Alaska certifies that projects comply with state water quality standards. This is commonly known as the 401 Certification. This review typically results in conditions placed on either or both the Section 404 permit and Coastal Consistency Determination. The U.S. Army Corps of Engineers initiates 401 Certification as part of the 404 permitting process. ADEC issues the certification.
	Antidegradation Policy (18 AAC 70.015(a)(3))	This policy requires that if a high quality water constitutes an outstanding national resource, such as a water of a national or state park or wildlife refuge or a water of exceptional recreational or ecological significance, the quality of that water must be maintained and protected.
	Drinking Water Program (18 Alaska Administrative Code 80)	This program requires public water systems to comply with state drinking water regulations, in accordance with the Federal Safe Drinking Water Act and Amendments, for the public health protection of the residents and visitors to the State of Alaska.
	Alaska Pollution Discharge Elimination System: Point Source and Storm water Discharges	As of October 31, 2008, ADEC is implementing a phased delegation of the USEPA NPDES program. The USEPA is transferring program components to ADEC by EPA in four phases. Storm water, the component applicable to the proposed Port MacKenzie Rail Extension, will be delegated to ADEC in Phase 2 on October 31, 2009. See discussion of the NPDES program under Federal regulations.
Local		
Matanuska-Susitna Borough (MSB)	Flood Plain Development Permit, including both the MSB Flood Hazard Development Permit and the Elevation Certificate (MSB 17.29)	Flood Plain Development Permits apply to development within a federally designated flood hazard area. A Flood Plain Development Permit (issued by MSB) would include both the MSB Flood Hazard Development Permit and the Elevation Certificate. An Alaska registered architect or engineer must certify the Development Permit Applications and either a registered engineer or surveyor must complete the elevation certificate.

4.2 Surface Water

This section describes the analysis of potential impacts to surface water from construction and operations of the proposed Port MacKenzie Rail Extension. Section 4.2.1 describes the surface water study area, Section 4.2.2 describes the methods employed to analyze impacts to surface water, Section 4.2.3 describes the affected environment (existing conditions), and Section 4.2.4 describes potential environmental consequences (impacts) to surface water.

4.2.1 Study Area

The proposed Port MacKenzie Rail Extension would be northwest of Anchorage on the west side of the Knik Arm. The area is within the Matanuska-Susitna Borough (MSB or Borough) Susitna River valley, bounded by the Susitna River on the west, Knik Arm of Cook Inlet on the south and east, and Parks Highway and the existing ARRC main line on the north. The Susitna River watershed is approximately 20,752 square miles; it is the fifth largest basin in Alaska, comprising more than half of the Cook Inlet drainage basin (USGS, 1999). Surface drainage in the area is generally to the west and south. Subsequently, areas either drain into Cook Inlet, Knik Arm, or the Susitna River, which also discharges to Cook Inlet (ARRC, 2008). The study area for surface waters is the area within the proposed rail line 200-foot ROW.

4.2.2 Analysis Methodology

The Applicant performed a hydrologic review of the study area to identify surface water resources, including pre- and post-project drainage patterns, flow rates, and floodplain limits and encroachments (ARRC, 2008). The Applicant also identified stream and river crossings from MSB's Geographic Information System Division data based on tax parcel maps and orthoimagery. After the Applicant's analysts identified crossing locations, they delineated crossing-location drainage areas with the Environmental Systems Research Institute ArcHydro computer program. After computing flow directions based on a U.S. Geological Survey 2 arc-second (30-meter) digital elevation map, analysts obtained a flow accumulation grid for the study area and then used ArcHydro to delineate the drainage area of each crossing location based on the flow direction and accumulation patterns. Analysts subsequently checked and refined the computer-generated delineations using Geological Survey digital topographic quadrangle maps. Several minor refinements to crossing locations resulted from SEA field studies in 2008. Analysts calculated the design flow used to size hydraulic structures for mapped streams for the 100-year flood event, as recommended by the American Railway Engineering and Maintenance-of-Way Association.

Crossing structures would consist of bridges and culverts. Crossing structures identified as "drainage structures" would be determined by the Applicant during the final design process and could include multi-plate culverts, pre-cast arches, and single or multiple short-span bridges. In addition, the Applicant would extend existing culverts and construct new bridges for rail sidings proposed along the existing ARRC main line where any of the alternatives would connect to the main line. The hydrologic review report is a preliminary analysis that determined the approximate locations of crossings and types of conveyance structures; final locations, conveyance structures, and structure sizes would be determined during final design and permitting. SEA conducted an independent review of the Applicant's methodology and hydrologic review report.

SEA used the results of the Applicant's hydrologic review report to qualitatively analyze potential impacts to surface water from the proposed Port MacKenzie Rail Extension. The analysis incorporated review of existing ARRC project descriptions, ARRC's voluntary proposed mitigation measures, and further review of waterbodies using Geographic Information Systems. SEA collected stream-characteristic and water-quality data at ARRC-proposed stream crossing locations in the summer of 2008 (Noel *et al.*, 2008) and considered these data in the analysis of potential impacts to surface water. SEA's surface water impact analysis focuses on general impacts to water quality and hydrology, which are based on rail line construction activities and conveyance structures proposed at each crossing. This section also addresses potential impacts to water quality during rail line operation. Other parts of this EIS address potential impacts to other resources associated with or that depend on surface waters, such as fisheries (Section 5.4 and Appendix F), floodplains (Section 4.4), navigation (Chapter 12), wetlands (Section 4.5 and Appendix C), essential fish habitat (Section 5.4 and Appendix G), and subsistence (Chapter 7).

4.2.3 Affected Environment

4.2.3.1 Hydrologic Environment

Surface waters in the study area include streams and rivers, lakes, and wetlands. Smaller streams join to form larger streams; the continued joining eventually forms rivers that ultimately flow into lakes, or wetlands. The interconnected system of moving waterbodies is a watershed. Watersheds are defined by the drainage basins or drainage divides, and can be discussed on small, local scales or on large scales. One watershed or basin can be comprised of multiple sub-watersheds or sub-basins.

The proposed Port MacKenzie Rail Extension would lie within the following nine watersheds (see Figure 4.2-1):

- Little Willow Creek watershed (172 square miles) receives drainage from Rogers Creek and many unnamed tributaries in the Talkeetna Mountains. Little Willow Creek begins at its headwaters in the Talkeetna Mountains and flows approximately 43 miles through MSB before discharging into the Susitna River. Six miles of the Willow Segment would transect this watershed.
- Willow Creek watershed (254 square miles) receives drainage from many small tributaries in the Talkeetna Mountains. Willow Creek begins at its headwaters in the Talkeetna Mountains and flows approximately 40 miles through MSB before discharging into the Susitna River. One mile of the Willow Segment would transect this watershed.
- The Susitna River watershed is extensive (6,160 square miles) and includes many major river tributaries. The Lower Susitna River sub-basin receives drainage from Little Willow Creek, Willow Creek, Rolly Creek, Fish Creek, and other small unnamed creeks before discharging into Cook Inlet. Approximately 8 miles of the Willow Segment would transect this watershed.

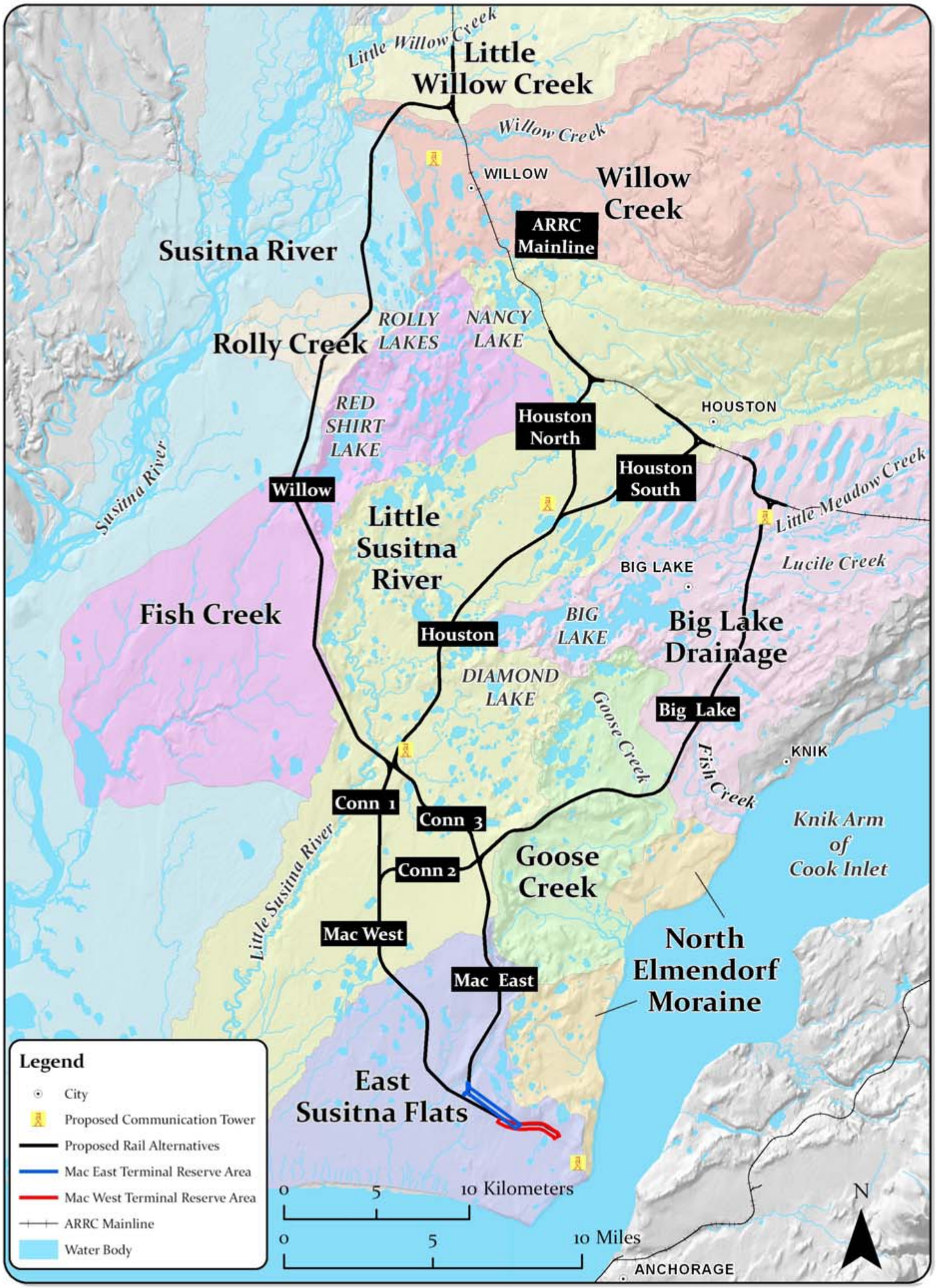

Figure 4.2-1. Watersheds in the Proposed Port MacKenzie Rail Extension Study Area

- Rolly Creek watershed (13 square miles) receives drainage from North Rolly Lake and many minor tributaries. Rolly Creek drains approximately 7 miles through MSB before discharging into the Susitna River. Four miles of the Willow Segment would transect this watershed.
- Fish Creek watershed (111 square miles) receives drainage from Lynx Creek and many small creeks in the Red Shirt Lake area. This watershed drains approximately 30 miles through MSB before discharging into Flat Horn Lake and then into the Susitna River. Eight miles of the Willow Segment would transect this watershed.
- The Little Susitna River watershed (373 square miles) receives drainage from Lake Creek and other small unnamed tributaries. The Little Susitna River begins in the Talkeetna Mountains at Hatcher Pass and flows approximately 122 miles through MSB and discharges into Cook Inlet (Wasilla SWCD, 2009). All of the rail line segments would transect this watershed, ranging from 2 miles for the Big Lake Segment to 10 miles for Houston.
- Big Lake Drainage Area watershed (120 square miles) receives drainage from Meadow Creek, Little Meadow Creek, Lucile Creek, Big Lake, and Fish Creek. It drains approximately 52 miles through MSB before discharging into the Knik Arm. Fourteen miles of the Big Lake Segment would transect this watershed.
- Goose Creek watershed (43 square miles) receives drainage from Stephens Lake and many small unnamed tributaries in the study area. It flows for approximately 14 miles before discharging into Knik Arm. Six miles of the Big Lake Segment would transect this watershed.
- East Susitna Flats watershed (66 square miles) is a nearly flat drainage system of many small unnamed streams discharging into Cook Inlet. About 8 miles of the Mac East Segment and 9 miles of the Mac West Segment would transect this watershed.

These watersheds can contain several distinct hydrologic regimes – high-gradient, high-elevation mountainous areas and low-gradient, low-elevation areas with lakes and wetlands. The Talkeetna Mountains, north of the Little Susitna River in the upper drainage area of the Little Susitna River, Willow Creek, and Little Willow Creek, have greater relief and a better-developed drainage patterns. This is due to the differential glacial erosion that took place in this area; however, drainage is still complicated by post-glacial surface morphology. In the lower drainage area of the Little Susitna River and all of the study area south of the Little Susitna River, the landscape is dominated by hundreds of small, irregular lakes. Most of these lakes are formed in kettle moraines where the land surface was shaped primarily by retreating glacial ice. They are not usually associated with stream systems. There are also a large number of drainage and outlet lakes, typically found in the central areas of watersheds where one of the main streams or tributary flows through or out of the lake. The abundance of these lakes indicates that the water inputs to area lakes by precipitation, surface runoff, and groundwater inflow are typically greater than water losses through evaporation and groundwater outflow (ARRC, 2008).

High- and low-gradient geomorphic areas have differing effects on the nine principal watersheds the proposed rail line alternatives would intersect. Four of these watersheds, Susitna, Little Susitna, Willow Creek, and Little Willow Creek, have their headwaters in the Talkeetna Mountains. More than half of the Willow Creek and Little Willow Creek watersheds are made up of mountainous terrain; their stream flow is dominated by high-elevation snow fields and rapid response to summer storms. The Susitna and Little Susitna watersheds have a smaller portion of their area in the Talkeetna Mountains; a larger portion of their watersheds are dominated by low-lying, low-gradient areas that moderate the water flow influence of the mountainous terrain. The Fish Creek, Rolly Creek, East Susitna Flats, Goose Creek, and Big Lake Drainage watersheds exclusively contain low-lying, low-gradient landforms that tend to retard runoff and reduce stream flow. All of the watershed areas can be characterized by increasing flows from spring ice breakup beginning in mid April and snowmelt runoff continuing from May to July; rainfall runoff from May to September; and fall freeze-up and stream flow recession from October through April (ARRC, 2008).

4.2.3.2 Water Quality Conditions

Federal and state water quality standards are designed to maintain the beneficial uses of state waters. Beneficial use can be defined based on the purpose for using the water and based on non-wasteful use of the water. Beneficial uses include aquatic life and agricultural, drinking, recreational, and other uses. Typical baseline water quality elements include color, dissolved oxygen, total dissolved solids, petroleum hydrocarbons, pH, residues, temperature, turbidity (suspended solids), and others.

Maintenance of the Federal and state water quality standards is required in all land use actions in Alaska. The proposed Port MacKenzie Rail Extension could impact waters that Federal and state agencies have designated as “fresh water aquatic life.”

Alaska Department of Environmental Conservation (ADEC) document 18 AAC 70 “Water Quality Standards” (ADEC, 2008a) and U.S. Environmental Protection Agency (USEPA) document “Quality Criteria for Water, 1986” (EPA, 1986) describe water quality standards for fresh water aquatic life. Table 4.2-1 lists and describes some of the Federal and State of Alaska water quality standards.

Table 4.2-1
Federal and Alaska Water Quality Standards for Fresh Water in Natural Environments[a]
(page 1 of 2)

Parameter	Criteria
Alkalinity	Alkalinity is a measure of the pH-buffering capacity of water or water's resistance to change in pH (*i.e.*, the capacity of water to neutralize acids). This capacity is caused by the water's content of carbonate, bicarbonate, hydroxide, and occasionally borate, silicate, and phosphate. Alkalinity is expressed in milligrams per liter of equivalent calcium carbonate. Alkalinity less than 20 milligrams per liter of calcium carbonate can be harmful to aquatic life.
Color	Color can indicate dissolved organic material, inadequate treatment, high disinfectant demand, or possible excessive production of disinfectant by-products or inorganic contaminants, including metal. Color points begin at 0. A point is the equivalent of a milligram of the substance in question per liter. Color or apparent color may not reduce the depth of the compensation point (the point at which there is just enough light for a plant to survive) for photosynthetic activity by more than 10 percent from the seasonally established norm for aquatic life. For all waters without a seasonally established norm for aquatic life, color or apparent color may not exceed 50 color units or the natural condition, whichever is greater.

Table 4.2-1
Federal and Alaska Water Quality Standards for Fresh Water in Natural Environments[a]
(page 2 of 2)

Parameter	Criteria
Dissolved Oxygen	Dissolved oxygen is the amount of gaseous oxygen dissolved in the water. Oxygen enters water through aeration (rapid movement) diffused from the surrounding air or as a waste product of photosynthesis. Dissolved oxygen must be greater than 7 milligrams per liter in waters used by anadromous or resident fish. In no case may dissolved oxygen be less than 5 milligrams per liter to a depth of 20 centimeters in the interstitial waters (water occupying interstices or pore volumes in rock) of gravel used by anadromous or resident fish for spawning. For waters not used by anadromous or resident fish, dissolved oxygen must be greater than or equal to 5 milligrams per liter but may not exceed 17 milligrams per liter. In no case may dissolved oxygen be greater than 17 milligrams per liter. The concentration of total dissolved gas may not exceed 110 percent of saturation at any point of sample collection. Dissolved oxygen below 1 to 2 milligrams per liter or beyond 110 percent can be harmful to aquatic life.
Total Dissolved Solids	Total dissolved solids are the combined content of all inorganic and organic substances in a molecular, ionized, or micro-granular suspended form. Total dissolved solids are measured only in fresh water, because the salinity of sea water comprises ions that are counted as total dissolved solids. Total dissolved solids may not exceed 1,000 milligrams per liter. Water may not have concentration of total dissolved solids if that concentration causes or reasonably could be expected to cause an adverse effect to aquatic life. Most aquatic ecosystems can tolerate total dissolved solids levels of 1,000 milligrams per liter. Total dissolved solids levels can be inferred from conductivity.
Petroleum Hydrocarbons	Petroleum hydrocarbons are contaminants with the potential to impact human and environmental health (and because they could be carcinogenic, mutagenic, or teratogenic). Total aqueous hydrocarbons in the water column (the water from the top of substrate to the surface of the water) may not exceed 15 micrograms per liter. Total aromatic hydrocarbons in the water column may not exceed 10 micrograms per liter. There may be no concentrations of petroleum hydrocarbons, animal fats, or vegetable oils in shoreline or bottom sediments that cause deleterious effects to aquatic life. Surface waters and adjoining shorelines must be virtually free from floating oil, film, sheen, or discoloration.
pH	pH is the measure for acidity, basic or alkaline, and is a logarithmic scale measure of hydrogen ion. “Pure water” has a neutral pH, equal to 7.0 on the logarithmic scale. pH levels below 7 are considered acidic, and greater than 7 are basic or alkaline. The water quality standard requires that pH not be less than 6.5 or greater than 8.5, nor vary more than 0.5 pH unit from natural conditions.
Residues	Residues are floating solids, debris, sludge, deposits, foam, scum, or any other material or substance that occurs in water as a result of human activity. Residues may not, alone or in combination with other substances, be present in concentrations or amounts that form objectionable deposits that are undesirable or a nuisance to aquatic or other species.
Temperature	Water temperature may not be caused to exceed 20 degrees Celsius (°C) at any time. The following maximum temperatures may not be exceeded, where applicable: (1) migration routes, 15 °C, (2) spawning areas, 13 °C, (3) rearing areas, 15 °C, and (4) egg and fry incubation, 13 °C. For all other waters, the weekly average temperature may not exceed site-specific requirements needed to (1) preserve normal species diversity and (2) prevent the appearance of nuisance organisms (i.e., must be such that the nuisance organisms are prevented from appearing).
Turbidity	Turbidity is the cloudiness or haziness of fluid caused by suspended solids generally invisible to the naked eye. Turbidity may not exceed 25 nephelometric turbidity units above natural conditions. For all lake waters, turbidity may not exceed 5 nephelometric turbidity units above natural conditions.

[a] Sources: ADEC, 2008a; EPA, 1986

SEA field crews collected baseline surface water quality data during August 2008 at proposed crossing sites along the proposed Port MacKenzie Rail Extension (Noel *et al.*, 2008). Crews collected data via visual observation from a helicopter and from on-the-ground testing and observations. Crews did not collect on-the-ground data from crossings that were inaccessible due to lack of adequate and safe road access or landing zones for the helicopter, or from crossings where the aerial survey indicated there was no waterbody and a ground visit was not warranted.

Table 4.2-2 summarizes water quality values collected at sampling sites along the proposed alternative segments and compares the data to Federal and Alaska water quality standards. These sampling points coincide with proposed waterbody crossing points along the proposed rail line segments. The records included in the table reflect sampling locations where water was present. Figure 4.2-2 shows the sample locations in relation to the proposed crossing sites.

Table 4.2-2
Summary of Water Quality Data in Streams Collected in 2008[a,b]

Segment and Crossing Mile Post	Date Collected	Flow (m/s)	Dissolved Oxygen (mg/L)	Temperature (°C)	Turbidity (NTUs)	Total Dissolved Solids (mg/L)	pH (s.u.)	Conductivity (μS/cm)
Water Quality Standard			7 - 17	≤ 20	≤ 25[c]	≤ 1000	6.5 - 8.5	≤ 500[d]
Big Lake								
B-16.6	8/12/2008	No Data	12.5	14.1	67	80	7.7	115
B-15.9	8/12/2008	No Data	10.6	11.2	2	130	6.7	199
B-15.2	8/12/2008	No Data	12.0	10.2	22	150	7.5	230
B-9.0	8/12/2008	No Data	12.0	15.0	1.0 to 2.0	100	7.4	150
B-6.4	8/13/2008	0.5	7.1	16.8	0	90	7.5	135
Connector 1								
C1-2.6	8/14/2008	No Data	9.9	13.8	4	130	7.6	201
Houston								
H-9.6	8/14/2008	0.4	8.0	18.0	29	30	7.1	40
H-6.3	8/14/2008	No Data	10.5	13.8	4	50	7.8	87
H-4.3	8/14/2008	No Data	10.4	13.4	3	60	7.1	94
H-0.8	8/14/2008	No Data	11.9	16.7	120	120	7.5	179
Houston North								
MP-179.9	8/15/2008	< 1	12.6	11.7	12	60	7.4	101
MP-179.4	8/15/2008	< 1	12.8	11.0	11	60	7.5	100
MP-179.0	5/15/2008	0.5 to 1	11.2	12.2	3	40	7.2	55
MP-178.5	8/15/2008	No Data	11.8	13.6	5	70	7.3	114
HN-4.8	8/16/2008	0.4	10.1	10.7	10	80	7.1	130
HN-4.4	8/16/2008	8 to 10	7.4	18.4	71	80	7.0	117
HN-3.2	8/15/2008	No Data	12.9	13.2	100	60	7.6	97
Houston South								
MP-175.0	8/16/2008	0	9.8	12.4	3	90	7.6	140
MP-174.3	8/15/2008	No Data	12.5	11.3	100	60	7.7	90
HS-1.0	8/16/2008	< 0.5	9.7	15.8	130	70	7.6	68
Mac East								
ME-4.5	8/13/2008	0.5	11.0	13.6	5	90	7.7	144
Mac West								
MW-11.0	8/13/2008	No Data	10	14.7	92	140	7.1	200
MW-10.1	8/13/2008	1.5	12.3	6.2	15	160	6.9	240
MW-4.6	8/13/2008	0.5 to 1	9.7	12.8	4	100	7.5	160
Willow								
MP-190.3	8/16/2008	No Data	11.9	15.6	64	80	7.2	127
MP-189.0	8/16/2008	No Data	10.1	13.6	27	60	6.8	80
W-24.0	8/16/2008	No Data	11.8	11.4	12	50	6.2	70
W-20.9	8/14/2008	No Data	11.5	11.9	27	80	7.3	118
W-16.7	8/17/2008	No Data	7.2	13.7	9	80	6.9	120
W-10.0	8/14/2008	0.9	10.7	18.9	54	60	7.1	90
W-0.6	8/15/2008	No Data	12.3	14.1	5	70	7.6	110

[a] Sources: ADEC, 2008a; EPA 1986; Noel *et al.*, 2008
[b] m/s = meters per second; mg/L = milligram/liter; °C = degrees Celsius; NTU = nephalometric turbidity units; pH = measure of the acidity or the alkalinity of a solution; u. = standard units; μS/cm = micro-siemens per centimeter; < = less than; ≤ = less than or equal to.
[c] Turbidity may not be 25 NTUs above natural conditions
[d] Conductivity is not a water quality standard, but acceptable range for aquatic life. TDS levels can be inferred from conductivity.

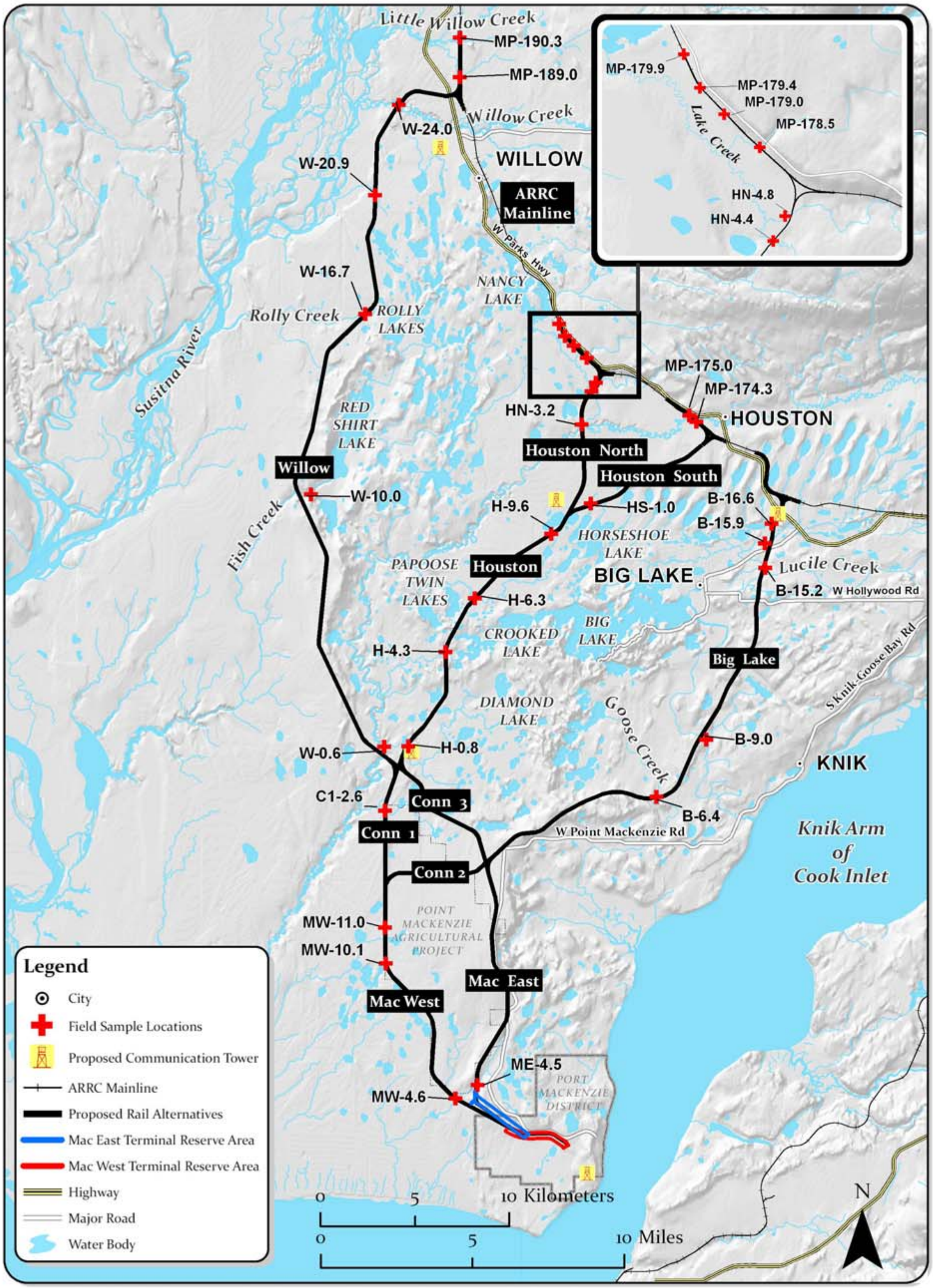

Figure 4.2-2. Sample Locations and Proposed Crossing Sites

The 2008 field data suggests that water quality at the proposed crossings met the current Federal and Alaska water quality standards during the collection dates. Turbidity values ranged from 0 to 130 nephalometric turbidity units, and these one-time values cannot be used to determine standard compliance. Unlike other water quality parameters, turbidity does not have a fixed value for its standard; the water quality standard for turbidity is site specific and may not be 25 nephalometric turbidity units or more above the natural conditions of the site because of human activities.

There are no U.S. Geological Survey water quality monitoring sites within the ROW of any of the alternative segments or downstream of any alternative segment crossings. Three Geological Survey water quality stream gauges are upstream of the project area on the Little Susitna River, the Susitna River, and Willow Creek. All three stations are upstream of the developed areas of MSB, and the nearest station to an alternative segment (Willow Creek station) is more than 8 miles upstream of the Willow Segment crossing. In addition, most of the available data were collected between 1952 and 1986, prior to the substantial growth MSB experienced in recent years. However, it is noteworthy that during the period of record, all water quality parameters met Federal and State of Alaska water quality standards except iron concentrations at the Little Susitna River station.

The Wasilla Soil and Water Conservation District collected water temperature data for the Little Susitna River at Houston. This data collection location is where ARRC proposes a bridge for the rail siding on the Houston South Segment. Most of the temperature samples were less than or equal to 10 degrees Celsius (°C), and two samples were 14°C, all well below the standard of 20°C.

According to ADEC, one waterbody in the study area is listed on the Section 303(d) list of impaired waters (Big Lake). The proposed Port MacKenzie Rail Extension would not cross Big Lake. Waterbodies are placed on the list if (1) the water quality standard(s) are exceeded, (2) the waterbody is impaired for one or more designated uses by a pollutant(s), and (3) the water body requires a total maximum daily load limitation or waterbody recovery plan to attain Alaska's water quality standards (18 AAC 70). Big Lake in Wasilla (approximately 2.2 miles from the Houston Segment and 1.9 miles from the Big Lake Segment; see Figure 4.2-2) is on the Section 303(d) list of impaired waters for non-attainment of the petroleum hydrocarbon water quality standard. ADEC collected water quality information at Big Lake beginning in the open water months of 2004 and 2005. Petroleum hydrocarbon concentrations appear to be influenced by the use of motorized watercraft. The area of impairment is estimated to be 1,250 acres (ADEC, 2008b).

4.2.4 Environmental Consequences

This section describes potential impacts to surface water hydrology and water quality as a result of the construction activities, conveyance structures proposed at each crossing, and proposed rail line operations. Section 4.2.4.1 describes potential impacts under the proposed action; Section 4.2.4.2 describes potential impacts under the No-Action Alternative. The impacts description provides a general guideline for understanding the potential effects of the proposed project because the location and/or design characteristics of some temporary construction facilities and rail line structures would be determined only during final design and permitting. Other parts of this EIS address potential impacts to other resources associated with or that depend on surface waters, such as fisheries (Section 5.4 and Appendix F), floodplains (Section 4.4), navigation (Chapter 12), wetlands (Section 4.5 and Appendix C), essential fish habitat (Section 5.4 and Appendix G), and subsistence (Chapter 7).

4.2.4.1 Proposed Action

Common Construction Impacts

Construction activities associated with the proposed rail line could result in short-term impacts to the flow and quality of surface water. The following paragraphs describe potential construction-related impacts that SEA anticipates would be common to all alternative segments.

Construction of the Rail Line and Unpaved Access Road

Construction of the rail line and unpaved access road would result in negligible impacts to water quality impacts except in areas were the rail line and access road would be near, adjacent to, or span waterbodies. In these areas, ROW clearing, grading, and construction of the rail line and access road would expose soil to the erosive forces of wind, rain, and surface runoff during construction and until temporarily disturbed areas were revegetated. The resulting impacts to water quality could include:

- Increased erosion and sediment availability/transport to watercourses during spring ice breakup, snowmelt, or rainstorms
- Nutrient loading associated with sediments that could contribute to changes in water quality
- Small petrochemical leaks from construction equipment that could enter a waterbody either directly as equipment crossed a waterbody or with surface runoff

If sediments were disturbed and entrained, the effect would be short term and temporary, lasting only during the construction period. Any turbid waters that could result from construction would return to background conditions once the fine material settled. SEA would not expect long-term impacts to water quality from rail construction activities.

Excavation of Borrow Areas

ARRC might obtain subballast and fill material from borrow areas established within the rail line ROW. Borrow areas would be identified by the Applicant during final design and permitting, but local shallow-water areas (former borrow areas) could be targeted areas for further extraction. Removal of material could disrupt these shallow-water areas, including disturbing sediment, increasing turbidity, and generally degrading water quality. If sediment were disturbed and entrained, the effect would be temporary and would last only during the construction and extraction period. Turbidity levels would return to background conditions after the fine material settled. SEA would expect no long-term impacts to water quality. Potential new borrow areas might also be identified in surface-water areas. ARRC has not established the location, timing, or duration of borrow activity. Depending on the annual and seasonal variation of flood stage and hydraulics of the waterbodies at the borrow areas, there could be impacts to water quality. Impacts could include short-term impacts, such as erosion of the borrow area, and flooding and increased erosion and sediment transport within the waterbodies. If borrow areas were developed in a floodplain and near to a waterbody, excavation could alter the hydraulics and conveyance of the watercourse during flood storage, which could lead to a short-term increase in flood storage, or alteration of channel alignment through rapid channel avulsion into the borrow areas.

Construction of Staging Areas

The proposed rail line could require construction of staging areas for temporary storage of equipment and materials. According to the Applicant, the objective would be to place staging areas within the proposed ROW at relatively flat, previously disturbed areas with established access to existing public roads. If the Applicant placed a staging area in or near a waterbody or floodplain, grading and filling associated with re-contouring and staging-area construction could disrupt natural drainage patterns during flooding episodes of major streams, during high runoff periods along seasonal drainages, or along shallow overland flow paths. Blockages or diversions to areas with insufficient flow capacity could result in seasonal or semi-permanent impoundments. Also, redirected surface flows could increase stream velocities at isolated locations where there could be increased bank scour or overbanking.

Clearing, grading, and filling associated with constructing staging areas would temporarily expose soil to the erosive forces of wind, rain, and surface runoff during construction and until the area was revegetated. If near a waterbody, this ground disturbance could mobilize sediment and increase turbidity, which could result in an overall degradation of water quality. The effect would be temporary and would last only during the construction period. Turbidity levels would return to background conditions after the fine material settled. In addition, small petrochemical leaks from construction equipment could enter a waterbody either directly or with surface runoff. SEA would not expect long-term impacts to water quality from constructing staging areas.

Construction and Installation of Bridges and Culverts

Common impacts that could result from the culvert and bridge construction and installation along the ROW would include the following:

- Sloughing, sheet rilling, and erosion of streambanks and riparian areas
- Increased stages and velocities of floodwater (due to temporary constrictions) possibly concurrent with increased backwater flooding
- Increased channel scour, bank erosion, and downstream sedimentation
- Blockage, convergence, or changes to the natural drainage during construction in the channel
- Communication between surface waters and groundwater in geotechnical boreholes that would be drilled to determine the suitability of the substrate at the crossing

Culvert construction and installation could result in impacts to water quality from localized disturbance of the streambank to gain access to the channel, and disturbance of the channel bed during culvert placement. In addition, if a culvert occupied only a small portion of the channel and ARRC covered the remaining channel width in fill, there would be additional streambank and channel disturbances and loss of channel area. These activities could result in increases in turbidity and sediment loads, and changes to natural drainage. Bed and bank disruption could also lead to increased sediment load downstream of the crossing; this impact, however, would generally be short term and temporary, and conditions would return to background levels after ARRC finished construction. The extension of existing culverts along the ARRC main line could affect water quality through disturbance of the existing rail embankment by exposing soils to erosive forces, which could increase sedimentation and turbidity. SEA would not expect culvert extensions to significantly affect existing flow conditions at the culverts.

Construction and installation of proposed bridges could result in impacts to water quality and flow, with the level of impact depending on (1) whether the proposed bridge would be a full or partial span, (2) the amount of in-channel work necessary for construction of piers and abutments, and (3) the angle of the bridge in relation to the river/stream (perpendicular or oblique). Consequently, the degree of bank and channel disturbances could vary substantially and at some sites could alter waterbody flow, bank erosion, and sedimentation processes. Based on the design and the need to work in the channel to construct piers and footings or along the stream banks to construct abutments, there could be impacts. In general, bridges typically result in fewer impacts to streams than culverts because they are able to maintain stream structure and flow characteristics better than culverts, maintain transport of bedload, and provide less restriction to flow than culverts.

Common Operations Impacts

Rail line operations could affect both the hydrology and quality of surface water. Operations impacts to surface waters would consist of long-term impacts that could result from the presence of the rail line and access road embankment, conveyance structures, and movement of trains along the rail line. The following paragraphs describe operations-related impacts that SEA anticipates would be common to all the proposed rail line segments.

Bridges and Culverts

The presence of bridges and culverts in or over a channel could alter channel hydraulics, which could increase channel scour and erosion processes (lateral migration, channel reorientation, bank undercutting) that could lead to an increase in sediment transport loads and downstream sedimentation. The approach direction (perpendicular or oblique), size of culvert, and the length of affected streambank and channel width would vary. Therefore, the degree of bank and channel infringement could also vary substantially, as would the extent of erosion and sedimentation. Culverts would likely result in greater potential impacts to flow and water quality due to the potential of culverts to constrict and alter flows more than bridges.

The presence of bridges could affect water quality as a result of altered flow hydraulics that could increase scour, erosion, and sedimentation. The level of impact would depend on the number of in-channel piers used to support the bridge and whether the proposed bridge was a full or partial span. The approach direction (perpendicular or oblique) and type of bridge construction (single partial span, single clear span, multiple-pier partial span, multiple-pier clear span), placement of abutments and/or in-channel piers, and the length of affected streambank and channel width would vary by structure. Therefore, the degree of bank and channel infringement could also vary substantially, as would the extent of erosion and sedimentation. Bridges typically result in fewer impacts to streams than culverts because they are able to maintain stream structure and flow characteristics better than culverts, maintain transport of bedload, provide less restriction to flow than culverts, and generally require less instream maintenance over time than culverts.

Rail Line and Unpaved Access Road Operations

In general, use of the rail line and unpaved access roads would result in negligible impacts to rivers and streams except in areas where the rail line and roads would be near waterbodies. When the rail line or roads would be near or adjacent to waterbodies, the potential consequences to water quality during spring ice break-up, snowmelt, or rainstorms could include increased transport of fine-grained sediments and increased concentrations of pollutants that could alter waterbody chemistry and pH. In addition, fugitive dust generated by rail operations and vehicles using gravel access roads, and chemicals used for access-road maintenance could affect water quality. The relative degree of water quality degradation would vary, depending on stream type, location, and habitat value. Small petrochemical leaks from trains or vehicles using the access road could also affect water quality if the pollutant entered a waterbody directly or via surface runoff.

Impacts by Segment

This section describes potential impacts associated with specific rail line segments by building on the common impacts to hydrology and water quality (see previous section) where project design information and environmental data are available to reasonably distinguish between the alternative segments. Factors used to differentiate between alternative segments could include the number of waterbody crossings, number of major waterbody crossings, number of new bridges and culverts, number of culvert extensions, acreage of wetlands and other waters in and adjacent to the ROW, presence of highly erodible soils, and multiple- or single-span bridges.

Because each proposed drainage structure would be identified by the Applicant during final design as a culvert or a bridge, this discussion of potential impacts to surface waters does not include their impacts for comparative purposes, other than to count them as crossings. In addition, the Applicant has indicated additional culverts might be needed for equalization across wetlands or for drainages that have not been identified. Because these culverts might or might not be installed and the actual numbers or locations have not been determined, they are not included in the following description of potential impacts.

Table 4.2-3 details waterbody crossings by rail line segments and includes crossing identification numbers so readers can match each crossing to corresponding figures.

Southern Segments/Segment Combinations

Table 4.2-4 provides summary details of waterbody crossings for each southern segment.

Table 4.2-3
Waterbody Crossings by Segment/Segment Combinations[a] (page 1 of 4)

	Mile Post	Waterbody Type[b]	Conveyance Type[c]	Diameter (inches) or Bridge Length (feet)[d]
Southern Segments/Segment Combinations				
Mac West	MW-12.0	Unidentified	Culvert	48
	MW-11.0	Unidentified stream	Culvert	36
	MW-10.1	Unidentified stream; inlet to Horseshoe Lake	Culvert	48
	MW-9.3	Wetland	Culvert	48
	MW-8.8	Wetland	Culvert	48
	MW-8.3	Unidentified	Culvert	48
	MW-7.8	Unidentified	Culvert	48
	MW-7.2	Unidentified	Culvert	48
	MW-6.8	Unidentified	Culvert	48
	MW-6.3	Unidentified	Culvert	48
	MW-5.2	Unidentified	Culvert	48
	MW-4.6	Unidentified stream; drains to Cook Inlet	Culvert	48
	MW-3.7	Wetland	Culvert	48
	T-1.2	Wetland	Culvert	48
	T-0.9	Unidentified	Culvert	48
Mac East	ME-7.4	Wetland	Culvert	48
	ME-4.5	Unidentified stream; direct to Cook Inlet	Culvert	36
	ME-2.5	Wetland	Culvert	48
Connector 1 Segment	C1-3.0	Wetland	Culvert	48
	C1-2.6	Unidentified stream; tributary to the Little Susitna River	Culvert	72
	C1-2.3	Wetland	Drainage structure	ND
	C1-1.1	Wetland	Culvert	48
	C1-0.9	Wetland	Culvert	48
	C1-0.7	Wetland	Culvert	48
	C1-0.2	Wetland	Culvert	48
Connector 2 Segment	C2-2.3	Unidentified	Culvert	48
	C2-1.9	Unidentified	Culvert	48
	C2-1.7	Unidentified	Culvert	48
	C2-0.2	Wetland	Culvert	48
Connector 3 Segment	C3-3.6	Wetland	Culvert	36
	C3-3.0	Wetland	Culvert	48
	C3-2.2	Wetland	Culvert	24
	C3-1.5	Unidentified	Culvert	36
Northern Segments				
Willow	MP-190.3	Unidentified stream; tributary to Little Willow Creek	Bridge	ND
	MP-189.6	Wetland	Culvert	36
	MP-189.3	Wetland	Culvert	36
	MP-189.0	Rodgers Creek	Bridge	ND
	MP-188.2	Wetland	Culvert	48
	W-25.6	Wetland	Culvert	48
	W-25.5	Wetland	Culvert	48
	W-24.8	Wetland	Culvert	48

Table 4.2-3
Waterbody Crossings by Segment/Segment Combinations[a] (page 2 of 4)

	Mile Post	Waterbody Type[b]	Conveyance Type[c]	Diameter (inches) or Bridge Length (feet)[d]
Northern Segments (continued)				
Willow (continued)	W-24.0	Willow Creek	Bridge	ND
	W-23.1	Wetland	Drainage structure	ND
	W-22.7	Unidentified	Culvert	48
	W-21.4	Unidentified	Culvert	48
	W-20.9	Unidentified stream; tributary to Susitna River	Culvert	36
	W-19.6	Wetland	Drainage structure	ND
	W-16.7	Unidentified stream; tributary to Rolly Creek	Culvert	72
	W-16.4	Unidentified stream; tributary to Rolly Creek	Culvert	48
	W-15.8	Unidentified	Culvert	48
	W-14.4	Unidentified stream; tributary to Rolly Creek	Culvert	36
	W-13.8	Unidentified	Culvert	48
	W-10.0	Fish Creek	Drainage structure	ND
	W-8.6	Unidentified	Culvert	36
	W-2.4	Unidentified	Culvert	48
	W-0.6	The Little Susitna River	Bridge	ND
Houston South	MP-175.0	Unidentified stream	Culvert	48
	MP-174.3	The Little Susitna River	Bridge	ND
	MP-173.3	Wetland	Culvert	48
	HS-1.9	Wetland	Culvert	48
	HS-1.4	Unidentified stream; tributary to Little Horseshoe Lake	Culvert	48
	HS-1.0	Stream; tributary to Little Horseshoe Lake	Culvert	36
	HS-0.8	Wetland	Culvert	48
Houston	H-9.6	Outflow Muleshoe Lake; inflow Colt Lake	Culvert	48
	H-9.4	Unidentified	Culvert	48
	H-8.3	Wetland	Culvert	48
	H-7.1	Wetland	Culvert	48
	H-6.3	Unidentified stream; tributary to the Little Susitna River	Drainage structure	ND
	H-5.8	Wetland	Culvert	36
	H-4.3	Unidentified stream; tributary to the Little Susitna River	Culvert	72
	H-2.8	Wetland	Culvert	48
	H-1.9	Wetland	Culvert	48
	H-1.2	Wetland	Culvert	24
	H-0.8	Unidentified stream; outlet of Diamond Lake	Drainage structure	ND

Table 4.2-3
Waterbody Crossings by Segment/Segment Combination[a] (page 3 of 4)

	Mile Post	Waterbody Type[b]	Conveyance Type[c]	Diameter (inches) or Bridge Length (feet)[d]
Northern Segments (continued)				
Houston North	MP-179.9	Unidentified stream	Culvert	48
	MP-179.8	Unidentified	Culvert	48
	MP-179.7	Unidentified	Culvert	36
	MP-179.6	Unidentified	Culvert	36
	MP-179.5	Unidentified	Culvert	48
	MP-179.4	Unidentified stream	Culvert	60
	MP-179.1	Unidentified	Culvert	48
	MP-179.0	Unidentified stream	Culvert	36
	MP-178.9	Unidentified	Culvert	36
	MP-178.5	Unidentified stream; tributary to Lake Creek	Culvert	48
	MP-178.1	Unidentified	Culvert	48
	MP-177.8	Unidentified	Culvert	36
	MP-177.5	Unidentified	Culvert	48
	HN-4.8	Unidentified stream; tributary to Lake Creek	Culvert	72
	HN-4.4	Lake Creek	Drainage structure	ND
	HN-3.2	The Little Susitna River	Bridge	ND
	HN-2.7	Wetland	Culvert	48
	HN-1.2	Wetland	Culvert	48
Big Lake	MP-170.7	Unidentified	Culvert	48
	MP-170.5	Unidentified stream	Culvert	60
	MP-170.1	Unidentified stream; outlet of Cheri Lake	Culvert	60
	B-18.3	Unidentified stream; inlet to Long Lake	Drainage structure	ND
	B-17.4	Unidentified stream	Drainage structure	ND
	B-16.6	Unidentified stream; inlet to Long Lake	Drainage structure	ND
	B-15.9	Little Meadow Creek	Drainage structure	ND
	B-15.8	Unidentified	Culvert	48
	B-15.2	Lucille Creek	Drainage structure	ND
	B-15.1	Unidentified stream; tributary to Lucille Creek	Culvert	36
	B-14.8	Wetland	Culvert	36
	B-14.5	Wetland	Culvert	48
	B-14.3	Wetland	Culvert	24
	B-13.5	Wetland	Culvert	48
	B-12.7	Wetland	Culvert	48
	B-11.9	Wetland	Culvert	24
	B-9.9	Wetland	Culvert	24

Table 4.2-3
Waterbody Crossings by Segment/Segment Combination[a] (page 4 of 4)

	Mile Post	Waterbody Type[b]	Conveyance Type[c]	Diameter (inches) or Bridge Length (feet)[d]
Northern Segments (continued)				
Big Lake (continued)	B-9.0	Fish Creek	Drainage structure	ND
	B-8.4	Wetland	Culvert	24
	B-7.2	Wetland	Culvert	36
	B-6.4	Goose Creek	Drainage structure	ND
	B-5.9	Wetland	Culvert	24
	B-4.1	Unidentified	Culvert	48

[a] Source: ARRC, 2008; Noel *et al.*, 2008.
[b] Unidentified designates an unmapped drainage area.
[c] Drainage structures would be determined during the final design process and could include multi-plate culverts, pre-cast arches, or bridges
[d] ND = No data; to be determined during final permitting and design.

Table 4.2-4
Summary of Waterbody Crossings along the Southern Segments/Segment Combinations[a]

	Mac West-Connector 1	Mac West-Connector 2	Mac East-Connector 3	Mac East
Numbers of Crossings				
Total Crossings	22	19	7	3
Types of Waterbodies				
Wetlands	10	5	5	2
Streams	4	3	1	1
Unidentified[b]	8	11	1	0
Types of Crossings				
Bridges	0	0	0	0
Drainage Structures[c]	1	0	0	0
Culverts	21	19	7	3
Culvert Extensions	0	0	0	0

[a] Source: ARRC, 2008; Noel *et al.*, 2008.
[b] Unidentified designates an unmapped drainage area.
[c] Drainage structures would be determined during the final design and permitting and could include multi-plate culverts, pre-cast arches, or bridges.

Mac West-Connector 1 Segment Combination

The Mac West-Connector 1 Segment Combination would cross 22 waterbodies with 1 drainage structure (culverts or bridges, depending on permitting and final design) and 21 culverts (see Figure 4.2-3). This segment combination would require more crossings than the other southern segment combinations, which would increase the potential for impacts to water quality and hydrology during rail line construction and operations. In addition, this segment combination would have the most acreage of wetlands and other waters of the U.S. (279 acres; see Section

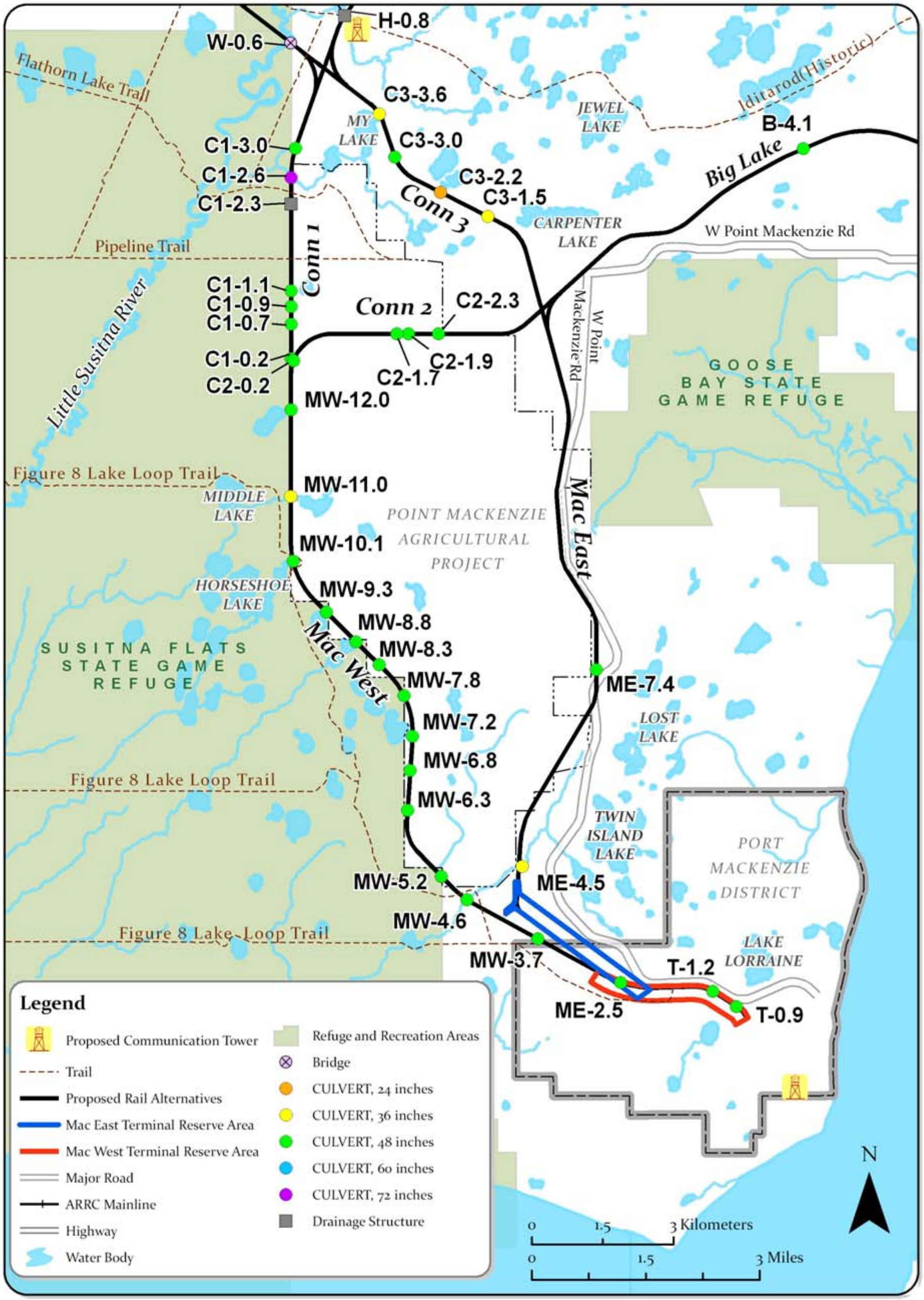

Figure 4.2-3. Mac East, Mac West, and Connector Segment Crossings
Proposed Port MacKenzie Rail Extension

4.5, Wetland Resources) in and along the ROW, which would increase the potential for impacts to water quality and alteration of hydrology in those areas. This segment combination would involve the lowest percentage of highly or potentially highly erodible soils (see Section 3.4, Geology and Soils) of the other southern segment combinations; however, the number of crossings and in-water work that would be required would be greatest for this segment combination. This segment combination would not cross any major rivers or streams. Overall, SEA anticipates that this segment combination would result in the greatest impact to surface waters of all the southern segment combinations.

Mac West-Connector 2 Segment Combination

The Mac West-Connector 2 Segment Combination would cross 19 waterbodies with 19 culverts (see Figure 4.2-3). This segment combination would require the second largest number of crossings compared to the other southern segment combinations, which would give it a higher potential for impacts to hydrology and water quality than the other southern segment combinations. In addition, this segment combination would have the second largest acreage of wetlands and other waters of the U.S. (236 acres; see Section 4.5, Wetland Resources) in and along the ROW, which would increase the potential for impacts to water quality impacts and alteration of hydrology. This segment combination would involve the second lowest percentage of highly or potentially highly erodible soils (see Section 3.4, Geology and Soils) of the other southern segment combinations. The Mac West-Connector 2 Segment Combination would not cross any major rivers or streams.

Mac East-Connector 3 Segment Combination

The Mac East-Connector 3 Segment Combination would cross seven waterbodies with seven culverts (see Figure 4.2-3). This segment combination would involve the second smallest number of crossings compared to the other southern segment combinations, which would give it a comparatively low potential for impacts to water quality and hydrology during rail construction and operations. In addition, this segment combination would involve the second lowest acreage of wetlands and other waters of the U.S. (106 acres; see Section 4.5, Wetland Resources) in and along the ROW, which would give it a lower potential for impacts to water quality impacts and alteration of hydrology. This segment combination would involve the greatest percentage of highly or potentially highly erodible soils (see Section 3.4, Geology and Soils) of the southern segment combinations. However, the smaller number of crossings and amount of in-water work that would be required compared to the Mac West-Connector 1 Segment Combination and the Mac West-Connector 2 Segment Combination would likely result in a lower direct impact to water quality. This segment combination would not cross any major rivers or streams.

Mac East Segment

The Mac East Segment would cross three waterbodies with three culverts (see Figure 4.2-3). This segment would involve the fewest crossings compared to the other southern segments/segment combinations. In addition, this segment would involve the lowest acreage of wetlands and other waters (101 acres; see Section 4.5, Wetland Resources) in and along the ROW, but not much lower than the Mac East-Connecter 3 Segment Combination. With the smallest acreage of wetlands and other waters of the U.S. of all the southern segments/segment combinations, SEA anticipates this segment would have a relatively low potential for impacts to water quality and alteration of hydrology in these areas. This segment would not cross any major rivers or streams. Overall, SEA anticipates that this segment would result in the lowest potential impact to surface waters of all the southern segments/segment combinations.

Northern Segments/Segment Combinations

Table 4.2-5 provides summary details of waterbody crossings for each northern segment/segment combinations.

Table 4.2-5
Summary of Waterbody Crossings along the Northern Segments/Segment Combinations[a]

	Willow	Big Lake	Houston-Houston North	Houston-Houston South
Numbers of Crossings				
Total Crossings	23	23	29	18
Types of Waterbodies				
Wetlands	8	10	8	9
Streams	9	10	11	8
Unidentified[b]	6	3	10	1
Types of Crossings				
Bridges	4	0	1	1
Drainage Structures[c]	3	7	3	2
Culverts	13	13	12	13
Culvert Extensions	3	3	13	2

[a] Source: ARRC, 2008; Noel *et al.*, 2008.
[b] Unidentified designates an unmapped drainage area.
[c] Drainage structures would be determined during the final design and permitting and could include multi-plate culverts, pre-cast arches, or bridges.

Willow Segment

The Willow Segment would cross 23 waterbodies with 4 bridges, 3 drainage structures, 13 culverts, and 3 culvert extensions (see Figure 4.2-4). This segment would involve the second largest number of crossings compared to the other northern segments and segment combinations, which would increase the potential for more impacts to water quality and hydrology compared to the other northern segments and segment combinations. This segment would have the smallest acreage of wetlands and other waters of the U.S. (85 acres, see Section 4.5, Wetland Resources) in and along the ROW compared to the other northern segments and segment combinations. Having the lowest acreage of wetlands and other waters of all the northern segments and segment combinations indicates this segment would have the least potential for impacts to water quality and alteration of hydrology in these areas. This segment would involve the second largest percentage of highly or potentially highly erodible soils (see Section 3.4, Geology and Soils) compared to the other northern segments and segment combinations, but the percentage for this segment is much closer to the percentage for the two segment combinations with the lowest percentages than the segment combination with the highest percentage. This segment would cross Rodgers Creek, Willow Creek, the Little Susitna River, and a tributary to Little Willow Creek with bridges. Multiple spans and in-water support piles would likely be required for Rogers Creek, Willow Creek, and the Little Susitna River because their channel widths all exceed ARRC's proposed bridge span length of 28 feet. Compared to other northern segments and segment combinations, this segment would involve the most bridge crossings and bridge

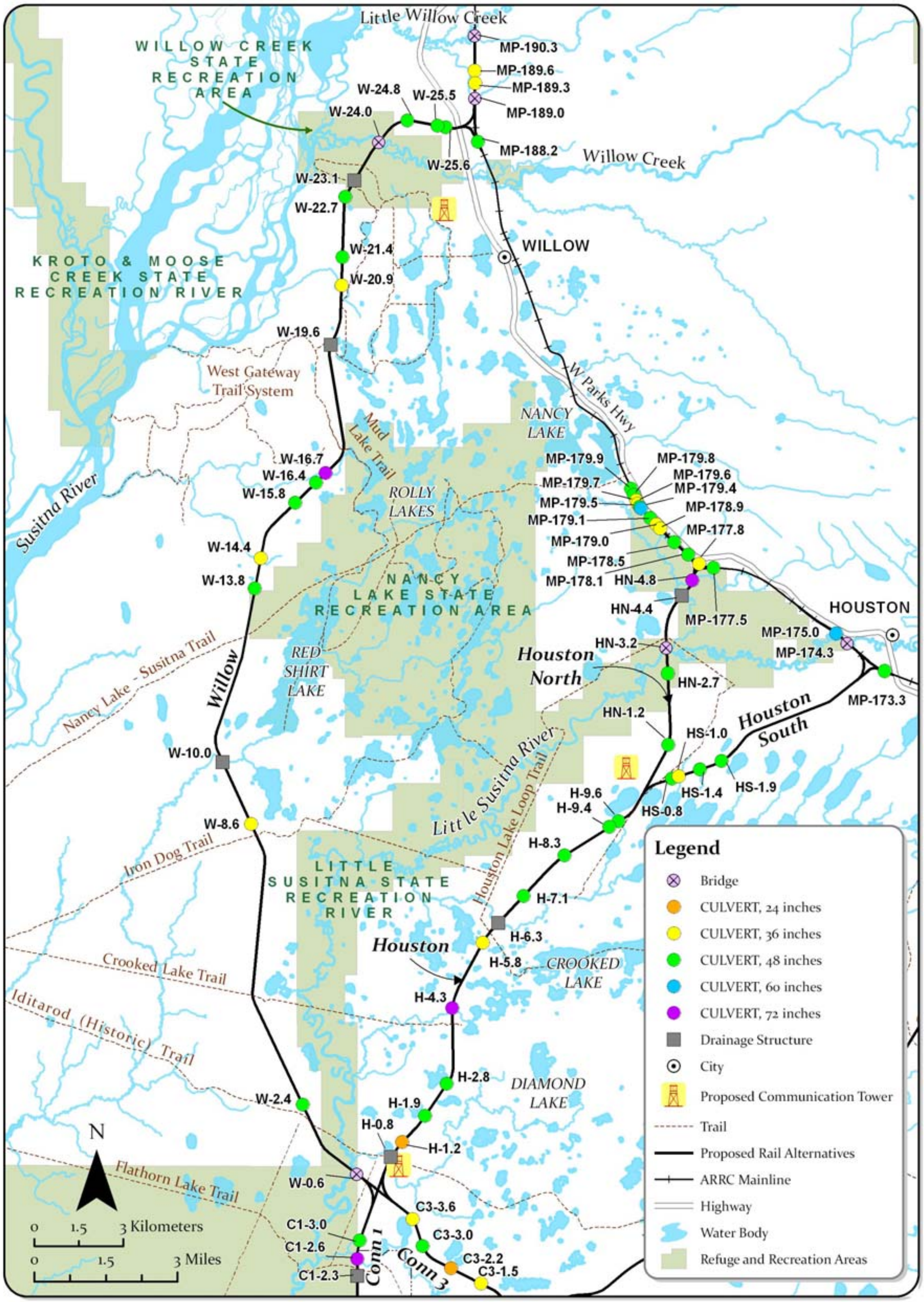

Figure 4.2-4. Willow, Houston, Houston North, and Houston South Segment Crossings Proposed Port MacKenzie Rail Extension

crossings that would require in-water support piles. The tributary to Little Willow Creek would likely have a single span bridge with no in-water support piles because the channel width is less than half of the 28-foot bridge span. The number of new culverts (13) proposed along this segment is not substantially different from the number of new culverts proposed along the other northern segment combinations. This segment would also involve one of the smallest number of culvert extensions along the main line.

Big Lake Segment

The Big Lake Segment would cross 23 waterbodies with 7 drainage structures, 13 culverts, and 3 culvert extensions (see Figure 4.2-5). This segment would involve the same number of crossings as the Willow Segment, and impacts to water quality and hydrology would be similar to those for the Willow Segment. In addition, this segment would have the second smallest acreage of wetlands and other waters of the U.S. (111 acres; see Section 4.5, Wetland Resources) in and along the ROW compared to the other northern segment combinations. This segment would have a lower potential for impacts to water quality and alteration of hydrology because it has one of the smallest acreages of wetlands and other waters of all the northern segment combinations. This segment would have the largest percentage of highly or potentially highly erodible soils (see Section 3.4, Geology and Soils), far exceeding the percentages for the other northern segment combinations. This could increase the potential for impacts to water quality if ARRC did not implement appropriate best management practices and mitigation measures. This segment would cross Little Meadow Creek, Lucile Creek, Fish Creek, and Goose Creek with drainage structures (culverts or bridges, depending on permitting and final design).

This segment would also require the relocation of approximately 2,440 feet of stream channel from an unnamed anadromous fish stream adjacent to the rail line between Mile Post B-17.1 and Mile Post B-17.6 into two new sections of 2,460-foot-long channel. There could be impacts to the specific stream reach involved and possible upstream and downstream effects. Potential impacts could be positive or negative, depending on the nature of the modification. Potentially, several characteristics of a reach could be altered, including channel morphology, channel hydraulics, sediment erosion and deposition processes, and water quality. Many of the detrimental effects of stream relocation could be avoided, with little compromise in channel efficiency, by employing channel design guidelines that do not destroy the hydraulic and morphologic equilibria of natural streams. These guidelines include minimal straightening; promoting bank stability by leaving trees, minimizing channel reshaping, and employing bank stabilization techniques; and emulating the morphology of natural stream channels.

The number of new culverts (13) proposed along this segment is not substantially different from the number of new culverts proposed along the other northern segment combinations. This segment would also require one of the smallest number of culvert extensions along the main line.

Houston-Houston North Segment Combination

The Houston-Houston North Segment Combination would cross 29 waterbodies with 1 bridge, 3 drainage structures, 12 culverts, and 13 culvert extensions (see Figure 4.2-4). This segment combination would involve the most crossings compared to the other northern segment combinations. However, this might exaggerate the level of potential impacts in relation to other segment combinations because 13 of these 29 crossings would be extensions of existing culverts

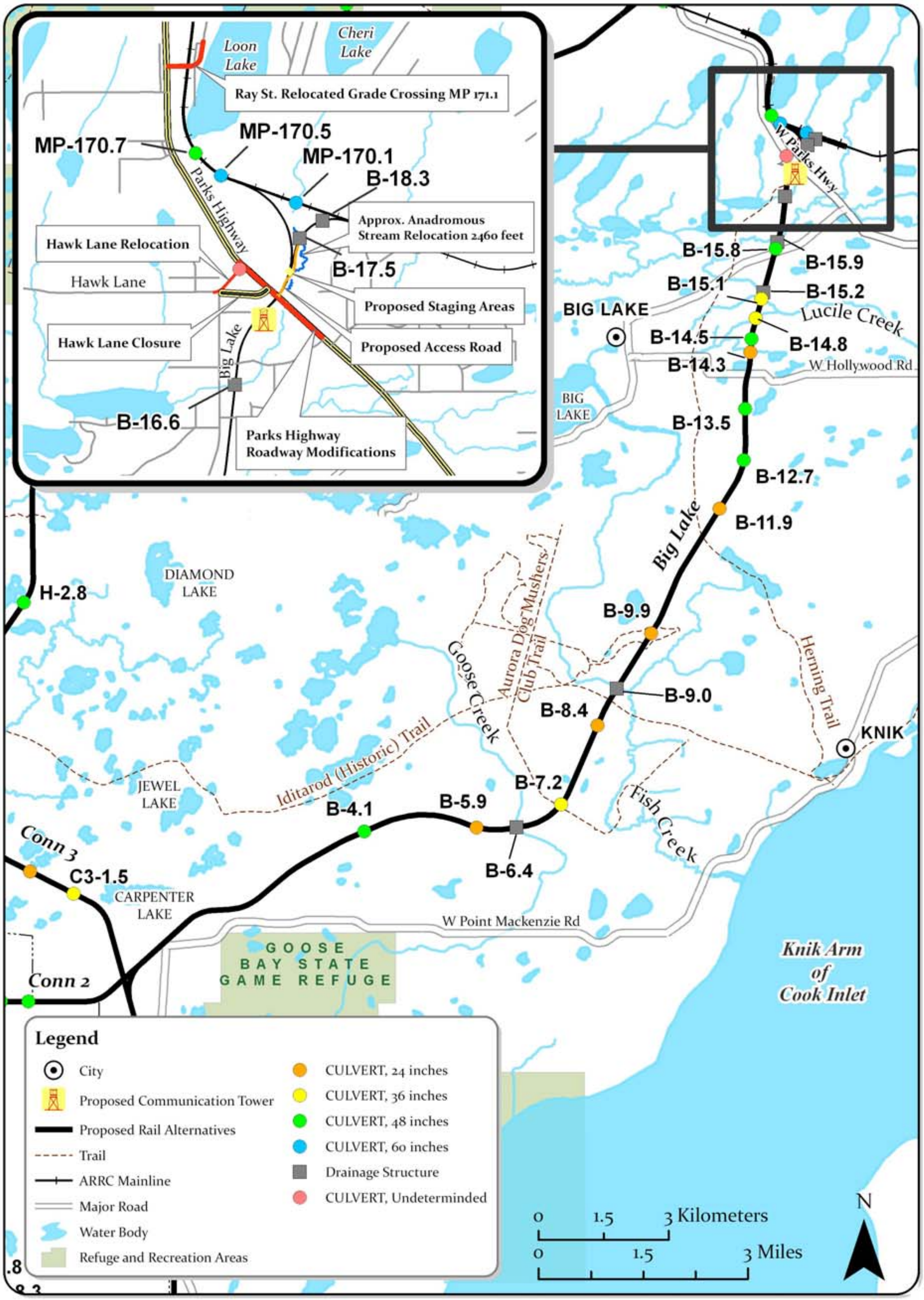

Figure 4.2-5. Big Lake Segment Crossings Proposed Port MacKenzie Rail Extension

under the main line, and extensions to these culverts might not have the same level or intensity of impact as the installation of a new culvert. Sixteen of the 29 crossings would be new. This segment combination would have the largest acreage of wetlands and other waters of the U.S. (198 acres; see Section 4.5, Wetland Resources) in and along the ROW, which could increase the potential for impacts to water quality and alteration of hydrology. This segment combination would have one of the smallest percentages of highly or potentially highly erodible soils (see Section 3.4, Geology and Soils) compared to the other northern segment combinations. This segment combination would cross Lake Creek and the Little Susitna River. Multiple spans and in-water support piles would likely be required for the Little Susitna River crossing because its channel width exceeds ARRC's proposed bridge span length of 28 feet. Compared to other northern segment combinations, this segment combination would require one of the smallest number of bridge crossings. This segment combination would cross Lake Creek with a drainage structure that would be determined during final permitting and design.

The number of new culverts (12) proposed along this segment combination is not substantially different from the number of new culverts proposed along the other northern segment combinations. This segment combination would also require the largest number of culvert extensions along the main line.

Houston-Houston South Segment Combination

The Houston-Houston South Segment Combination would cross 18 waterbodies with 1 bridge, 2 drainage structures, 13 culverts, and 2 culvert extensions (see Figure 4.2-4). This segment combination would involve the fewest crossings compared to the other northern segment combinations, and would have the least potential for impacts to water quality and hydrology during rail line construction and operations. This segment combination would have one of the higher acreages of wetlands and other waters of the U.S. (144 acres; see Section 4.5, Wetland Resources) in and along the ROW compared to the other northern segment combinations, which would increase the potential for impacts to water quality and alteration of hydrology in these areas. This segment combination would have the smallest percentage of highly or potentially highly erodible soils (see Section 3.4, Geology and Soils) compared to the other northern segment combinations, but the percentage for this segment combination is similar to two other northern segment combinations. This segment combination would cross the Little Susitna River with a bridge. Multiple spans and in-water support piles would likely be required for the Little Susitna River crossing because its channel width exceeds ARRC's proposed bridge span lengths of 28 feet. Compared to other northern segment combinations, this segment combination would have one of the smallest number of bridge crossings.

The new culverts (13) proposed along this segment combination is not substantially different from the number of new culverts proposed along the other northern segment combinations. This segment combination would also have the smallest number of culvert extensions along the main line.

Summary of Potential Impacts by Alternative

The primary factor to consider when comparing potential impacts to surface water among alternatives is the number of waterbody crossings, because it is this activity that could most directly affect water quality and hydrology during rail line construction and operations. The more in-water work that would result from a larger number of culverts and bridges during construction, the greater the potential for impacts to surface water. In addition, bridges generally would be expected to result in fewer hydrology impacts than culverts, because bridges are able to maintain stream structure and flow characteristics better than culverts, maintain transport of bedload, provide less restriction to flow, and generally require less instream maintenance over time. Other minor factors that can be considered when assessing potential impacts to surface water can include the presence of highly erodible soils, the extension of existing culverts versus constructing new culverts, or the amount of wetlands and other waters of the U.S. near the ROW that could be affected by water quality impacts during construction and operations. However, these potential impacts can be reduced and minimized through best management practices and mitigation measures and are not expected to be primary determining factors when comparing potential impacts to surface water among alternatives.

Table 4.2-6 summarizes waterbody crossings associated with the eight proposed Port MacKenzie Rail Extension alternatives.

Table 4.2-6
Waterbody Crossings by Alternative[a]

	Alternative							
	Mac West-Connector 1-Willow	Mac West-Connector 1-Houston-Houston North	Mac West-Connector 1-Houston-Houston South	Mac West-Connector 2-Big Lake	Mac East-Connector 3-Willow	Mac East-Connector 3-Houston-Houston North	Mac East-Connector 3-Houston-Houston South	Mac East-Big Lake
Numbers of Crossings								
Total Crossings	45	51	40	42	30	36	25	26
Types of Waterbodies								
Wetlands	18	18	19	15	13	13	14	12
Streams	13	15	12	13	10	12	9	11
Unidentified[b]	14	18	9	14	7	11	2	3
Types of Crossings								
Bridges	4	1	1	0	4	1	1	0
Drainage Structures[c]	4	4	3	7	3	3	2	7
Culverts	34	33	34	32	20	19	20	16
Culvert Extensions	3	13	2	3	3	13	2	3

[a] Source: ARRC, 2008; Noel *et al.*, 2008.
[b] Unidentified designates an unmapped drainage area.
[c] Drainage structures would be determined during the final design process and could include multi-plate culverts, pre-cast arches, or bridges.

The number of waterbody crossings would range from 25 along the Mac East-Connector 3-Houston-Houston South Alternative to 51 along the Mac West-Connector 1-Houston-Houston North Alternative. The Mac East-Connector 3-Houston-Houston South Alternative would require fewest crossings with the smallest number of drainage structures and culvert extensions, and one of the smallest number of culverts, which would result in the least in-water work and the smallest potential impact during operations. The Mac West-Connector 1-Houston-Houston

North Alternative would require the most crossings, which would require the most in-water work. While this alternative would require one less new culvert than two other alternatives, it would require 13 culvert extensions that would require in-water work.

4.2.4.2 No-Action Alternative

Under the No-Action Alternative, ARRC would not construct and operate the proposed Port MacKenzie Rail Extension, and there would be no surface water impacts from the project.

4.3 Groundwater

This section describes potential impacts to groundwater from the proposed Port MacKenzie Rail Extension. Section 4.3.1 defines the groundwater study area, Section 4.3.2 describes the methods employed to analyze impacts to groundwater, Section 4.3.3 describes the affected environment (existing conditions), and Section 4.3.4 describes potential environmental consequences (impacts) to groundwater.

4.3.1 Study Area

The proposed Port MacKenzie Rail Extension would be northwest of Anchorage on the west side of the Knik Arm (ARRC, 2008). The study area is within the Susitna River valley and bounded by the Susitna River on the west, Knik Arm of Cook Inlet on the south and east, and Parks Highway and the existing ARRC main line on the north. Groundwater in the Susitna River basin is recharged mainly by snowmelt and precipitation infiltrating into the foothill slopes of the Talkeetna or Chugach mountains, and by direct snowmelt and precipitation throughout the area (ADEC, 2006).

4.3.2 Analysis Methodology

To identify potential impacts to groundwater from proposed Port MacKenzie Rail Extension construction and operations, the analysis incorporated review of existing ARRC project descriptions and groundwater and well data the USEPA, U.S. Geological Survey, and ADEC collected.

4.3.3 Affected Environment

Groundwater is the subsurface water that saturates the pores and cracks in soil and rock. Groundwater discharges replenish streams, rivers, and wetland habitats with fresh water. An aquifer is a geologic layer that transmits groundwater. There are different types of aquifers, which are characterized based on aquifer composition. Most groundwater is more protected from quick contamination than surface water, depending on a contaminant's ability to permeate the overlying soils or rock.

Groundwater is a source of drinking water for approximately 50 percent of Alaska's total population and 90 percent of the state's rural residents. Alaska has 1,602 public drinking water systems; 83 percent of those use a groundwater source. In areas with a greater population, such as Anchorage, Juneau, and Ketchikan, the amount of groundwater use in the public water system represents 37 percent of the total fresh water use, with the majority of water drawn from surface waters. Conversely, 90 percent of private drinking water supplies are from groundwater sources.

Of the estimated 63 million gallons of fresh groundwater used in Alaska each day, more than 50 percent is used for public water supplies and roughly 10 percent is used for domestic water. Southcentral and Interior Alaska have the greatest dependence on groundwater, with the largest groundwater withdrawals occurring in Anchorage, Fairbanks, Matanuska-Susitna Borough (MSB), and Kenai Peninsula Borough. Most of Alaska's aquifers consist of unconsolidated materials derived from glaciers, rivers, and streams.

In MSB, approximately 60 percent of Houston residents, 50 percent of Willow residents, and 85 percent of Big Lake residents have individual wells; the remainder haul water. Sixty-two percent of homes in the Wasilla area have individual water wells, and the city operates a piped water system to supply water to the remainder. The city's drinking water system consists of three primary groundwater wells and four 1-million-gallon above-ground steel reservoirs. Therefore, drinking water in MSB is primarily from groundwater sources (ADNR, 2009; City of Wasilla, 2008).

In the study area, groundwater is fed by direct infiltration of precipitation and snowmelt and by streams infiltrating into foothills slopes. The surface of the water table is a subdued expression of the area's topography. Regionally, groundwater flows southerly from the Talkeetna Mountain foothills to the Cook Inlet coast (USGS, 2006). There are no USEPA-designated sole-source aquifers in the study area (USEPA, 2009).

All Alaska land use actions require maintenance of Federal and state water quality standards. Title 18 AAC 70, Water Quality Standards, and the USEPA Water Criteria for Water, 1986, describe standards for drinking water quality.

The following paragraphs summarize the quality of community water in the study area of MSB (FHWA, 2007):

- Four groundwater wells tapping multiple unconfined aquifers provide community water for Wasilla. The wells range from 146 feet to 250 feet deep. Raw water quality is very good, and the system does not require treatment other than routine chlorination.
- Typical domestic supply from the glacial deposits near Houston has met expectations of a range of 10 to 50 gallons per minute, while it is reported that yields as high as 1,000 gallons per minute could be achieved through proper well design at locations near the Little Susitna River. Sandstone and coal layers at depth also supply potable water. Water quality concerns in the Houston area include incidental occurrences of high concentrations of hydrogen sulfide and conductivity, iron, total dissolved solids, and phosphorous.
- In the Big Lake area, higher yields are typical from the confined aquifer – up to 110 gallons per minute compared to approximately 5 to 50 gallons per minute in the shallow deposits. The quality of drinking water near Big Lake is generally good; however, some wells contain constituent concentrations that exceed regulatory standards. These include total dissolved solids (as high as 1,430 milligrams per liter), iron (as high as 7.2 milligrams per liter), chlorides (700 milligrams per liter), sulfates (130 milligrams per liter), and manganese (0.46 milligram per liter).

The ADNR web-based Well Log Tracking System contains groundwater data for all known water wells in the state. At present, there are more than 30,000 water-well logs in the database. Table 4.3-1 lists all 223 known drinking water supply wells identified in the database for the study area by Township, Range, and Section. Figure 4.3-1 shows the Townships, Ranges, and Sections in the study area, as defined in Section 4.3.1.

Table 4.3-1
Alaska Department of Natural Resources-Identified Drinking Water Supply Wells in the Study Area[a]

Township – North	Range – West	Sections	Number of Wells within Township/Range/ Section(s) in the Study Area
14	4	4, 5, 7, 8, 17, 18, 20 through 23, 26, 27	7
14	5	1, 12, 13	4
15	4	4 through 8, 17, 20, 28, 29, 32, 33	2
15	5	1 through 3, 10 through 12, 14, 15, 22, 23, 26, 27, 35, 36	19
16	3	2, 3, 9, 10, 16, 20, 21, 29, 30	6
16	4	6, 7, 25 through 27, 31-35	3
16	5	1, 4, 5, 9, 10, 12-16, 22 through 27, 34 through 36	3
17	2	6	0
17	3	1, 2, 6, 11 through 14, 23, 26, 34, 35	98
17	4	1, 2, 3, 10, 11, 15 through 17, 19 through 21, 29-31	14
17	5	5, 8, 9, 16, 17, 21, 28, 29, 32, 33	0
18	3	20, 21, 27, 28, 31 through 33, 35	50
18	4	2, 3, 10, 11, 13, 14, 23, 24, 26, 35	12
18	5	2 through 4, 9, 10, 16, 17, 20, 21, 29, 32	0
19	5	2, 3, 10, 11, 15, 22, 27, 34	0
20	4	19, 20, 31	5
20	5	35, 36	0
Totals			**223**

[a] Source: ADNR, 2009.

The ADEC Drinking Water Program is responsible for requiring that public water systems (a public well is one that provides water for 25 or more people) supply safe drinking water for public consumption that meets minimum Federal health-based standards established by the USEPA in the Federal Safe Drinking Water Act. Alaska has had primary enforcement responsibility of the public water system supervision program (Safe Drinking Water Program) since 1978. There are approximately 343 public water supply wells that have been identified within MSB, 223 which have been identified within the study area. All but six use groundwater as their primary source of water; the remaining six use surface water (ADEC, 2008b). Two of the 343 well systems (the Willow Trading Post in Willow at Township 19N, Range 4W, Section 8; and the Pioneer Lodge in Willow at Township 19N, Range 4W, Section 6) are near the study area and listed on the USEPA Significant Non-Complier list for violations of the total coliform rule. A significant non-complier is a system whose serious, frequent, or persistent non-compliance of drinking water regulations meets the significant non-complier criteria as defined by the USEPA for a specific rule. The USEPA and ADEC do not have the authority to regulate private drinking water wells (ADEC, 2008c).

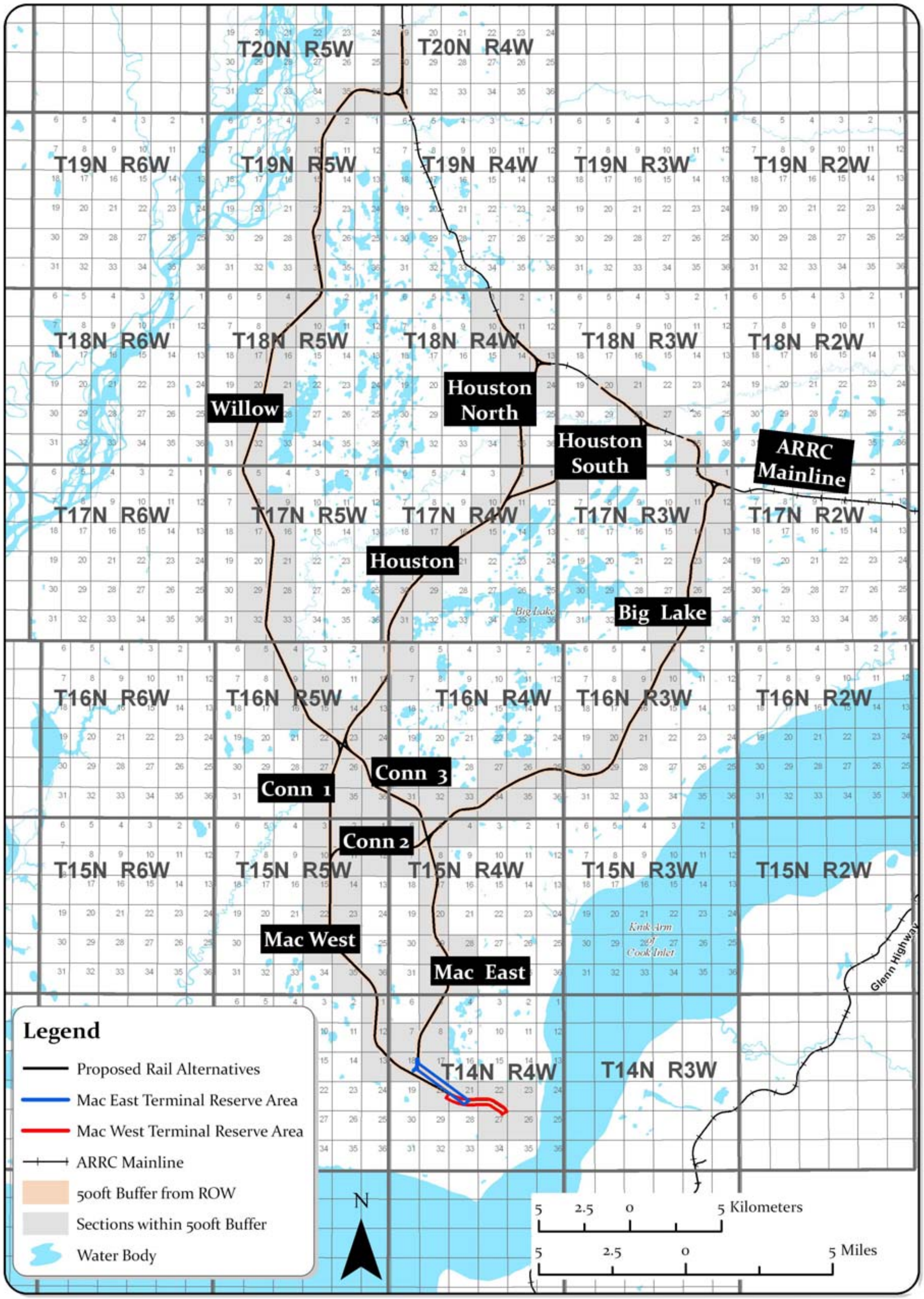

Figure 4.3-1. Proposed Port MacKenzie Rail Extension Township, Range, and Section Map

Historical (2005) monitoring data from the U.S. Geological Survey at groundwater sites near the proposed Port MacKenzie Rail Extension were used to describe baseline water quality. The data are derived from samples that were not collected at regular intervals and varied from one sample per year to one sample per month. The parameters collected also varied during the sampling periods, but temperature, conductivity, and pH were measured at most locations.

Table 4.3-2 compares selected water quality parameters to drinking water standards. Figure 4.3-2 shows the sample locations in relation to the proposed action and alternatives.

Table 4.3-2
Historic Water Quality Parameters Compared to State and Federal Standards for Drinking-Water Quality[a,b]

Date	Temperature. (°C)	Alkalinity (mg/L CaCO3)	Chloride (mg/L)	pH (s.u.)	Conductivity (µS/cm)
Water Quality Standard					
	≤ 15	30 to 500[c]	250[d]	6.0 to 8.5	< 1500[e]
Big Lake					
8/3/05 – Site B-1	9.1	64	4.54	7.0	141
9/16/05 – Site B-1	9.6			6.9	147
8/1/05 – Site B-2	6.6	101	0.59	8.4	210
9/9/05 – Site B-2	6.0			8.3	215
8/9/05 – Site B-3	4.5	114	2.16	8.5	219
9/12/05 – Site B-3	4.4			8.4	222
Lake Lucile					
8/10/05 – Site L-1	5.9	117	21.50	7.6	319
9/14/05 – Site L-1	6.3			7.8	283
8/15/05 – Site L-2	5.8	192	31.30	7.6	506
9/9/05 – Site L-2	5.6			7.6	503
8/10/05 – Site L-3	5.9	110	2.62	8.4	229
9/13/05 – Site L-3	5.9			8.3	231
Cottonwood Lake					
8/8/05 – Site C-1	4.6	179	3.98	7.8	377
9/14/05 – Site C-1	4.5			7.9	377
8/9/05 – Site C-2	9.6	137	4.41	7.4	297
9/14/05 – Site C-2	9.4			7.6	307
8/8/05 – Site C-3	4.1	191	38.20	7.4	543
Seymour Lake					
8/12/05 – Site S-1	4.8	152	1.53	7.3	301
9/13/05 – Site S-1	4.6			7.3	303
8/12/05 – Site S-2	4.8	148	1.81	7.1	301
9/13/05 – Site S-2	4.6			7.1	304
8/12/05 – Site S-3	4.9	189	2.59	7.2	378
9/13/05 – Site S-3	4.5			7.2	375
Memory Lake					
8/5/05 – Site M-1	5.5	191	44.60	6.9	538
9/12/05 – Site M-1	5.1			6.9	547
8/3/05 – Site M-2	8.2	129	1.95	7.2	269
9/9/05 – Site M-2	7.5			7.1	277
8/5/05 – Site M-3	5.5	114	1.40	6.9	222
9/12/05 – Site M-3	5.4			6.9	225

[a] Sources: USGS, 2006; ADEC, 2008d; USEPA, 1986.
[b] °C = degrees Celsius; mg/L = milligrams per liter; CaCO3 = calcium carbonate; pH = measure of the acidity or the basicity of a solution; s.u. = standard units; µS/cm = micro-siemens per centimeter; ≤ = less than or equal to; < = less than.
[c] The USEPA limits alkalinity in terms of total dissolved solids limit (500 parts per million) and to some extent by the limit on pH. The aesthetic objective is generally 30 to 500 mg/L $CaCO_3$.
[d] Neither chlorides nor sulfates may exceed 250 mg/L as part of the total dissolved solids standard.
[e] Conductivity is not a water quality standard, but acceptable range for drinking water. Total dissolved solids levels can be inferred from conductivity.

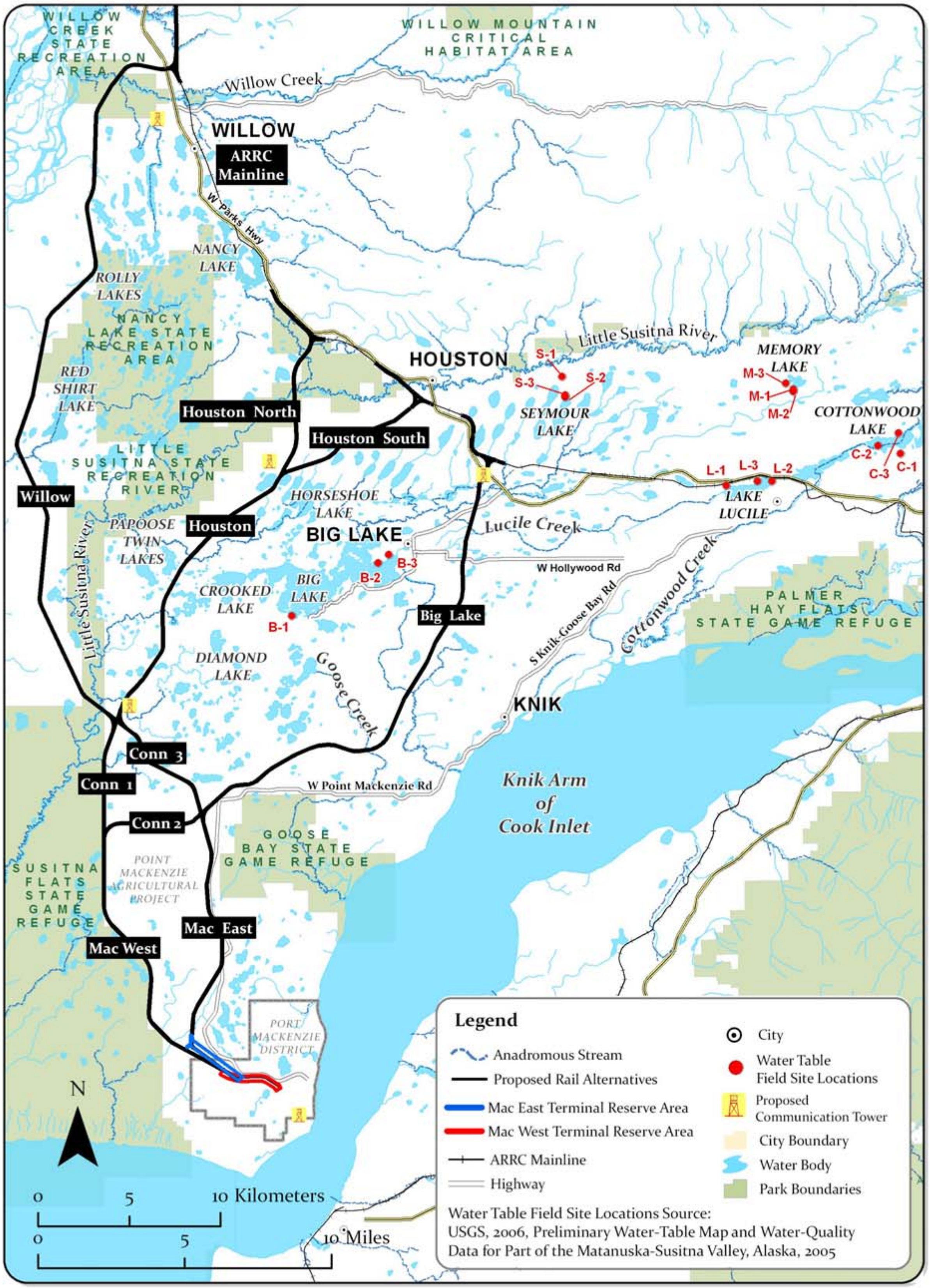

Figure 4.3-2. U.S. Geological Survey Groundwater Sampling Locations

As shown, the available U.S. Geological Survey data for areas in and around the study area (Big Lake, Seymour Lake, Memory Lake, Lake Lucille, and Cottonwood Lake) indicates that groundwater quality meets drinking water standards in those areas. However, there might still be localized water quality impairment in other areas of the study area. Research has shown the following potential areas of concern:

- Arsenic – Conditions favorable to the occurrence of arsenic in groundwater are found throughout the study area. These include the presence of iron oxide and sulfide minerals in the aquifer materials, and phosphates and organic carbon in alkaline (high pH) groundwater. According to the ADEC, seven public water systems in MSB are out of compliance with the Federal standard for arsenic, which limits levels to no more than 10 micrograms per liter. The wells identified had concentrations of arsenic between 25 micrograms per liter and 400 micrograms per liter (White, 2009).
- Contaminated sites – SEA searched the ADEC on-line databases for incidents of "open" leaking underground storage tank sites and "active" contaminated sites. The search resulted in the identification of five sites within 1 mile of the study area with potential risk for contamination. See Section 3.4.3 for a detailed summary.
- Groundwater recharge areas – There has been no regional hydrogeologic mapping for MSB. Based on general geological conditions in the study area, recharge to unconfined aquifers occurs through downward percolation of precipitation. Recharge to deeper aquifers is by infiltration of groundwater through aquitards and "leaky" confining layers, by lateral migration from other aquifers, and/or by direct infiltration of precipitation where the till or other confining layers are absent. Groundwater recharge occurs over most of the land surface, with local discharge to low-lying areas such as lakes, streams, and wetlands.

4.3.4 Environmental Consequences

4.3.4.1 Proposed Action

The analysis of potential impacts to groundwater from proposed Port MacKenzie Rail Extension construction and operations is not specific to rail line segments because there would be no impacts to groundwater that distinguish segments, such as the presence of protected groundwater aquifers or groundwater wells within the 200-foot ROW. Rather, this section describes common impacts that could occur throughout the study area during proposed rail line construction and operations, and provides a general guideline for understanding the effects of the proposed project. These common impacts vary only by location, but the level of impact would be the same. Because the location and/or design characteristics of some temporary construction facilities and rail line structures would be determined only during the final design and permitting process, the impact determinations for facilities and structures represent conservative best estimates of potential impacts from rail line facilities and structures in the study area.

Construction Impacts

Construction of the rail line, sidings, power lines, buried communications cables, an access road, and other facilities could affect groundwater movement and quality. Groundwater movement could be altered by changes in infiltration and recharge rates due to compaction of the overlying soil. Groundwater quality could be altered if project components and operations provide additional sources or pathways for pollutants to the groundwater. The following paragraphs describe potential construction-related impacts common to all alternative segments.

Construction of Rail Line, Associated Facilities, Unpaved Access Roads, and Staging Areas

Construction of the rail line, associated facilities, unpaved access roads, and staging areas could alter infiltration and recharge characteristics and could permanently reduce or impede infiltration due to surface soil compaction. These effects would be limited to the footprint of the rail line, facilities, access roads, and staging areas, which represents a small fraction of the total recharge area. Any contaminants released to the ground during construction could be introduced to groundwater through infiltration, thus effecting groundwater quality.

Excavation of Borrow Areas

Extraction of material from borrow areas could affect the local hydrogeologic regime (and water balance) by the removal of saturated materials. Depending on the hydraulic transmissivity of the soils in the borrow areas, they would likely fill with groundwater over time. Water levels in the pond would fluctuate with the water table, and would be a source of groundwater discharge through evaporation during summer and a source of groundwater recharge during ice break-up and major rainstorms. Dewatering of aquifers or reservoirs of local, shallow, thawed, water-bearing zones could occur during construction and operation of any borrow area. These activities could result in hydrological and water quality impacts to groundwater.

Operations Impacts

Potential operations activities could affect groundwater through the same mechanisms described above for construction impacts. The presence of culverts, bridge pilings, or other permanent maintenance structures would result in negligible impacts to groundwater infiltration because these facilities would not affect infiltration processes. However, the presence of the rail line close to any shallow groundwater wells could reduce or impede infiltration due to surface soil compaction. Given the limited surface area of the rail line, it would be expected that these impacts would be negligible. In addition, the presence of bridges or culverts near or over springs and seeps could disrupt groundwater discharge processes and create instability concerns that would need to be addressed in structure design. Furthermore, any contaminants released to the ground during operations could be introduced to groundwater through infiltration, thus effecting groundwater quality.

4.3.4.2 No-Action Alternative

Under the No-Action Alternative, ARRC would not construct and operate the proposed Port MacKenzie Rail Extension, and there would be no groundwater impacts from the project.

4.4 Floodplains

This section describes the analysis of potential impacts to floodplains from the proposed Port MacKenzie Rail Extension. Section 4.4.1 defines the floodplain study area, Section 4.4.2 describes the methods employed to analyze impacts to floodplains, Section 4.4.3 describes the affected environment (existing conditions), and Section 4.4.4 describes potential environmental consequences (impacts).

4.4.1 Study Area

The study area for the SEA analysis of potential impacts to floodplains is a portion of the Susitna River valley bounded by the Susitna River to the west, the Knik Arm extension of Cook Inlet to the south and east, and Parks Highway and the existing ARRC main line to the north. SEA then focused its analysis on Federal Emergency Management Agency (FEMA)-mapped 100-year floodplains in the study area.

4.4.2 Analysis Methodology

SEA initially identified floodplains in the study area by reviewing FEMA Flood Insurance Rate Maps developed during the Flood Insurance Study of the MSB in 1999. In the study area, the flood study mapped 100-year floodplains (areas that have a 1-percent chance of annual flooding) along Willow Creek, Little Willow Creek, the Little Susitna River, Lake Creek, Deception Creek, and Lucile Creek. FEMA has also designated floodways in the study area along Willow Creek and the Little Susitna River. A floodway is the portion of the channel of a river or other watercourse and the adjacent land area that must remain undeveloped so as to discharge a 100-year flood without cumulatively increasing the water surface elevation more than a designated height (FEMA, 2009a). According to FEMA guidelines, a FEMA-designated floodway must be maintained in an unobstructed condition to prevent an unacceptable increase in flood levels.

FEMA has not mapped much of the study area and it is therefore designated as having possible but undetermined flood hazard risk. For streams in the study area for which FEMA maps were not available, SEA estimated the presence of floodplains from aerial photography and topographic mapping provided by the Applicant, the U.S. Geological Survey, and MSB. SEA also considered Applicant-proposed water crossings (either bridges or culverts) in its evaluation of potential impacts to floodplains from the proposed action.

4.4.3 Affected Environment

Floodplains are valuable hydrological and ecological resources that serve many functions, including the storage of storm water, erosion and sediment control, and wildlife habitat. For human communities, floodplains can be considered a hazard area for development because properties in floodplains can be inundated during flooding.

In Alaska, flooding can result from rainfall runoff, snowmelt, groundwater, ice jam, flash flooding, fluctuating lake levels, alluvial fan, and glacial dammed lake outbreaks. Although the available data is limited in its period of record, the historical record demonstrates that flooding is not uncommon in the study area, particularly along the Little Susitna River and Little Willow

Creek (see Table 4.4-1). In fall 2006, heavy rainfall led to widespread flooding, particularly along the Little Susitna River near Houston and Willow Creek along Parks Highway, contributing to road closures, property damage, and loss of telephone service (Hollander, 2006).

Table 4.4-1
Floods in the Proposed Port MacKenzie Rail Extension Study Area Since 1980[a]

Little Willow Creek near Kashwitna	Willow Creek near Willow	The Little Susitna River near Houston	Nancy Lake Tributary near Willow	Deception Creek near Willow
August 25, 1984	July 28, 1980	September 16, 1980	June 21, 1980	June 21, 1980
August 12, 1985	October 11, 1986	July 11, 1981	October 11, 1986	October 11, 1986
September 20, 1986	August 19, 2006	August 26, 1984		
October 11, 1986		August 13, 1985		
		September 21, 1986		
		October 12, 1986		
		August 19, 2006		

[a] Sources: USGS, 2009a; USGS, 2009b; MSB, 2006.

Within the study area, FEMA has delineated 100-year floodplains along Willow Creek, Little Willow Creek, Lake Creek, Deception Creek, Lucile Creek, and the Little Susitna River. The presence of FEMA-regulated floodplains typically indicates these water courses present some level of flooding risk to residential and commercial development. FEMA-regulated floodways have also been delineated on Willow Creek and the Little Susitna River. Figure 4.4-1 shows mapped floodplains in the study area and potential rail line crossings of those floodplains.

4.4.4 Environmental Consequences

This section describes potential impacts to floodplains under the proposed action (Section 4.4.4.1) and the No-Action Alternative (Section 4.4.4.2). Impact determinations for the facilities and structures identified in this section represent best estimates, because the location or design characteristics of some temporary construction facilities and rail line structures would be determined only during the final design and permitting process. This section focuses on direct impacts to floodplains, and in some cases changes in flood flows, that could result from impacts to floodplains. While impacts to floodplains could affect other resource areas such as water quality, wetlands, and fisheries, this section does not address those impacts. For a description of the potential impacts to water quality, see Section 4.2; for a description of potential impacts to wetlands, see Section 4.5; and for a description of potential impacts to fisheries, see Section 5.4.

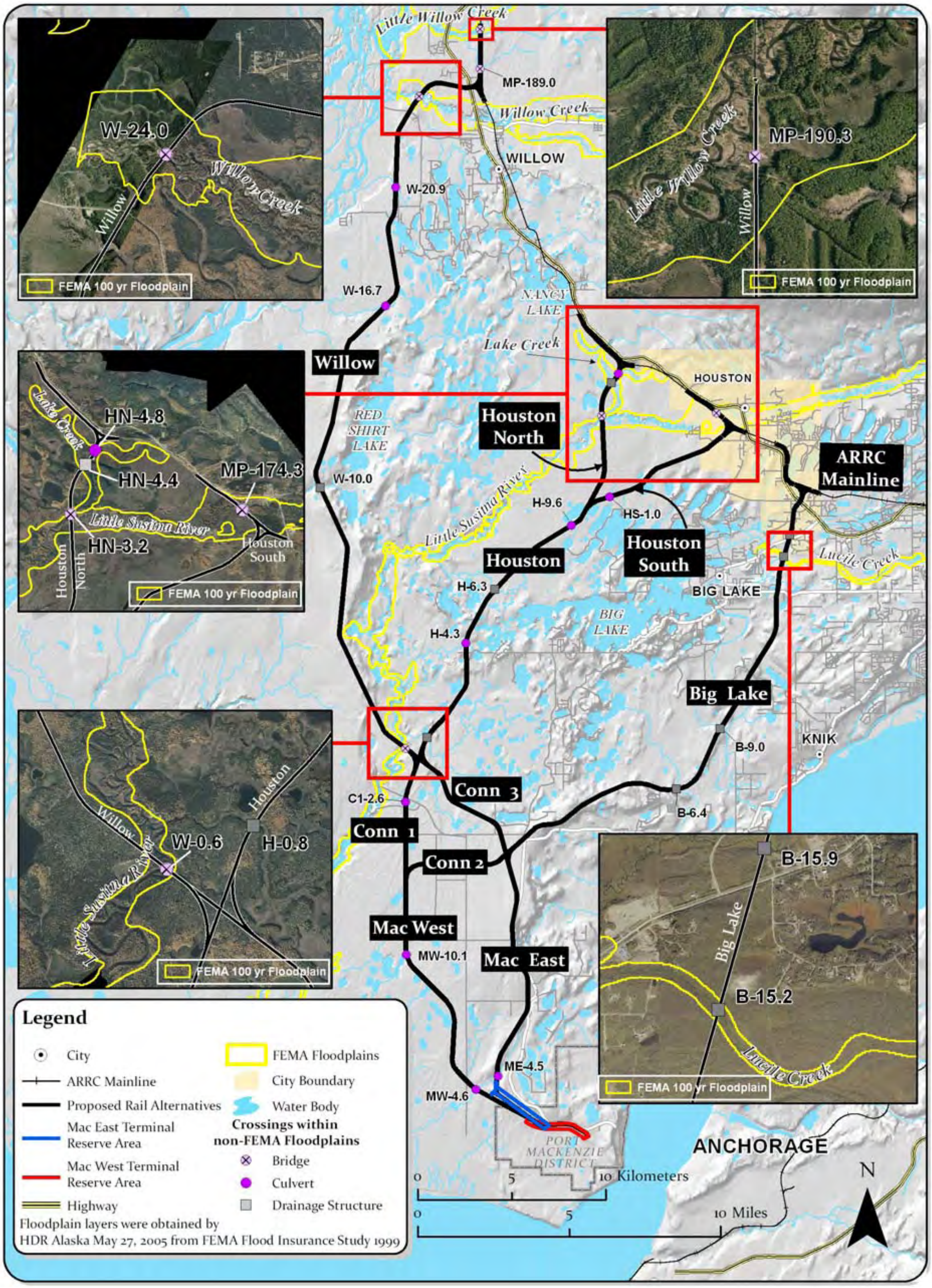

Figure 4.4-1. Floodplains in the Proposed Port MacKenzie Rail Extension Study Area

4.4.4.1 Proposed Action

Common Impacts

Construction Impacts

Rail and Access Road Alignments

Rail line and access roads placed within the 100-year floodplain would require fill placement. Rail and road beds would either parallel the watercourse that defines the floodplain or cross perpendicular to the watercourse. The parallel alignments could reduce floodplain storage volume. Perpendicular alignments could constrict flood flow paths, and increase floodwater elevation upstream of the constriction. However, the affected areas would be small compared to the total floodplain storage available; therefore, SEA would expect minimal impacts to floodplain storage from the placement of the rail line and access roads. Rail line and access road alignments created by fill within the floodplain could also redirect flood flows to existing channels, leading to channel erosion and the potential alteration of channel alignment.

Excavation of Borrow Areas

The Applicant would use borrow areas to obtain ballast and fill material required for both the rail line and the access road. If ARRC developed borrow areas in a floodplain and in proximity to a watercourse, excavation of ballast and fill material could alter the hydraulics and conveyance of the watercourse during flood stage. This could lead to a short-term increase in flood storage, or alteration of channel alignment through rapid channel avulsion (tearing away of soil) into the borrow areas.

Staging Areas

The Applicant would store construction materials and establish locations for staging areas in the 200-foot ROW on relatively flat, previously disturbed land, and would not likely place these facilities in floodplains. In the unlikely event that ARRC developed staging areas in a floodplain, natural drainage patterns could be disrupted if construction activities occurred during flooding episodes of major streams, during high runoff periods, or along shallow overland flow paths. In addition, the presence of staging areas within floodplains could create blockages or diversions, which could impact conveyance capacity and result in increased flooding elevations.

Construction and Installation of Bridges and Culverts

Impacts to floodplains from construction and installation of bridges and culverts would be similar to those described above for access roads. There could be additional impacts associated with the temporary diversion of flow while culverts and bridge sections were being installed. These activities could temporarily reduce channel capacity in the area of construction, leading to higher floodwaters in surrounding areas. ARRC would size all water crossings to convey the 100-year flow event associated with local drainages. For larger stream and river crossings, ARRC would construct bridges as single- or multiple-span segments that would either completely or only partially span (or clear) the existing active river channel. The proposed locations for bridges would be associated with crossings of Willow Creek, Rogers Creek, the

Little Susitna River, and a tributary to Little Willow Creek. For crossings associated with smaller streams, the Applicant would install culverts to convey flows under the rail line.

Operations Impacts

Impacts to floodplains during rail line operations would be common to all proposed rail line alternatives. The continued presence of raised rail beds and bridge crossings could lead to changes in floodplain hydraulics and result in alterations of channel alignment and channel erosion. In addition, channel stabilization designed to protect the rail line from channel migration could create increased channel migration upstream and downstream of the proposed protection measures. Obstruction of culverts could result from the deposition of soil and other debris during high flows or from the accumulation of ice during cold weather. Such obstructions would reduce the conveyance capacity of the culvert and could lead to increased flooding in the vicinity of the water crossing.

Impacts by Alternative Segment

Southern Segments and Segment Combinations

Table 4.4-2 summarizes floodplains in the area of the southern rail line segments and segment combinations. As mentioned in Section 4.4.2, much of the project area has not yet been mapped by FEMA. For areas without FEMA data, SEA estimated the presence of potential floodplains along identified streams from aerial photography, topographic mapping, and wetland mapping. No additional floodplain mapping sources were available for this analysis.

Table 4.4-2
Floodplain Summary for the Proposed Port MacKenzie Rail Extension Southern Segments and Segment Combinations[a]

	Mac West-Connector 1	Mac West-Connector 2	Mac East-Connector 3	Mac East
Within FEMA[b]-designated 100-Year Floodplain	No Data	No Data	No Data	No Data
FEMA Floodway	No Data	No Data	No Data	No Data
Crossings with the potential for floodplains (non-FEMA)	MW-4.6, MW-10.1, C1-2.6	MW-4.6, MW-10.1	ME-4.5	ME-4.5

[a] Sources: ARRC, 2008; FEMA, 1999; FEMA, 2009b; MSB, 2007; USGS, 2009c
[b] FEMA = Federal Emergency Management Agency.

Mac West-Connector 1 Segment Combination

There are no FEMA floodplain data for the area along the Mac West-Connector 1 Segment Combination. SEA identified three potential floodplains at stream crossings MW-4.6, MW-10.1, and C1-2.6, with approximate floodplain widths of 450, 150, and 300 feet, respectively. The Applicant has proposed culverts at these crossings. This segment combination would also intersect the flow path of multiple unnamed waterbodies, without clearly defined channels or discernable floodplains, that drain adjacent lakes and convey local surface water to the Little

Susitna River and Cook Inlet. Because ARRC would size all proposed water crossings to convey the 100-year flow event associated with local drainages, proposed rail line construction and operations along Mac West-Connector 1 would not be likely to result in adverse impacts to floodplains.

Mac West-Connector 2 Segment Combination

There are no FEMA floodplain data for the area along the Mac West-Connector 2 Segment Combination. SEA identified two potential floodplains at proposed stream crossings MW-4.6 and MW-10.1, with approximate floodplain widths of 450 and 150 feet, respectively. The Applicant has proposed culverts at these crossings. Smaller undefined flow paths associated with this segment combination do not have discernable floodplains. Because ARRC would size all proposed water crossings to convey the 100-year flow event associated with local drainages, rail line construction and operations along the Mac West-Connector 2 Segment Combination would not be likely to result in impacts to floodplains.

Mac East-Connector 3 Segment Combination

There are no FEMA floodplain data for the area along the Mac East-Connector 3 Segment Combination. SEA identified one potential floodplain at proposed stream crossing ME-4.5, with an approximate floodplain width of 450 feet. The Applicant has proposed a culvert at this crossing. This segment combination would also intersect the flow path of multiple waterbodies, without clearly defined channels or discernable floodplains, that drain to adjacent lakes or Cook Inlet. Because ARRC would size all proposed water crossings to convey the 100-year flow event associated with local drainages, rail line construction and operations along the Mac East-Connector 3 Segment Combination would not be likely to result in adverse impacts to floodplains.

Mac East Segment

There are no available FEMA floodplain data for the area along the Mac East Segment. SEA identified one potential floodplain at proposed stream crossing ME-4.5, with an approximate floodplain width of 450 feet. The Applicant has proposed a culvert at this crossing. This segment would also intersect the flow path of two waterbodies, without clearly defined channels or discernable floodplains, that drain to adjacent Cook Inlet. Because ARRC would size all proposed water crossings to convey the 100-year flow event associated with local drainages, rail line construction and operations along Mac East would not be likely to result in adverse impacts to floodplains.

Northern Segments and Segment Combinations

Table 4.4-3 summarizes floodplains in the area of the northern rail line segments and segment combinations. As stated above, there are FEMA data for the Little Susitna River, Willow Creek, Lucile Creek, Lake Creek, and a tributary to Little Willow Creek. For areas without FEMA data, SEA determined the presence of potential floodplains along identified streams from aerial photography, topographic mapping, and wetland mapping. No other floodplain mapping sources were available.

Table 4.4-3
Floodplain Summary for the Proposed Port MacKenzie Rail Extension Northern Segments and Segment Combinations[a]

	Willow		Big Lake	Houston-Houston North			Houston-Houston South	
Proposed water crossing	W-0.6	W-24.0	MP-190.3	B-15.2	HN-3.2	HN-4.4	HN-4.8	MP-174.3
Steam name	The Little Susitna River	Willow Creek	Little Willow Creek Tributary	Lucile Creek	The Little Susitna River	Lake Creek	Lake Creek Tributary	The Little Susitna River
Would cross FEMA[b]-designated 100-Year Floodplain	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Would Cross FEMA Floodway	Yes	Yes	No	No	Yes	No	No	Yes
Crossings with potential floodplains (non-FEMA)	W-10.0, W-14.4, W-16.7, W-20.9, MP-189.0		B-6.4, B-9.0, B-15.9	H-0.8, H-4.3, H-6.3, H-9.6			H-0.8, H-4.3, H-6.3, H-9.6, HS-1.0	

[a] Sources: ARRC, 2008; FEMA, 1999; FEMA, 2009b; MSB, 2007; USGS, 2009c.
[b] FEMA = Federal Emergency Management Agency.

Willow Segment

The Willow Segment would cross multiple streams, including Fish Creek, Rogers Creek, Willow Creek, the Little Susitna River, and multiple unnamed tributaries. Approximately 8,065 feet (about 1.5 miles) of the Willow Segment ROW would cross 38 acres of FEMA-designated 100-year floodplains. This area accounts for 1 percent of the total floodplain area along the Little Susitna River, Little Willow Creek, and Willow Creek, the three waterbodies with FEMA-designated floodplains the Willow Segment would cross. This segment would also require construction of three waterbody crossings within FEMA-designated floodplains (see crossing locations MP-190.3, W-24.0, and W-0.6 on Figure 4.4-1). At the northern extent of the Willow Segment along its connection with the main line, the proposed rail line would be within the FEMA-designated floodplain of Little Willow Creek. ARRC proposed a bridge at crossing MP-190.3 along Little Willow Creek, which ARRC would design to convey 100-year flows. The FEMA-designated floodplain is 2,800 feet (about 0.5 mile) wide in the vicinity of proposed crossing MP-190.3 at a tributary of Little Willow Creek. The Willow Segment would also cross Willow Creek near the connection of the segment with the main line, and the Little Susitna River near the connection of the segment with Connector 1 Segment. Both waterbodies have FEMA-delineated floodplains and floodways. The FEMA-designed floodplain is approximately 4,350 feet (about 0.8 mile) wide in the vicinity of this proposed crossing (W-24.0). ARRC proposes bridges at both crossing locations (W-24.0 for Willow Creek and W-0.6 for the Little Susitna River). Because the Applicant has indicated that bridge spans would be 28 feet long and the floodways at both locations are approximately 300 feet wide, it is likely ARRC would have to construct bridge pilings within Willow Creek and the Little Susitna River. Construction of such pilings within the floodways could alter floodwaters and lead to an increase in flood levels in the vicinity of the water crossings. At proposed crossing W-0.6, the FEMA-designated floodplain is approximately 1,750 feet (about 0.3 mile) wide.

The Willow Segment would cross several smaller water courses not associated with any FEMA-designated floodplains. SEA identified five potential floodplains at proposed crossings W-10.0 on Fish Creek, and W-14.4, W-16.7, W-20.9, and MP-189.9 on Rogers Creek, with approximate widths of 130, 40, 530, 150, and 320 feet, respectively. Proposed conveyance structures at these crossings include one drainage structure, three culverts, and a bridge. Installation of the culverts could require temporary diversion of water flow. This action could temporarily reduce channel capacity in the area of construction, leading to higher floodwaters upstream of the crossing.

Because ARRC would size all proposed water crossings to convey the 100-year flow event associated with local drainages, rail line construction and operations along the Willow Segment would not be likely to result in adverse impacts to floodplains at these locations.

Big Lake Segment

The Big Lake Segment would cross Little Meadow Creek, Lucile Creek, Fish Creek, Goose Creek, and multiple unnamed channels. Approximately 460 feet of the Big Lake Segment ROW would cross 2 acres of FEMA-designated 100-year floodplains. This area would account for less than 1 percent of the floodplain area along Lucile Creek, the only waterbody with a FEMA-designated floodplain the segment would cross (see crossing location B-15.2 on Figure 4.4-1). ARRC has proposed a drainage structure for crossing B-15.2; final design will determine whether it would be a culvert or a bridge.

This segment would cross several streams not associated with FEMA-designated floodplains. SEA identified potential floodplains at crossings B-6.4 (Goose Creek), B-9.0 (Fish Creek), and B-15.9 (Little Meadow Creek), with approximate widths of 850, 200, and 450 feet, respectively. Conveyance structures at these crossings would include three drainage structures; final design would determine whether they would be culverts or bridges. Because ARRC would size all proposed water crossings to convey the 100-year flow event associated with local drainages, rail line construction and operations along the Big Lake Segment would not be likely to result in adverse impacts to floodplains.

Houston-Houston North Segment Combination

The Houston-Houston North Segment Combination would cross the Little Susitna River, Lake Creek, and several unnamed tributaries. Approximately 6,600 feet (about 1.25 miles) of the segment combination ROW would cross 27 acres of FEMA-designated 100-year floodplains. This area would account for approximately 2 percent of the floodplain area along the Little Susitna River and Lake Creek. This segment combination would also require construction of three waterbody crossings within FEMA-designated floodplains (see crossing locations HN-3.2, HN-4.4, and HN-4.8 in Figure 4.4-1). ARRC proposes a bridge at crossing HN-3.2. It is likely that multiple bridge spans and in-water pilings would be required for this bridge crossing because the Applicant has indicated that bridge spans would be 28 feet long and the floodway at this location is approximately 145 feet wide. Construction of such pilings within the floodway could alter floodwaters and lead to an increase in flood levels in the vicinity of the water crossing. The Little Susitna River has a FEMA-designated floodplain approximately 2,150 feet (about 0.4 mile) wide at proposed crossing HN-3.2. Lake Creek has a FEMA-designated floodplain 3,760 feet (about 0.7 mile) wide at proposed crossings HN-4.4 and HN-4.8. Although crossing HN-4.8 would be on a tributary of Lake Creek, it would be within the Lake Creek FEMA-designated floodplain. The other streams do not have FEMA-designated floodplains.

ARRC proposes a drainage structure for crossing HN-4.4, but has not determined the type of structure. ARRC has proposed a culvert at the Lake Creek tributary crossing at (HN-4.8). Installation of the culvert could require temporary diversion of water flow. This action could temporarily reduce channel capacity in the area of construction, leading to higher floodwaters upstream of the crossing.

There are several smaller streams along this segment not associated with any FEMA-designated floodplains. SEA identified four potential floodplains at crossings H-0.8, H-4.3, H-6.3, and H-9.6, with approximate widths of 200, 185, 400, and 170 feet, respectively. Conveyance structures for these crossings would be two drainage structures and two culverts. Installation of the culverts could require temporary diversion of water flow. This action could temporarily reduce channel capacity in the area of construction, leading to higher floodwaters upstream of the crossing.

Because ARRC would size all proposed water crossings to convey the 100-year flow event associated with local drainages, rail line construction and operations along the Houston-Houston North Segment Combination would not be likely to result in adverse impacts to floodplains.

Houston-Houston South Segment Combination

This segment combination would cross the Little Susitna River and several unnamed tributaries. Approximately 1,945 feet (about 0.4 mile) of the segment combination ROW would cross 19 acres of FEMA-designated 100-year floodplains. This area would account for less than 1 percent of the floodplain area along the Little Susitna River, the only waterbody with FEMA-designated floodplains the Houston-Houston South Segment Combination would cross. This segment combination would also require construction of one waterbody crossing within a FEMA-designated floodplain (crossing MP-174.3), where ARRC proposes a bridge. It is likely that multiple bridge spans and in-water pilings would be required for this bridge because the Applicant has indicated that bridge spans would be 28 feet long and the floodway at this location is approximately 100 feet wide. Construction of such pilings within the floodway could alter floodwaters and lead to an increase in flood levels in the vicinity of the water crossing. At proposed crossing MP-174.3, the Little Susitna River has a FEMA-designated floodplain 1,950 feet wide.

There are several smaller streams along this segment combination not associated with any FEMA-designated floodplains. SEA identified five potential floodplains at crossings H-0.8, H-4.3, H-6.3, H-9.6, and HS-1.0, with approximate widths of 200, 185, 400, 170, and 200 feet, respectively. Conveyance structures at these crossings would be two drainage structures and three culverts. Installation of the culverts could require temporary diversion of water flow. This action could temporarily reduce channel capacity in the area of construction, leading to higher floodwaters upstream of the crossing.

Because ARRC would size all proposed water crossings to convey the 100-year flow event associated with local drainages, rail line construction and operations along the Houston-Houston South Segment Combination would not be likely to result in adverse impacts to floodplains.

Summary of Impacts by Rail Line Alternative

Table 4.4-4 summarizes potential impacts to floodplains for each Port MacKenzie Rail Extension alternative. In general, the more rail line and ROW in floodplains along an alternative, the greater the potential for impacts to floodplain capacity and flood flows. The Mac West-Connector 1-Willow and Mac East-Connector 3-Willow alternatives would impact the greatest amount of FEMA- designated floodplains, with approximately 8,065 feet (about 1.5 miles) of rail line crossing 37 acres of 100-year floodplain. The Mac West-Connector 1-Willow Alternative would also cross an additional eight streams, two more than the Mac East-Connector 3-Willow Alternative, that have a high potential for floodplains. In addition, both alternatives would require three waterbody crossings within FEMA-designated floodplains. For both alternatives, two of the waterbody crossings would impact FEMA-designated floodways through bridge construction. The Mac West-Connector 2-Big Lake and the Mac East-Big Lake alternatives would impact the least acreage of floodplains with approximately 460 feet of rail line crossing 2 acres of 100-year floodplain. In addition, both of these alternatives would require only one waterbody crossing within a FEMA-designated floodplain, and would not impact any FEMA-designated floodways. The Mac West-Connector 2-Big Lake Alternative would also cross an additional five streams, one more than the Mac East-Big Lake Alternative, that have a high potential for floodplains.

All rail line alternatives would have the potential to impact smaller, undefined water courses in the study area not associated with FEMA-designated floodplains. Because ARRC would size all proposed water crossings to convey the 100-year flow event associated with local drainages, rail line construction and operations along any of the alternatives would not be likely to result in adverse impacts to floodplains.

4.4.4.2 No-Action Alternative

Under the No-Action Alternative, ARRC would not construct and operate the proposed Port MacKenzie Rail Extension, and there would be no floodplain impacts from the project.

Table 4.4-4
Potential Impacts to Floodplains by Alternative

	Mac West-Connector 1-Willow	Mac West-Connector 1-Houston-Houston North	Mac West-Connector 1-Houston-Houston South	Mac West-Connector 2-Big Lake	Mac East-Connector 3-Willow	Mac East-Connector 3-Houston-Houston North	Mac East-Connector 3-Houston-Houston South	Mac East-Big Lake
Crossings within FEMA[a]-mapped 100-year floodplain	3	3	1	1	3	3	1	1
Rail line within FEMA-mapped 100-year floodplain (feet[b])	8,065	6,600	1,945	460	8,065	6,600	1,945	460
Project right-of-way within FEMA-mapped 100-year floodplain (acres)	37	30	9	2	37	30	9	2
Crosses FEMA floodway	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Crossings with potential floodplain (non-FEMA)	8	7	8	5	6	5	6	4

[a] FEMA = Federal Emergency Management Agency.
[b] To convert feet to miles, multiply by 0.0001894.

4.5 Wetland Resources

This section describes the analysis of potential impacts to wetland resources from the proposed Port MacKenzie Rail Extension. Section 4.1 lists applicable regulations. Section 4.5.1 defines the wetlands study area, Section 4.5.2 describes the methods SEA employed to analyze impacts to wetlands, Section 4.5.3 describes the affected environment, and Section 4.5.4 describes potential impacts to wetlands.

4.5.1 Study Area

The Applicant proposed that a 1,000-foot-wide corridor study area for each proposed segment would be adequate to assess potential impacts to wetland functions outside the 200-foot right-of-way (ROW). The U.S. Army Corps of Engineers agreed to the 1,000-foot corridor with reservations, including the potential that additional wetlands delineation and analysis might be needed if any of the proposed rail alternatives or their segments were rerouted through areas outside the study area corridor, possibly causing the Applicant time delays and additional costs. SEA determined that the 1,000-foot-wide corridor was acceptable, and used available information on the location and classification of wetlands within 500 feet of the centerline of proposed rail line segments. SEA quantitatively assessed impacts within the 200-foot ROW, and generally characterized potential impacts to wetlands outside the 200-foot ROW.

4.5.2 Analysis Methodology

SEA independently verified information on wetlands within 500 feet of the centerline of the proposed rail segments, based on a 2008 field study that used the USACE delineation manual and assessed wetland functions (HDR 2008). Unless otherwise noted, this EIS assumes that construction activities would occur within the 200-foot-wide ROW and that construction activities would disturb the entire ROW. SEA calculated the aerial extent of wetlands that would be directly affected by the proposed project using Geographic Information System analysis of delineated wetland areas within the 200-foot-wide rail line ROW.

SEA used information on wetlands functions and values developed using a combination of Geographic Information System modeling to assess variables at the watershed level and the application of *A Rapid Procedure for Assessing Wetland Functional Capacity* (Magee and Hollands, 1998; HDR, 2008). SEA used the wetlands functional assessment to describe potential impacts to wetland functions that would result from project alternatives. SEA compared impacts by alternative and assessed comparisons of wetland functions between the alternatives (low functioning, moderate functioning, and high functioning). Low-functioning wetlands include wetlands assessed with a functional capacity value of 0.33 and lower, moderate-functioning wetlands include wetlands assessed with a functional capacity value above 0.33 and below 0.66, and high-functioning wetlands include wetlands assessed with a functional capacity value of 0.66 or higher. See Appendix C for a more detailed description of analysis methodology.

4.5.3 Affected Environment

Wetlands are areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions (33 CFR 328.3(b)). By regulatory definition, wetlands support hydrophytic vegetation, show signs of wetland hydrology, and contain hydric soils. Less than 1 percent of the wetlands in the study area did not appear to have surface connections to waterways or other wetlands. These wetlands could be isolated and might not fall under Corps of Engineers jurisdiction.

Appendix C describes wetland communities in the study area. Based on field delineations completed by ARRC and aerial photos, SEA independently verified the wetland community types within the study area. Table 4.5-1 summarizes wetland types within 500 feet of the centerline of the proposed rail line segments.

Table 4.5-1
Summary of Wetland Types within 500 Feet of the Centerline of Proposed Rail Line Segments[a]

Wetland Type (NWI Code[c])	Proportion of Wetland Area by Category (percent)[b]	Wetland Area (acres)
Broadleaf Forest Wetlands (PFO1)	5.7	48
Needleleaf Forest Wetlands (PFO4)	92.9	786
Mixed Forest Wetlands (PFO#/#)	1.4	12
Subtotal Forest Wetlands (PFO) [d]	**25.1**	**846**
Broadleaf Scrub/Shrub Wetlands (PSS1)	41.6	829
Needleleaf Scrub/Shrub Wetlands (PSS4)	9.2	183
Mixed and Other Scrub/Shrub Wetlands (PSS#/#)	49.2	981
Subtotal Scrub/Shrub Wetlands (PSS)	**59.3**	**1,993**
Emergent Wetlands (PEM)	**10.9**	**367**
Palustrine Waters (P)	29.9	47
Riverine Waters (R)	23.6	37
Lacustrine Waters (L)	46.5	73
Subtotal Other Wetlands and Waters	**4.7**	**157**
All Wetlands and Waters		***3,363***

[a] Source: HDR 2008.
[b] Proportion of wetland area for broader wetland types (PFO, PSS, and Other Wetlands and Waters) are in bold. Proportion of wetland areas within each wetland type are listed for Forested Wetlands (PFO 1,PFO4, PFO#/#), Scrub/Shrub Wetlands (PSS1, PSS4, PSS#/#), and Other Wetlands and Waters (PEM, P, R, Other Waters).
[c] National Wetland Inventory (NWI) Codes as defined by Classification of Wetlands and Deepwater Habitats (Cowardin *et al.*, 1979): PFO = Palustrine Forested; PSS = Palustrine Scrub/Shrub; PEM = Palustrine Emergent; R = Riverine; L = Lacustrine.
[d] Totals might not equal sums of values due to rounding.

- Forested wetlands: Forested wetlands are one of the predominant wetland types within the study area. Forested wetlands include broadleaf, needleleaf, and mixed broadleaf/needleleaf forest communities. Forested wetlands function to increase nutrient export, modify stream flow, and contribute to the diversity and abundance of wetland fauna. Needleleaf forested wetland communities also have high functional capacities for improving water quality.
- Scrub/shrub wetlands: Scrub/shrub wetlands also dominate the study area and include broadleaf, needleleaf, and mixed shrub communities. Like forested wetlands, scrub/shrub wetlands also function to increase nutrient export and modify stream flow. Scrub/shrub wetland communities also have high functional capacities for improving water quality and contributing to the abundance and diversity of wetland fauna because of the abundance of browse and nesting habitat. Seasonally flooded broadleaf scrub/shrub communities adjacent

to streams have a high functional capacity for contributing to the food chain by exporting nutrients downstream.

- Emergent wetlands: Emergent wetlands are less common within the study area. Emergent wetlands are dominated by graminoid species – sedges and grasses. They can also contain scattered shrubs. Emergent wetlands associated with a stream function to buffer floodwaters, moderate stream flow, contribute to the food chain through nutrient export, and in some cases, provide habitat for juvenile fish, waterfowl, and other wildlife.
- Other waters and riverine wetlands: Other waters and riverine habitats in the study area include ponds (with and without aquatic bed vegetation such as lilypads, horsetails, and pondweed), lakes (waterbodies larger than 20 acres), and perennial and intermittent streams. Open water wetlands, lakes, and ponds are highly valued for their functions to improve water quality, buffer storm and floodwaters, and provide valued habitat for a variety of wildlife. Streams and riverine communities are considered sensitive habitats due to their high value for fish habitat and sensitivity to disturbance (Hall *et al.*, 1994).

4.5.3.1 Unique or Sensitive Wetlands

The 2008 field delineation identified the Goose Creek Fen within the study area. Goose Creek Fen is a floating mat fen system located on either side of Goose Creek along the Big Lake Segment. Approximately 18 acres of the fen is within the study area. Fens are peat wetlands fed by a combination of precipitation, groundwater, and surface water (Gore, 1983). Fens typically have a higher potential of hydrogen (pH) and greater nutrient content than bogs, and support more diverse plant communities that provide habitat for a number of aquatic and terrestrial organisms. Where they are connected to surface water systems, fens help to maintain the quality of stream water and provide valuable wildlife habitat. Because of their unique features, fens are important ecological features. Unlike many freshwater wetlands, floating mat wetlands adjacent to streams are renewed by fresh water inputs and are not degenerated into acidic muskegs with low wildlife productivity (Bedford and Godwin, 2003). The Goose Creek fen receives overbank flooding from Goose Creek and provides the high-value function of moderating stream flows during periods of high water. These floating wetlands provide high-value rearing habitat for anadromous fish species because they protect fish from predators and keep them warm during winter. These wetlands also function to export carbon into the food chain through the decaying plant matter that makes up the floating mat. A high carbon-export function is highly valued, because it helps support the food chain locally and in downstream habitats.

There are 11,250 acres of wetland mitigation bank lands throughout the MSB (MSB, 2007). The MSB has identified mitigation bank lands for preservation (through conservation easements or other tools) to offset potential development throughout the MSB (Figure 4.5-1). “Wetland Functional Assessment and Wetland Delineation: Big Lake South Bank Plan Su-Knik Wetland Mitigation Bank” (Herrera Environmental Consultants, 2008) describes a portion of these mitigation bank lands. The mitigation bank areas are important to wetlands management in the MSB. They are ecologically valuable lands that protect and support fish and wildlife habitat and provide water recharge and filtering areas important for human uses (MSB, 2007). The MSB Big Lake South mitigation bank consists of multiple parcels in three separate geographic units that total approximately 2,039 acres of upland and wetland. The Goose Creek and Threemile Creek geographic units would be within the Big Lake Segment ROW. The total area of the

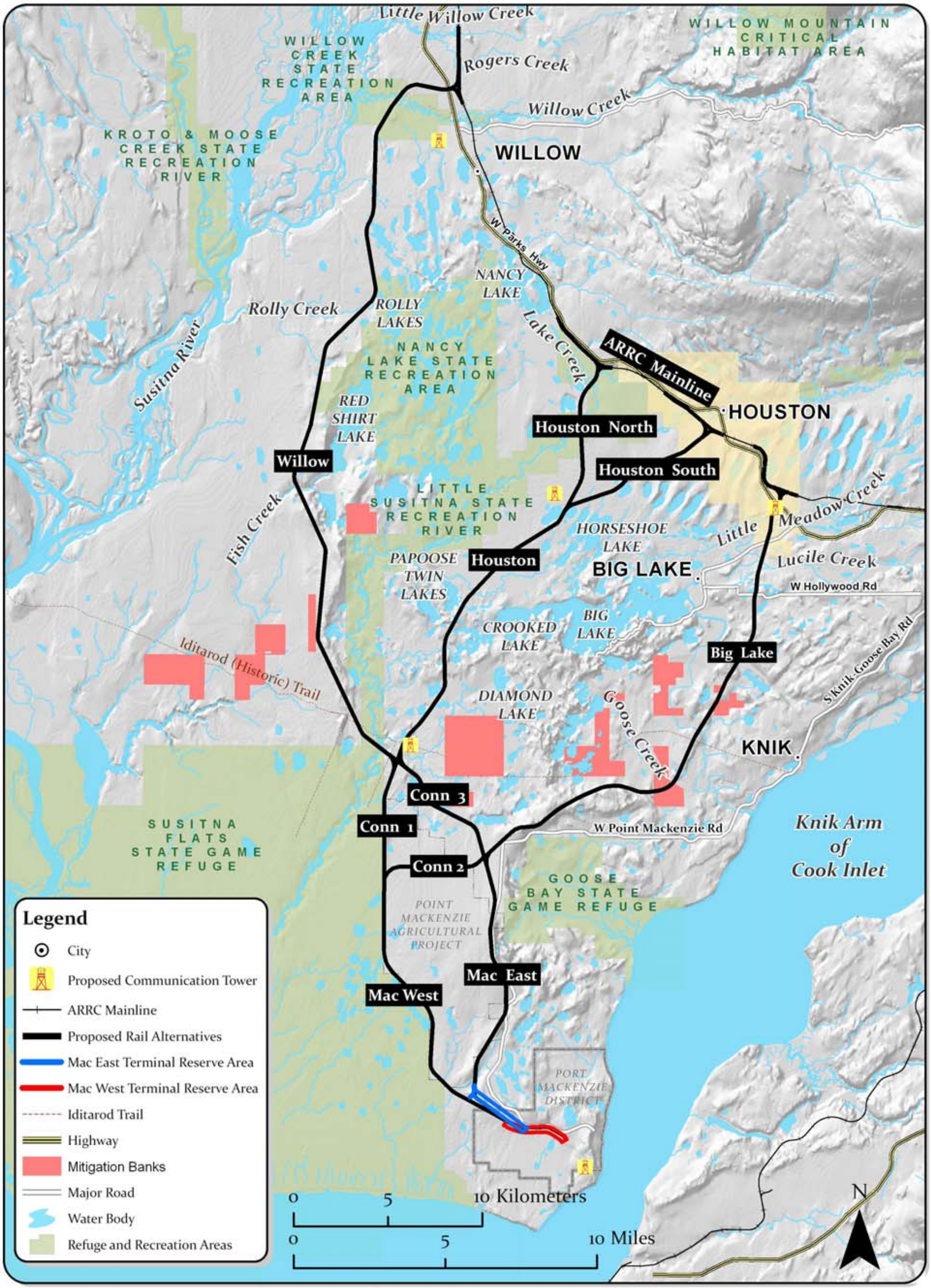

Figure 4.5-1. Mitigation Banks near the Proposed Port MacKenzie Rail Extension

Goose Creek geographic unit is 837 acres, 18 acres of which would be within the Big Lake Segment ROW. The total area of the Threemile Creek geographic unit is 320 acres, 7 acres of which would be within the Big Lake Segment ROW. According to the MSB report identifying the bank lands, most of the wetlands within the Goose Creek and Threemile Creek geographic units are riverine wetlands (Herrera Environmental Consultants, 2008). The report categorizes forested, scrub/shrub, and emergent wetlands as riverine wetlands for purposes of assessing their function for the mitigation bank report. These wetlands provide highly valued functions for floodwater retention, nutrient export, and as plant and animal habitat support (Herrera Environmental Consultants, 2008). It should also be noted that Goose Creek Fen is within the Goose Creek geographic unit.

4.5.3.2 Wetland Functions and Values

Wetland functions are the chemical, physical, and biological processes or attributes that contribute to the self maintenance of a wetland and determine the ecological significance of wetland properties (HDR, 2008). Wetlands serve specific functions for the environment, such as controlling erosion, or supply humans a benefit, such as providing recreation areas. Wetland functions (and values) for study area wetlands that were identified and evaluated include storm and floodwater storage (flood control), stream flow moderation (maintaining aquatic habitat and aesthetic appreciation opportunities), groundwater recharge/discharge (replenishing water supplies), sediment removal and nutrient cycling (water quality protection and nutrient export), and contributions to the abundance and diversity of wetland vegetation and wildlife (maintaining aquatic habitat and fish and wildlife harvest opportunities) (USEPA, 2001; HDR, 2008).

Wetlands in the study area are very highly functional because they are predominantly intact, undisturbed systems (Herrera Environmental Consultants, 2008). The primary factors influencing the performance of wetland functions in the study area are climatic conditions, quantity and quality of water entering and leaving the wetland, and disturbances or alterations in the wetland or the surrounding ecosystem (HDR, 2008). An assessment of the functional capacity of wetlands in the study area by the Applicant and reviewed by SEA indicates (HDR, 2008):

- Wetlands without an outlet tend to have a high functional capacity to store storm and floodwater.
- All wetlands have a high functional capacity to modify water quality.
- Wetlands without an outlet tend to have a low functional capacity to modify stream flow.
- Wetlands with an outlet tend to have a high functional capacity to export detritus.
- Wetlands have a moderately high functional capacity to contribute to the abundance and diversity of wetland fauna.
- Riverine waters and wetlands with outlets have higher functional capacity to perform groundwater discharge and lower functional capacities to perform groundwater recharge.
- Wetlands performing moderate to high stream flow moderation functions were rare compared to other functions.

4.5.4 Environmental Consequences

This section describes the results of SEA's analysis of potential impacts to wetlands (as defined above) within the 200-foot ROW of the proposed Port MacKenzie Rail Extension alternative segments. On average, approximately 29 percent of the area within the ROW would be considered wetlands, according to the U.S. Army Corps of Engineers established criteria for determining wetlands (Environmental Laboratory, 1987; USACE, 2007). Rail line construction would directly affect wetlands within the ROW and could also affect wetlands within 500 feet on either side of the rail line centerline. Rail line construction would require clearing, excavation, and placement of fill material in wetlands. The placement of fill would cause a permanent loss of wetland functions within the fill area and could result in additional impacts to adjacent wetland areas inside and outside the ROW. Because many wetland functions depend on the size of the wetland or the contiguous nature of the wetland with other habitats, clearing and filling a wetland could lower the ability of adjacent wetlands to perform functions that depend on size or an unfragmented connection to a waterbody. The extent of impacts into the adjacent wetland both inside and outside the ROW would depend on the immediate area surrounding the impact, such as adjacent waterbodies, size of contiguous wetland being fragmented, and sensitivity of the wetland type to fragmentation. Appendix C includes detailed wetlands data for each alternative segment.

4.5.4.1 Proposed Action

Common Impacts

There would be impacts to wetlands from excavation and direct placement of fill into wetlands for construction of the rail line, access road, and other associated facilities within the 200-foot ROW. ARRC would place associated facilities inside the 200-foot ROW where possible. During final design and permitting, ARRC may need to construct outside the ROW for work spaces, borrow areas, and associated facilities. These areas would be identified by the Applicant during final design and permitting, and the Applicant would avoid wetland areas as much as practicable. If a wetland is used as a borrow area, excavation of the wetland would not eliminate the water body, but would convert it to a different type of water body (See Section 4.2.4.1 for additional borrow area impacts). Wetland areas adjacent to the rail line ROW could also be affected through fragmentation. Wetland hydrology, vegetative cover, habitat, and other functions would be altered or diminished by the effects of the rail bed and rail line operations. The following sections describe construction impacts within the 200-foot ROW that would be common to all alternative segments, and potential impacts to wetlands outside the 200-foot ROW. Although common to all alternative segments, potential impacts outside the 200-foot ROW would depend on the size and type of wetland size being crossed in any given location.

Construction

Wetlands would be both excavated and filled within the footprints of the rail bed and access road. Construction activities resulting in the direct loss of wetlands, through excavation or fill placement, would predominantly affect the most common wetland types within the area – forested and scrub/shrub. Loss or alteration of wetlands also could eliminate or reduce adjacent wetland function. Filling or draining wetlands would prevent surface water storage and reduce wetland water quality enhancement functions, while accelerating the flow of water downstream, thereby increasing the potential for flooding. Construction activities would affect wetland functions and values, both short and long term.

Loss of Fish, Wildlife, and Plant Habitats

Fill placed in wetlands would result in permanent direct loss of habitat. Changing the hydrologic regime of wetlands by fragmenting the connection between larger wetland areas could also result in impacts to the ability of adjacent wetlands to support a high diversity of wetland fauna. For example, permanently flooded areas that provide valuable habitat for waterfowl could be drained by culverts. When floods or other high-water events occur, culverts could sink into the underlying peat, or rise up and become perched, and over time could prevent the movement of water from one side of the rail bed to the other. In this way, wetlands on one side of the rail bed might be drained, changing the hydrology of the wetland system. A change in the hydrology of the system could result in impacts to wetlands adjacent to the rail bed, and could reach outside the extent of the 200-foot ROW. Where the rail bed embankment would fragment or interrupt contiguous emergent and scrub/shrub communities, the ability of the wetland to provide wildlife habitat also would be affected. Channel modifications that change instream water temperatures could diminish habitat suitability for fish and wildlife (USEPA, 1993). During construction, fugitive dust generated by excavation and grading would cause short-term, local increases in levels of air-borne particulates. Loose soil blowing from haul-truck beds and traffic in vehicle access and construction staging areas could generate fugitive dust. Dust deposited in wetlands could affect plant growth by changing soil productivity and permeability and reducing water quality, which could result in reduced wetland plant diversity next to haul roadways.

Degradation of Water Quality

Reduction in total wetland area and alteration of wetland hydrology would reduce the capacity of regional wetlands to improve water quality. For example, changing the natural sheet flow of a contiguous wetland to channelized flow through culverts could reduce the residence time of water within the wetland and would lower the capability of the wetland to improve water quality. Removal of wetland and riparian vegetation during rail line construction activities would expose mineral soils to erosion and cause increased sediment loading to wetlands (Childers and Gosselink, 1990). High sediment loads entering wetlands through channels and drainage ditches can smother aquatic vegetation and benthic invertebrates, fill in riffles and pools, and increase water turbidity (USEPA, 1993). Borrow areas established next to wetlands could also degrade water quality through sedimentation and increased turbidity in the wetland (Irwin, 1992). Silts and fines precipitate from still waters, leading to sedimentation, which reduces water storage capacity, smothers vegetation, and reduces oxygen concentrations, which ultimately affects wetland richness, diversity, and productivity.

Loss of Storm and Floodwater Storage Capacity

Removal of wetland vegetation would reduce the capacity of the wetlands to impede and redistribute storm and floodwaters (USEPA, 2001). Storm and floodwater storage capacity is directly related to the size of the wetland and the existence of an outlet for water. Emergent wetlands are especially adept at moderating floodwaters during storm events because of their vegetation composition and deep organic soils. Disturbance or fragmentation of a large undisturbed wetland by reducing its size or creating a water outlet through installation of a culvert would reduce the capacity of the wetland to store floodwaters. Impacts to floodwater storage capacity could reach beyond the 200-foot ROW, depending on the location of fragmentation within the wetland.

Loss of Riparian Zones

Riparian habitats are adjacent to waterbodies and are the transition areas between terrestrial and aquatic ecosystems (NRC, 2002). They provide a mechanism through which energy, materials, and water pass and are significant in ecology, environmental management, and civil engineering because of their role in soil conservation, their biodiversity, and their influence on aquatic ecosystems. Riparian zones act as natural filters, protecting aquatic environments from excessive sedimentation, polluted surface runoff, and erosion (Nakasone *et al*., 2003). They supply shelter and food for many aquatic animals and shade that is an important part of stream temperature regulation. Research shows riparian zones are instrumental in water quality improvement for both surface runoff and water flowing into streams through subsurface or groundwater flow (Mengis *et al.*, 1999).

The direct loss of wetland vegetation due to construction activities could also affect adjacent riparian vegetation. Depending on the type of crossing proposed at a given location, riparian vegetation could be altered upstream and downstream of the crossing. In some cases, these changes could be outside the 200-foot ROW. For example, alteration of localized water velocities and flow patterns, and impacts to floodplains could alter the mean high water line of the water body. This change in water level could cause riparian vegetation to become submerged; in some cases this would cause a loss of vegetation. Section 4.4 describes impacts to floodplains in more detail.

Loss and Degradation of Hydric Soils

Impacts to wetland soils would result from filling, excavating, or clearing for construction of the rail bed and associated facilities, resulting in the permanent loss of some hydric soils that sustain wetlands. The presence of thick organic mats within wetlands is directly related to the ability of a wetland to provide water quality functions to the surrounding watershed (HDR, 2008). Soil stability depends on vegetative cover, and when vegetation is disturbed, soil can become unstable.

Interruption and Reduction of Natural Hydrologic Functions

Disturbances in wetland hydrology, such as interruption of surface flow or creation of outlets, could create surface impoundments or increase outflow. When the water table of a wetland drops because of decreased inflow or increased outflow, there can be changes in vegetation and degradation of the peat layer, which can ultimately result in degradation of the wetland and reduction or elimination of its functions. Rail bed embankments could fragment normal sheet flow through wetlands, leading to the creation of surface impoundments that would decrease water circulation and lead to water stagnation. Decreased water circulation also results in increased water temperature, lower dissolved oxygen levels, changes in salinity and pH, the prevention of nutrient outflow, and increased sedimentation (USEPA, 1993). Rail beds and roadbeds could create impoundments even with installation of properly placed and maintained culverts. Once installed, even a properly sized culvert can become an ice trap because its location within an embankment exposes the culvert to maximum cooling conditions (Freitag and McFadden, 1997). This is of special concern in the study area because weather conditions are subject to alternating periods of freeze and thaw, which can cause ice to build up in culverts.

Operations

Most effects to wetlands within the ROW would occur during construction, while some effects would occur during rail line operations. Railroad maintenance would include clearing of vegetation, repairs to the tracks and associated structures (access road, ditches, bridges, and culverts), and cleaning out ditches and culverts. These activities would be infrequent and short in duration.

Maintenance and use of the access road could include the use of rock salt and sand for increasing traction, which could damage or kill vegetation and aquatic life (Campbell *et al.*, 1994). Soil stabilizers and chemical agents used along roadways could damage wetland plants (USEPA, 1993). Any toxic substances, such as rock salt and bridge maintenance materials, that are spilled on the access road could adhere to sediments and could subsequently accumulate in impoundments as a result of decreased water circulation, leading to bioaccumulation of contaminants by wetland biota. Bioaccumulation of toxins occurs at higher trophic levels, which could ultimately cause toxicity.

Storm water discharges from the rail bed and roadbed would convey storm water and low concentrations of pollutants to wetlands along the receiving waterways and drainage channels, potentially altering soil chemistry and soil pH and affecting vegetation adjacent to the rail line. Runoff from bridges can increase loadings of hydrocarbons, heavy metals, toxic substances, and deicing chemicals directly into wetlands (USEPA, 1993). Moreover, precipitation runoff could have a similar effect on the pH of wetlands, depending on the parent materials for the rail bed and roadbed. The primary pollutants that cause degradation are sediment, nutrients, salt, heavy metals, and selenium. Other impacts could include low dissolved oxygen and pH (USEPA, 1993).

Fugitive dust generated by vehicles using the access road could affect wetlands next to the access road by covering vegetation with fine dust particles and inhibiting photosynthesis. Train operations could produce fugitive dust. Fugitive dust settling in wetlands along the rail line ROW could affect soil pH, surface hydrology, and sheet flow (DNRP, 2004).

Sparks from rail line operations and maintenance are not known to have been a common cause of fires, but could increase the potential for fires. Fires caused by operations could impact wetlands outside the 200-foot ROW. However, the increased risk of fire in these areas from rail line operations would be low, and wide-ranging changes in fire management for the area surrounding the rail line would be unlikely.

Impacts by Segment and Segment Combinations

Wetlands would be permanently removed or altered through direct excavation and filling for the rail line and associated facilities. The intensity of impact would depend on the size of the area to be excavated and filled during rail line construction and operations. Overall, wetlands along all the segments are high functioning for five out of eight functions analyzed for the project (61 to

62 percent of wetlands along each segment are high functioning). All segments are relatively low functioning for groundwater recharge. Wetlands along all segments are moderate functioning for streamflow moderation and storm and floodwater storage. This section describes the wetland types and areas within the 200-foot ROW for alternative segments and segment combinations. This section also compares wetland functions between segments and segment combinations where there would be notable differences. Appendix C includes additional detail regarding wetland functions. Impacts outside of the 200-foot ROW cannot be quantitatively assessed, and would depend on the type of wetland crossed, the type and size of drainage structures, value of nearby water bodies and habitat, and proposed avoidance, minimization and mitigation measures (see Chapter 19). When possible, these impacts are discussed in more general terms.

Southern Segments and Segment Combinations

Wetland communities within the 200-foot ROW of the southern segments and segment combinations would be directly affected through the loss of 98 to 279 acres (depending on segment or segment combinations) of wetlands through excavation, filling, or related construction activities (Figure 4.5-2 and Table 4.5-2). Impacts described for segments, including Mac East and Mac West, include impacts to the terminal reserve areas outside the 200-foot ROW. Impacts from construction activities would be permanent and would eliminate or limit most wetland functions. In general, the southern segments and segment combinations have a higher proportion of lower functioning wetlands within the 200-foot ROW than the northern segments and segment combinations. Approximately 13 percent of the wetlands potentially affected by the proposed rail line along the southern segments and segment combinations are low functioning.

Most of the affected wetlands would be scrub/shrub and forested communities common in the region (Hall *et al.*, 1994). Most forested wetlands along the southern segments and segment combinations are comprised of needleleaf communities. In some locations, the direct loss of wetlands to construction activities would eliminate adjacent riparian zones. All four southern segments and segment combinations (Mac West-Connector 1, Mac West-Connector 2, Mac East-Connector 3, and Mac East) would include the crossing of streams and skirting of lakes and ponds, which could impact the waterbody and the adjacent riparian wetlands through the placement and operation of drainage structures. The acreages of other wetlands and waters along the southern segments and segment combinations would be relatively minor, with these waters making up 1 percent or less of the study area. Table 4.5-2 details the acreages of other wetlands and waters the four southern segments and segment combinations could impact.

Mac West-Connector 1 Segment Combination

This segment combination would have the potential to affect the largest wetland acreages near the southern terminus of the proposed rail line (279 acres within the 200-foot ROW and terminal reserve area). Compared to other segments and segment combinations, the Mac West-Connector 1 Segment Combination has wetlands that are proportionally the highest functioning for export of detritus and groundwater discharge (98 and 92 percent) (also see Appendix C). The Mac West-Connector 1 Segment Combination would affect a higher proportion and acreage of scrub/shrub wetlands, predominately mixed needleleaf/broadleaf scrub/shrub wetland communities than other southern segments and segment combinations (Table 4.5-2). The Mac

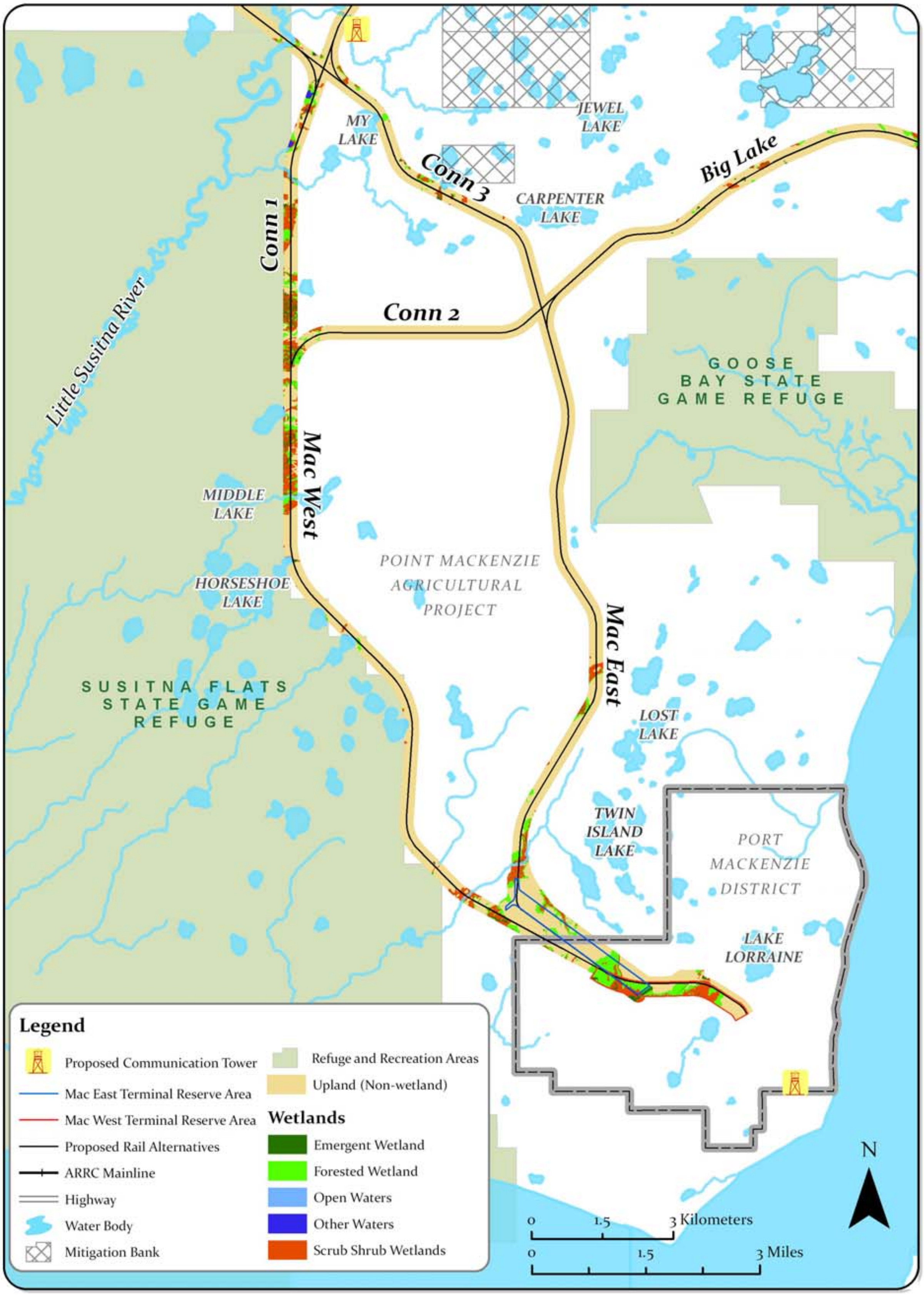

Figure 4.5-2. Wetlands near the Mac East, Mac West, and Connector Segments

Table 4.5-2
Wetlands within the 200-foot Right-of-Way of the Southern Segments and Segment Combinations[a, b]

National Wetlands Inventory Code	Description	Mac West-Connector 1		Mac West-Connector 2		Mac East-Connector 3		Mac East	
		Area (acres)	Wetland Proportion (percent)	Area (acres)	Wetland Proportion (percent)	Area (acres)	Wetland Proportion (percent)	Area (acres)	Wetland Proportion (percent)
PFO1	Broadleaf Forest Wetlands	25	19.7	25	21.0	23	31.1	23	31.9
PFO4	Needleleaf Forest Wetlands	93	73.2	85	71.4	48	64.9	46	63.9
PFO#/#	Mixed Forest Wetlands	9	7.1	9	7.6	3	4.0	3	4.2
PFO	**Subtotal Forest Wetlands [c]**	**127**	**45.5**	**119**	**50.4**	**74**	**71.8**	**72**	**73.5**
PSS1	Broadleaf Scrub/Shrub Wetlands	24	18.6	22	22.0	7	25.0	5	20.0
PSS4	Needleleaf Scrub/Shrub Wetlands	9	7.0	5	5.0	1	3.6	1	4.0
PSS#/#	Mixed and Other Scrub/Shrub Wetlands	96	74.4	73	73.0	20	71.4	19	76.0
PSS	**Subtotal Scrub/Shrub Wetlands**	**129**	**46.2**	**100**	**42.4**	**28**	**27.2**	**25**	**25.5**
PEM	**Emergent Wetlands**	**22**	**7.9**	**16**	**6.8**	**1**	**0.9**	**1**	**0.1**
P	Palustrine Waters	0	27.3	None	None	None	None	None	None
R	Riverine Waters	0	18.2	None	None	0	100.0	0	100.0
L	Lacustrine Waters	1	54.5	1	100.0	None	None	None	None
	Subtotal Other Wetlands and Waters	**1**	**0.4**	**1**	**0.4**	**0**	**0.1**	**0**	**0.1**
	All Wetlands and Waters	***279***		***236***		***103***		***98***	

[a] Source: HDR, 2008; HDR, 2010.
[b] Wetland impacts within the Mac East and Mac West segments include impacts from the terminal reserve areas located outside the 200-foot right-of-way.
[c] Totals might not equal sums of values due to rounding.

West-Connector 1 Segment Combination would cross three large areas of patterned forested/scrub/shrub/emergent bog. Patterned bogs have a high functional value for contribution to abundance and diversity of wetland fauna due to the diversity of summer and winter browse vegetation, nesting habitat for song birds, and cover for other small mammals in the scrub/shrub areas, combined with ease of movement through the emergent areas (HDR 2008). Fragmentation of these patterned bogs by construction of the rail bed could lower the ability of adjacent wetlands to provide wildlife habitat. The Mac West-Connector 1 Segment Combination would also affect a lower proportion but higher total acreage of forested wetlands than other southern segments and segment combinations (Table 4.5-2).

Mac West-Connector 2 Segment Combination

Construction of this segment combination would impact about 236 acres of wetlands within the 200-foot ROW and terminal reserve areas (Figure 4.5-2 and Table 4.5-2). Like the Mac West-Connector 1 Segment Combination, this segment combination also would have a large proportion of high-functioning wetlands for the export of detritus and groundwater discharge functions compared to other segments and segment combinations. Though both the northern and southern segments and segment combinations are low functioning for groundwater recharge, the Mac West-Connector 2 Segment Combination has the highest proportion of wetlands in this category (87 percent). The Mac West-Connector 2 Segment Combination would cross predominantly mixed scrub/shrub and needleleaf forested wetlands. The Mac West-Connector 2 Segment Combination would have large areas of patterned bog within the ROW that would be fragmented by construction of the rail line. Fragmentation of these patterned bogs could lower the adjacent wetland's ability to perform certain functions outside the 200-foot ROW.

Mac East-Connector 3 Segment Combination

This segment combination has the potential to affect the least wetland acreages (103 acres within the 200-foot ROW and terminal reserve area), with only 19 percent of the segment combination being comprised of wetlands. The Mac East-Connector 3 Segment Combination would affect a higher proportion of forested wetlands, although the overall acreage would still be just under half that of the Mac West-Connector 1 Segment Combination. The presence of 0.1 acre of other wetlands and waters along this segment combination is one of the lowest of all the southern segments and segment combinations. Construction of Connector 3 Segment, while only impacting 5 acres of wetland overall, would impact wetlands adjacent to My Lake; these impacts could lower the ability of adjacent wetlands to provide wildlife habitat by fragmenting the wetlands adjacent to the lake. Other hydrological connections also could be modified, potentially causing impacts to wetland functions beyond the 200-foot ROW. Compared to other segments and segment combinations across all functions, the Mac East-Connector 3 Segment Combination has among the highest proportion of low-functioning wetlands along its length (13 percent) and therefore the lowest proportion of high-functioning wetlands along its length (60 percent).

Mac East

By itself, the Mac East Segment is very similar to the Mac East-Connector 3 Segment Combination because the Connector 3 Segment contributes only approximately 5 acres of wetlands to the total. The Mac East Segment would impact 98 acres of wetlands within the 200-foot ROW and terminal reserve areas. These wetlands are predominantly forested wetlands (74 percent). Similar to the Mac East-Connector 3 Segment Combination, compared to other segments and segment combinations, the Mac East Segment would also have a higher proportion of low-functioning wetlands along its length.

Northern Segments and Segment Combinations

Construction of the northern segments and segment combinations (Willow, Big Lake, Houston-Houston North, and Houston-Houston South) would affect 85 to 198 acres of wetland communities within the 200-foot ROW (depending on segment and segment combination) through excavation, filling, or other construction activities, including the development of the rail line, sidings, a power line, a buried communications cable, and an access road (Figures 4.5-3 and 4.5-4, and Table 4.5-3). Impacts from construction activities would be permanent and would eliminate or limit most wetland functions within the footprint of the ROW.

Most of the affected wetlands would be broadleaf and mixed scrub/shrub communities, which comprise from about 60 to 80 percent of the wetland habitats in the study area. Shrub wetlands are a predominant feature of the landscape in Southcentral Alaska (Hall *et al.,* 1994). Forested wetlands along the northern segments and segment combinations consist completely of needleleaf communities (Table 4.5-3). Overall, the northern segments and segment combinations have a slightly higher proportion of high-functioning wetlands than the southern segments and segment combinations for all eight wetland functions. In some locations, the direct loss of wetlands to construction activities would eliminate adjacent riparian zones. Construction of each of the northern segments and segment combinations would include the crossing of streams and skirting of lakes and ponds, which could affect the waterbodies and the adjacent riparian wetlands through the placement of the drainage structure. The acreages of these other wetlands and waters the northern segments and segment combinations would affect would be relatively minor, because they comprise only 1 to 4 acres of the study area. Table 4.5-3 details the acreages of other wetlands and waters the four northern segments and segment combinations would affect.

Willow

Wetlands along this segment comprise 12 percent of wetlands within the 200-foot ROW, the lowest proportion of wetlands along any of the northern segments and segment combinations. Of the 85 acres of potentially affected wetlands, 58 percent are comprised of scrub/shrub wetlands, predominantly broadleaf communities (Figure 4.5-3 and Table 4.5-3). The Willow Segment would also affect a larger proportion of riverine waters than the other northern segments and segment combinations – approximately 2 acres. SEA cannot quantitatively assess downstream impacts to riverine wetlands outside the 200-foot ROW because detailed hydrology modeling has not been conducted. However, a decrease in riverine wetlands along a stream corridor would put more pressure on downstream habitats to make up for the lost functions, and could as a result lower the ability of the downstream wetland to perform such functions as buffering storm water flows or providing habitat for fish. Although wetlands along all segments and segment combinations are high functioning for groundwater discharge, the Willow Segment has the lowest proportion of wetlands in this category (77 percent).

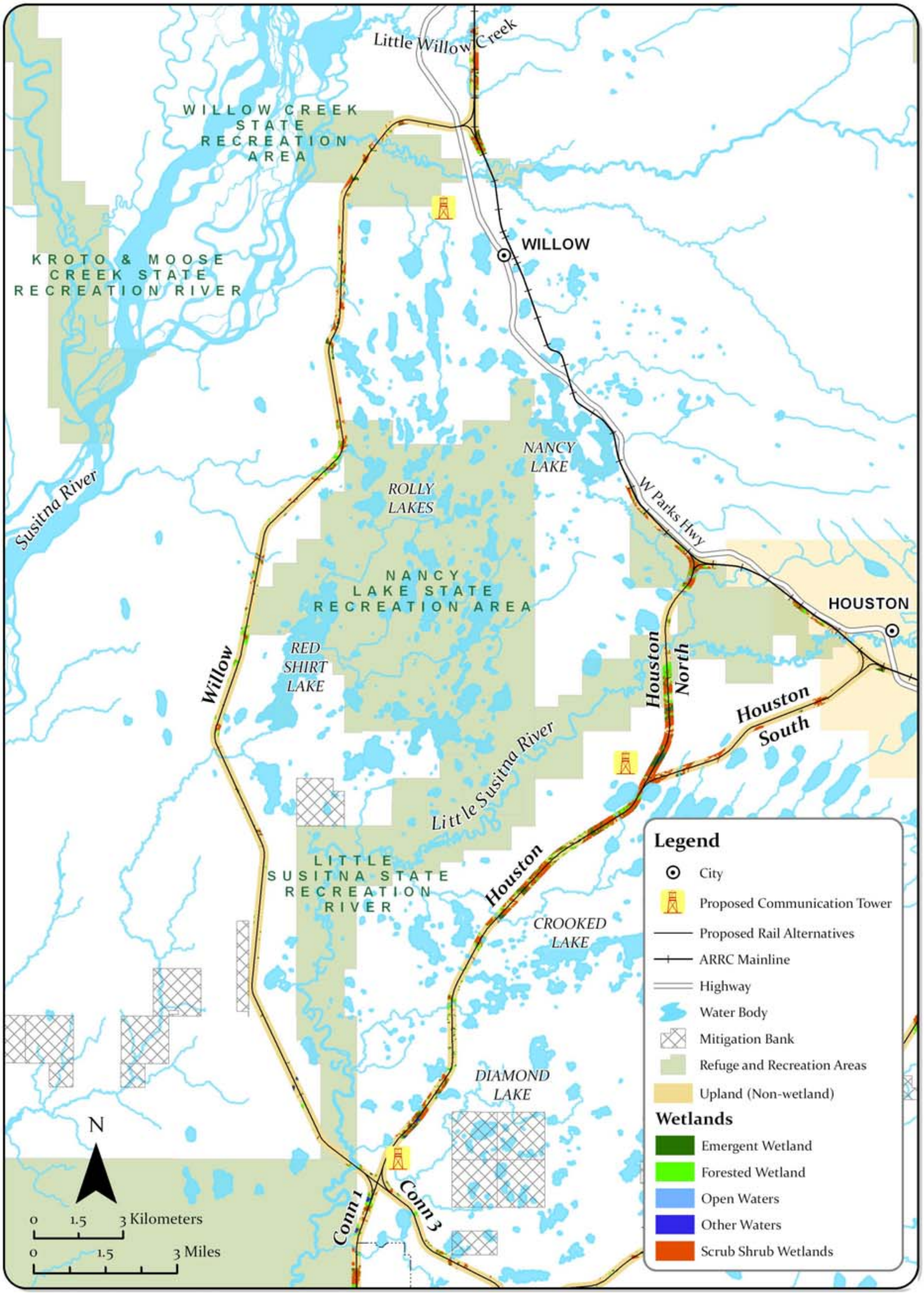

Figure 4.5-3. Wetlands near the Willow, Houston, Houston North, and Houston South Segments

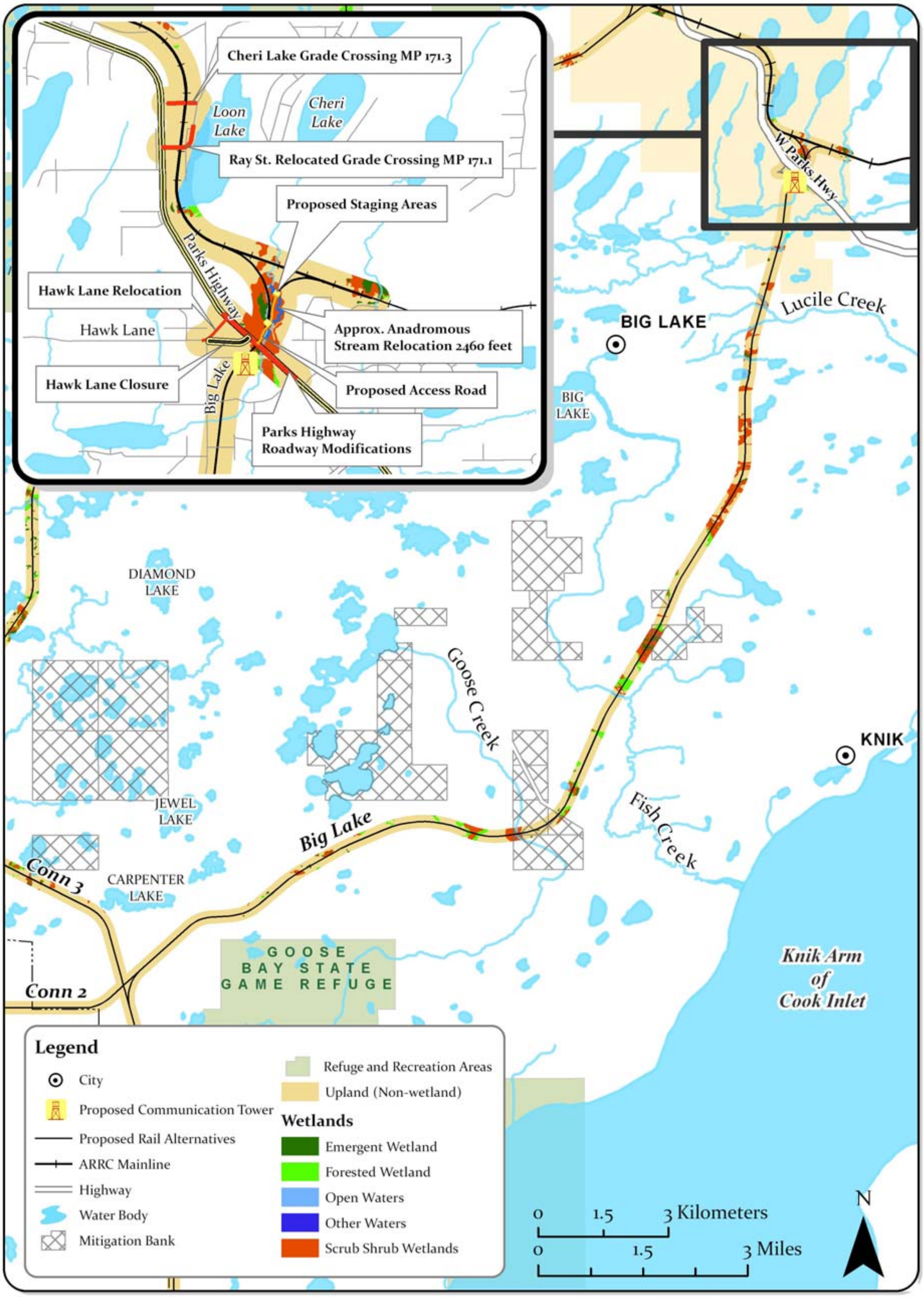

Figure 4.5-4. Wetlands near the Big Lake Segment

Table 4.5-3
Wetlands within the 200-foot Right-of-Way for the Northern Segments and Segment Combinations[a]

National Wetlands Inventory Code	Description	Willow		Big Lake		Houston-Houston North		Houston-Houston South	
		Area (acres)	Wetland Proportion (percent)	Area (acres)	Wetland Proportion (percent)	Area (acres)	Wetland Proportion (percent)	Area (acres)	Wetland Proportion (percent)
PFO1	Broadleaf Forest Wetlands	0	0	0	0	0	0	0	0
PFO4	Needleleaf Forest Wetlands	21	100.0	16	100.0	42	100.0	26	100.0
PFO#/#	Mixed Forest Wetlands	0	0	0	0	0	0	0	0
PFO	**Subtotal Forest Wetlands[b]**	**21**	**24.7**	**16**	**14.4**	**42**	**21.2**	**26**	**17.9**
PSS1	Broadleaf Scrub/Shrub Wetlands	35	70.4	44	50.3	49	39.9	30	31.0
PSS4	Needleleaf Scrub/Shrub Wetlands	2	4.0	14	16.3	9	7.0	7	7.4
PSS#/#	Mixed and Other Scrub/Shrub Wetlands	13	25.6	29	33.4	65	53.1	59	61.6
PSS	**Subtotal Scrub/Shrub Wetlands**	**50**	**58.8**	**87**	**78.4**	**123**	**62.1**	**96**	**66.2**
PEM	**Emergent Wetlands**	**11**	**13.0**	**7**	**6.3**	**29**	**14.7**	**20**	**13.8**
P	Palustrine Waters	1	26.7	0	0	3	61.1	2	70.8
R	Riverine Waters	2	73.3	1	55.6	1	38.9	1	29.2
L	Lacustrine Waters	0	0	<1	44.4	0	0	0	0
	Subtotal Other Wetlands and Waters	**3**	**3.5**	**1**	**0.9**	**4**	**2.0**	**3**	**2.1**
	All Wetlands and Waters	***85***		***111***		***198***		***145***	

[a] Source: HDR, 2008; HDR, 2010.
[b] Totals might not equal sums of values due to rounding.

There are approximately 6 acres of MSB wetland mitigation bank lands outside the 200-foot ROW but within 500 feet of the Willow Segment. Mitigation bank lands within 500 feet of the segment are designated as upland in this area and impacts to wetlands within the bank lands from construction of the rail bed would not be likely.

Big Lake

Construction of this segment would impact about 111 acres of wetlands (Figure 4.5-4 and Table 4.5-3). The Big Lake Segment would cross predominantly scrub/shrub wetlands, which comprise 78 percent of the total wetlands along the route. Most of the scrub/shrub wetlands along the Big Lake Segment are post-fire transitional scrub/shrub wetlands (Herrera, 2008). These wetlands have evolved in places where the previous forested wetland was burned away by the Miller's Reach 2 fire of 1996. As the canopy cover of these scrub/shrub wetlands increases over time, the dominant forest wetland community will begin to take over these areas. The Big Lake Segment would also impact 25 acres of wetland mitigation bank lands, primarily composed of riverine and riparian wetlands, but also including scrub/shrub wetlands and uplands. These areas are locally important to MSB and are highly valued (Herrera Environmental Consultants, 2008). Impacts to mitigation bank wetlands could be evaluated as reaching beyond the 200-foot ROW, because the value of these bank wetlands for the purposes of the mitigation bank is based on their contiguous, unfragmented state.

Construction of the Big Lake Segment would involve relocation of two sections and a total of 2,440 feet (0.45 mile) of an anadromous stream. The relocated stream channel (2,460 feet) would be located within emergent and scrub/shrub wetlands. The area where the stream is flowing is a large contiguous emergent and scrub/shrub wetland mosaic providing high-value functions to the watershed. Wetland impacts associated with the stream relocation could be minimized through careful construction methods to minimize impacts to adjacent wetlands and restoration of wetlands within the impact area after the stream relocation was completed. With proper construction, impacts to wetlands from the stream relocation would likely be temporary because the relocated stream would continue to feed fresh water into the emergent system and the wetland functions would continue as before.

There is a large floating mat fen along the Big Lake Segment, located on either side of Goose Creek. This wetland is unique to the study area and provides high-value functions to the watershed. The fen buffers floodwaters, moderates stream flow, contributes to the food chain through nutrient export, and provides safe and warm rearing habitat for overwintering juvenile fish and habitat for waterfowl. Impacts within the 200-foot ROW within the fen would be approximately 4 acres. However, the floating nature of the vegetation and the open water beneath make it likely that an area greater than 200 feet would be needed to construct the rail line. When compared to the other segments and segment combinations, the Big Lake Segment would have the highest proportion of high-functioning wetlands and the lowest proportion of low-functioning wetlands across all functions. Impacts outside the 200-foot ROW would be likely for construction of the rail line over Goose Creek fen, unless the Applicant proposed a bridge or other drainage structure that would minimize the impact footprint. Fragmentation of this fen by the rail line could significantly impact the entire fen system downstream of the rail line, depending on what type of drainage structure the Applicant proposed for the area.

Houston-Houston North Segment Combination

Construction of this segment combination would impact about 198 acres of wetlands, the highest proportion of wetlands of all the northern segments and segment combinations (88 percent) (Figure 4.5-3 and Table 4.5-3). The Houston-Houston North Segment Combination would cross predominantly mixed and broadleaf scrub/shrub wetlands. It also would impact the largest area of emergent wetlands and palustrine waters than all the other northern segments and segment combinations (32 acres). This is due to the presence of two patterned emergent/scrub/shrub bogs along the Houston North Segment (Figure 4.5-3). Patterned bogs like these contain undulating ridges of peat, providing a mosaic of habitats and providing high functional capacity for improvement of water quality, and due to their large size, storm and floodwater storage (HDR, 2008). Fragmentation of these habitats could result in impacts that reach beyond than the 200-foot ROW. The extent and intensity of the impacts (if any) outside the 200-foot ROW would depend on the type of drainage structures proposed at any given location, and the avoidance, minimization, and mitigation measures proposed for impacts at the site. The Houston North Segment would also fragment habitat adjacent to Houston Lake and could impact the adjacent wetlands north of the segment. These wetlands would no longer be contiguous with the Houston Lake wetlands and would not function as highly for some of the wetland functions (for example, improving water quality and providing habitat for wildlife) a forested wetland adjacent to a lake would provide. Compared to other segments and segment combinations, Houston-Houston North Segment Combination has the lowest proportion of low-functioning wetlands along its length (9 percent) and therefore one of the highest proportions of both moderate- and high-functioning wetlands.

Houston-Houston South Segment Combination

This segment combination would impact 144 acres of wetlands. The Houston-Houston South Segment Combination would predominantly cross scrub/shrub wetlands, with 67 percent of the ROW along this segment combination consisting of this wetland type. Scrub/shrub wetlands are known to provide wildlife habitat for a variety of species. Fragmentation of these habitats could decrease the ability of adjacent wetlands to provide wildlife habitat due to the smaller overall area of the wetland.

Summary of Impacts to Wetlands by Alternative

The largest sources of disturbance and impacts to wetlands from the proposed Port MacKenzie Rail Extension would be filling, excavating, or clearing for the rail bed and associated facilities. Impacts to wetlands from rail line construction and operations would vary by project alternative. Although some alternatives would require a relatively higher portion of wetlands fill, alternatives with fewer acres of fill could have a more intense impact to wetlands within the study area, depending on the sensitivity and/or importance of the affected wetland and the value of the adjacent habitat that would be fragmented as a result of the proposed project. In addition, the potential for impacts to wetlands could, in some cases, be significantly decreased, depending on the avoidance, minimization, and mitigation measures proposed for the area. Overall, wetlands within all proposed alternatives are high functioning for five of the eight wetland functions analyzed for the proposed rail line. Approximately 60 percent of the wetlands along any given alternative are functioning high overall, 29 percent are functioning moderately, and 11 percent are functioning low for one or more wetland functions. The wetlands along the alternatives are highest functioning for export of detritus, groundwater discharge, wildlife habitat, modification of water quality, and vegetation diversity. Eighty-six to 100 percent of the wetlands along any given alternative perform these functions. Table 4.5-4 summarizes acreages of impacts to wetland types for each alternative. Appendix C provides more detail on specific wetland functions and area of impacts to those functions from each alternative. The following summarizes impacts to wetlands by alternative.

Mac West- Connector 1-Willow

Construction of this alternative would impact 363 acres of wetlands and waters within the 200-foot ROW and terminal reserve areas. Wetlands within the ROW would be permanently affected by the construction of the proposed project and would experience loss of function. Mac West-Connector 1-Willow would cover the largest overall area than any of the alternatives and would have the largest proportion of uplands along its length (72 percent). Although only 28 percent of this alignment is comprised of wetlands and waters, the Mac West-Connector 1-Willow Alternative would affect the third largest acreage of wetlands among the alternatives. Compared to other alternatives, Mac West-Connector 1-Willow would have among the largest proportion of wetlands that are low functioning for groundwater recharge (80 percent). Adjacent wetlands outside the 200-foot ROW might also be affected by fragmentation or hydrological modification, especially along the Mac West-Connector 1 Segment Combination of the alternative.

Mac West-Connector 1-Houston-Houston North

Construction of this alternative would impact 478 acres of wetlands and waters within the 200-foot ROW and terminal reserve areas. Compared to the other alternatives, this alternative would impact the greatest overall acreage of wetlands. It also would impact the greatest number of acres of forested, scrub/shrub, and emergent wetlands of all the alternatives, and would impact the highest acreage of waters (6 acres). Many of the wetlands along this alternative comprise areas of patterned bog that have a high functional value for contribution to abundance and diversity of wetland fauna. Compared to other alternatives, the Mac West-Connector 1-Houston-Houston North Alternative has one of the highest proportions of wetlands that are high functioning for both export of detritus (98 percent), and groundwater discharge (91 percent). Although this alternative would occupy less overall acreage compared to other alternatives, 45 percent of the alignment is comprised of wetlands, the highest of the alternatives.

Mac West-Connector 1-Houston-Houston South

Construction of this alternative would impact 424 acres of wetlands and waters within the 200-foot ROW and terminal reserve areas. Wetlands within the ROW would be permanently affected by construction of the proposed project and would experience loss of function. Like the Mac West-Connector 1-Houston-Houston North Alternative, Mac West-Connector 1-Houston-Houston South also has among the largest proportions of wetlands that are high functioning for export of detritus and groundwater discharge. Adjacent wetlands outside the 200-foot ROW could also be affected by fragmentation or hydrological modification, especially within the Mac West-Connector 1 Segment Combination. Compared to other alternatives, impacts to forested and

Table 4.5-4
Summary of Impacts to Wetlands (acres) within the 200-Foot Right-of-Way by Alternative[a,b,c]

Alternative	Forested Wetlands	Scrub/ Shrub Wetlands	Emergent Wetlands	Total Wetlands	All Waters[d]	Total Wetlands and Waters	Total Uplands
Mac West-Connector 1-Willow	148	179	32	359	4	363	942
Mac West-Connector 1-Houston-Houston North	169	253	50	472	6	478	577
Mac West-Connector 1-Houston-Houston South	153	226	41	420	4	424	643
Mac West-Connector 2-Big Lake	135	187	24	346	1	347	757
Mac East-Connector 3-Willow	94	78	13	185	3	188	1,095
Mac East-Connector 3-Houston-Houston North	116	151	30	297	4	301	712
Mac East-Connector 3-Houston-Houston South	100	124	21	245	3	248	779
Mac East-Big Lake	88	112	8	208	1	209	768

[a] Source: HDR, 2008; HDR, 2010.
[b] Acres for alternatives will not match the sum of the acres for individual segments. Segment curves and overlaps were eliminated to represent each alternative as one contiguous area.
[c] Wetland impacts within the Mac East and Mac West segments include impacts from the terminal reserve areas outside the 200-foot right-of-way.
[d] Includes palustrine, riverine, and lacustrine waters.

scrub/shrub wetlands along this alternative would be the second highest (153 and 226 acres, respectively).

Mac West-Connector 2-Big Lake

Construction of this alternative would impact 347 acres of wetlands and waters. The Big Lake Segment of this alternative would impact locally important MSB wetland mitigation bank areas that contain high-value wetlands. This alternative would also impact the unique floating fen located on either side of Goose Creek along the Big Lake Segment. Impacts to this high value wetland would depend on the size of drainage structure or crossing designed for the water body. The Mac West-Connector 2-Big Lake Alternative has among the largest proportion of high-functioning wetlands compared to other alternatives. This is likely due to the Big Lake Segment, because this segment also contains the largest proportion of high-functioning wetlands of all the segments. While the acres affected would not be as great as some of the other alternatives, there would be impacts to functions and values of locally important wetlands such as the floating fen, and the intensity of the impacts would depend on the avoidance, minimization, and mitigation measures proposed for the area.

Mac East-Connector 3-Willow

Construction of this alternative would impact 188 acres of wetlands and waters, the lowest impact to wetlands of all the alternatives. Compared to other alternatives, this alternative would have the lowest proportion of wetlands, with just 15 percent of the ROW being comprised of wetlands. Although the overall acreage of impacts to wetlands in the ROW would be relatively low for this alternative, impacts to riverine and open water wetlands could be locally significant, depending on the avoidance, minimization and mitigation measures incorporated into the project. Though wetlands crossed by all eight alternatives are high functioning for the export of detritus, Mac East-Connector 3-Willow has the lowest proportion of high-functioning wetlands compared to other alternatives (91 percent). This alternative also has the largest proportion of low-functioning wetlands and for the export of detritus function (9 percent). Although all alternatives cross high functioning wetlands overall, compared to other alternatives for individual functions, the Mac East-Connector 3-Willow Alternative stands out as having the lowest proportion of high-functioning wetlands across all functions. The alternative would cross a moderate number of riverine habitats and would pass between lakes and other open water habitat. Impacts to these wetland types could extend beyond the 200-foot ROW and terminal reserve areas, depending on best management practices incorporated into the project.

Mac East-Connector 3-Houston-Houston North

Construction of this alternative would impact 301 acres of wetlands and waters (approximately 30 percent of the area within the ROW and terminal reserve areas). Impacts to wetlands along this alternative would be the fourth lowest of all the alternatives. However, impacts to riverine and open water wetlands along this alternative would be the second highest of all the alternatives. Because of the sensitivity of these habitats to fragmentation, the presence of open and flowing water adjacent to and within the 200-foot ROW potentially increases the chances that impacts to wetlands could extend beyond the 200-foot ROW into adjacent habitats.

Mac East-Connector 3-Houston-Houston South

Construction of this alternative would impact 248 acres of wetlands and waters. Compared to other alternatives, this alternative would impact one of the lowest overall numbers of acres of wetlands and waters, with more than half of that impact being the loss of scrub/shrub wetlands. There could be impacts to wetlands outside the 200-foot ROW and terminal reserve areas from fragmentation of wetland communities that provide wildlife habitat. Although the overall acres of impacts to wetlands for this alternative would be relatively low, the intensity of the impacts could be greater than others, depending on the avoidance, minimization, and mitigation measures incorporated into the project.

Mac East-Big Lake

Construction of this alternative would impact 209 acres of wetlands and waters, with more than half of the impact to scrub/shrub wetlands. This alternative would have the lowest impact on both emergent and other waters than any of the alternatives. It would cover the lowest overall acreage of the alternatives, with the 200-foot ROW and terminal reserve areas comprising only 977 acres. However, this alternative would impact 25 acres of MSB wetland mitigation bank lands, and likely require additional mitigation to replace these high-value wetlands. This alternative would also impact the unique floating fen located on either side of Goose Creek along the Big Lake Segment. Impacts to this high-value wetland would depend on the size of drainage structure or crossing designed for the water body. The Mac East-Big Lake Alternative has the largest proportion of high-functioning wetlands compared to other alternatives. This is likely due to the Big Lake Segment, because this segment also contains the highest proportion of high-functioning wetlands compared to other segments. Although the acreage of impacts to wetlands would be relatively low for this alternative, impacts to sensitive habitats like the Goose Creek fen and the MSB mitigation bank could be more intense, depending on the avoidance, minimization, and mitigation measures incorporated into the project.

4.5.4.2 No-Action Alternative

Under the No-Action Alternative, the proposed Port MacKenzie Rail Extension would not be constructed and operated, and there would be no wetland/fill losses or reduction of wetland function.

5. BIOLOGICAL RESOURCES

This chapter describes the existing environment for biological resources and potential impacts to those resources from proposed Port MacKenzie Rail Extension construction and operations. The analysis focuses on four primary biological resources – vegetation, wildlife, fisheries, and threatened and endangered species – because of their importance in providing habitat (vegetation cover), human use (wildlife and fisheries), and regulatory compliance (threatened and endangered species). During consultations with Federal and State of Alaska resource agencies, one federally protected endangered animal species and depleted stock – the Cook Inlet beluga whale – was identified and no state-protected species were identified as occurring in the area the proposed rail line could affect (see Appendix A). On related topics, Section 4.4 addresses impacts to wetlands, and Chapter 7 addresses subsistence uses of biological resources.

The proposed Port MacKenzie Rail Extension would be in the Cook Inlet basin, bordered on the northeast and west by the Alaska Range and on the east by the Chugach-St. Elias Mountains. The level rolling topography, defined by glacial moraines, drumlin fields, eskers, and outwash plains, supports diverse vegetation communities dominated by spruce and hardwood forests. Uplands support mixed forests of white spruce, quaking aspen, and paper birch; tall scrub communities develop in floodplains; and lowlands support black spruce and acidic shrub bogs. Wildland fire incidence varies from low to moderate. The Susitna and Matanuska rivers drain glaciers in the surrounding mountains and, along with their tributaries, support salmon and other freshwater fishes. Beluga whales and harbor seals occur throughout the Cook Inlet and in the Knik Arm of the Cook Inlet. Wetland and upland habitats support moose, bears, and a variety of small mammals. Numerous lakes, swamps, bogs, and estuaries attract large numbers of shorebirds and waterbirds, while extensive forests support many landbirds.

Appendices D, E, and F provide more detailed descriptions of the regional and site-specific conditions for vegetation, wildlife, and fisheries resources. These appendices form the basis for the impact assessment, further describe analytical methods, and provide detailed results of qualitative and quantitative impact assessment for the proposed rail segments and alternatives. The impact assessments are based on spatial analyses, field surveys, and literature reviews. Appendix G provides the results of the Essential Fish Habitat Assessment in compliance with the Magnuson-Stevens Fishery Management and Conservation Act. Appendix H provides the results of the Biological Assessment for the Cook Inlet beluga whale in compliance with the Endangered Species Act.

5.1 Regulatory Setting

Rail line construction and operations activities that have a potential to affect vegetation, fisheries, wildlife, and endangered species or their habitats are regulated by various Federal and state agencies. Table 5.1-1 lists and describes specific laws and regulations that protect biological resources and apply to the proposed rail line. These Federal and State of Alaska regulations and associated requirements provide the framework for agencies to review Port MacKenzie Rail Extension design, construction, and operations to ensure avoidance, minimization, or mitigation of impacts to biological resources in the project area.

Table 5.1-1
Applicable Federal and State Laws and Regulations (page 1 of 2)

Permit/Activity/Regulation	Authority[a]	Description
FEDERAL		
National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS)		
Essential Fish Habitat Consultation	Magnuson-Stevens Fishery Management and Conservation Act (16 U.S.C. 1801-1883)	Provides for the management of fish and other species in designated Exclusive Economic Zones.
Fish and Wildlife Coordination Act Consultation	Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq.*)	Requires evaluation of the impacts to fish and wildlife and development of mitigation for proposed development projects, including involvement of the National Marine Fisheries Service and state fish and wildlife management agencies.
Endangered Species Act Consultation	Endangered Species Act (16 U.S.C. 1531 *et seq.*)	Provides for the protection of federally managed fisheries and marine mammals that have been identified as in danger of becoming extinct including habitats that have been identified as critical to their survival.
Marine Mammal Protection Act Consultation	Marine Mammal Protection Act as amended (16 U.S.C. 1361 *et seq.*)	Provides for protection of marine mammals and regulates the incidental take of marine mammals for specified otherwise legal activities.
U. S. Fish and Wildlife Service		
Bald and Golden Eagle Protection Act Clearance	Bald and Golden Eagle Protection Act (16 U.S.C. 668)	Provides for the protection of bald and golden eagles, their nests, or their eggs from harm or disturbance.
Migratory Bird Protection Act Consultation	Migratory Bird Treaty Act (16 U.S.C. 703)	Provides for protection of birds that migrate between the United States and Canada, Mexico, Japan, or Russia.
Fish and Wildlife Coordination Act Consultation	Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq.*)	Requires evaluation of the impacts to fish and wildlife and development of mitigation for proposed development projects, including involvement of the U.S. Fish and Wildlife Service and state fish and wildlife management agencies.
Endangered Species Act Consultation	Endangered Species Act (16 U.S.C. 1531)	Provides for the protection of wildlife, fish, and plants that have been identified as in danger of becoming extinct including habitats that have been identified as critical to their survival. There are no federally protected wildlife, fish, or plants or designated critical habitats within the jurisdiction of the Fish and Wildlife Service in the project area.
STATE		
Alaska Department of Natural Resources		
Alaska Forest Resources Practice Act Regulations	Division of Forestry, Alaska Resources and Practices Act, AS 41.17	The Division of Forestry manages state forests and provides technical advice to the Division of Lands on sound forest practices necessary to ensure the continuous growing and harvesting of commercial forest species on other state land. Regulates operations on private forest land and provides public information and assistance regarding forest practices and timber management.
Prohibited and Restricted Noxious Weeds Regulations	Division of Agriculture, 11 AAC 34.020	Provides for the regulation and identification of prohibited noxious weeds and establishes the maximum allowable tolerances for restricted noxious weeds.

Table 5.1-1
Applicable Federal and State Laws and Regulations (page 2 of 2)

Permit/Activity/Regulation	Authority[a]	Description
STATE (continued)		
Alaska Department of Fish and Game		
Fish Habitat (Title 16) Permit	Habitat Division, AS 16.05.841 or 16.05.871	Requires environmental review for any activity conducted within fish-bearing waters, such as proposed bridges, culverts, fords and crossings (both winter and summer); material sites; tailings facilities; and water-withdrawal structures.
Fish Passage Evaluation	Habitat Division, AS 16.05.841	Requires notification and authorization for activities within or across streams used by fish if such uses or activities could cause an impediment to passage of fish as determined by the Alaska Department of Fish and Game. Culvert installation; stream realignment or diversions; dams; low-water crossings; and construction, placement, deposition, or removal of any material or structure below mean high water line all require fish passage evaluation.
Anadromous Fish Evaluation	Habitat Division, AS 16.05.871	Requires notification and approval from fish habitat biologists "to construct a hydraulic project or use, divert, obstruct, pollute, or change the natural flow or bed" or "to use wheeled, tracked, or excavating equipment or log-dragging equipment in the bed" of an anadromous waterbody. Includes all activities within or across streams and all instream activities including construction; road crossings; gravel removal; placer mining; water withdrawals; the use of vehicles or equipment in the waterway; stream realignment or diversion; bank stabilization; blasting; and the placement, excavation, deposition, disposal, or removal of any material potentially affecting an anadromous waterbody.
Conservation and Protection of Alaska Fish and Game Regulations	AS 16.20	Provides for the protection and preservation of Alaska natural habitat and game populations.
Fish Resources Permit	Division of Sport Fish and the Division of Commercial Fisheries (5 AAC 41)	Provides for the regulation of the transportation, possession, or release of live fish for scientific or educational purposes
Fish, Game, Aquatic Plant Resources Regulations	AS 16.05.020 (2)	Provides for the regulation of hunting and trapping and for the management of game populations in Alaska.
Endangered Species Take Permit	AS 16.20.195	Required for harvesting, injuring, importing, exporting, or capturing a state listed endangered species.
Regulation and Management of Game and Fish Resources	Title 16, Chapter 5	Provides for the regulation of hunting and management of game populations in Alaska. Provides for the regulation of fishing and management of fisheries in the state.

[a] AAC = Alaska Administrative Code; AS = Alaska Statute; U.S.C. = United States Code.

5.2 Vegetation Resources

5.2.1 Study Area

The study area is defined as vegetation cover within 5 miles of the centerline (10 mile total width) of the proposed rail line segments. This study area provides context for the evaluation of potential impacts to vegetation resources from the proposed Port MacKenzie Rail Extension. Within the study area is the 200-foot right-of-way (ROW) of the rail line segments. The Surface Transportation Board's (STB or the Board) Section of Environmental Analysis (SEA) focused the analysis of potential impacts to vegetation cover on the 200-foot ROW and associated facilities.

5.2.2 Analysis Methodology

SEA used Geographic Information System analysis to identify, classify, and quantitatively assess potential impacts to vegetation along the ROW for each of the rail line segments. Descriptions of existing conditions for vegetation are based on data in Nowacki *et al.* (2001), Gallant *et al.* (1995), Viereck *et al.* (1992), and ANHP *et al.* (2008). SEA identified and quantified vegetation types along the 200-foot ROW using the U.S. Geological Survey National Land Cover Database (Homer *et al.*, 2004). SEA also used this database to estimate the prevalence of vegetation types beyond the 200-foot ROW to assess potential impacts to vegetation. SEA further incorporated data on invasive plant populations (ANHP *et al.*, 2008) and fire management (BLM AFS, 2008a, 2008b) to inform this analysis.

5.2.3 Affected Environment

The study area is in the Cook Inlet Basin Ecoregion, a gently sloping lowland basin characterized by a variety of woodland and wetland habitats (Nowacki *et al.*, 2001). Both mature forests and wetland areas serve important ecological functions and provide key wildlife habitat. Forests provide valuable ecosystem services such as photosynthesis and nutrient cycling, and help to prevent erosion and provide riparian buffers. In addition, forests help maintain clean air and water through respiration and their role in the water cycle. When disturbed, mature forests could take up to 100 years to recover (Viereck *et al.*, 1992), and depending on the nature of the disturbance, could be permanently altered.

Wetland plant communities provide habitat and forage for terrestrial and aquatic life, filter surface water flows, and buffer storm waters and floodwaters. In addition, wetland plant communities are remarkably diverse – wetlands are home to 31 percent of all plant species in the United States (USEPA, 2001).

In addition to wetland habits, evergreen, deciduous, and mixed forest stands are the predominant vegetation classes in the study area (Homer *et al*., 2004; Gallant *et al.*, 1995). Stands of white spruce, black spruce, or a mixture of the two species are common in evergreen forests. Closed stands of white spruce occupy young river terraces where soil drainage is good; closed stands of black spruce occupy poorly drained floodplain soils. Mixed closed stands with both white spruce and black spruce often have tall shrub understories of alder and willow. Colder and wetter soils support black spruce woodlands, where the tall shrub understory is a much more important component of the ecosystem than in closed forest stands. Mixed forests generally consist of paper birch or quaking aspen with black and/or white spruce, or in some places, are codominated by white spruce and balsam poplar.

Shrub/scrub wetland communities can be found in floodplains and drainageways and are typically dominated by willow or alder. In wet areas, these shrub/scrub communities can include sedges, marsh fivefinger, or other wetland plants. Woody wetlands consist of low-shrub/scrub plant communities in saturated areas with thick organic mats, and can include resin birch, willows, and typical bog plants like Labrador tea, bog blueberry, leatherleaf, sedges, and sphagnum moss. Some woody wetland communities form tussock bogs dominated by cottongrasses. Emergent herbaceous wetlands occupy lake and pond margins, sloughs, oxbows, fens, and poorly drained areas of silty or organic soils. Plants characteristic of emergent herbaceous wetlands include sedges, marsh fivefinger, horsetail, cinquefoil, and aquatic plants like pond lily and water milfoil.

Riparian areas scoured by floodwater in the study area generally follow a successional sequence from bare alluvium, to alluvium with scattered willows and herbs, open willow shrub, closed alder and willow shrub, open balsam poplar forest with a dense alder understory, closed balsam poplar forest with alder understory, mixed balsam poplar-white spruce forest, to closed white spruce forest (Viereck *et al.*, 1992). Development from the closed alder willow shrub to mature balsam poplar forest occurs over a period of 75 to 90 years, and the transition from mixed balsam poplar-white spruce forest to white spruce-dominant forests usually occurs gradually over the span of almost 100 years.

Vegetation cover characteristics in the study area are primarily the result of the generally level topography, mild weather, proximity to the coast, soils created by intense historic glaciations of the region, and the lack of permafrost. Development of vegetation communities is also influenced by slope, aspect, elevation, parent material (the primary material from which soil is formed), and the succession of vegetation communities subsequent to flooding and fire. Forestry, military activity, agriculture, urban and recreational development, transportation development, gravel mining, insect infestations, moose browsing, and the spread of invasive and noxious plants have also affected vegetation in the study area.

Figure 5.2-1 depicts the distribution of vegetation classes around the proposed rail line segments. Table 5.2-1 shows the relative abundance of the different vegetation cover classes present in the study area. Appendix D describes the relevant vegetation classes.

5.2.3.1 Fire Ecology

In the study area, evergreen forests, and in particular black spruce forests, are the most susceptible to fire. As a result, stands of black spruce older than 100 years are rare (Viereck *et al.*, 1992). Recently burned areas typically revegetate with herbaceous communities, which is often dominated by fireweed, and followed by plant communities dominated with bluejoint reedgrass and willow scrub. Broadleaf forests follow willow communities in uplands on south-facing slopes or on well-drained river terraces, while paper birch forests develop on east-, west-,

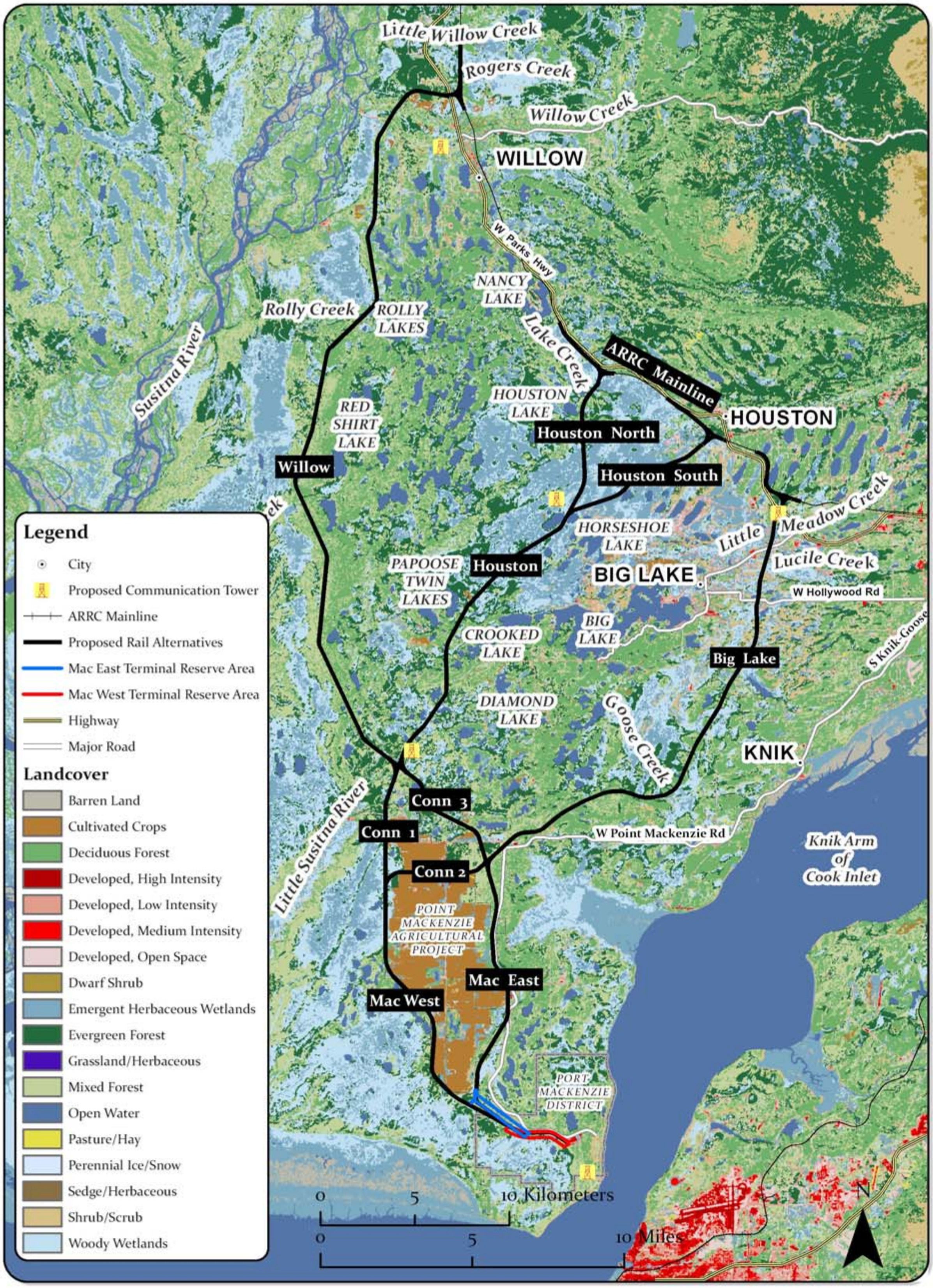

Figure 5.2-1. Overview of Vegetation Classes Around the Rail Line Segments

Table 5.2-1
Vegetation Cover Classes within the Study Area of the Proposed Port MacKenzie Rail Extension Alternatives[a]

Study Area Cover (percent)[b]	Class Name	Study Area Cover (percent)	Class Name
<1	Barren Land	13	Evergreen Forest Closed
2	Cultivated Crops	<1	Evergreen Forest Open
16	Deciduous Forest Closed	<1	Evergreen Forest Woodland
2	Deciduous Forest Open	18	Mixed Forest Closed
<1	Deciduous Forest Woodland	<1	Mixed Forest Open
<1	Developed, High Intensity	<1	Mixed Forest Woodland
1	Developed, Low Intensity	11	Open Water
<1	Developed, Medium Intensity	<1	Pasture/Hay
1	Developed, Open Space	3	Shrub/Scrub
14	Emergent Herbaceous Wetlands	16	Woody Wetlands

[a] Source: Homer e*t al.*, 2004; the study area is defined as vegetation cover within 5 miles of the centerline (10 mile total width) of the proposed rail line segments.
[b] < = less than.

and some north-facing slopes and in flat areas. Mixed forests develop as spruce becomes established within the broadleaf forests, followed by spruce forests in some locations.

5.2.3.2 Invasive and Noxious Plants

Most of Alaska has remained relatively free from large-scale habitat changes resulting from nonnative plant species, primarily because the state has a small human population and relatively few areas of man-made disturbance. However, the Matanuska-Susitna Valley in the study area is one of the most developed regions of the state. As a consequence, 54 species of nonnative plants have been identified in the study area at 179 different sites (ANHP *et al.*, 2008). The most common nonnative plants in the study area are common dandelion, annual bluegrass, and white sweet clover. These plants and some other nonnative plant species common to the area are considered to be highly invasive weed species. Higher concentrations of invasive weed species are found in developed areas, especially along Parks Highway, which passes through the study area between Wasilla and Willow, on Knik-Goose Bay Road between Big Lake and Knik, and the Point MacKenzie Agricultural Project. However, surveys for invasive weed species generally are concentrated within developed areas; therefore, the extent of invasion away from road systems is likely underreported.

The State of Alaska regulates the spread of invasive weed species and has listed 14 species as prohibited noxious weeds and 9 species as restricted noxious weeds under Title 11 of Alaska state statutes (11 ACC 34.020). Prohibited noxious weeds are any species of plants, which when established, are or may become destructive and difficult to control by ordinary means of cultivation or other farm practices. Restricted noxious weeds are species of plants which are very objectionable in fields, lawns, and gardens, but which can be controlled by good cultural practices. Four prohibited noxious weeds and five restricted noxious weeds were identified in the study area (Table 5.2-2). Appendix D provides a complete list of regulated and nonregulated invasive plants in the study area based on field surveys performed between 2002 and 2007 (ANHP *et al.*, 2008).

Table 5.2-2
Prohibited and Restricted Noxious Weeds in the Proposed Port MacKenzie Rail Extension Study Area[a]

Common Name	Species	Occurrence (sites)	Status[b]
Canada Thistle	*Cirsium arvense*	1	P
Quackgrass	*Elymus repens*	51	P
Brittlestem Hempnettle	*Galeopsis tetrahit*	7	P
Butter and Eggs	*Linaria vulgaris*	14	R
Plantain	*Plantago major*	85	R
Annual Bluegrass	*Poa annua*	96	R
Black Bindweed	*Polygonum convolvulus*	45	R
Perennial Sowthistle	*Sonchus arvensis*	2	P
Tufted Vetch	*Vicia cracca*	44	R

[a] Source: ANHP *et al.*, 2008; the study area is defined as vegetation cover within 5 miles of the centerline (10 mile total width) of the proposed rail line segments.
[b] R = restricted; P = prohibited.

5.2.3.3 Rare Plants

Extensive surveys for rare plant species have not been completed for the entire study area, but available data do not indicate the presence of any known rare plant species, such as Federal- or state-protected threatened, endangered, or candidate species, within the study area (Lipkin, 2008; HDR, 2008; USFWS, 2009).

5.2.4 Environmental Consequences

5.2.4.1 Proposed Action

The primary impacts to vegetation from proposed rail line construction and operations would be the destruction of vegetation cover and the replacement of some cover with gravel fill. The extent of such impacts would vary based on the affected vegetation types, their relative abundance, soil conditions, hydrology, topography, and the extent of topographic modification required for construction. Permanent impacts would include vegetation loss due to placement of gravel fill for the railbed and access road, excavation of gravel, and construction of rail line associated facilities. Other long-term impacts would include the loss or alteration of forested habitat due to the removal of vegetation at temporary workplaces that would be restored after project construction. Operations impacts would include vegetation removal and control within the 200-foot ROW where necessary for safe operations. In addition, impacts to vegetation resources could include altered vegetation communities due to soil compaction and the spread of invasive plant species, and altered vegetation succession caused by the interruption of natural wildland fire ecology.

The primary construction and operations impacts would be similar across all vegetation types; that is, vegetation would be removed and soil structures could be altered.

Common Impacts

Construction Impacts

There would be impacts to vegetation through clearing for construction of the rail line, access road, and other associated facilities; most of these impacts would be within the 200-foot ROW. There could also be impacts to vegetation near the ROW as a result of dust deposition, changes in soil and moisture conditions, fragmentation of vegetation communities, invasion by nonnative plants, and the alteration of natural fire regimes. The extent of these potential impacts to vegetation communities would depend on several factors, including vegetation type, topography, hydrology, proximity to invasive plant populations, and other disturbance patterns. The following paragraphs describe potential construction-related impacts common to all the segments.

Vegetation Clearing and Fill Placement

Clearing of vegetation within the 200-foot ROW would alter plant community composition and structure. There also would be vegetation clearing and disturbance outside the 200-foot ROW for construction of associated facilities, such as the terminal reserve area. Some vegetation regrowth would be expected, although plant communities would be temporarily or permanently altered. Placement of fill to support the rail line and access road would result in the permanent loss of vegetation. Vegetation loss would be short term in the areas that could be restored or allowed to revegetate by natural succession. However, the natural-succession process would be hindered by mechanical vegetation management in some areas, as described under Operations Impacts.

Some areas, such as temporary staging areas that may be needed outside the 200-foot ROW, would be restored after construction. The type of vegetation that would develop as a result of restoration would depend on the type of vegetation cleared, the soil conditions present, and the surrounding vegetation. Most restoration efforts would be initiated with establishment of an initial grassy and herbaceous ground cover to prevent excess erosion and the spread of invasive weeds. Restoration of grass-like plants such as sedges, rushes, and grasses and shrub/scrub habitats could occur within 5 to 20 years, and would be considered a short-term habitat loss. Shrubs would also require 5 to 20 years to return to their original community composition and height (ADF&G, 2001). Forested areas stripped of vegetation during construction would require from 70 to 200 years for regeneration and would be considered a long-term loss of habitat, even with restoration (ADF&G, 2001). Forest communities would likely be replaced, in part, by either native early successional-stage vegetation or invasive plants.

Soil Compaction and Erosion

Soil compaction would result from heavy equipment transiting areas associated with construction of the rail line, access road, and associated facilities and would occur primarily within the 200-foot ROW. Compaction of soils would inhibit germination of some seeds in the upper soil surface, inhibit infiltration of precipitation, inhibit root penetration, and could cause development of bare soil areas or establishment of invasive plants. In addition, removal of vegetation cover would exacerbate erosion; therefore, rail line construction would increase erosion rates. Erosion and sedimentation effects could extend beyond the 200-foot ROW, especially in areas with steep terrain.

Spread of Invasive Plants

Construction of the rail line, access road, and associated facilities could increase the spread of invasive plants by the following pathways:

- Construction equipment used on the site could carry seeds or propagative plant parts from other construction projects or infested areas.
- Removal of overburden and cut materials to offsite locations could spread invasive species, and placement of fill from borrow sites could introduce invasive plants.
- Seed mixtures used to revegetate slopes and exposed soils could contain invasive plant seeds.

Thus, native vegetation next to the rail line, access road, and other areas cleared for the project could experience competition from invasive plants. Changes in local soil conditions and exposed mineral soils also allow invasive plants to spread, which could contribute to encroachment of invasive plants on vegetation communities adjacent to the ROW. This could contribute to larger-scale vegetation changes that could result in altered vegetation communities and impacts to ecological integrity.

Although comprehensive data for invasive plant infestations is not available for all areas, there are higher concentrations of invasive plant species in developed areas, especially along Parks Highway, which passes through the study area between Wasilla and Willow, on Knik-Goose Bay Road between Big Lake and Knik, and the Point MacKenzie Agricultural Project. Construction of segments near developed areas with existing infestations of noxious and invasive weeds would increase the potential to spread invasive plants. Invasive plants pose risks to wildlife habitat and could be of particular concern in areas adjacent to Susitna Flats State Game Refuge and other wildlife management areas. Table 5.2-3 lists the number of known weed sites near each Port MacKenzie Rail Extension segment and Parks Highway.

Rare Plants

There are no known threatened or endangered plant species in the study area (Lipkin, 2008; HDR, 2008; USFWS, 2009). Rare plant species, if present, would be subject to the same impacts as other vegetation, with the additional concern that clearing or other disturbance could severely impact or even eliminate these species in the local area.

Dust Deposition

Wind-blown dust from the access road and railbed could damage or eliminate plants by direct cover with mineral fines, which inhibit photosynthesis and respiration. More tolerant native and nonnative invasive plants could replace existing vegetation communities in areas exposed to dust. The magnitude and duration of dust exposure would determine vegetation response and the intensity of potential impacts (Auerbach, 1997).

Table 5.2-3
Weed Sites Near Proposed Port MacKenzie Rail Extension Segments and Parks Highway

	Number of Weed Sites within 0.5 Mile of Segment Centerlines
Segment	
Connector 1	0
Connector 2	2
Connector 3	0
Houston	0
Houston North	4
Houston South	7
Mac East	3
Mac West	2
Willow	2
Big Lake	10
Parks Highway	41

Fragmentation

Fragmentation of vegetation communities from rail line construction would alter plant communities along the alignment edges and could facilitate the spread and establishment of invasive nonnative plants (Hansen and Clevenger, 2005). Permanent rail facilities would replace vegetation cover, which would result in linear separation of the landscape (Meffe *et al.*, 1997). Linear construction projects, such as roads and rail lines, divide vegetation communities, converting interior communities into edge communities (Watson, 2005).

Wildland Fires

Clearing of vegetation in the ROW could interrupt the natural fire cycle. Rail line construction would lead to fragmentation of fuel material for wildland fires. This could result in the creation of fire breaks such that a fire starting on one side of the ROW might not cross the cleared alignment to the opposite side of the ROW. This could lead to an increase in fuel accumulation along either side of the ROW and an increased risk of more intense wildland fires, resulting in more damage to vegetation and prolonged vegetation recovery periods. This could change the natural cycle of fire and lead to decreased biodiversity from ecological succession, because the separated vegetation communities might experience different rates of ecological succession. This disruption of natural fire cycles and succession patterns would be of special concern in areas where proposed rail line alternatives would cross through black spruce forests, which are especially vulnerable to fire (Viereck, 1992). For example, in 1996, the Millers Reach 2 fire burned 37,348 forested acres in the Big Lake area between Knik and Houston, including 129 acres in the proposed rail line ROW (BLM AFS, 2008a).

Much of the study area can be considered “wildland-urban interface,” where structures and human development intermingle with natural vegetation, increasing the risk for destructive wildland fires. Fires in the wildland-urban interface can pose significant threats to homes, other structures, and forested habitat. Fire management strategies are described in the BLM Alaska Wildland Fire Management Plan (BLM, 2005). Under the current fire management scenario, the Port MacKenzie Rail Extension alternatives would cross three levels of fire protection –

modified, full, and critical (BLM, AFS 2008b). Areas covered by critical and full protection designations are the highest priorities for fire suppression because these designations indicate risk to human life, property, developed areas, and high-value natural resources. While changes in fire management strategies in the study area are not anticipated, the BLM Alaska Fire Service periodically reviews management strategies as ecological conditions change. Appendix D provides a more detailed description of fire management and fire history in the study area.

Floodplains

Construction of the proposed rail line in floodplain areas could impact vegetation communities through the alteration of natural drainage patterns and floodplain storage capacity. These changes could affect vegetation outside the 200-foot ROW. For example, alteration of natural drainage patterns could change the location of the mean high water line and cause riparian vegetation to become submerged. In some cases, this would cause a loss of vegetation or alter plant community composition. Floodplains throughout the study area are home to late-successional mixed and evergreen forest communities, which would be vulnerable to construction impacts because of the long time required for recovery.

Operations Impacts

The following paragraphs describe potential operations-related impacts common to all segments.

Maintenance Clearing

Continued disturbance of vegetation and soil would result from ongoing mechanical clearing and trimming of vegetation within the ROW where necessary to ensure safe operation of the rail line (see Appendix D). Other methods of vegetation maintenance might include thermal removal, steam or hot water removal, fire removal, smothering vegetation with impenetrable plastic layers along the base of the embankment, or manual removal (Torstensson, 2001). These activities would disturb successional vegetation cover, providing an opportunity for growth of invasive species. Any vegetation removed by burning could increase the risk of fire spreading beyond the vegetation management target area and could result in the unintentional destruction of vegetation resources (ARRC, 1984). The alteration of vegetation cover from ROW maintenance would be considered a permanent impact.

Chemical Spills

Vegetation could be affected in the unlikely event of a release of hazardous materials from a train derailment or collision. The level of impact would depend on the type and quantity of material spilled. However, as noted in Section 11.4.1.3, Rail Safety, the Alaska Railroad Corporation (ARRC or the Applicant) has not indicated any plans to carry hazardous materials along the proposed Port MacKenzie Rail Extension. In the unlikely event of a spill of hazardous materials, degradation of vegetation would depend on factors such as the specific material spilled, runoff type, and vegetation community affected.

Dust Deposition and Runoff

Soil disturbance due to rail line operations would produce fugitive dust, which could result in the deposition of dust along the rail line. High quantities of dust deposited on plants such as mosses and lichens can lead to a greater chance of mortality due to a reduction in the plant's ability to photosynthesize. Increased soil erosion can lead to an overall decrease in the number of plant species found in a plant community (Klinger *et al.*, 1983; Walker *et al.*, 1987a, 1987b). Precipitation runoff from road and rail embankments and associated facilities and across dust deposits during rail line operations could result in changes in soil chemistry. The extent of such impacts would depend on the site-specific pH (measure of acidity or alkalinity) of the soil, which would result in reduced nutrient levels, altered organic horizon depth, higher soil bulk density, and lower soil moisture. These changes could cause reduced vegetation biomass and diversity, especially in areas with acidic soils, such as evergreen forest habitats (Auerbach *et al.*, 1997). Potential effects on plant communities from dust deposition and runoff would occur primarily within and adjacent to the 200-foot ROW.

Wildland Fire and Fire Management

While railroads in Alaska are not known to have been a common cause of wildland fires in the past, sparks from rail line operations and maintenance could increase the potential for fires (DeWilde and Chapin, 2006). SEA does not anticipate changes in fire management practices as a result of the proposed rail line. Appendix D provides a more detailed description of fire management and fire history in the study area.

Impacts by Segments and Segment Combinations

Vegetation would be permanently removed during clearing for construction of the rail line and associated facilities. The level of potential impact would depend on the size and type of vegetation in the area to be cleared during rail line construction and operations. The following paragraphs describe the vegetation types and areas of vegetation that would be removed within the 200-foot ROW and for associated facilities by segments and segment combinations. The descriptions include identification and discussion of construction and operations impacts when there would be differences between segments and segment combinations, or when impacts would be notable.

Southern Segments

Construction of any of the southern segments and segment combinations (Mac West-Connector 1, Mac West-Connector 2, Mac East-Connector 3, Mac East) would impact a variety of vegetation. Each of these segments and segment combinations would pass through a combination of undisturbed forest and woodlands, wetlands, and agricultural areas, as shown in Figure 5.2-2. Table 5.2-4 lists vegetation cover within the 200-foot ROW of the southern segments and segment combinations. Construction of southern segments and segment combinations would fragment vegetation communities already affected by existing development. This would reduce the capacity of remaining forests and other plant communities to provide ecological functions like wildlife habitat and nutrient cycling.

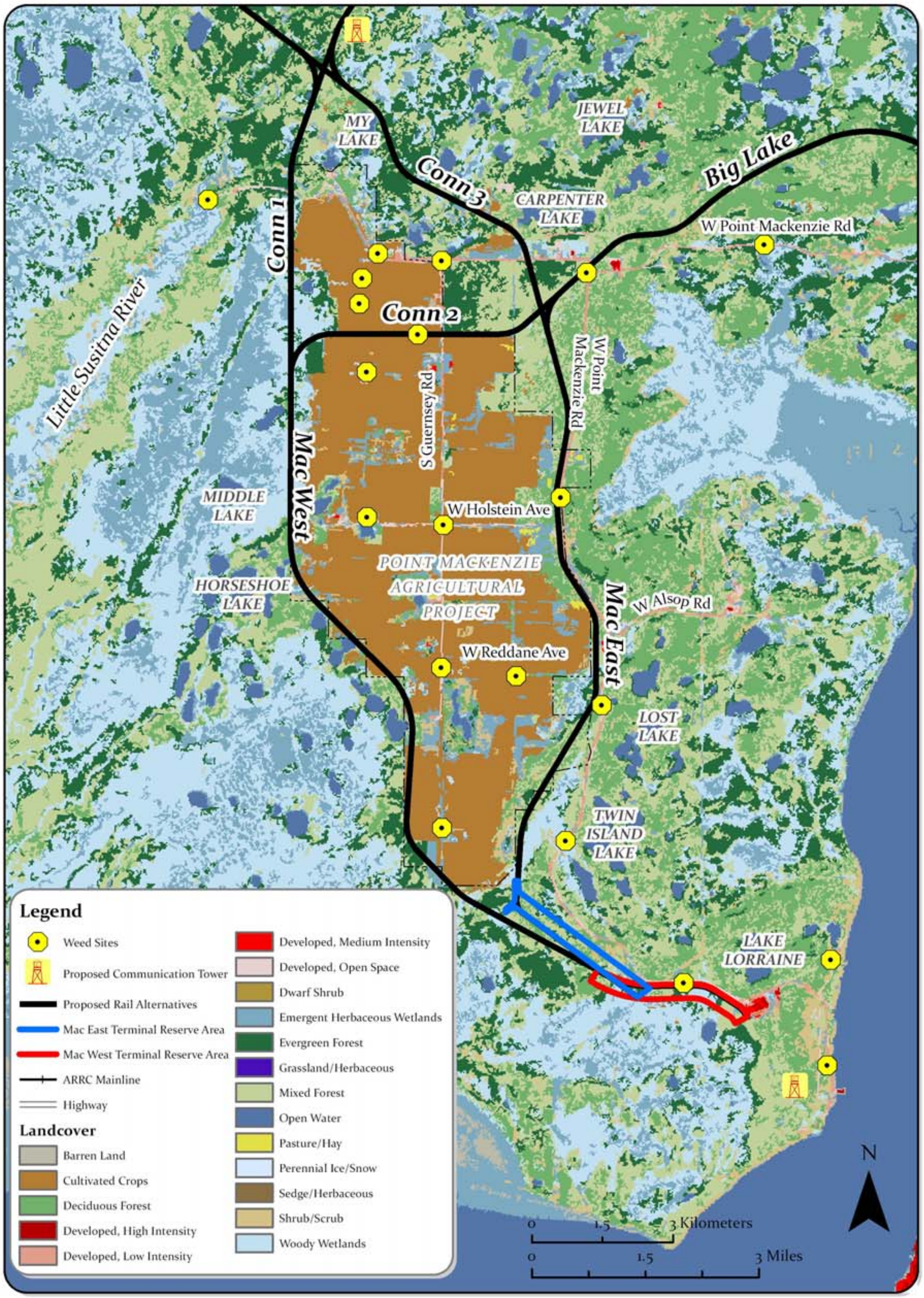

Figure 5.2-2. Vegetation Classes along the Mac West, Mac East, and Connector Segments

Table 5.2-4
Summary of Impacts to Vegetation (acres) by Segments and Segment Combinations for the Southern Segments[a]

Segment	Cultivated Crops/ Pasture/Hay	Deciduous Forest	Evergreen Forest	Mixed Forest	All Forests	Shrub/ Scrub	Woody Wetlands	Emergent Wetlands	Total Area[b]
Mac West-Connector 1	64	50	112	170	**332**	11	158	40	605
Mac West-Connector 2	93	50	91	166	**307**	11	134	37	582
Mac East-Connector 3	5	155	87	249	**491**	33	40	21	590
Mac East	1	143	47	200	**390**	31	34	13	469

[a] Source: Homer *et al*., 2004.
[b] Totals might not equal sums of values due to rounding.

Clearing and cultivation associated with agricultural activities within the Point MacKenzie Agricultural Project area have been the most significant sources of disturbance in the area of the southern segments and segment combinations. Higher concentrations of invasive plant species are found in developed agricultural areas near Port MacKenzie. The potential for the spread of invasive plant species in this area is much lower than for the northern segments as fewer weed sites have been identified in the southern portion of the study area (see Table 5.2-3). The fire protection level in this area is primarily “full,” indicating that human life, property, developed areas, or high-value natural resources could be at risk, with small areas designated as “modified” (see Appendix D). Fire activity in this area has been historically low (see Appendix D).

Mac West-Connector 1 Segment Combination

Construction of this segment combination could result in clearing of about 605 acres of vegetation within the 200-foot ROW – 64 acres of cultivated crops/pasture/hay, 50 acres of deciduous forest, 112 acres of evergreen forest, 170 acres of mixed forest, 11 acres of shrub/scrub, 158 acres of woody wetlands, and 40 acres of emergent herbaceous wetlands (Table 5.2-4). There are two known weed sites within the proposed ROW for this segment combination (Table 5.2-3).

Mac West-Connector 2 Segment Combination

Construction of this segment combination could result in clearing of about 582 acres of vegetation within the 200-foot ROW – 93 acres of cultivated crops/pasture/hay, 50 acres of deciduous forest, 91 acres of evergreen forest, 166 acres of mixed forest, 11 acres of shrub/scrub, 134 acres of woody wetlands, and 37 acres of emergent wetlands (Table 5.2-4). There are four known weed sites within the proposed ROW for this segment combination (Table 5.2-3). In 1991, the Stromberg Fire burned 475 acres of mixed agricultural and forested land near the intersection of Mac West and Connector 2, outside the proposed ROW (BLM AFS, 2008a).

Mac East-Connector 3 Segment Combination

Construction of this segment combination would result in the clearing of about 590 acres of vegetation within the 200-foot ROW – 5 acres of cultivated crops/pasture/hay, 155 acres of deciduous forest, 87 acres of evergreen forest, 249 acres of mixed forest, 33 acres of shrub/scrub, 40 acres of woody wetlands, and 21 acres of emergent wetlands (Table 5.2-4). There are three known weed sites within the proposed ROW for this segment combination (Table 5.2-3).

Mac East Segment

Construction of this segment would involve the clearing of approximately 469 acres of vegetation within the 200-foot ROW – about 1 acre of cultivated crops/pasture/hay, 143 acres of deciduous forest, 47 acres of evergreen forest, 200 acres of mixed forest, 31 acres of shrub/scrub, 34 acres of woody wetlands, and 13 acres of emergent wetlands (Table 5.2-4). There are three known weed sites within the proposed ROW for this segment (Table 5.2-3). The Mac East Segment is very similar to Mac East-Connector 3 Segment Combination, with proportionally the same approximate vegetation distribution within the 200-foot ROW.

Northern Segments

Construction of any of the northern segments and segment combinations (Willow, Big Lake, Houston-Houston North, or Houston-Houston South) would impact a variety of vegetation. These segments would pass through a combination of relatively undisturbed forests, woodlands, and wetlands, and some developed areas, as shown in Figures 5.2-3 and 5.2-4. Table 5.2-5 lists vegetation cover within the 200-foot ROW of the northern segments and segment combinations.

Residential and commercial development and associated roads and infrastructure have been the most significant sources of disturbance in the area of the northern segments and segment combinations. Higher concentrations of invasive plant species are found in developed areas near Big Lake and along Parks Highway. The potential for the spread of invasive plants in this area is moderate to high. Rail line construction and operations would increase the likelihood that weeds would spread to more remote areas. The fire protection level in this area is primarily “critical,” especially in developed areas near Parks Highway; more remote areas along the Willow Segment and in other places are designated as “full.” These designations indicate that human life, property, developed areas and/or high-value natural resources are at risk (refer to figures and tables in Appendix D for more detail on fire protection designations). Fire activity in this area has been moderate (see Appendix D). In 1996, the Millers Reach fire burned 37,348 acres in the Big Lake area between Knik and Houston.

Willow Segment

This segment would pass through areas that are primarily undeveloped; vegetation cover is mostly mixed and deciduous forest. Construction of the Willow Segment could alter natural fire ecology and provide a vector for the introduction and spread of nonnative plants. Construction of this segment would result in the clearing of about 684 acres of vegetation within the 200-foot ROW – 2 acres of cultivated crops/pasture/hay, 253 acres of deciduous forest, 90 acres of evergreen forest, 282 acres of mixed forest, 4 acres of shrub/scrub, 27 acres of woody wetlands, and 25 acres of emergent wetlands (Table 5.2-5). There are two known weed sites within the proposed ROW of this segment (Table 5.2-3). Much of this segment would pass through remote areas, and in contrast to the other northern segments, the fire protection level here is mostly “full” (see Appendix D).

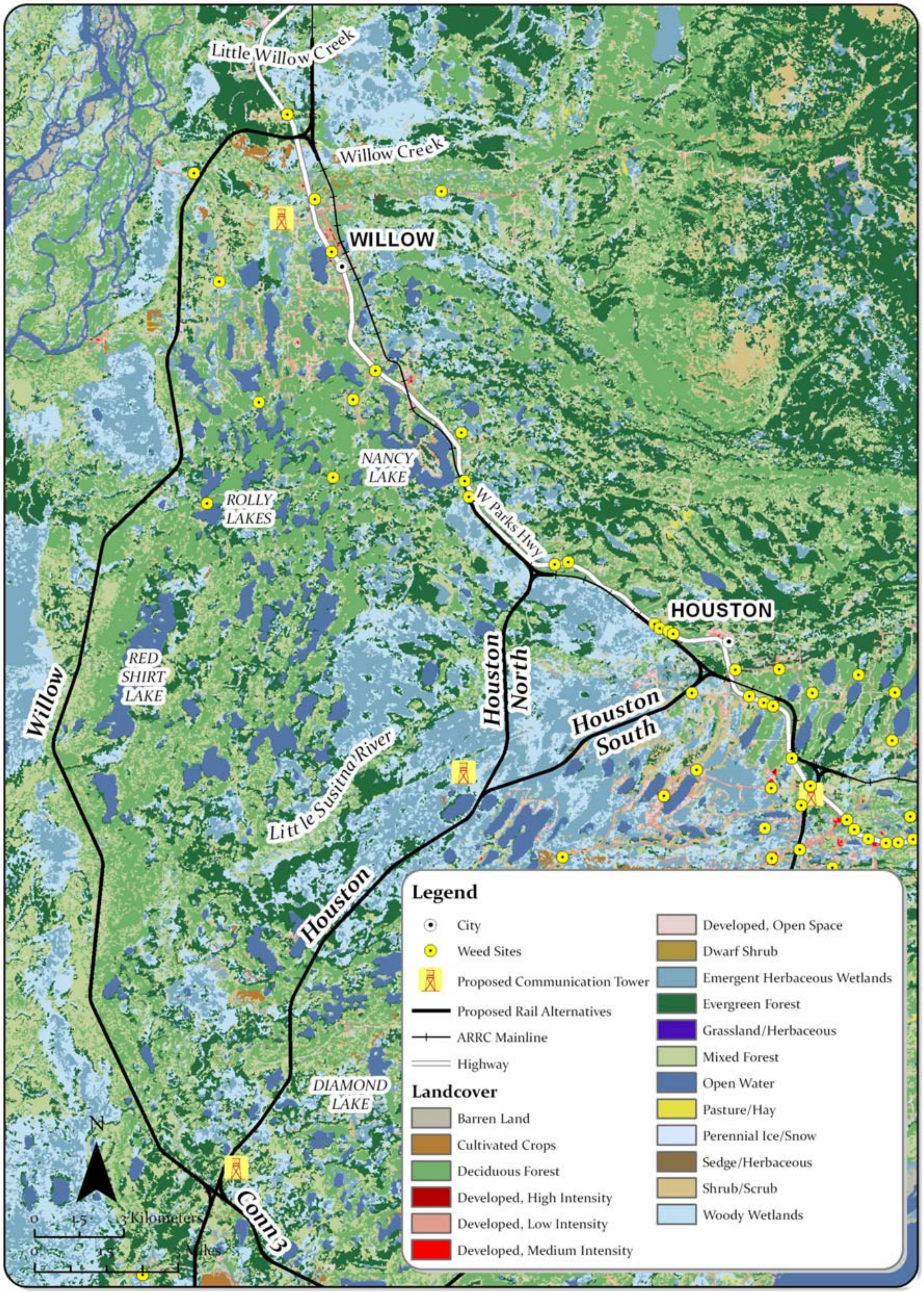

Figure 5.2-3. Vegetation Classes along the Willow, Houston, Houston North, and Houston South Segments

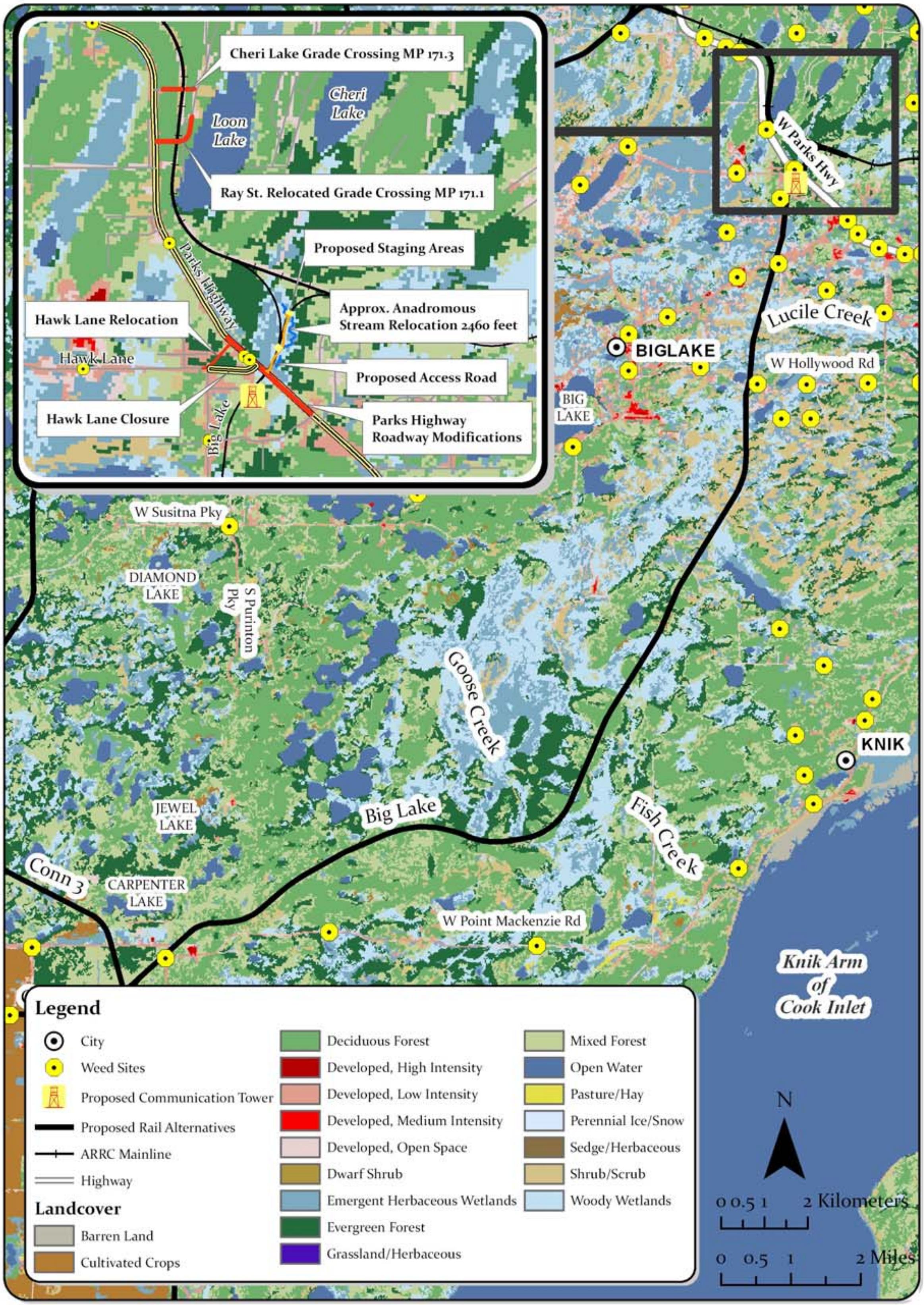

Figure 5.2-4. Vegetation Classes along the Big Lake Segment

Table 5.2-5
Summary of Impacts to Vegetation (acres) by Segments and Segment Combinations for the Northern Segments[a]

Segment	Cultivated Crops/ Pasture/ Hay	Deciduous Forest	Evergreen Forest	Mixed Forest	All Forests	Shrub/ Scrub	Woody Wetlands	Emergent Wetlands	Total Area[b]
Willow	2	253	90	282	**625**	4	27	25	684
Big Lake[c]	<1	131	45	123	**299**	41	77	57	474
Houston-Houston North	0	96	85	75	**256**	1	109	81	447
Houston-Houston South	0	59	68	51	**177**	27	90	146	441

[a] Source: Homer *et al*., 2004.
[b] Totals might not equal sums of values due to rounding. Values less than one were rounded to one acre.
[c] < = less than.

Big Lake Segment

This segment would pass through deciduous and mixed forests and wetlands that have been fragmented by human development. Impacts to natural vegetation remaining in these areas could contribute to additional fragmentation of forested and wetland habitats. Construction of this segment would result in the clearing of about 474 acres of vegetation within the 200-foot ROW – less than 1 acre of cultivated crops/pasture/hay, 131 acres of deciduous forest, 45 acres of evergreen forest, 123 acres of mixed forest, 41 acres of shrub/scrub, 77 acres of woody wetlands, and 57 acres of emergent wetlands (Table 5.2-5). There are 10 known weed sites within the proposed ROW of this segment (Table 5.2-3). In 1996, the Millers Reach 2 fire burned 129 acres within the proposed ROW along 21 miles of the Big Lake Segment (see Appendix D, Table D-7).

Houston-Houston North Segment Combination

There are many lakes and associated wetlands along the Houston-Houston North Segment Combination. Construction of the Houston-Houston North Segment Combination would in places separate forested areas from adjacent wetland plant communities, disrupting continuity and damaging the integrity of lake fringe areas that provide water and nutrient cycling functions and are important for wildlife use. Construction of this segment combination would result in the clearing of about 447 acres of vegetation within the 200-foot ROW – 96 acres of deciduous forest, 85 acres of evergreen forest, 75 acres of mixed forest, 1 acre of shrub/scrub, 109 acres of woody wetlands, and 81 acres of emergent wetlands (Table 5.2-5). There are four known weed sites within the proposed ROW for this segment combination (Table 5.2-3). In 1996, the Millers Reach 2 fire burned 102 acres within the proposed ROW along 19 miles of the Houston-Houston North Segment Combination (see Appendix D, Table D-7).

Houston-Houston South Segment Combination

Construction of this segment combination would result in the clearing of about 441 acres of vegetation within the 200-foot ROW – 59 acres of deciduous forest, 68 acres of evergreen forest, 51 acres of mixed forest, 27 acres of shrub/scrub, 90 acres of woody wetlands, and 146 acres of emergent wetlands (Table 5.2-5). There are seven known weed sites within the proposed ROW of this segment combination (Table 5.2-3). In 1996, the Millers Reach 2 fire burned 202 acres within the proposed ROW along 20 miles of this segment combination (see Appendix D, Table D-7).

Impacts to Vegetation by Alternative

The primary impact to vegetation from the proposed Port MacKenzie Rail Extension construction and operations would be the loss of the existing vegetation cover. Other impacts would include an increase in the spread of invasive plant species, and interruption of the natural fire cycle as the rail line would restrict the natural pathway of wildland fires. Potential impacts were quantitatively assessed for the areas within the proposed ROW. Table 5.2-6 summarizes the estimated cleared vegetation along the alternatives. Estimates are conservative because they assume clearing of the entire 200-foot ROW.

SEA also compared the percentage of each vegetation class the alternatives would affect to the relative abundance of each vegetation class. Through this analysis, SEA determined that regardless of alternative, all vegetation classes would experience a vegetation loss of 0.5 percent or less as a result of rail line construction. It should be noted that while such a small reduction in relative abundance may seem negligible in the context of the overall study area, this loss could still represent a meaningful loss of habitat at the local level, depending on unique ecological features or landscape position. For example, the Big Lake Segment would result in a comparatively small impact to forests in terms of acres. However, this segment would pass through a patchwork of human development and fragmented forest communities, so the loss of forested habitat could represent a more meaningful loss of forested habitat and associated ecological function and values.

Vegetation clearing would result in a long-term impact for forest communities, even with restoration, especially for late-succession forests and wetlands that would be slow to recover. Some cleared areas would likely be restored after construction; other areas would be covered by fill. Loss of vegetation cover, soil disturbance, and the use of fill materials and seed sources contaminated with the invasive plant seeds would contribute to the spread of weed species. With appropriate restoration efforts, vegetation clearing would result in a short-term impact to grasslands and shrub/scrub communities.

Potential impacts to vegetation from rail line construction and operations vary by alternative. While all rail line alternatives would result in the loss of vegetation across all vegetation classes, the Mac West-Connector 1-Willow and Mac East-Connector 3-Willow alternatives would result infestations. Of these two alternatives, the Mac West-Connector 2-Big Lake Alternative has the highest number of known weed sites within its ROW and is therefore the alternative most likely to contribute to the spread of invasive weeds.

Forested areas at greatest risk for fire are those dominated by evergreen trees, and in particular, black spruce. While all of the alternatives would impact forested areas to some extent, the Mac West-Connector 1-Willow and Mac East-Connector 3-Willow alternatives would impact the

Table 5.2-6
Impacts to Vegetation (acres) by Alternative[a,c]

Alternative	Cultivated Crops/ Pasture/ Hay	Deciduous Forest	Evergreen Forest	Mixed Forest	All Forests	Shrub/ Scrub	Woody Wetlands	Emergent Wetlands	*Total Area*[b]
Mac West-Connector 1-Willow	66	304	195	442	**941**	15	185	65	1,272
Mac West-Connector 1-Houston-Houston North	64	146	190	238	**574**	12	267	121	1,038
Mac West-Connector 1-Houston-Houston South	64	110	173	214	**496**	38	248	186	1,032
Mac West-Connector 2-Big Lake	94	181	136	289	**606**	52	211	94	1,056
Mac East-Connector 3-Willow	7	405	173	515	**1093**	38	66	46	1,249
Mac East-Connector 3-Houston-Houston North	5	247	168	306	**721**	34	148	102	1,010
Mac East-Connector 3-Houston-Houston South	5	211	151	282	**643**	60	129	167	1,003
Mac East-Big Lake	1	272	92	314	**678**	71	109	70	930

[a] Source: Homer *et al*., 2004.
[b] Totals might not equal sums of values due to rounding.
[C] Segment-level data does not sum to alternative-level data as a result of the method used to calculate the rail line routes. Connector segment acreages were calculated by summing both possible “arms” of each connector segment (the arms necessary to connect the segment to either the Willow or Houston segments). Alternative acreages were calculated by generating a smooth path from the respective Mac Terminal to either the Willow or Houston segment, and thus include only the one, necessary connector “arm” (as the extra "arm" connecting to the other segment would not be necessary if that route was built).

greatest amount of evergreen forest, and thus would clear vegetation in those areas most at risk for fire. As a result of the more developed nature of these areas, the Mac West-Connector 2-Big Lake and Mac East-Big Lake alternatives would impact the greatest amount of land at the highest priority of fire protection (see Appendix D, Tables D-4 and D-6).

All rail line alternatives would cross areas of steeper terrain and highly or potentially highly erodible soil, leading to impacts resulting from erosion and sedimentation along the ROW when vegetation is removed. The Mac West-Connector 2-Big Lake and Mac East-Big Lake alternatives cross the highest percentage of highly erodible soils (47 percent of soils crossed, each) though for all rail line alternatives, 31 percent or more of soils crossed would be highly or potentially highly erodible (see Chapter 3, Table 3-8). The Mac West-Connector 2-Big Lake and

Mac East-Big Lake alternatives also cross the greatest length of steeper terrain (6,000 and 6,400 linear feet, respectively) (see Chapter 3, Table 3-2).

Finally, all rail line alternatives would result in impacts to floodplains along the ROW. Of the alternatives, four (Mac West-Connector 1-Willow, Mac West-Connector 1-Houston-Houston North, Mac East-Connector 3-Willow, and Mac East-Connector 3-Houston-Houston North) impact the greatest amount of floodplains (37.0, 30.3, 37.0 and 30.3, respectively) within the ROW (see Chapter 4, Table 4.4-5). Construction of the rail line in these floodplain areas could result in alteration of natural drainage patterns and floodplain storage capacity, creating changes that could affect vegetation outside the 200-foot ROW. The following paragraphs and Table 5.2-6 summarize potential impacts to vegetation by alternative.

Mac West-Connector 1-Willow Alternative

Construction of this alternative would impact 1,272 acres of vegetation within the 200-foot ROW. This alternative would impact the greatest amount of total vegetation (Table 5.2-6). Because a large amount of the potential impact would be to forested area, restoration of vegetation along this alternative could take between 70 and 200 years, representing a long-term loss of habitat. In addition, this alternative would impact a substantial acreage of floodplains, approximately 37 acres which are within the ROW (see Chapter 4, Table 4.4-5). Construction in floodplain areas could impact vegetation through the alteration of natural drainage patterns and floodplain storage capacity, creating changes that could affect vegetation outside the 200-foot ROW. Because the Mac West-Connector 1-Willow Alternative would traverse the flattest terrain with only 700 linear feet of the rail line with a slope greater than 5 percent (see Chapter 3, Table 3-2), removal of vegetation along this alternative would not contribute to a substantial increase in erosion and sedimentation beyond the 200-foot ROW. This alternative only has 35 percent of its soils classified as highly or potentially highly erodible (see Chapter 3, Table 3-8).

Mac West-Connector 1-Houston-Houston North Alternative

Construction of this alternative would impact 1,038 acres of vegetation within the 200-foot ROW. Compared to other alternatives, the Mac West-Connector 1-Houston-Houston North Alternative would impact the greatest number of acres of woody wetlands. After, Mac West-Connector 1-Willow, the Mac West-Connector 1-Houston-Houston North Alternative would impact the largest amount of evergreen forests, which are more susceptible to fire than other vegetation types in the area (Table 5.2-6). This alternative would also impact a substantial acreage of floodplains, approximately 30 acres which are within the rail line ROW (see Chapter 4, Table 4.4-5), which could lead to impacts to vegetation outside the ROW due to alteration of natural drainage patterns and floodplain storage capacity. Because the Mac West-Connector 1-Houston-Houston North Alternative would traverse little highly erodible soil (only 31 percent of soils crossed are highly or potentially highly erodible and only 1,600 linear feet with a slope greater than 5 percent, see Chapter 3, Tables 3-2 and 3-8), removal of vegetation along this alternative would not contribute to a substantial increase in erosion and sedimentation beyond the 200-foot ROW.

Mac West-Connector 1-Houston-Houston South Alternative

Construction of this alternative would impact 1,032 acres of vegetation within the 200-foot ROW. Compared to other alternatives, the Mac West-Connector 1-Houston-Houston South Alternative would impact the least number of acres of deciduous forest. Compared to other alternatives, this alternative would result in the greatest impact to emergent wetland (Table 5.2-6). The Houston South Segment of this alternative would traverse a relatively high concentration of invasive plant populations, which would contribute to a greater risk for the spread of weed species. This alternative would impact 9 acres of floodplain within the ROW (see Chapter 4, Table 4.4-5). Because the Mac West-Connector 1-Houston-Houston South Alternative would traverse little highly erodible soil (only 31 percent of the soils crossed are highly or potentially highly erodible and only 1,600 linear feet of land has a slope greater than 5 percent, see Chapter 3, Tables 3-2 and 3-8), removal of vegetation along this alternative would not contribute to a substantial increase in erosion and sedimentation beyond the 200-foot ROW.

Mac West-Connector 2-Big Lake Alternative

Construction of this alternative would impact 1,056 acres of vegetation within the 200-foot ROW. Compared to the other alternatives, the Mac West-Connector 2-Big Lake Alternative would impact the greatest number of acres of agricultural areas (Table 5.2-6). The Big Lake Segment of this alternative would travel through some developed areas and would traverse a relatively high concentration of invasive plant populations, which would contribute to a greater risk for the spread of weed species. The Big Lake Segment would also travel through areas of steep terrain and highly erodible soil (47 percent of the soils crossed by this alternative are highly or potentially highly erodible and only 6,000 linear feet of land has a slope greater than 5 percent, see Chapter 3, Tables 3-2 and 3-8). Therefore, removal of vegetation along this alternative could contribute to a substantial increase in erosion and sedimentation beyond the 200-foot ROW. Because this alternative would have the least impact on floodplains (2 acres in ROW, see Chapter 4, Table 4.4-5), it would not be expected to lead to substantial impacts to vegetation outside the 200-foot ROW due to alteration of natural drainage patterns and floodplain storage capacity. Because of its proximity to more developed areas, the Mac West-Connector 2-Big Lake Alternative would also result in the greatest impact to land under a critical fire protection classification.

Mac East-Connector 3-Willow Alternative

Construction of this alternative would impact 1,249 acres of vegetation within the 200-foot ROW. After Mac West-Connector 1-Willow, this alternative would have the greatest impact to vegetation (in terms of acreage) of all the alternatives. Compared to other alternatives, the Mac East-Connector 3-Willow Alternative would impact the greatest number of acres of forested land and the least number of acres of woody wetlands (Table 5.2-6). Due to the large acreage of forested land this alternative would impact, restoration of vegetation along this alternative could take between 70 and 200 years, representing a long-term habitat loss. In addition, this alternative would impact a substantial acreage of floodplains (37 acres in ROW, see Chapter 4, Table 4.4-5). Construction in floodplain areas could impact vegetation through the alteration of natural drainage patterns and floodplain storage capacity, creating changes that could affect vegetation outside the 200-foot ROW. This alternative would also travel through areas of steep terrain and highly erodible soil (41 percent of the soils crossed are highly or potentially highly erodible and 1,100 linear feet of land has a slope greater than 5 percent, see Chapter 3, Tables 3-2 and 3-8).

Mac East-Connector 3-Houston-Houston North Alternative

Construction of this alternative would impact 1,010 acres of vegetation within the 200-foot ROW (Table 5.2-6). The Houston North Segment of this alternative would traverse a relatively high concentration of invasive plant populations, which would contribute to a greater risk for the spread of weed species. This alternative would also impact a substantial acreage of floodplains (30 acres in the ROW, see Chapter 4, Table 4.4-5), which could lead to impacts to vegetation outside the ROW due to alteration of natural drainage patterns and floodplain storage capacity. This alternative would also travel through areas of steep terrain and highly erodible soil (39 percent of the soils crossed are highly or potentially highly erodible and 2,000 linear feet of land has a slope greater than 5 percent, see Chapter 3, Tables 3-2 and 3-8).

Mac East-Connector 3-Houston-Houston South Alternative

Construction of this alternative would impact 1,003 acres of vegetation within the 200-foot ROW. The Houston South Segment of this alternative would traverse a relatively high concentration of invasive plant populations, which would contribute to a greater risk for the spread of weed species. This alternative would also travel through areas of steep terrain and highly erodible soil (38 percent of the soils crossed are highly or potentially highly erodible and 2,000 linear feet of land has a slope greater than 5 percent, see Chapter 3, Tables 3-2 and 3-8). The Mac East-Connector 3-Houston-Houston South Alternative would also impact 9 acres of floodplain in the ROW (see Chapter 4, Table 4.4-5).

Mac East-Big Lake Alternative

Construction of this alternative would impact 930 acres of vegetation within the 200-foot ROW, the least overall impact to vegetation (in terms of acreage) of all the alternatives (Table 5.2-6). Compared to other alternatives, the Mac East-Big Lake Alternative would impact the fewest number of acres of agricultural land. Along with the Mac West-Connector 2-Big Lake Alternative, this alternative would also result in the least impact to floodplains (2 acres in the ROW, see Chapter 4, Table 4.4-5). Therefore, the Mac East-Big Lake Alternative would not be expected to lead to substantial impacts to vegetation outside the 200-foot ROW due to alteration of natural drainage patterns and floodplain storage capacity. The Mac East-Big Lake Alternative would travel through the greatest area of steep terrain and highly erodible soil (47 percent of the soils crossed are highly or potentially highly erodible and 6,400 linear feet of land has a slope greater than 5 percent, see Chapter 3, Tables 3-2 and 3-8, see Chapter 3, Tables 3-2 and 3-8). Therefore, removal of vegetation along the rail line could contribute to a substantial increase in erosion and sedimentation beyond the 200-foot ROW. This alternative, along with the Mac West-Connector 2-Big Lake Alternative, would result in the greatest impact to land under a critical fire protection classification as a result of its proximity to more developed areas. However, this alternative would also impact the least acreage of evergreen forest, which is the most susceptible vegetation in the study area to fire.

5.2.4.2 No-Action Alternative

Under the No-Action Alternative, ARRC would not construct and operate the proposed Port MacKenzie Rail Extension, and there would be no impacts to vegetation.

5.3 Wildlife

This section describes wildlife resources (primarily game mammals, nongame mammals, marine mammals, and birds) regularly present in the proposed Port MacKenzie Rail Extension study area and potential impacts to those resources from the project. Section 5.1 describes the regulatory setting for wildlife, Section 5.3.1 defines the study area, Section 5.3.2 describes the analysis methodology, Section 5.3.3 describes the affected environment (existing conditions), and Section 5.3.4 describes potential environmental consequences (impacts) to wildlife resources from the proposed rail line.

5.3.1 Study Area

The study area is 5 miles on each side of a segment centerline (a 10-mile-wide corridor) along the proposed rail line segments. The study area provides context for the evaluation of potential impacts to wildlife from the proposed Port MacKenzie Rail Extension project. Population estimates, and harvest and management of game mammals are based on Alaska Department of Fish and Game (ADF&G) Game Management Unit 14. The proposed rail line alternatives would cross Subunits 14A and 14B. Within the study area is the 200-foot right-of-way (ROW) of the rail line segments.

5.3.2 Analysis Methodology

SEA evaluated potential impacts to wildlife based on habitat use, habitat requirements, and seasonal movements of animals in the study area. SEA based the wildlife habitat analysis on the results of the vegetation analysis described in Section 5.2 using the reported density and habitat use of animals present in the study area; based the analysis of impacts to eagle, raptor, large owl, loon, and swan habitats on raptor survey data for the proposed Port MacKenzie Rail Extension (Shook and Ritchie, 2008) and waterbird data from the U.S. Fish and Wildlife Service (Conant *et al.,* 2007; Platte *et al.,* 2008); and based the analysis of habitat loss for small owls, shorebirds, seabirds, and landbirds on density data for breeding bird survey routes in or near the study area (Sauer *et al.,* 2008; Benson, 2001).

SEA evaluated potential fragmentation of large contiguous habitat areas, referred to as core areas or habitats, by visual comparison and consideration of spatial statistics generated using the Patch Analyst (Centre for Northern Forest Ecosystem Research, Thunder Bay, Ontario, Canada) extension for ArcGIS® (ESRI, Redlands, California), as follows:

- Aggregated habitat polygons for the existing raster image landcover map (Homer *et al.*, 2004) by landcover class within the study area.
- Constructed core habitat areas using a 100-foot buffer, based on the 30-meter pixel size for the landcover map.
- Identified and computed spatial statistics for core habitats larger than 100 acres that the segments would cross.

SEA estimated rail collision mortality for moose based on the reported annual mortality for moose from segments of the existing rail line operating in Game Management Subunits 14A and 14B. SEA evaluated timing and severity of disturbance and collision mortality along specific segments and alternatives based on fall moose distribution data (ADF&G, 2008), moose habitat mapping, and patterns of historical moose-train and moose-vehicle collision mortalities.

5.3.3 Affected Environment

The proposed rail line would be within ADF&G Game Management Unit 14 (6,625 square miles) and would cross Subunits 14A (2,561 square miles) and 14B (2,152 square miles). Moose and black bears are the primary big game mammals in the study area. Trappers harvest marten, beaver, red fox, lynx, mink, and wolves in the area. Appendix E provides additional descriptions of mammals and birds in the study area. Wildlife habitats in the study area are dominated by forested habitats (50 percent), followed by wetland habitats (32 percent), open water habitats (11 percent), developed or barren areas (4 percent), and agricultural habitats (3 percent) (Homer *et al.,* 2004).

5.3.3.1 Mammals

Bears

Black and brown (grizzly) bears are common in Game Management Unit 14. During spring, black bears use moist lowlands where early growing vegetation, especially horsetail (*Equisetum* spp.), comprises the bulk of their diet. Black bears also eat carrion, moose calves, and salmon when available. During fall, black bears primarily feed on berries, especially blueberries, in open meadows or alpine areas. Brown bears feed on a variety of plants and animals, using their long claws to expose ground squirrels in burrows and dig roots. Brown bears feed on berries, grasses, sedges, horsetails, cow parsnips, salmon, roots, and various mammals, including ground squirrels and moose. As food becomes scarce and temperatures drop in fall, both black and brown bears go into hibernation in dens generally excavated into small mounds, hillsides, or river terraces. Bears may remain dormant in winter dens as long as 7 to 8 months. Sows give birth to their young while in their winter dens and emerge with their young in May.

Black bear and brown bear populations in Subunits 14A and 14B are managed to provide the greatest opportunity for hunters (Kavalok, 2005, 2007). Hunters harvested an average of 76 black bears per year in Subunits 14A and 14B from 1996 through 2003 (Kavalok, 2005). Many black bears are harvested by resident hunters during May at bait stations as bears emerge from their dens and during late September in conjunction with moose and other big game (Kavalok, 2005). Hunters harvested an average of 15 brown bears annually in Game Management Unit 14 from 1996 through 2005 (Kavalok, 2007). Most brown bears are harvested during fall, although about one quarter of the harvest occurs during spring (Kavalok, 2007). Bear population trends in Subunits 14A and 14B are suspected to be stable or increasing (Kavalok, 2005, 2007).

Moose

Moose in the study area include both locally migrant and resident populations (Masteller, undated; Modafferi, 1988). Estimated annual home ranges for moose in Southcentral Alaska average 112 square miles for nonmigratory cows and 195 square miles for migratory cows; cow summer ranges vary from 4 square miles to 100 square miles (Hundertmark, 1997). Moose ranges are influenced by the sex and age of individuals, the range characteristics of the cow, and habitat conditions (Hundertmark, 1997). Moose tend to use traditional migratory routes and calves learn migratory behavior as they follow their mothers on annual migrations (Hundertmark, 1997). Fall movements to winter habitats occur post-rut and are generally initiated by snow depths of more than 15 inches (Peek, 1997). Moose are well adapted to traveling across snow, but depths of more than 28 inches can affect moose movements and habitat use (Peek, 1997). Moose might use closed canopy needleleaf forests, which generally have lower snow depths, as snowpack reaches more than 38 inches (Peek, 1997).

During calving in mid May to mid June (Modafferi, 1988), cow moose generally select habitats with heavy cover, such as dense tall shrub or closed needleleaf forests, often returning to areas used for calving in previous years (Masteller, undated; Tremblay *et al.,* 2007). Moose forage on sedges, horsetail, pondweeds, and grasses during spring, and vegetation in shallow ponds, forbs and the leaves of birch, willow, and aspen during summer. Aquatic habitats provide aquatic and emergent vegetation, relief from insects, drinking water, and water for cooling to assist with thermoregulation. Moose mate from mid September through October (Modafferi, 1988), selecting more open habitats during the rut. During fall, moose transition from a leafy to a woody diet and feed on willow, birch, and aspen twigs during winter. Moose generally use open areas with abundant shrub forage during winter.

Moose populations in Subunits 14A and 14B are managed to provide for high levels of human consumptive use, and to provide a maximum opportunity for hunters (Peltier, 2006a, 2006b). Most moose are harvested by hunters using off-road vehicles or highway vehicles for access during the general hunting season in fall, with an average annual harvest of 468 moose in Subunit 14A and 62 moose in Subunit 14B (Peltier, 2006a, 2006b). The moose population in Subunit 14A has remained relatively stable at about 5,500 to 6,500, and the moose population in Subunit 14B has remained relatively stable at around 1,500 (Peltier, 2006a, 2006b).

Wolves

Wolves are common throughout the study area. Wolves are social animals that live in packs of 2 to 12 animals, usually including parents and pups; larger packs contain multiple females and can include two or three litters of pups. Wolves breed in February and March, and litters are born in May or early June, averaging four to seven pups. Pups are born in a den excavated in well drained soil. Wolves center their activities near their den sites, traveling as far as 20 miles in search of food to bring back to the den. Pups are weaned during mid summer, and pups are usually moved away from the den in mid to late summer.

Wolf populations in Subunits 14A and 14B are managed to provide for optimum harvest of wolves (Peltier, 2006c). Most harvested wolves are taken by trappers using snares and traps during mid winter, although hunters shoot some, with an average annual harvest of 14 wolves per year in Subunit 14A and 7 wolves per year in Subunit 14B (Peltier, 2006c). Abundant moose, beaver, and salmon have allowed wolf numbers to increase in Game Management Unit 14 over the last 30 years (Peltier, 2006c). During winter, a pack might kill a moose every few days. Wolf and prey populations can be affected by a number of factors, including weather and food availability.

Furbearers

Furbearers are quite varied in ecology and habitat use. Beaver, mink, muskrat, and river otter all depend on aquatic habitats, but only beaver and muskrat forage on vegetation. Ermine and mink prefer riparian woodlands and feed on small warm-blooded mammals, but will eat birds, eggs, frogs, fish, and insects. Martens depend on small warm-blooded mammals, but also subsist on berries, bird eggs, and vegetation preferring forested areas with black spruce and bogs. Wolverines (a weasel relative) are habitat generalists that can be expected to use available forested and riparian habitats in the study area. They are solitary animals and primarily scavengers, although they will also prey on small mammals.

The canids – red fox, coyote, and wolf – range widely and use many habitat types, with home range size increasing with the increasing size of the species. These three species compete for smaller prey and will exclude the smaller canid from their range such that foxes are less abundant where coyote are common, and coyote are absent or scarce where wolves are abundant.

Lynx have a wide range; the size of their range is dependent on prey availability. Lynx populations are particularly influenced by hare populations, which in turn are regulated through vegetation following an 8- to 10-year cycle. All furbearers use some type of nest, den, or burrow for reproduction and some species use these structures year round.

Furbearers targeted by trappers in this area are marten, river otter, wolf, wolverine, beaver, fox and lynx, although the reported harvest indicates that muskrat, red fox, and mink were most often reported as harvested (Blejwas, 2006). Wolverine and lynx are considered scarce in Game Management Unit 14, while red squirrels, mice, and rodents are considered abundant (Blejwas, 2006). Most trappers in Game Management Unit 14 use traps or snares to harvest furbearers and access trapping areas from established roads and trails using snow machines (Peltier, 2007).

Other Mammals

Other mammals in the study area include bats, flying squirrels, porcupines, shrews, voles, and lemmings. Bats, flying squirrels, and porcupines depend on forested habitats. Shrews, voles, and lemmings are important forage for raptors, owls, and many furbearers.

Marine Mammals

Beluga whales, harbor porpoises, and harbor seals might be present in the Knik Arm near Port MacKenzie near the southern terminus of the proposed Port MacKenzie Rail Extension. Beluga whales, harbor porpoises, and harbor seals are likely to travel upriver in the Susitna and Little Susitna Rivers in pursuit of prey species.

5.3.3.2 Birds

There is a suite of resident birds in the study area, including owls, grouse, ravens, magpies, jays, woodpeckers, chickadees, and finches. Many birds in the study area are migratory, arriving or passing through in spring beginning with raptors and waterfowl in April and continuing with the arrivals of songbirds through May, passing through or leaving in late summer and fall during July through October. Hunters harvest waterfowl primarily during the fall migration from September to December, and harvest upland game birds from late summer through March.

Waterbirds

Waterbirds, including waterfowl, loons, grebes, gulls, and shorebirds, are considered migratory. The most abundant waterfowl in the study area are mallard, green-winged teal, scaup, American wigeon, goldeneye, northern pintail, and scoters, which generally nest near aquatic habitats (Mallek and Groves, 2008). Many geese, ducks, swans, sandhill cranes, and shorebirds stage in and migrate through the Cook Inlet basin during spring and fall. Trumpeter swans, common loons, Pacific loons, and red-necked grebes nest in the study area on the numerous lakes and ponds (Conant *et al.,* 2007; Platte *et al.,* 2008). Shorebirds and cranes generally nest in wetland habitats, although some shorebirds nest in upland habitats. Shorebirds in the study area include common snipe, greater and lesser yellowlegs, spotted sandpipers, solitary sandpipers, and red-necked phalaropes (URS, 2006; Sauer *et al.,* 2008). Seabirds in the area include herring gulls, mew gulls, glaucous-winged gulls, Bonaparte's gulls, and arctic terns (URS, 2006; Sauer *et al.,* 2008). Hunters harvest ducks, geese, snipe, and sandhill cranes from ponds, lakes, wetlands, agricultural fields, and rivers during fall migrations.

Raptors

Raptors in or near the study area include bald eagles, red-tailed hawks, sharp-shinned hawks, osprey, great horned owls, great gray owls, northern saw-whet owls, and boreal owls (Sauer *et al.,* 2008; Shook and Ritchie, 2008; Benson, 2001). Bald eagles are the most abundant large raptor nesting in the study area, followed by red-tailed hawks (Shook and Ritchie, 2008). Balsam poplar is the most commonly used nest tree for large stick nests along the proposed rail line alternatives, followed by aspen, spruce, and birch (Shook and Ritchie, 2008). Smaller raptors and owls are not effectively surveyed during normal breeding-bird and stick-nest surveys. Owl surveys in the Chugach National Forest approximately 30 miles south-southeast of the study area indicate that boreal and northern saw-whet owls are likely abundant in the area (Benson, 2001).

Landbirds

Landbirds belong to many diverse groups and include both migrant and resident birds. Resident birds remain active during winter. Resident woodpeckers, chickadees, crossbills, and redpolls rely primarily on fruit and seed crops. Resident ravens, magpies, and gray jays scavenge on winter or predator-killed carrion. However, many birds feed primarily on insects that are not available during winter, and these birds remain in Southcentral Alaska only during the summer breeding season when insects are abundant.

Birds of Conservation Concern

Forty-two birds featured in the ADF&G Comprehensive Wildlife Conservation Plan (ADF&G, 2006) have been documented to occur in the study area during the breeding season, including 5 waterbirds, 3 waterfowl, 2 seabirds, 2 shorebirds, 6 raptors, 2 owls, and 22 landbirds. The 22 landbirds include 7 resident birds, 7 short-distance migrants, and 8 long-distance migrants. Eight birds in the study area are designated U.S. Fish and Wildlife Service Birds of Conservation Concern – the arctic tern, bald eagle, horned grebe, lesser yellowlegs, murrelet species (marbled or Kittliz's murrelets), olive-sided flycatcher, rusty blackbird, and solitary sandpiper (USFWS, 2008). Three birds in the study area are designated ADF&G Alaska Species of Special Concern – blackpole warbler, olive-sided flycatcher, and Townsend's warbler (ADF&G, 1998).

5.3.4 Environmental Consequences

The potential impacts of proposed Port MacKenzie Rail Extension construction and operations to wildlife would be influenced by the animals' dependence on specific habitats, the availability of preferred and used habitats, the amount of preferred habitat the project would affect, ecology and life history, and past and present population trends. Because game mammal populations are managed for sustainable human harvest, project-related effects to population abundance and distribution, available habitat, and predator-prey relationships can also affect management of these game mammals. Appendix E provides supporting descriptions of environmental consequences, and the results of qualitative and quantitative analyses.

5.3.4.1 Proposed Action

This section first describes general impacts common to all alternatives, then describes how those general impacts apply to wildlife, and concludes with a description of specific impacts along segments and alternatives. Many potential impacts to wildlife would be similar regardless of alternative and are therefore described as common impacts.

Common Impacts

Construction Impacts

Temporary impacts could occur from construction-related activities such as clearing the ROW, laying the new railbed and rail line, installing communications towers and power lines, construction staging areas, and excavation of borrow sites. In general, construction-related activities would cause temporary (short-term) disturbance and displacement of wildlife, although these activities could also cause mortality. Vegetation clearing and fill placement during construction would result in long-term habitat loss and alteration. Potential construction impacts to wildlife would include:

- Short-term habitat loss – The project would require temporary removal of vegetation cover, which provides wildlife habitat, in construction staging areas. These sites would be revegetated after rail line construction activities were completed.
- Short-term disturbances – Disturbances from construction activities would result in temporary displacement of wildlife from the project area, potentially resulting in reduced survival and reduced productivity. Construction noise and human activity could cause denning mammals to flee from hibernation sites or abandon young. Abandoned young would likely perish and the energy expended during fleeing could cause reduced survival rates over harsh winter months. Bears and moose could be intentionally harassed by hazing to protect workers and equipment. Construction activities during breeding seasons could lead to loss of

breeding success, especially if animals were differentially displaced because of sex or age. Disturbance-related displacement from favored breeding habitats could result in energy spent finding suitable replacement habitats, thus limiting survival of offspring or adults.

- Construction mortality – Construction-related traffic along the access road would include gravel haul trucks and other traffic. Wildlife could be hit and killed or fatally injured by construction vehicles, especially within areas or during weather conditions with poor visibility coincident with high traffic levels. Mammals in hibernation, in dens or nests with young, or in middens or nests in trees that are unable to escape during ROW clearing and gravel placement or extraction would be destroyed. Birds with eggs or young in nests in trees or on the ground would be destroyed during ROW clearing.
- Long-term habitat loss – Vegetation clearing, placement of gravel fill, and gravel extraction would result in permanent loss of wildlife habitats and alteration of surrounding habitats. Construction of the 30- to 45-mile rail line would require a minimum area of about 900 acres and a maximum area of about 1,300 acres of primarily forested and wetland wildlife habitats. For all habitat types at the scale of mapping used for assessment (Homer *et al.,* 2004), the maximum area of impact would represent less than 1 percent of habitats available within 5 miles of the proposed alternatives.
- Long-term habitat alteration – Wildlife that reuse den or nest sites might abandon them due to habitat changes and disturbance next to the project. This displacement from previously used habitats would require extra energy that could reduce survival rates. Alteration of habitats would include reduced or increased forage, vegetation for herbivores, insects for insectivores, small mammals for carnivores, and fish for marine mammals. Changes in the natural fire regime that maintains the boreal forest ecosystem could result from the addition of the rail line, which could act as a fire break through this region.

Operations Impacts

Rail line operations would include running one round-trip train per day over the rail line and maintaining the ROW. Rail line operations would result in the following common types of impacts to wildlife:

- Operations mortality – Train traffic on the rail line would result in wildlife fatalities, especially in areas or under weather conditions with poor visibility and in areas with concentrated use by wildlife. Collision-related mortality would be most obvious for large wildlife because collisions with small mammals and birds would generally occur without notice. An unknown number of small mammals and birds would be killed or injured during collisions with trains. Mammals and birds that feed on carrion from previous collisions with trains and birds attracted to gravels along the road and railbeds would likely have an increased incidence of collision mortality. Power lines on poles associated with the rail line and three new communications towers would increase the collision potential for birds (Manville, 2005).
- Habitat fragmentation – Review and analysis of land cover mapping (Homer *et al.*, 2001) indicates that the proposed rail line would contribute to habitat fragmentation of forested and wetland habitats (Appendix E). Issues relevant to wildlife related to habitat fragmentation

include barriers to movement, creation of edge effects, reductions in core areas of available habitats, facilitation of predator movements, intrusion of invasive species, and intrusion of humans (Jalkotzy *et al.*, 1997). Much of the habitat the proposed rail line would cross is a mosaic of habitats, has been previously fragmented by improved and unimproved roads, and is crossed by a network of trails.

- Barrier to movements – All large wildlife and most birds would be expected to cross the rail line ROW unimpeded. However, small animals such as lemmings, shrews, voles, and amphibians would likely be unable to cross the rail line and some mammals and resident landbirds might avoid crossing the rail line. Brood-rearing waterfowl and waterbirds would likely be unable to cross the rail line and might avoid crossing along waterways through small-diameter culverts.
- Edge effects and reductions in core habitat size – Fragmentation splits large areas of contiguous habitat of uniform type (patches or core habitats) into smaller pieces; increasing the amount of habitat edge or the area where one habitat is bordered by a differing habitat. In particular, fragmentation of late-succession forest habitats would impact forest nesting landbirds and old-growth dependent mammals, such as the martin, by fragmenting large patches of forest and creating edge habitat. This could lead to a reduction in core habitat size which would ultimately result in decreased reproductive potential.
- Facilitation of predator movements – Any alteration of predator survival (especially for wolves and bears, the primary predators of moose in the region) due to increased nutrition from rail-killed moose or other large game mammals or decreased energy for travel from creation of a travel corridor would have the potential to disrupt predator-prey relationships in the area.
- Intrusion of invasive species – Invasive plants and animals reduce habitat quality for native wildlife, reduce biodiversity, and threaten ecosystem integrity. Section 5.2 addresses invasive plant species; Section 5.4 addresses invasive animals in the study area, including northern pike.
- Human disturbance – ARRC regulations would prohibit access to the rail line ROW.

• Reduced survival or productivity – Disturbance from train passage could cause animals nesting or foraging near the ROW to startle and flee, potentially alerting predators to their location and facilitating predation. Periodic disturbances during the breeding season could lead to a loss or reduction in breeding success because adults tending young might be interrupted or displaced from dens or nest.

- Displacement or attraction – Wildlife displaced by the rail line could experience decreased survival or productivity because of increased energy costs expended from using marginal habitats or expended locating new preferred habitats. Predators and scavengers such as wolves, coyotes, foxes, ravens, and magpies might be attracted to the rail line by the increased availability of carcasses from animals colliding with trains, which would benefit predators and scavengers.
- Exposure to spills and leaks of toxic materials – Chapter 11 addresses the potential for spills or releases of toxic materials**.** Wildlife could be exposed to small leaks of fuels, oils, antifreeze, and other toxic substances used to operate and maintain equipment, or by

exposure to spills caused by derailment or collision during rail line operations. A spill could also lead to a reduction in available food because it would kill forage such as insects, small mammals, and fish.

Bears

The proposed alternatives would have similar effects on black and brown (grizzly) bears. Based on the reported densities, there are an estimated 64 to 120 black bears and 24 to 32 brown bears in the study area (Kavalok, 2006, 2007). Habitat loss from the proposed alternatives would result in reduced habitat for less than one black bear and less than one brown bear and would likely be of no consequence to existing black and brown bear populations.

Construction of the proposed rail line across rivers and streams would fragment riparian habitats bears use for travel and forage. The rail line would cross most major rivers via bridges, which generally would have sufficient height and span to allow bears to cross underneath. The rail line and access road could act as a fire break, leading to decreased incidence of wildland fires spreading across the rail alignment. Fires can be either beneficial to bears by increasing plant growth and berry crops and leading to increased forage and prey animals, or detrimental to bears by clearing large areas of forest, thus reducing black bear numbers, or adversely affecting salmon streams, thus reducing prey. If construction of bridges and bridge approaches for streams with salmon spawning runs occurred coincident with these runs during summer into early winter, bears could be temporarily displaced from these foraging habitats.

The rail line alternatives could coincide with bear den sites. Vegetation clearing and excavation during fall and winter could affect one black or brown bear den, based on the estimated density of bears in the study area. While there could be impacts to a few individuals, these impacts are unlikely to have adverse impacts on the bear population. Food-conditioned bears attracted to worksites or construction areas by food and garbage odors might be killed in defense of life or property. Sows that become food-conditioned by access to human food or garbage teach their cubs to also associate humans with food, which can eventually lead to the destruction of entire family groups.

Few bears would be expected to be hit by trains. Bears would generally be expected to avoid the rail line, although some bears might be attracted to the rail line if grains or animal feeds such as wheat, barley, oats, or dog foods were spilled and not effectively removed. Bears could also be attracted to the rail line by rail-killed carrion during their active periods – spring through fall. The one round-trip train per day and periodic summer maintenance work would cause displacement of up to one bear, and this impact is unlikely to adversely impact the bear population.

Moose

Preferred moose habitats include riparian willow, poorly drained meadows, and early succession forests. Based on fall moose densities adjusted by the proportion of the study area within each Game Management Unit, there would be an estimated 2,873 moose in the study area (Peltier, 2006a, 2006b). Habitat loss from project alternatives would result in reduced habitat for five to seven moose, which would likely be of no consequence to the existing moose population. The total area of vegetation removed for the ROW might underestimate the total impact to moose habitat if moose avoid the ROW and access road (Laurian *et al.*, 2008; Rolley and Keith, 1980). However, snow conditions and migratory behaviors can negate avoidance, and because moose use a variety of habitats and readily cross rail lines and roadways during most of the year, habitat loss and fragmentation as a result of the rail line would generally be of minor consequence to moose.

Moose-train collision mortality from operation of the 33- to 47-mile-long rail line would average three to four moose per year, ranging from one to nine collision mortalities per year, primarily during January, February, November, and December (ADF&G, 2008). Increased train traffic on the mainline as a result of rail line construction would result in a combined direct and indirect moose-train collision mortality average of 6 to 7 moose per year, ranging from 3 to 17 moose per year. Brush cutting for vegetation maintenance could concentrate highly palatable forage for moose along the rail line (Rea and Gillingham, 2007; Rea *et al.,* 2007), which could increase the time moose spend near the rail line, thereby increasing the probability that the animal would cross the rail line and be hit by a train. Migratory moose could experience a disproportionate level of mortality compared to resident moose, if movements across the proposed rail line were more common for migratory populations than resident populations. An unknown number of moose would also likely be injured during unreported glancing blows; some of these injuries would likely cause reduced survival or reduced mobility, which would facilitate predation.

The proposed rail line may result in indirect effects on moose habitat, movements, survival, and reproduction related to disturbance, as well as direct and indirect loss of moose habitat and moose due to moose-train collision mortality. All moose would be expected to successfully cross the rail line ROW, unless they were hit by a train or work vehicle. The one round-trip train per day and periodic maintenance work could also cause displacement of moose from the ROW.

Wolves

Wolves are habitat generalists, and would not likely be directly affected by habitat loss due to proposed rail line construction, but could be indirectly affected by habitat loss if there were changes in potential prey species. Rail line construction could directly affect wolf den sites. There could be natal and seasonal den sites for the estimated 18 to 21 wolf packs in Game Management Unit 14 along the rail line alternatives. Noise from construction activities would affect a larger area than the immediate footprint of the project and could result in displacement of a few individual wolves from the immediate area. If construction activities occurred in early spring shortly after pups were born, disturbance near an active den site could lead to abandonment of the den and loss of the pups, but could also result in adult wolves moving the pups to a new den site.

Wolves hunt daily, traveling in areas that provide the best passage, such as rivers, ridges, creeks, trails, and infrequently used roads. Wolves residing in the study area would likely be attracted to and travel along the rail line, although few wolves would be expected to be hit by trains. Indirect effects due to disturbance could cause displacement of wolves from the vicinity of rail line, although wolves would be more likely to be attracted to the rail line by the increased availability of animal carcasses from moose-train collisions and bird collisions with power lines.

Furbearers and Other Mammals

Forested, wetland, and riparian habitats would be the primary habitats used by the diverse assemblage of furbearing animals in the area. Estimated potential impacts to furbearer and other mammals as a result of habitat loss would result in average habitat loss for furbearers that could affect as many as 7 to 17 beavers, 21 to 42 ermine, 16 to 60 least weasels, 6 to 16 female mink, 30 to 58 muskrats, 463 to 926 red squirrels, and 26 to 69 snowshoe hare (see Appendix E, Table E-4). Average habitat loss for other mammals, many of which serve as a forage base for furbearers, raptors, and owls, could affect as many as 802 northern bog lemmings, 5 to 39 northern flying squirrels, 19 to 44 porcupine, 1,036 to 3,453 shrews, and 1,036 to 4,144 voles (see Appendix E, Table E-4). Habitat loss in riparian areas would be of disproportional consequence to river otters, muskrats, or beavers if burrows and den sites were destroyed and suitable substrates and materials for den construction were rare. As these animals are very common in the study area, the effects of habitat loss on furbearer and other mammal populations in the project area is unlikely to adversely impact the species' population.

A few furbearers and other mammals would likely be hit and killed by construction vehicles. Several train-animal collision mortalities could be expected each year due to proposed rail line operations, and porcupines would be especially vulnerable. Small animals such as lemmings, shrews, voles, and amphibians would be physically blocked from crossing the rail line ROW or would likely experience increased predation as they were exposed while attempting to cross the ROW. Bats with young roosting in trees would be destroyed if these trees were removed during ROW clearing activities in spring and summer.

Many mammals are curious and could experience fatalities if they ingest toxic substances either directly or indirectly through self cleaning of oiled fur or hair or through consumption of oiled prey. Fur provides insulation that is lost upon contact with petroleum-based products such as diesel fuel and oil, leading to hypothermia, especially for mammals tied to aquatic environments, such as beavers and otters.

Marine Mammals

Habitat impacts at large river crossings would likely be sufficiently far from river deltas that harbor porpoises and beluga whales would be unlikely to come in contact with bridges. Harbor seals might travel as far as bridge locations on the Little Susitna River but would unlikely to regularly occur this far upstream. Most project construction and operations effects on marine mammals would be caused by impacts to stream habitats and water quality for prey species – anadromous salmonids and other forage fishes such as eulachon, smelt, and whitefish – and disturbance from potential increased ship traffic at Port MacKenzie facilities. These indirect impacts would be likely to result in negligible effects to forage species and minor disturbance to a few harbor seals and harbor porpoises. Section 5.5 and Appendix H address potential project impacts to the Cook Inlet beluga whale.

Birds

The primary impacts to birds from proposed rail line construction and operations would be habitat loss, alteration, and fragmentation and mortality from collisions with power lines on poles and with communications towers. All birds would experience a loss of nesting, foraging, and migration staging habitats due to rail line construction along a linear alignment. The loss of forested habitat would be considered a long-term impact, even if a portion of this habitat were subsequently restored, because of the time it takes for forested habitat to regenerate. Loss of forest communities would generally require 5 to 20 years or more to reestablish trees and shrub habitat for cover, perching, and nesting for most raptors and landbirds; 50 to 100 years for trees large enough to support eagle and large owl nests; and more than 50 years to grow the snags to support cavity nesting landbirds. Construction of the rail line and associated facilities would result in short-term disturbance and long-term habitat modification along the approximately 30- to 45-mile-long rail line. Average habitat loss would affect as many as 50 waterbirds and waterfowl, 6 raptors and owls, 35 shorebirds, 4 seabirds, and 940 landbirds (Sauer *et al.,* 2008; Mallek and Groves, 2008; Benson, 2001; Shook and Ritchie, 2008).

Construction of railbeds and roadbeds across wetlands would alter the suitability of habitats near these structures for ground-nesting waterbirds and waterfowl due to changes in water abundance and distribution. Reduced habitat suitability would indirectly affect bird survival and reproductive potential. Tree-nesting raptors and cavity-nesting landbirds reuse nest structures and loss of nest trees could lead to reduced or lost reproduction in subsequent years from energy spent establishing new nests and nesting territories. This would have a disproportionate and delayed consequence for long-distance migrant landbirds (Schmiegelow and Hannon, 1999).

Habitat fragmentation caused by loss and changes in vegetation cover within the ROW through large areas of core forest habitats would have the greatest effect on resident and migrant landbirds (Hinkle *et al.*, 2002), although resident birds would be likely to respond to the rail line and access road corridor as a barrier to movement (Desrochers and Hannon, 1997). Forest-nesting landbird abundance, diversity, and reproduction rates all become depressed as a result of fragmentation associated with linear developments (Jalkotzy *et al.*, 1997). Linear developments can increase landbird nest predation by concentrating predator forage activity, such as gray jays and ravens, along the newly created edge habitats (Ibarzabal and Desrochers, 2004; Marzluff and Restani, 1999).

Rail line operations would result in continued disturbances to birds due to train movement. Disturbance to nesting birds could result in incubating birds flushing from their nests and leaving the nest vulnerable to mammalian and avian predators. For ground-nesting birds, flushing might alert nearby mammalian and avian predators to the location of the nest, which could subsequently result in nest depredation and lost reproduction. Many waterfowl and shorebirds stage in the project area during spring and fall migrations, remaining within an area to congregate and feed while on their way to and from breeding and wintering habitats. Many landbirds migrate through Interior Alaska on their way to and from nesting grounds in Western and Arctic Alaska. Disturbance of migrant birds in staging habitats could limit the birds' ability to acquire the fat stores necessary to continue migration, and could reduce reproductive outputs of birds traveling to nesting grounds in spring, or reduce survival of birds traveling to wintering grounds in fall.

Bird nests with eggs or young in trees, shrubs or on the ground would be destroyed if ROW clearing activities occurred during spring and summer. Factors influencing collision risk are related to the type of bird, environmental factors, and the location and configuration of the power lines and towers. Power-line poles and communications towers would provide perches for raptors and other predatory birds, which would facilitate predation on ground-nesting waterfowl, waterbirds, and landbirds and would lead to reduced productivity of birds nesting close to these structures. Heavy bodied, less-agile birds and birds in large flocks, such as cranes, swans, and geese, would be more likely to experience fatalities from collisions with power lines and communications towers because they might lack the ability to quickly negotiate obstacles. Power poles associated with the project could result in fatalities from electrocution for opportunistic raptors using them for nesting sites, or vantages for territorial defense and hunting. Raptors are particularly susceptible to electrocution by poorly designed power poles, especially when these are placed near nesting territories or foraging habitats.

Oiled birds ingest contaminants during preening, leading to toxicity. Birds could also ingest oiled prey, especially birds that regularly scavenge on carcasses. Feathers of birds provide insulation and buoyancy that are lost upon contact with petroleum-based products such as diesel fuel and oil, leading to hypothermia and an inability for waterbirds and waterfowl to float.

Birds of Conservation Concern

Forty-two birds featured in the ADF&G Comprehensive Wildlife Conservation Plan have been documented in the study area, and an average of 271 birds (216 to 346, depending on alternative) could be affected by reduced habitat availability and suitability due to proposed rail line construction (see Appendix E, Table E-8). Habitat loss could affect a number of U.S. Fish and Wildlife Service- and ADF&G-designated birds of conservation and special concern, as detailed in Appendix E, Table E-8, which presents the number of nesting birds impacted [arctic tern; bald eagle – average 4 birds, range 2 to 12 birds; blackpole warbler – average 35 birds, range 30 to 43 birds; horned grebe; lesser yellowlegs – average 9 birds, range 8 to 11 birds; murrelet species; olive-sided flycatcher – average 15 birds, range 13 to 18 birds; rusty blackbird – average 2 birds, range 1 to 2 birds; solitary sandpiper – average 1 bird, range 1 bird; and Townsend's warbler]. Averages and ranges are not provided for bird species that have been documented in the project area, but data are insufficient to estimate the scale of impact. Other potential impacts to birds of conservation concern are as described for birds above.

Impacts to Wildlife by Segment

Southern Segments and Segment Combinations

Construction of the southern segments and segment combinations would result in direct loss of between 450 to 600 acres of wildlife habitat (Table 5.3-1). None of the southern segments and segment combinations would cross moose calving habitat (Table 5.3-1). The southern segments and segment combinations would generally cross more high-density moose habitat (estimated fall 2008) than the northern segments and segment combinations (Figure 5.3-1), although high-density moose areas can vary annually. Habitats supporting between 300 and 470 birds would be lost due to construction of the southern segments and segment combinations (Table 5.3-2). Construction of the southern segments and segment combinations could result in disturbance to nesting trumpeter swans and loons within 0.5 mile of the ROW (Table 5.3-3). Raptor and owl nests within 0.5 mile of the ROW that could be disturbed or destroyed during construction include bald eagle, osprey, and great horned owl nests (Table 5.3-3).

Table 5.3-1
Direct Loss of Wildlife Habitat for the Southern Segments and Segment Combinations[a,b] (acres)

Habitat Type	Southern Segments and Segment Combinations			
	Mac West-Connector 1	Mac West-Connector 2	Mac East-Connector 3	Mac East
Agricultural (total)	***64***	***93***	***4***	***<1***
Closed Evergreen Forest	109	88	86	47
Open Evergreen Forest	1	1	0	0
Woodland Evergreen Forest	2	2	<1	<1
Closed Deciduous Forest	37	36	133	121
Open Deciduous Forest	4	4	9	9
Woodland Deciduous Forest	10	10	13	13
Closed Mixed Forest	162	158	235	186
Open Mixed Forest	3	3	9	8
Woodland Mixed Forest	5	5	6	6
Forested Habitats (total)	***332***	***306***	***491***	***390***
Emergent Wetlands	40	37	21	13
Shrub/Scrub Wetlands	11	11	33	31
Woody Wetlands	158	134	40	34
Wetland Habitats (total)	***209***	***182***	***94***	***78***
Total Habitat Area	**605**	**581**	**589**	**468**
Moose Habitats				
Moose Calving Habitat	0	0	0	0
Moose Winter Habitat	351	242	73	1
Moose Foraging Habitat				
Woodland and Open Forests	24	24	37	36
Emergent Wetlands	40	37	21	13
Shrub/Scrub Wetlands	11	11	33	31
Woody Wetlands	158	134	40	34
Total Moose Foraging Habitat	**233**	**206**	**131**	**114**

[a] Sources: Homer *et al.,* 2004; ADF&G, 1985. Habitat impacts include the 200-foot right-of-way and terminal reserve areas.
[b] Totals might not equal sums of values due to rounding.

The southern segments and segment combinations would contribute to fragmentation of primarily agricultural and woody wetland core habitats (Figure 5.3-2 and Appendix E). Both the Mac West-Connector 1 Segment Combination and the Mac East-Connector 3 Segment Combination would skirt the edges of the Point MacKenzie Agricultural Project and would cross agricultural core habitats. In all instances, most of the agricultural area would remain intact, but the edge would be encroached upon at several locations primarily because the agricultural edge is uneven (Figure 5.3-2). The Mac West-Connector 1 and Mac West-Connector 2 segment combinations would cross a large area of woody wetland core habitat and would contribute to fragmentation of this habitat. The Mac West-Connector 2 and Mac East-Connector 3 segment combinations would fragment core areas of mixed and evergreen forest habitats near the junction of the Mac East Segment and Connector 3 Segment (Figure 5.3-2).

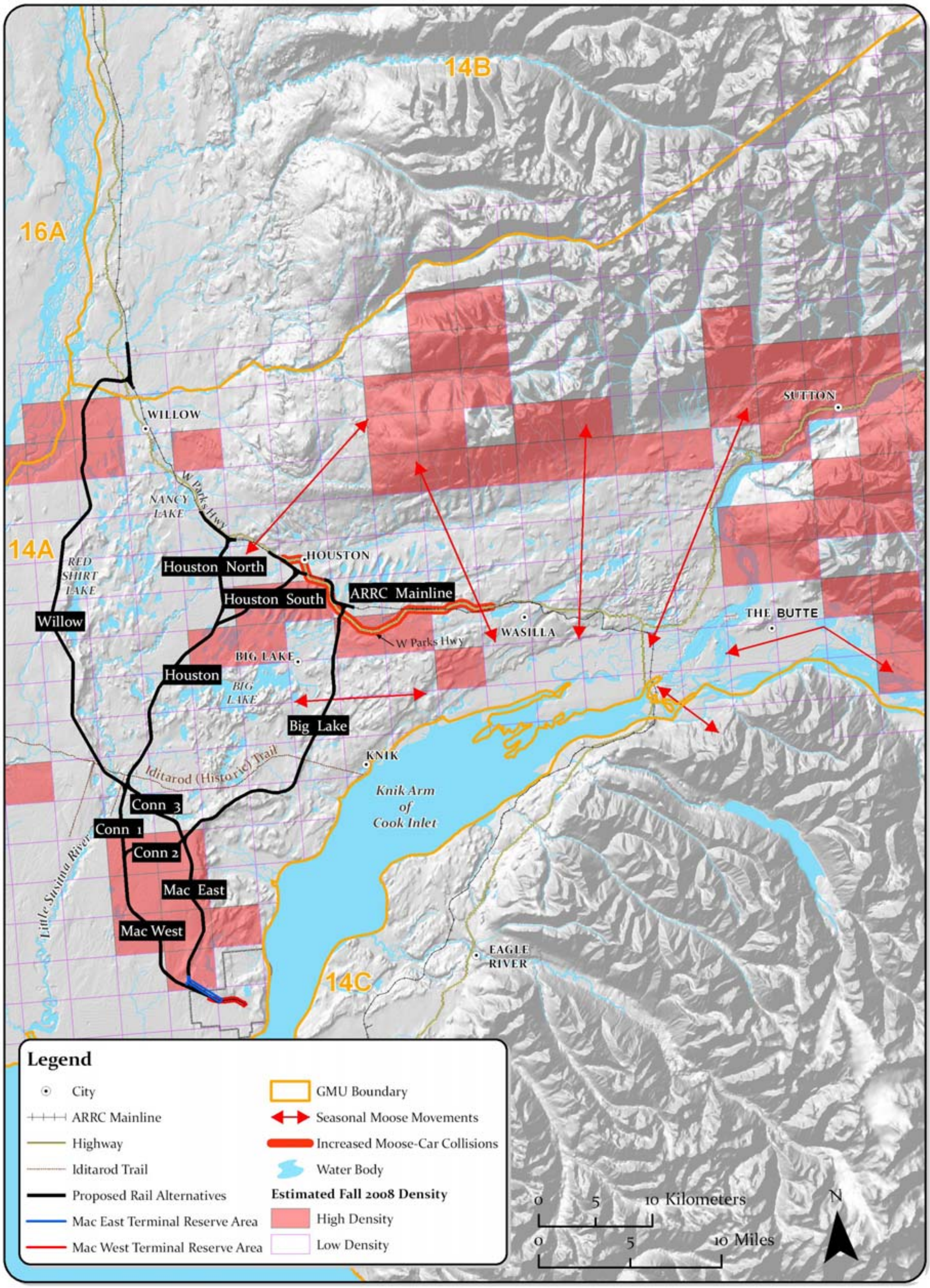

Figure 5.3-1. Estimated Fall 2008 Moose Density and Generalized Movement Patterns (ADF&G, 2008; Masteller, undated; Modafferi, 1988)

Table 5.3-2
Estimated Nesting Habitat Loss Impacts to Birds for the Southern Segments and Segment Combinations (individuals displaced)[a,b]

Bird Type	Mac West-Connector 1	Mac West-Connector 2	Mac East-Connector 3	Mac East
Waterbirds	2	1	2	1
Geese & Swans	1	0	1	0
Ducks	*25*	*19*	*24*	*19*
Dabbling Ducks	15	6	15	12
Diving and Sea Ducks	10	13	9	7
Raptors and Owls	3	3	3	2
Shorebirds	16	15	15	10
Seabirds (gulls)	2	1	2	1
Landbirds	*422*	*395*	*407*	*276*
Resident	31	29	30	21
Short-Distance Migrant	110	103	107	72
Long-Distance Migrant	281	263	270	183
Total Individuals[c]	**471**	**434**	**454**	**309**

[a] Sources: Shook and Ritchie, 2008; Sauer *et al.,* 2008; Platte *et al.,* 2008; Mallek and Groves, 2008; Benson, 2001.
[b] Estimate based on 200-foot right-of-way and terminal reserve footprint areas multiplied by nesting season density for waterbirds, geese and swans, ducks, small owls (Benson, 2001), shorebirds, seabirds, and landbirds in the study area (Appendix E). Raptors and large owl impacts based on nests identified within the 200-foot right-of-way (Shook and Ritchie, 2008).
[c] Total includes waterbirds, geese and swans, ducks, raptors and owls, and landbirds. Dabbling ducks and diving and sea ducks are subcategories of ducks. Landbirds categorized by migration are subcategories of landbirds.

Table 5.3-3
Estimated Nesting Habitat Disturbance to Swans, Loons, Raptors, and Owls along the Southern Segments and Segment Combinations (nests or nesting lakes disturbed)[a,b]

Bird Type	Mac West-Connector 1	Mac West-Connector 2	Mac East-Connector 3	Mac East
Trumpeter Swans	0	0	2	0
Common Loons (No. of young)[d]	3	3	4	0
Common Loon Lakes (No. with broods)	5 (2)	5 (2)	4	0
Pacific Loons	0	0	1	0
Total Waterbirds	**3**	**3**	**7**	**0**
Bald Eagle	1	0	0	0
Osprey	1	1	1	1
Red-tailed Hawk	0	0	0	0
Great Horned Owl	0	0	1	0
Great Gray Owl	0	0	0	0
Northern Saw-whet Owl[c]	1	1	1	1
Boreal Owl[c]	2	2	2	1
Total Raptors and Owls	**5**	**4**	**5**	**3**

[a] Sources: Conant *et al.,* 2007; Platte *et al.,* 2008; Shook and Ritchie, 2008; Benson, 2001.
[b] Estimate based on nest of nesting lake observations within 0.5 mile of proposed segments. Data for waterbirds are a sample of segment areas and actual impacts might be higher; surveys for raptors and large owls covered the entire segment.
[c] Estimate for small owls based on nesting densities near the study area multiplied by the 200-foot right-of-way and terminal reserve footprint areas (Benson, 2001).
[d] No. = Number.

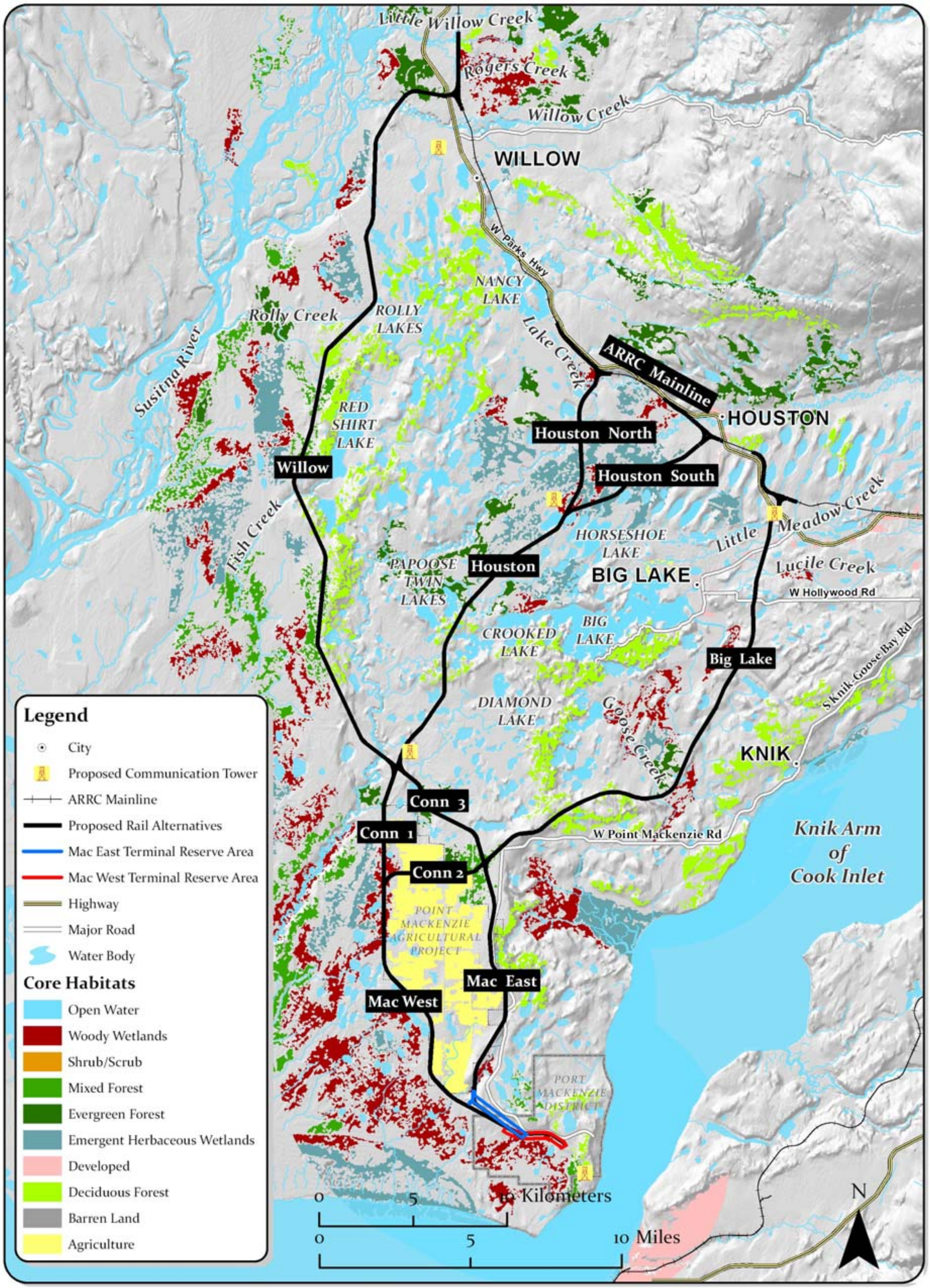

Figure 5.3-2. Core Habitat Areas in the Study Area (Homer *et al.*, 2004)

Northern Segments and Segment Combinations

Construction of the northern segments would result in direct loss of between 400 and 700 acres of wildlife habitat (Table 5.3-4). The northern segments and segment combinations would generally cross through less high-density moose habitat (estimated fall 2008) than the southern segments and segment combinations, although high-density moose areas can vary annually (Figure 5.3-1; ADF&G, 2008). All of the northern segments and segment combinations except Big Lake would cross moose calving habitat (Table 5.3-4). Habitats supporting between 500 and 800 birds would be lost due to construction of the northern segments and segment combinations (Table 5.3-5).

Table 5.3-4
Direct Loss of Wildlife Habitat for the Northern Segments and Segment Combinations (acres)[a,b]

Habitat Type	Willow	Big Lake	Houston-Houston North	Houston-Houston South
Agricultural (total)	***2***	***<1***	***0***	***0***
Closed Evergreen Forest	89	43	82	65
Open Evergreen Forest	<1	2	1	1
Woodland Evergreen Forest	<1	<1	1	1
Closed Deciduous Forest	228	114	79	55
Open Deciduous Forest	20	15	11	3
Woodland Deciduous Forest	5	3	5	1
Closed Mixed Forest	270	115	68	47
Open Mixed Forest	7	5	5	3
Woodland Mixed Forest	4	3	2	1
Forested Habitats (total)	***625***	***300***	***256***	***177***
Emergent Wetlands	25	57	81	146
Shrub/Scrub Wetlands	4	41	1	27
Woody Wetlands	27	77	109	90
Wetland Habitats (total)	***57***	***174***	***191***	***263***
Total Habitat Area	**684**	**474**	**447**	**441**
Moose Habitats				
Moose Calving Habitat	307	0	328	295
Moose Winter Habitat	645	0	445	413
Moose Foraging Habitat				
Woodland and Open Forests	38	28	27	10
Emergent Wetlands	25	57	81	146
Shrub/Scrub Wetlands	4	41	1	27
Woody Wetlands	27	77	109	90
Total Moose Foraging Habitat	**94**	**203**	**218**	**273**

[a] Source: Homer *et al.* 2004; ADF&G, 1985. Includes 200-foot ROW, stream and road relocation areas along the Big Lake Segment.
[b] Totals might not equal sums of values due to rounding.

Table 5.3-5
Estimated Nesting Habitat Loss to Birds for the Northern Segments and Segment Combinations (individuals displaced)[a,b]

Bird Type	Willow	Big Lake	Houston-Houston North	Houston-Houston South
Waterbirds	2	2	1	1
Geese & Swans	1	1	0	0
Ducks	*30*	*21*	*19*	*19*
Dabbling Ducks	18	13	12	12
Diving & Sea Ducks	12	8	7	7
Raptors and Owls	4	3	3	2
Shorebirds	28	20	18	18
Seabirds (gulls)	3	2	2	2
Landbirds	*760*	*536*	*478*	*495*
Resident	56	40	35	37
Short-Distance Migrant	199	140	125	129
Long-Distance Migrant	505	356	318	329
Total Individuals[c]	**828**	**585**	**521**	**537**

a Sources: Shook and Ritchie, 2008; Sauer *et al.,* 2008; Platte *et al.,* 2008; Mallek and Groves, 2008; Benson, 2001.
b Estimate based on 200-foot right-of-way, stream and road relocation footprint areas multiplied by nesting season density for waterbirds, geese and swans, ducks, small owls (Benson, 2001), shorebirds, seabirds, and landbirds in the study area (Appendix E). Raptors and large owl impacts based on nests identified within the 200-foot right-of-way (Shook and Ritchie, 2008).
c Total includes waterbirds, geese and swans, ducks, raptors and owls, and landbirds. Dabbling ducks and diving and sea ducks are subcategories of ducks. Landbirds categorized by migration are subcategories of landbirds.

Construction of the northern segments and segment combinations could result in disturbance to nesting trumpeter swans and loons within 0.5 mile of the ROW (Table 5.3-6). Raptor and owl nests within 0.5 mile of the ROW that could be disturbed or destroyed during construction include bald eagle, red-tailed hawk, great horned owl, and great gray owl nests (Table 5.3-6).

The northern segments and segment combinations would contribute to fragmentation of primarily forested and emergent wetland habitats (Figure 5.3-2; Appendix E). The Willow Segment would cross the largest area of core evergreen forest and the Houston-Houston South Segment Combination would cross the largest area of core emergent wetland habitat (Figure 5.3-2).

Impacts to Wildlife by Alternative

The primary potential impacts to wildlife from proposed Port MacKenzie Rail Extension construction would be habitat loss and alteration, moose-train collision mortality, bird-power line and communications tower collision mortality, and potential changes in human disturbance and harvest patterns.

Rail line construction would result in direct loss of an average of approximately 1,100 acres (ranging from 930 acres to 1,272 acres depending on alternative) of wildlife habitat (Table 5.3-7), which is less than one percent of the 435,895 acres of available habitat in the study area. By comparing the total forested habitat averaged across all alternatives (719 acres) to the total

Table 5.3-6
Estimated Nesting Habitat Disturbance Impacts to Swans, Loons, Raptors, and Owls along the Northern Segments and Segment Combinations (nests or nesting lakes disturbed)[a,b]

Birds or Lakes	Willow	Big Lake	Houston-Houston North	Houston-Houston South
Trumpeter Swans	2	0	1	1
Common Loons (No. of young) [d]	7	2	9 (4)	8 (4)
Common Loon Lakes (No. with broods)	7	6	12 (4)	10 (4)
Pacific Loons	5	1	2	3 (2)
Total Waterbirds	**14**	**3**	**12**	**12**
Bald Eagle	6	1	1	1
Osprey	0	0	0	0
Red-tailed Hawk	0	0	6	5
Great Horned Owl	0	0	1	0
Great Gray Owl	0	0	1	1
Northern Saw-whet Owl[c]	2	1	1	1
Boreal Owl[c]	2	2	1	1
Total Raptors and Owls	**10**	**4**	**11**	**9**

[a] Source: Conant *et al.,* 2007; Platte *et al.,* 2008 ; Shook and Ritchie, 2008; Benson, 2001.
[b] Estimate based on observations within 0.5 mile of proposed segments. Note that data for waterbirds are a sample of segment areas and actual impacts might be higher; surveys for raptors and large owls covered the entire segment.
[c] Estimate for small owls based on nesting densities near the study area multiplied by the 200-foot right-of-way, stream relocation and road relocation areas (Benson, 2001).
[d] No. = Number.

wildlife habitat loss averaged across all alternatives (1,074 acres) SEA's analysis indicates that on average, 67 percent of wildlife habitat loss would be from forested habitats (Table 5.3-7). Similarly, by comparing the total wetland habitat averaged across all alternatives (317 acres) to the total wildlife habitat loss averaged across all alternatives (1,074 acres) SEA calculated that 30 percent of wildlife habitat loss would be from wetland habitats. Across all alternatives, rail line construction would result in the loss of less than one percent of the total forested habitat available in the study area, as well as less than one percent of the total wetland habitat available in the study area. This habitat loss would contribute to habitat fragmentation of core forested and wetland habitats (Figure 5.3-2). Habitat loss impacts to bears, moose, wolves, furbearers, other mammals, and birds are previously described under the heading Common Impacts. Habitat fragmentation would detrimentally impact some species, such as small animals and resident landbirds, which are not anticipated to cross the rail line. Other species, such as moose and other large mammals would be expected to cross the rail line ROW unimpeded, and thus are not expected to be adversely impacted by habitat fragmentation due to rail line construction. In general, the landscape in the study area is composed of a mosaic of small habitat patches (Appendix E) averaging less than 4 acres in size. Core habitat areas, the interior areas of habitat patches, greater than 100 acres in size, averaged larger for open water and agriculture habitat types than other habitat types (Appendix E). Core areas greater than 100 acres for wildlife habitats crossed by rail line segments averaged 6 to 49 times larger than core wildlife habitats throughout the study area (Appendix E).

Table 5.3-7
Direct Loss of Wildlife Habitat for the Alternatives (acres)[a,f,g]

Habitat Type	Alternatives: Mac West-Connector 1-Willow	Mac West-Connector 1-Houston-Houston North	Mac West-Connector 1-Houston-Houston South	Mac West-Connector 2-Big Lake	Mac East-Connector 3-Willow	Mac East-Connector 3-Houston-Houston North	Mac East-Connector 3-Houston-Houston South	Mac East-Big Lake	Summary: Average Habitat Loss[b]	Available Study Area Habitat
Agricultural (total)	***66***	***64***	***64***	***94***	***7***	***5***	***5***	***1***	***38***	***12,192***
Forest Type										
Evergreen	195	190	173	136	173	168	151	92	160	66,340
Deciduous	304	146	110	181	405	247	211	272	234	93,449
Mixed	442	238	214	289	515	306	282	314	325	97,324
Forest Structure										
Closed	880	524	462	554	1,018	657	596	614	663	237,204
Open	35	25	14	29	45	36	25	40	31	15,155
Woodland	26	26	20	23	29	28	23	25	25	4,754
Forested Habitats (total)[c]	***941***	***574***	***496***	***606***	***1,093***	***721***	***643***	***678***	***719***	***257,113***
Emergent Herbaceous Wetlands	65	121	186	94	46	102	167	70	106	70,426
Shrub/Scrub Wetlands	15	12	38	52	38	34	60	71	40	13,580
Woody Wetlands	185	267	248	211	66	148	129	109	170	82,584
Wetland Habitats (total)	***265***	***400***	***472***	***356***	***149***	***284***	***356***	***250***	***317***	***166,590***
Wildlife Habitat Total[d]	**1,272**	**1,038**	**1,032**	**1,056**	**1,249**	**1,010**	**1,003**	**930**	**1,074**	**435,895**
Moose Habitats										
Calving	307	328	295	0	307	328	295	0	233	132,242
Winter	981	783	751	242	705	502	470	1	554	241,990
Forage Habitat[e]	326	451	506	408	224	348	403	315	373	186,499

[a] Sources: Homer *et al.,* 2004; ADF&G, 1985.
[b] Averaged value by category for the eight alternatives. Does not represent an alternative. Average of the combined habitats (i.e., forested, wetland, wildlife) are average values for the alternatives and do not represent the sum of categories.
[c] The sum of forested habitats is based on the sum of two separate habitat groupings: 1) leaf type (evergreen, deciduous, mixed) or 2) cover type (closed, open, woodland).
[d] Totals do not include developed land other than agricultural land, although most of the developed habitats in the project area likely support some wildlife use.
[e] Moose forage evaluated as the total of open and woodland forests, and all wetlands.
[f] Totals might not equal sums of values due to rounding.
[g] Segment-level data does not sum to alternative-level data as a result of the method used to calculate the rail line routes. Connector segment acreages were calculated by summing both possible "arms" of each connector segment (the arms necessary to connect the segment to either the Willow or Houston segments). Alternative acreages were calculated by generating a smooth path from the respective Mac Terminal to either the Willow or Houston segment, and thus include only the one, necessary connector "arm" (as the extra "arm" connecting to the other segment would not be necessary if that route was built).

Combined direct moose-train collision mortality for the proposed alternatives and indirect moose-train collision mortality from increased train traffic on the existing rail line would average 6 to 7 moose per year, ranging from 3 to 17 moose per year (Appendix E). Power lines on poles and communications towers built to support the rail line would increase collision mortality for all birds, but would have the greatest potential for damage where power lines and towers were near staging habitats, such as wetlands, agricultural fields, and tidal mudflats, used by sandhill cranes, geese, swans, ducks, or shorebirds during migration; or when power lines and towers were near raptor nests and foraging habitats.

ARRC regulations prohibit unauthorized access to rail line ROWs and bars public access across the rail line except at authorized crossing locations. Although grade crossings at public and private roads and officially recognized trails would maintain existing access along established routes, user access to other areas across the rail line would be controlled.

Both increased moose mortality and changes in hunter and trapper access could require changes in the management of game mammals in the portions of Game Management Subunits 14A and 14B, which all rail line alternatives cross.

Mac West-Connector 1-Willow Alternative

This alternative would result in the loss of 1,272 acres of wildlife habitat (Table 5.3-7) and fragmentation of 2,847 acres of forested and woody wetland core habitats (Table 5.3-8). Of the 1,272 acres of wildlife habitat loss under this alternative, 74 percent (941 acres) would comprise forested habitat and 21 percent (265 acres) would comprise wetland habitat (Table 5.3-7). This alternative would result in the loss of the largest area of moose winter habitat (981 acres) of all the alternatives (Table 5.3-7) and would cross 65 percent low-density and 35 percent high-density moose areas based on estimated fall 2008 densities (Figure 5.3-1). Wildlife use of this area, especially bears, wolves, furbearers, raptors, owls, and forest-nesting landbirds, would be expected to be high because of the remoteness of the area and proximity to anadromous fish resources on the Susitna River and its tributaries. Nesting-habitat loss would affect 1,275 birds (Table 5.3-9). Nesting-habitat disturbance would affect 17 swans and loons, the greatest number of bald eagle nests (6) of all the alternatives, and an estimated 14 raptor and owl nests (Table 5.3-10). Construction of the Mac West-Connector 1-Willow Alternative would open a corridor through primarily closed forest habitats that would contribute to fragmentation.

Mac West-Connector 1-Houston-Houston North Alternative

This alternative would result in the loss of 1,038 acres of wildlife habitat (Table 5.3-7) and fragmentation of 2,592 acres of primarily woody wetland and emergent wetland core habitats (Table 5.3-8). Of the 1,038 acres of wildlife habitat loss under this alternative, 55 percent (574 acres) would comprise forested habitat and 39 percent (400 acres) would comprise wetland habitat (Table 5.3-7). This alternative would result in the loss of nearly 800 acres of moose winter habitat and over 300 acres of moose calving habitat (Table 5.3-7) and would cross 71 percent low-density and 29 percent high-density moose areas based on estimated fall 2008 densities (Figure 5.3-1). Wildlife use of this area, especially bears, wolves, furbearers, raptors, owls, and forest-nesting landbirds, would be expected to be moderate because of recreational

Table 5.3-8
Core Habitats Greater than 100 Acres Fragmented by Alternative[a,b]

	Mac West-Connector 1-Willow		Mac West-Connector 1-Houston-Houston North		Mac West-Connector 1-Houston-Houston South		Mac West-Connector 2-Big Lake		Mac East-Connector 3-Willow		Mac East-Connector 3-Houston-Houston North		Mac East-Connector 3-Houston-Houston South		Mac East-Big Lake	
	No.	**Acres**	**No.**	**Acres**	**No.**	**Acres**	**No.**	**Acres**	**No.**	**Acres**	**No.**	**Acres**	**No.**	**Acres**	**No.**	**Acres**
Wildlife Habitats																
Evergreen Forest	10	716	5	256	5	256	6	343	10	831	5	371	5	371	5	225
Deciduous Forest	30	496	19	113	19	113	12	502	30	496	19	113	19	113	12	502
Mixed Forest	37	427	2	1	2	1	11	549	46	638	11	212	11	212	13	244
Emergent Wetland	0	0	10	871	7	1,536	0	0	0	0	10	871	7	1,536	0	0
Shrub/Scrub Wetland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Woody Wetland	12	1,209	21	1,350	20	1,303	10	1,237	4	711	13	852	12	805	4	753
Agriculture	3	7,060	3	7,060	3	7,060	4	8,321	1	2,785	1	2,785	1	2,785	0	0
Forests	77	1,638	26	370	26	370	29	1,393	86	1,965	35	697	35	697	30	971
Wetland	12	1,209	31	2,221	27	2,840	10	1,237	4	711	23	1,723	19	2,341	4	753
Forest and Wetland	89	2,847	57	2,592	53	3,210	39	2,631	90	2,675	58	2,419	54	3,038	34	1,725

[a] Source: Homer *et al.*, 2004.
[b] No. = number of core habitat polygons greater than 100 acres crossed by alternative. Area = total area of core habitats greater than 100 acres crossed by alternative in acres.

development in the area. Nesting-habitat loss would affect 973 birds (Table 5.3-9). Nesting-habitat disturbance would affect 15 swans and loons, 2 bald eagle nests, and an estimated 16 raptor and owl nests (Table 5.3-10). Construction of the Mac West-Connector 1- Houston-Houston North Alternative would open a corridor through primarily wetland habitats that would contribute to fragmentation.

Mac West-Connector 1-Houston-Houston South Alternative

This alternative would result in the loss of 1,032 acres of wildlife habitat (Table 5.3-7) and fragmentation of 3,210 acres of primarily emergent wetland and woody wetland core habitats (Table 5.3-8). Of the 1,032 acres of wildlife habitat loss under this alternative, 48 percent (496 acres) would comprise forested habitat and 46 percent (472 acres) would comprise wetland habitat (Table 5.3-7). This alternative would result in the loss of more than 700 acres of moose winter habitat and almost 300 acres of moose calving habitat (Table 5.3-7) and would cross 66 percent low-density and 34 percent high-density moose areas based on estimated fall 2008 densities (Figure 5.3-1). Wildlife use of this area, especially furbearers, waterbirds, and wetland-nesting landbirds, would be expected to be moderate to high because of habitat characteristics and recreational development in the area. Nesting-habitat loss would affect 990 birds (Table 5.3-9). Nesting-habitat disturbance would affect 15 swans and loons, 2 bald eagle nests, and an estimated 14 raptor and owl nests (Table 5.3-10). Construction of the Mac West-Connector 1-Houston-Houston South Alternative would open a corridor through primarily wetland habitats that would contribute to fragmentation.

Mac West-Connector 2-Big Lake Alternative

This alternative would result in the loss of 1,056 acres of wildlife habitat (Table 5.3-7) and fragmentation of 2,631 acres of forested and wetland core habitats (Table 5.3-8). Of the 1,056 acres of wildlife habitat loss under this alternative, 57 percent (606 acres) would comprise forested habitat and 34 percent (356 acres) would comprise wetland habitat (Table 5.3-7). This alternative would result in the loss of more than 200 acres of moose winter habitat (Table 5.3-7) and would cross 51 percent low-density and 49 percent high-density moose areas based on estimated fall 2008 densities (Figure 5.3-1). Wildlife use of this area, especially furbearers, waterbirds, forest-nesting and wetland-nesting landbirds, would be expected to be moderate because of habitat characteristics and recreational and rural development in the area. Nesting-habitat loss would affect 1,024 birds (Table 5.3-9). Nesting-habitat disturbance would affect 6 loons, 1 bald eagle nest, and an estimated 8 raptor and owl nests (Table 5.3-10). Construction of the Mac West-Connector 2-Big Lake Alternative would open a corridor through forested and wetland habitats that would contribute to fragmentation.

Mac East-Connector 3-Willow Alternative

This alternative would result in the loss of 1,249 acres of wildlife habitat (Table 5.3-7) and fragmentation of 2,675 acres of forested and woody wetland core habitats (Table 5.3-8). Of the 1,249 acres of wildlife habitat loss under this alternative, 88 percent (1,093 acres) would comprise forested habitat and only 12 percent (149 acres) would comprise wetland habitat (Table 5.3-7). This alternative would result in the loss of about 700 acres of moose winter habitat and

Table 5.3-9
Estimated Nesting Habitat Loss for Birds for the Alternatives[a]

	Individuals Displaced by Alternative[b]								Summary	
Bird Type	**Mac West-Connector 1-Willow**	**Mac West-Connector 1-Houston-Houston North**	**Mac West-Connector 1-Houston-Houston South**	**Mac West-Connector 2-Big Lake**	**Mac East-Connector 3-Willow**	**Mac East-Connector 3-Houston-Houston North**	**Mac East-Connector 3-Houston-Houston South**	**Mac East-Big Lake**	**Average Impact[c]**	**Estimated Project Area Population[d]**
Waterbirds	4	3	3	3	4	3	3	3	3	1,587
Geese and Swans	1	1	1	1	1	1	1	1	1	543
All Ducks	*54*	*43*	*44*	*45*	*53*	*42*	*43*	*40*	*46*	*21,109*
Dabbling Ducks	34	27	27	28	33	26	27	25	28	13,127
Diving and Sea Ducks	20	16	17	17	20	16	16	15	17	7,982
Raptors and Owls	7	7	6	6	7	6	5	5	6	4,063
Shorebirds	43	33	33	34	42	31	32	29	35	Unknown
Seabirds (gulls)	4	3	3	4	4	3	3	3	4	Unknown
Landbirds	*1,162*	*883*	*900*	*931*	*1,135*	*851*	*867*	*794*	*940*	*456,024*
Resident	86	65	67	69	84	63	64	58	69	24,957
Short-Distance Migrant	304	231	235	243	297	222	227	208	246	182,238
Long-Distance Migrant	772	587	598	619	754	566	576	528	625	248,828
Total Individuals[e, f]	**1,275**	**973**	**990**	**1,024**	**1,245**	**936**	**953**	**874**	**1,034**	**483,326**

[a] Sources: Rosenberg, 2004; Shook and Ritchie, 2008; Sauer *et al.*, 2008; Platte *et al.*, 2008; Mallek and Groves, 2008; URS, 2006; Benson, 2001.

[b] Estimate based on 200-foot right-of-way, terminal reserve, stream relocation, and road relocation footprint areas multiplied by nesting season density for waterbirds, geese and swans, ducks, raptors and owls in the study area (Appendix E). Estimate based on route mileage multiplied by nesting season linear density for shorebirds, seabirds and landbirds in the study area.

[c] Averaged value by category for the eight alternatives. Does not represent an alternative.

[d] Estimate based on regional or average project area densities multiplied by area within 5 miles of all proposed segments, or on the proportion of the project area and total population estimates for Bird Conservation Region 4 in Alaska.

[e] Total includes waterbirds, geese and swans, ducks, raptors and owls, and landbirds. Dabbling ducks and diving and sea ducks are subcategories of ducks. Landbirds categorized by migration are subcategories of landbirds and totals for birds of conservation concern are included within the appropriate category above.

[f] Differences in totals are due to rounding and significant figures.

Table 5.3-10
Estimated Nesting Habitat Disturbance to Swans, Loons, Raptors, and Owls by Alternative[a]

Birds	Individuals Displaced by Alternatives[b]								Estimated Study Area Population or Nests[c]
	Mac West-Connector 1-Willow	Mac West-Connector 1-Houston-Houston North	Mac West-Connector 1-Houston-Houston South	Mac West-Connector 2-Big Lake	Mac East-Connector 3-Willow	Mac East-Connector 3-Houston-Houston North	Mac East-Connector 3-Houston-Houston South	Mac East-Big Lake	
Trumpeter Swans	2	1	1	0	4	3	3	0	224
Common Loons (No. of young)[e]	10	12 (4)	11 (4)	5	11	13 (4)	12 (4)	2	657
Common Loon Lakes (No. with broods)	12 (2)	17 (6)	15 (6)	11 (2)	11	16 (4)	14 (4)	6	
Pacific Loons (young)	5	2	3 (2)	1	6	3	4 (2)	1	141
Total Waterbirds	**17**	**15**	**15**	**6**	**21**	**19**	**19**	**3**	**1,022**
Bald Eagle	6	2	2	1	5	1	1	1	30 nests
Osprey	1	1	1	1	1	1	1	1	7 nests
Red-tailed Hawk	0	6	5	0	0	6	5	0	44 nests
Great Horned Owl	0	1	0	0	1	2	1	0	7 nests
Great Gray Owl	0	1	1	0	0	1	1	0	7 nests
Northern Saw-whet Owl[d]	3	2	2	3	3	2	2	2	1,200
Boreal Owl[d]	4	3	3	3	4	3	3	3	1,600
Total Raptors and Owls	**14**	**16**	**14**	**8**	**14**	**16**	**14**	**7**	**2,895**

[a] Sources: Conant *et al.,* 2007; Platte *et al.,* 2008; Shook and Ritchie, 2008; Benson, 2001.
[b] Estimate based on observations within 0.5 miles of proposed segments, note that data for waterbirds are a sample of segment areas and actual impacts could be higher, surveys for raptors and large owls covered the entire segment.
[c] Estimate based on densities within the surveyed areas or observed nests.
[d] Estimate for small owls based on nesting densities near the study area multiplied by alternative footprint areas (Benson, 2001).
[e] No. = Number.

307 acres of moose calving habitat (Table 5.3-7) and would cross 61 percent low-density and 39-percent high density moose areas based on estimated fall 2008 densities (Figure 5.3-1). Wildlife use of this area, especially bears, wolves, furbearers, raptors, owls, and forest-nesting landbirds, would be expected to be high because of the remoteness of the area and proximity to anadromous fish resources on Susitna River and its tributaries. Nesting-habitat loss would affect 1,245 birds (Table 5.3-9). Nesting-habitat disturbance would affect an estimated 21 swans and loons, the largest number of all the alternatives; 5 bald eagle nests; and an estimated 14 raptor and owl nests (Table 5.3-10). Construction of the Mac East-Connector 3-Willow Alternative would open a corridor through primarily closed forest habitats that would contribute to fragmentation.

Mac East-Connector 3-Houston-Houston North Alternative

This alternative would result in the loss of 1,010 acres of wildlife habitat (Table 5.3-7) and fragmentation of 2,419 acres of emergent wetland, woody wetland, and forested core habitats (Table 5.3-8). Of the 1,010 acres of wildlife habitat loss under this alternative, 71 percent (721 acres) would comprise forested habitat and 28 percent (284 acres) would comprise wetland habitat (Table 5.3-7). This alternative would result in the loss of about 500 acres of moose winter habitat and more than 300 acres of moose calving habitat (Table 5.3-7), and would cross 66 percent low-density and 34-percent high density moose areas based on estimated fall 2008 densities (Figure 5.3-1). Wildlife use of this area, especially furbearers, waterbirds, and wetland-nesting landbirds, would be expected to be moderate because of habitat characteristics and recreational and rural development in the area. Nesting-habitat loss would affect 936 birds (Table 5.3-9). Nesting-habitat disturbance would affect an estimated 19 swans and loons, 1 bald eagle nest; and an estimated 16 raptor and owl nests (Table 5.3-10). Construction of the Mac East-Connector 3-Houston-Houston North Alternative would open a corridor through primarily wetland habitats that would contribute to fragmentation.

Mac East-Connector 3-Houston-Houston South Alternative

This alternative would result in the loss of 1,003 acres of wildlife habitat (Table 5.3-7) and fragmentation of 3,038 acres of emergent wetland, woody wetland, and forested core habitats (Table 5.3-8). Of the 1,003 acres of wildlife habitat loss under this alternative, 64 percent (643 acres) would comprise forested habitat and 35 percent (356 acres) would comprise wetland habitat (Table 5.3-7). This alternative would result in the loss of 470 acres of moose winter habitat and nearly 300 acres of moose calving habitat (Table 5.3-7), and would cross 61 percent low-density and 39 percent high-density moose areas based on estimated fall 2008 densities (Figure 5.3-1). Wildlife use of this area, especially furbearers, waterbirds, and wetland-nesting landbirds, would be expected to be moderate because of habitat characteristics and recreational development in the area. Nesting-habitat loss would affect 953 birds (Table 5.3-9). Nesting-habitat disturbance would affect an estimated 19 swans and loons, 1 bald eagle nest, and an estimated 14 raptor and owl nests (Table 5.3-10). Construction of the Mac East-Connector 3-Houston-Houston South Alternative would open a corridor through primarily wetland habitats that would contribute to fragmentation.

Mac East-Big Lake Alternative

This alternative would result in the loss of 930 acres of wildlife habitat (Table 5.3-7) and fragmentation of 1,725 acres of forested and woody wetland core habitats (Table 5.3-8). Of the

930 acres of wildlife habitat loss under this alternative, 73 percent (678 acres) would comprise forested habitat and only 27 percent (250 acres) would comprise wetland habitat (Table 5.3-7). This alternative would cross 58 percent low-density and 42 percent high-density moose areas based on estimated fall 2008 densities (Figure 5.3-1). Wildlife use of this area, especially furbearers, waterbirds, forest-nesting and wetland-nesting landbirds, would be expected to be moderate because of habitat characteristics and recreational and rural development in the area. Nesting-habitat loss would affect 874 birds (Table 5.3-9). Nesting-habitat disturbance would affect an estimated 3 loons, 1 bald eagle nest, and 7 raptor and owl nests (Table 5.3-10). Construction of the Mac East-Big Lake Alternative would open a corridor through forested and wetland habitats that would contribute to fragmentation.

5.3.4.2 No-Action Alternative

Under the No-Action Alternative, ARRC would not construct and operate the proposed Port MacKenzie Rail Extension, and there would be no impacts to wildlife.

5.4 Fisheries Resources

This section describes fisheries resources in the proposed Port MacKenzie Rail Extension study area and potential impacts from the project on these resources. Section 5.1 describes the regulatory setting for fisheries, Section 5.4.1 defines the study area, Section 5.4.2 describes the analysis methodology, Section 5.4.3 describes the affected environment (existing conditions), and Section 5.4.4 describes potential environmental consequences (impacts) to fisheries resources from the proposed rail line.

5.4.1 Study Area

The study area for fisheries resources is the surface waters within the Susitna River basin that are bounded on the west by the Susitna River, on the south by Cook Inlet, on the east by Knik Arm, and on the north by the existing Alaska Railroad Corporation main line (Figure 5.4-1).

5.4.2 Analysis Methodology

SEA analyzed potential impacts to fisheries resources from proposed rail line construction and operations for each rail line crossing based on current and potential anadromous and resident fish use; existing habitats; anadromous and resident fish habitat requirements; anadromous and resident fish seasonal movement patterns; proposed crossing or conveyance types and sizes; potential stream blockage; and the stream contributions to important recreational, commercial or subsistence/personal-use fisheries. SEA based the analysis of potential instream fish habitat on the review of stream-crossing characteristics as described in Section 4.2, Surface Water; reported anadromous fish presence and habitat use data (Johnson and Daigneault, 2008); and fish habitat data collected at or near proposed stream crossings during SEA field investigations in 2008 (Noel *et al.*, 2008). Streams are determined to be fish-bearing if they are cataloged anadromous waters (Johnson and Daigneault, 2008), if they are connected to a cataloged anadromous water, or if fish habitat was determined to be present during SEA stream-crossing investigations in 2008 (Noel *et al.*, 2008).

As described in Section 4.2, the Applicant performed a hydrologic review of the study area to identify surface water resources, including pre- and post-project drainage patterns, flow rates, and floodplain limits and encroachments. This review also included a preliminary determination of the types and sizes of conveyance structures for many of the anticipated water crossings. As indicated in Section 5.4.4, channel-width data collected during SEA's 2008 field studies at fish-bearing stream crossings were found to not always match the size of the conveyance structure identified by the Applicant during the earlier preliminary design. SEA determined that it would not be reasonable to use the potential impacts that would be anticipated for these undersized structures to distinguish between alternatives because the hydrologic review and Applicant-proposed conveyance structures are preliminary, and the final conveyance structure types and sizes would be determined during final permitting and design. ARRC would base final conveyance structure designs on the reasonable terms, conditions, and design criteria that would result from the ADF&G Fish Habitat permit that would likely ensure a conveyance structure size similar to the channel width to maintain flow conditions suitable for fish passage.

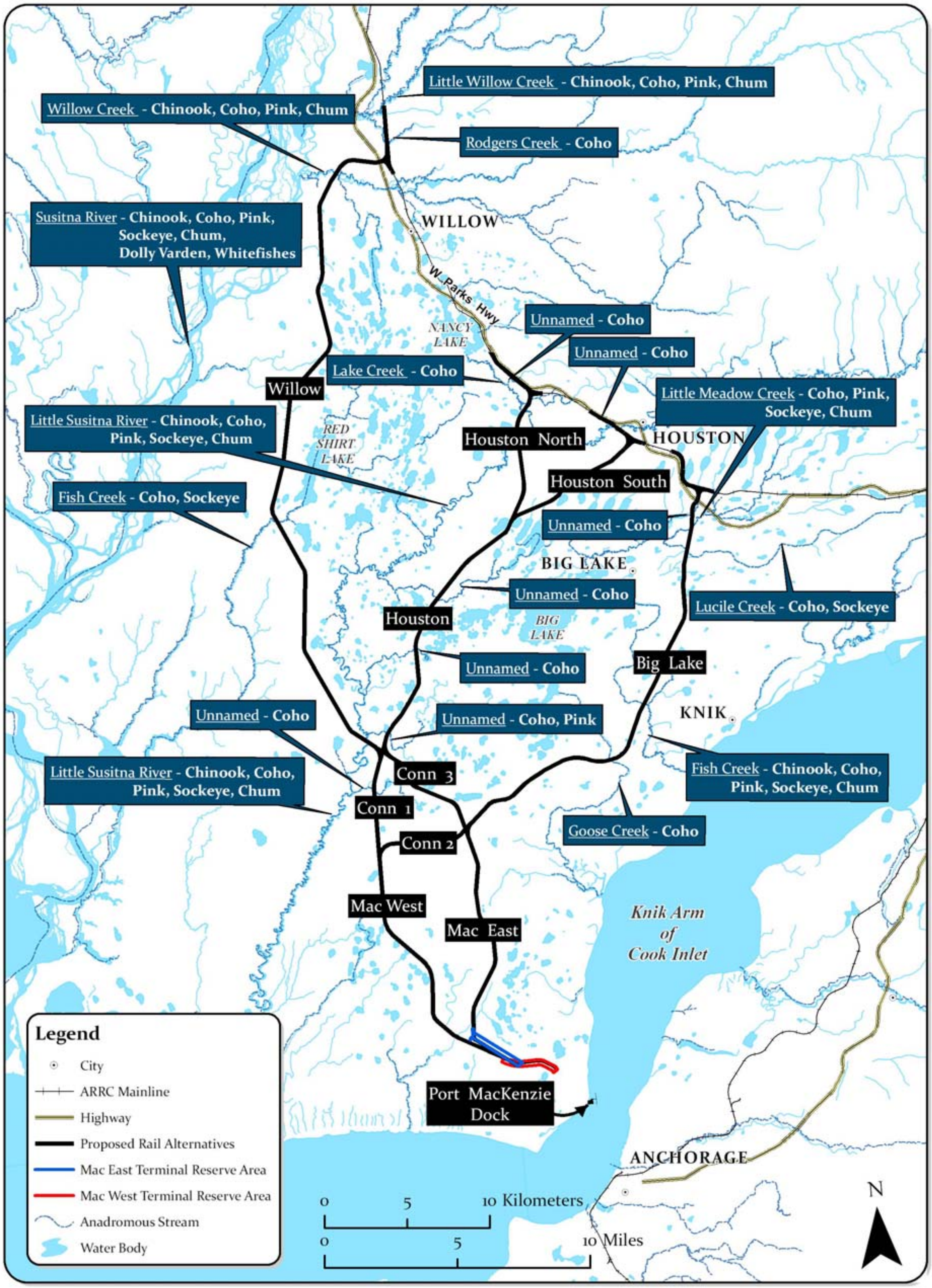

Figure 5.4-1. Waters in the Study Area Documented as Important for Chinook, Chum, Coho, Pink, and Sockeye Salmon under Alaska Statute 16.05.871(a) (Johnson and Daigneault, 2008)

5.4.3 Affected Environment

Lakes, rivers, and perennial and intermittent streams along the proposed rail extension alternatives provide habitat for fish either throughout or during portions of the year. Most streams in the study area are likely to contain resident and/or anadromous fishes, and some streams could contain fish of conservation concern as identified in Alaska's Comprehensive Wildlife Conservation Strategy (Table 5.4-1). Study area waters might support spawning, foraging, rearing, refuge, and/or migratory use by fish. The proposed project would affect notable fish-bearing waters in this area, including the Little Susitna River, Fish Creek, Willow Creek, Rodgers Creek, Lake Creek, Goose Creek, Lucile Creek, Little Meadow Creek, and several unnamed tributary streams (Figure 5.4-1). Fish present in the study area include resident (life cycle does not include migration into marine waters) and anadromous (life cycle includes migrations to marine waters) species. Anadromous fishes commonly present in the study area include all five Pacific salmon; Chinook (king), chum (dog), coho (silver), pink (humpy), and sockeye (red); and eulachon (hooligan) and Dolly Varden (Johnson and Daigneault, 2008). In the study area, there could be anadromous fish populations using one or more different life-history strategies, including freshwater residents, freshwater migratory, and saltwater migratory.

Study area fresh waters support recreational, commercial, subsistence, and personal-use fisheries for salmon, rainbow trout, Dolly Varden, eulachon, and northern pike, with limited opportunities for lake trout and burbot. Northern pike are not native to Southcentral Alaska, although they are present naturally throughout most of the state. In Southcentral Alaska, northern pike are considered an invasive species, reducing or eliminating healthy populations of Chinook salmon, coho salmon, and rainbow trout in some lakes and streams (ADF&G, 2009a). There are also native fish such as sculpins, suckers, sticklebacks, and smelt in the study area that play a crucial role in the aquatic ecosystem, providing prey for terrestrial animals and freshwater and anadromous fishes (ADF&G, 2006; Groot and Margolis, 1991). Table 5.4-1 lists fish potentially present in the study area. Appendix F provides supporting information on regional recreational, commercial, subsistence, and personal-use fisheries in the study area.

Cook Inlet salmon – Chinook (king), chum (dog), coho (silver), pink (humpy), and sockeye (red) – are federally-regulated. Therefore, the freshwater resources these species use are protected under the Essential Fish Habitat provisions of the Magnuson-Stevens Fishery Management and Conservation Act. Magnuson-Stevens Act defines Essential Fish Habit as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S.C. 1801-1883). Figure 5.4-1 shows streams documented as supporting Essential Fish Habitat protected fisheries in the study area (Johnson and Daigneault, 2008). Salmon runs in the study area begin in May as Chinook salmon travel upstream to spawn and continue through September when coho salmon spawn throughout area streams (Table 5.4-2). Appendices F and G provide supporting information on crossing-specific fish habitat conditions, documented fish presence, and an analysis of potential project construction and operations effects on Essential Fish Habitat and aquatic animals of conservation concern.

Table 5.4-1
Fish Potentially Present in the Port MacKenzie Rail Extension Study Area[a]

Common Name	Species	Potential Use[b]	Anadromy (Y/N)	Conservation Concern[c] (Y/N)
American Shad	*Alosa sapidissima*	–	Y	N
Arctic Char	*Salvelinus alpinus*	R,S	N	N
Arctic Grayling	*Thymallus arcticus*	R,S	N	N
Arctic Lamprey	*Lampetra camtschatica*	S	Y	N
Bering Cisco	*Coregonus laurettae*	R	Y/N	Y
Burbot	*Lota lota*	R,S	N	N
Chinook (King) Salmon	*Oncorhynchus tshawytscha*	C,R,S	Y	N
Chum (Dog) Salmon	*Oncorhynchus keta*	C,R,S	Y	N
Coastrange Sculpin	*Cottus aleuticus*	–	N	N
Coho (Silver) Salmon	*Oncorhynchus kisutch*	C,R,S	Y	N
Dolly Varden	*Salvelinus malma*	R	Y/N	N
Eulachon (Hooligan)	*Thaleichthys pacificus*	S	Y	Y
Humpback Whitefish	*Coregonus pidschian*	R,S	Y/N	N
Lake Trout	*Salvelinus namaycush*	R	N	N
Longnose Sucker	*Catostomus catostomus*	S	N	N
Ninespine Stickleback	*Pungitius pungitius*	–	N	Y
Northern Pike	*Esox lucius*	R,S	N	N
Pacific Lamprey	*Lampetra tridentata*	S	Y/N	Y
Pink (Humpy) Salmon	*Oncorhynchus gorbuscha*	C,R,S	Y	N
Pond Smelt	*Hypomesus olidus*	–	N	N
Rainbow Smelt	*Osmerus mordax*	S	Y/N	Y
Rainbow Trout	*Oncorhynchus mykiss*	R	Y/N	Y
Round Whitefish	*Prosopium cylindraceum*	R	N	N
Slimy Sculpin	*Cottus cognatus*	–	N	N
Sockeye (Red) Salmon	*Oncorhynchus nerka*	C,R,S	Y/N	N
Threespine Stickleback	*Gasterosteus aculeatus*	–	N	Y

[a] Sources: ADF&G, 2007; Johnson and Daigneault, 2008; Mecklenburg *et al.*, 2002; Morrow, 1980.
[b] Potential Use Codes: C = commercial, R = recreational, S = subsistence/personal use.
[c] Species of Conservation Concern are listed in the Alaska's Comprehensive Wildlife Conservation Strategy (ADF&G, 2006).

Table 5.4-2
Salmon Spawning Run Timing within the Port MacKenzie Rail Extension Study Area[a]

Salmon and Streams	May	June	July	August	September
Chinook Salmon					
Parks Highway Streams					
Susitna River Streams					
The Little Susitna River					
Lower					
Upper					
Chum Salmon (less abundant)					
Susitna River Streams					
Coho Salmon					
Parks Highway Streams					
Susitna River Streams					
The Little Susitna River					
Lower					
Upper					
Pink Salmon (abundant in even years)					
Susitna River Streams					
Sockeye Salmon					
Susitna River Streams					
The Little Susitna River					

[a] Source: ADF&G, 2009b.

5.4.4 Environmental Consequences

5.4.4.1 Proposed Action

Rail line construction would require multiple stream crossings at locations that have fish or fish habitat. Project construction methods and timing, the type of stream crossing structure installed, and daily operations procedures would influence the severity and types of potential impacts to fish and fish habitat at each stream crossing. The primary impacts of crossing structures to fish and fish habitat would be loss and degradation of instream habitats due to placement of structures, alteration of stream hydrology and water quality due to increased erosion and sedimentation, and blockage of movements. Section 4.2 describes potential alterations to stream hydrology and water quality from conveyance structures.

Each stream crossing would result in site-specific impacts to aquatic and riparian habitats. Stream channel characteristics such as area of runs, glides, riffles, and pools; water velocities; channel substrates such as cobble, gravel, sand, and silt; bank morphology and composition; water quality; bank vegetation; and unblocked access interact to determine fish use and habitat suitability for eggs and larvae and juvenile or adult fish. The type of crossing structure used at a crossing would also influence potential impacts to fish and fish habitat through habitat loss, alteration, degradation, and access.

Common Impacts

Construction Impacts

Rail line construction would result in short-term disturbance and long-term fish habitat loss and modification at steam crossings along the approximately 30 to 45 miles of rail line. The following paragraphs describe the types of potential construction-related impacts to fish and fish habitats that would be common to all proposed rail line stream crossings.

Loss or Alteration of Instream and Riparian Habitats

During construction, there would be a temporary loss of instream habitat where water was diverted from the existing stream channel to facilitate installation of bridge pilings, bank armoring, or culverts. Bridge abutments or instream pilings, armoring around abutments and the nearby banks, and installation of instream culverts would remove streambed and shoreline areas that would otherwise be available for fish use. Bridge and culvert installation would cause the loss of rearing, foraging, and cover habitat along the banks; scouring of spawning areas through removal of instream large woody debris; loss of overhanging bank habitat structure and vegetation; and alteration of stream flows.

During construction, the riparian corridor would be cleared of vegetation as necessary for bridge, culvert, and access road construction. Riparian corridors along stream banks provide important instream habitat protection from stream bank erosion and sedimentation. Stream bank vegetation moderates stream temperature in summer, provides cover for fish to hide from predators, and provides a velocity refuge for juvenile fish (Marcus *et al.*, 1990). Removal of riparian vegetation and disturbance of stream banks would result in increased erosion, increased sediment loading to the stream, increased turbidity, elevated water temperatures, reduced productivity, and a reduction in overall habitat complexity (Hicks *et al.*, 1991; Waters, 1995). Sedimentation resulting from construction activities would temporarily impact juvenile fish, eggs, and larvae in nearby spawning beds and invertebrate forage production (Waters, 1995).

Mortality from Instream Construction

During construction, there could be direct mortality of fish when equipment was driven through a streambed. Redds, eggs, and fry within or downstream of the construction site could be lost or their viability reduced through sedimentation, excessive vibration, and scour caused by construction equipment. Movement of construction equipment could cause compaction of the soils and gravels in the streambed, resulting in the death of larval fish and eggs. In areas where there is a soft sediment bottom, equipment movement could create areas that redirect stream flow, and portions of the streambed could become dry and isolated, resulting in mortality of fish as they become isolated from free-flowing waters. Water diversions and temporary dewatering could also impact developing eggs and pre-emergent fry (Becker *et al.*, 1982; Becker *et al.*, 1983; Holland, 1987) through desiccation or freezing. Eggs, larvae, and juvenile fish would be more susceptible to mortality from instream construction because larger fish would be expected to avoid equipment and could move away from the construction area.

Blockage of Fish Movement

Depending on timing, construction-related activities could block fish movements. Construction methods that depend on water diversions during open-water construction could create temporary physical barriers to fish passage or alter stream flows sufficiently to create either high- or low-water conditions that prevent fish movements within and between lakes, tributaries, and rivers to rearing or spawning habitats. Connectivity between tributaries and mainstem habitats is particularly important for maintaining productivity of juvenile salmonids (Bramblett *et al.*, 2002). Instream construction could temporarily reduce stream flows sufficiently to block upstream migration of adult salmon or displace juvenile or small fish from rearing and foraging habitats due to high flows. Blocked spawning fish might attempt to use inadequate spawning areas, which would result in uncertain survival of eggs, larvae, and juvenile fish, and ultimately would likely result in reduced productivity.

Degradation of Water Quality

Clearing of vegetation from the ROW, grading, construction of the access road, and placement of bridges and culverts would expose soil to erosion from wind, rain, stream-flow, and runoff. Erosion delivers sediment to streams, which can degrade water quality and reduce fish habitat quality and productivity through sedimentation and turbidity (Waters, 1995). While increased erosion and sedimentation might be temporary during construction, increased fine sediments reduce oxygen exchange, which results in lower survival of eggs and larvae in spawning gravels (Grieg *et al.*, 2005). High turbidity could result in avoidance behavior, reduced foraging success in sight-feeding fish (Barrett *et al.*, 1992), induced physiological stress, and increased mortality (Waters, 1995).

Fuel leaks from construction equipment could reduce water quality and result in toxic affects to fish and aquatic invertebrate forage. Spills and leaks could enter the water either directly as equipment crossed streams or indirectly with runoff from bridges and adjacent roadbeds or railbeds.

Alteration of Stream Hydrology and Ice Breakup

Construction activities could cause changes in flow patterns through the hyporheic zone, the region beneath a stream bed where there is mixing of shallow groundwater and surface water. Excavation and vegetation clearing would dislodge fine sediments that could infiltrate the hyporheic zone and clog interstitial spaces, and vibrations from construction equipment can cause substrates to settle and become compacted (Sear, 1995; Huggenberger *et al.*, 1998). Hyporheic flow and groundwater upwelling (springs) are important in salmonid egg development (Brown and Mackay, 1995; Baxter and McPhail, 1999). There could be permanent changes in subsurface flow from bank and substrate armoring, instream support structures, and changes in channel morphology caused by bridges and culverts interrupting lateral stream migration.

Ice dams can also form in areas where bridges and culverts constrict stream channels. Ice dams could cause scour of the streambed and erosion along the upstream side of affected streams. The movement of the ice and rush of water when the dam fails can damage spawning beds.

Noise and Vibration Impacts

Depending on the timing of construction, there could be potential impacts to salmonids from underwater pile driving noise and vibration during bridge construction. Exposure to pile driving vibration and noise could displace juvenile fish, trigger avoidance behavior, and disrupt fish sense of hearing and the function of the lateral line, the sensory organ that detects vibration (Hastings et al., 1996; McCauley et al, 2003). Whereas it is possible that fish could swim away from a sound source, thereby decreasing exposure to sound, eggs are often stationary or move very slowly and could be exposed to extensive human-generated sound if it is presented in the surrounding water column or substrate. However, data are limited or inconclusive concerning the effects of sound, including pile driving noise, on developing eggs (Hastings and Popper, 2005; California Department of Transportation, 2009). The few studies on the effects on fish eggs, larvae, and fry are insufficient to reach any conclusions with respect to the way sound would affect survival (Hastings and Popper, 2005).

Operations Impacts

Many potential impacts to stream crossings initiated during construction would continue to contribute to impacts to fisheries resources during rail line operations. Operations-related impacts would be common for all stream crossings along the proposed rail line.

Loss or Alteration of Instream and Riparian Habitats

Bridges that have abutments or pilings in the streambed cause permanent losses of fish spawning and rearing habitats, as discussed above. Instream bridge supports lead to upstream scour and downstream bed-load deposition, which extends the area of instream habitat the structure affects. Bridges and open-bottom culverts also create shade that results in degradation and loss of overhanging riparian vegetation that juvenile fish use for cover and forage. Bridges typically require placement of riprap, which permanently displaces vegetation that filters runoff, resulting in a permanent loss of juvenile rearing habitat along the hardened bank beneath the bridges (Schmetterling *et al.*, 2001; Fischenich, 2003).

Closed-bottom culverts placed directly in the streambed cause permanent loss of any existing spawning and rearing habitats, alter stream flow and stream bottoms on either end of the culverts, and change adjacent riparian habitat. When culverts are installed, fill is usually placed around the culvert, and streambanks upstream and downstream of the culvert are reinforced with riprap. During high-water events, water can bypass improperly sized culverts and create scour pools, causing additional streambank erosion. As erosion continues over time, there can be additional loss of habitat as more riprap is added.

Bridge abutments and culverts could impede the transport of large woody debris, which provides rest areas, shade, and cover for fish and substrate for aquatic vegetation and invertebrates (House and Boehne, 1986; Marcus *et al.*, 1990). When large woody debris blocks conveyance structures, the debris is typically removed from the stream system and placed beyond the flood plain, resulting in permanent loss of this habitat structure and an interruption in the downstream transport of large woody debris.

Culverts placed in the soft substrate across wetlands could sink over time, creating ponds on the upslope side of the railbed and drying on the down slope side of the railbed. If a culvert blocks water flow, nutrients would no longer be cycled through wetlands to receiving waters, which would affect nutrient input to aquatic plants and animals that provide forage for fish. If surface water exchange between wetlands and streams was interrupted, stream flows could be reduced and riparian vegetation along the stream corridor could begin to decline, which would result in erosion, bank sloughing, and increased sedimentation during high-water conditions.

Blockage of Fish Movement

Improperly imbedded and maintained culverts and the surrounding fill could change the ability of the culvert to convey water. Flooding levels exceeding the culvert design could result in the culvert becoming more deeply embedded in the streambed, and over time the culvert opening could become inefficient at passing fish to upstream habitats. Habitat loss would increase as culverts failed and fish movements were blocked, preventing fish populations from accessing upstream and downstream habitats.

Bridges and culverts could also create constrictions, restricting the downstream movement of large woody debris important for productive salmonid habitats (House and Boehne, 1986), or ice, causing ice jams and flooding. Water in undersized culverts often freezes solid and is slow to melt due to the insulation of road or rail embankments, blocking spring movements of fish to foraging and spawning habitats.

Degradation of Water Quality

Maintenance activities such as clearing drainage ditches and management of vegetation in the ROW could cause an increase in turbidity and sedimentation over natural background levels in streams. ARRC does not propose to transport hazardous materials along the proposed Port MacKenzie Rail Extension; however, spills of nontoxic bulk materials could have physical impacts if spills occurred at or near stream crossings. See Chapter 11 and Section 13.3 for a discussion of rail safety and the movement of materials.

Impacts to Fisheries by Segment and Segment Combinations

All segments and segment combinations would cross streams or waterbodies that provide habitat for fish, and this habitat could be affected by rail line construction and operations. The paragraphs below describe notable site-specific impacts to fish and fish habitats by rail line segment and segment combinations. Appendix F describes site-specific conditions at each fish or fish habitat-bearing stream crossing.

Southern Segments and Segment Combinations

The southern segments would cross streams at five locations that support fish or fish habitat (Table 5.4-3, Figure 5.4-2). The Mac West-Connector 1 is the only southern segment combination that would cross waters supporting anadromous fish (crossing C1-2.6). All crossings would use closed-bottom culverts, which would be buried to approximately 40 percent of their diameter where possible. Proposed culverts along the southern segments and segment combinations range in size from 50 percent or less of the wetted widths at the five stream

Table 5.4-3
Fish-Bearing Streams the Southern Segments would Cross[a]

Segment/ Crossing Location	Crossing Identification	Stream Name	ADF&G Anadromous Catalog Number[b]	Waterbody	Fish	Channel Width (feet)	Conveyance Type[c]	Conveyance Size (inches)[c]	Habitat[b] SP	Habitat[b] R	Habitat[b] M	Habitat[b] OW	Potential Blockage
Mac West													
MW-11.0	MW-084R	Inlet to Horseshoe Lake	0.8 mile upstream from COr	Stream	Resident	11	Culvert	36	--	Y	Y	--	No
MW-10.1	MW-085	Inlet to Horseshoe Lake	Edge of COr in Horseshoe Lake	Spring	Resident	9	Culvert	48	--	Y	--	--	No
MW-4.6	MW-095	Unnamed	1.3 miles upstream from COp	Stream	Resident	35	Culvert	48	--	Y	Y	--	No
Mac East													
ME-4.5	ME-078	Unnamed	2.3 miles upstream from COp	Stream	Resident	6	Culvert	36	--	Y	P	--	Yes - DS
Connecter 1													
C1-2.6	C1-026	The Little Susitna Tributary	247-41-10100-2080: COpr	Stream	Anadromous	27	Culvert	72	--	Y	Y	--	No

[a] Sources: ADF&G, 2009c; Johnson and Daigneault, 2008; Noel *et al.*, 2008

[b] Anadromous catalog codes: K = Chinook salmon, CH = chum salmon, CO = coho salmon, P = pink salmon, S = Sockeye salmon, p = present, r = rearing, s = spawning. Habitat abbreviations: Rearing (R), Migration (M), and Over-wintering (OW) habitats for either or both anadromous and resident fish species; Spawning (SP) habitat evaluated for resident trout, Arctic grayling and Dolly Varden and anadromous salmon (*i.e.*, gravels and upwelling suitable for spawning are present at crossing site). Y = verified, -- = not present, P = probable.

[c] Culverts are closed cylindrical structures; size is diameter (HDR Alaska, Inc. and TNH-Hanson, LLC, 2008; Pochop, 2008).

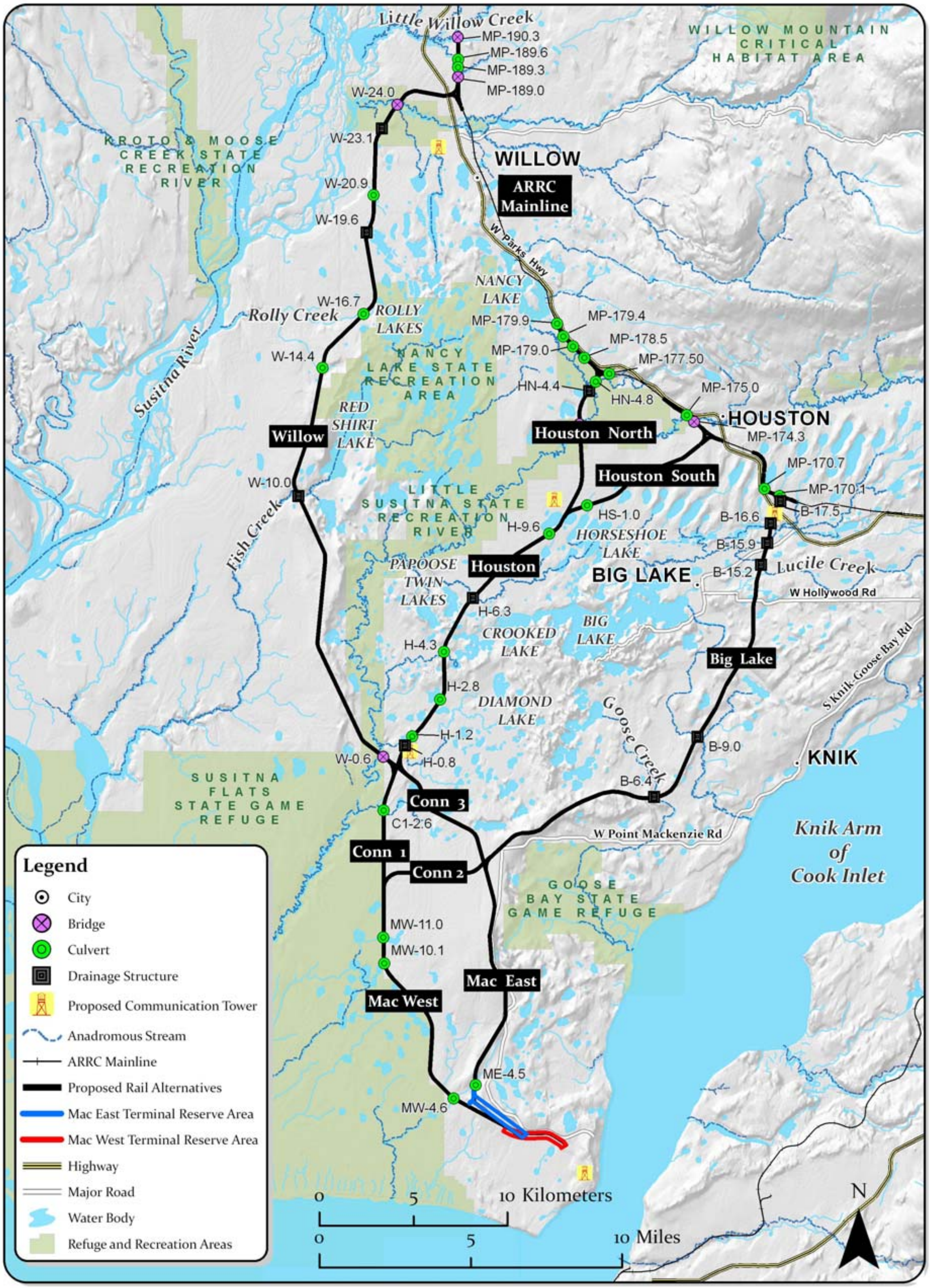

Figure 5.4-2. Fish-Bearing Streams Crossed by the Port MacKenzie Rail Extension Alternatives (Johnson and Daigneault, 2008; ADF&G, 2009c; Noel *et al.*, 2008)

crossings (Table 5.4-3). Flooding previously washed out a culvert at a road crossing near the MW-4.6 crossing (Record 95, Noel *et al.*, 2008). Of the southern segments and segment combinations, the Mac West-Connector 1 Segment Combination would cross the most fish-bearing streams, while the Mac East-Connector 3 Segment Combination and Mac East Segment would cross the fewest fish-bearing streams (Table 5.4-4). None of the crossings along the southern segments and segment combinations appear to cross habitats capable of supporting spawning or overwintering for resident game fish or anadromous fish. Stream-crossing sites along the southern segments and segment combinations primarily support summer rearing and migration of fish (Table 5.4-3).

Northern Segments and Segment Combinations

The northern segments and segment combinations would cross fish-bearing streams at 38 locations, including 14 crossings of streams with resident fish or fish habitat and 24 crossings of streams that support anadromous fish (Table 5.4-5, Figure 5.4-2). The Willow Segment would cross the Little Susitna River and Susitna River drainages, including six streams with resident fish or fish habitat and six streams that support anadromous fish (Table 5.4-5). The Houston-Houston North Segment Combination would cross the Little Susitna River and Little Susitna drainages, including six crossings of streams with resident fish habitat or providing connectivity to fish habitat and eight crossings of streams that support anadromous fish (Table 5.4-5). The Houston-Houston South Segment Combination would also cross the Little Susitna River and Little Susitna drainages, including four streams with resident fish habitat or providing connectivity to fish habitat and five streams that support anadromous fish (Table 5.4-5). The Big Lake Segment would cross the Big Lake and Goose Creek drainages, including one crossing of a stream with resident fish habitat and eight crossings of streams that support anadromous fish (Table 5.4-5).

Proposed northern segment crossings include 6 bridges, 12 drainage structures, 19 culverts, and 1 stream-bed relocation (Table 5.4-5). Of the 19 proposed northern segment culverts, 26 percent would be smaller than the wetted width of the stream crossing (Table 5.4-5). The Houston-Houston North Segment Combination would cross the most fish-bearing streams, while the Houston-Houston South Segment Combination and Big Lake Segment would cross the fewest fish-bearing streams (Table 5.4-6). Fourteen of the crossings along the northern segments would cross habitats capable of supporting spawning and 21 crossings could support overwintering for resident game fish or anadromous fish (Table 5.4-5). Most (67 percent) of the streams the Willow Segment would cross have no potential blockages, such as culverts at existing road or rail road crossings of the stream, while all of the streams the Big Lake Segment would cross have potential blockages due to ineffective culverts (Table 5.4-6).

Impacts to Fisheries by Alternative

The primary potential impacts to fisheries from construction and operation of the proposed Port MacKenzie Rail Extension alternatives would be loss and degradation of instream and riparian habitats due to placement of bridges, drainage structures, and culverts; alteration of stream and wetland hydrology; blockage of fish movements; and increased erosion and sedimentation from the removal of riparian vegetation. Section 4.2, Surface Water, and Section 4.5, Wetlands, describe alterations of stream and wetland hydrology caused by fill and conveyance structures. All crossings of fish-bearing streams would result in some loss or alteration of stream and

Table 5.4-4
Summary of Fish-Bearing Streams Crossed by the Southern Segments and Segment Combinations[a]

	Mac West-Connector 1	Mac West-Connector 2	Mac East-Connector 3	Mac East
Total Fish-Bearing Stream Crossings	**4**	**3**	**1**	**1**
Fish Communities				
Anadromous	1	0	0	0
Resident	3	3	1	1
Habitat				
Spawning	0	0	0	0
Rearing	4	3	1	1
Migration	3	2	1[a]	1[a]
Over-Winter	0	0	0	0
Potential Blockages				
None	4	3	0	0
Natural - Beaver Dams	0	0	0	0
Artificial - Up Stream	0	0	0	0
Artificial - Down Stream	0	0	1	1
Artificial - Up and Down Stream	0	0	0	0
Conveyance Structure				
Bridge	0	0	0	0
Culvert	4	3	1	1
Drainage Structure	0	0	0	0
Relocation	0	0	0	0

[a] Sources: ADF&G, 2009c; Johnson and Daigneault, 2008; Noel *et al.*, 2008.

riparian habitats. Bridged crossings would likely result in a smaller area of instream habitat loss compared to closed-bottomed culverts. In general, clear-span bridges (those without instream supports) would have less potential to create conditions that would cause loss of spawning habitats, blockage of fish movements, alteration of stream hydrology, and increased erosion and sedimentation.

The proposed project alternatives would require a minimum of 10 and a maximum of 18 crossings of streams that have been documented to contain either fish or fish habitat (Table 5.4-7; Noel et al., 2008). The alternatives requiring the minimum number of fish-bearing stream crossings (10) are the Mac East-Big Lake and Mac East-Connector 3-Houston-Houston South alternatives. The alternative requiring the maximum number of crossings (18) is Mac West-Connector 1-Houston-Houston North. Table 5.4-7 summarizes fish communities, fish habitat use, proposed conveyance structures, and potential existing stream blockages for the 43 fish-bearing stream crossings by alternative. Appendix F describes site-specific conditions at each fish-bearing stream crossing.

Table 5.4-5
Fish-Bearing Streams the Northern Segments would Cross[a] (page 1 of 3)

Segment/ Crossing Location	Crossing Identification	Stream Name	Alaska Department of Fish and Game Anadromous Catalog Number[b]	Waterbody	Fish	Channel Width (feet)	Conveyance Type[c]	Conveyance Size[c]	Habitat[a]				Potential Blockage[b]
									SP	R	M	OW	
Willow													
MP-190.3	W-098	Little Willow Creek Tributary[d]	0.2 mile upstream from COr	Stream	Anadromous	12.3	Bridge	NA	Y	Y	Y	--	No
MP-189.6	W-099	Unnamed		Stream	Resident	1 to 4	Culvert Extension	36 inches	--	Y	Y	Y	Yes - US
MP-189.3	W-100	Unnamed		Stream	Resident	1 to 2	Culvert Extension	36 inches	--	Y	Y	--	Yes - US
MP-189.0	W-101R	Rodgers Creek	247-41-10200-2130-3020: COr	Stream	Anadromous	36.3	Bridge	NA	Y	Y	Y	Y	No
W-24.0	W-106	Willow Creek	247-41-10200-2120: CHs, COsr, Ksr, Ps	Stream	Anadromous	97.5	Bridge	NA	Y	Y	Y	Y	No
W-23.1	W-107	Willow Creek Tributary	0.3 mi upstream COr	Stream	Resident	2	Drainage Structure	NA	--	Y	Y	Y	Yes - DS
W-20.9	W-110	Susitna River Tributary[e]	Nominated	Stream	Anadromous	7.4	Culvert	36 inches	Y	Y	Y	Y	Yes - US
W-19.6	W-112	Unnamed		Stream	Resident	1 to 2	Drainage Structure	NA	--	Y	Y	--	No
W-16.7	W-113	Rolly Creek Tributary	1.6 miles upstream COp	Stream	Resident	1 to 2	Culvert	72 inches	--	Y	Y	Y	No - BD
W-14.4	W-116	Rolly Creek Tributary	3.2 miles upstream COp	Stream	Resident	1 to 2	Culvert	36 inches	--	Y	Y	Y	No - BD
W-10.0	W-118R	Fish Creek	247-41-10200-2020: COr, Sp	Stream	Anadromous	15	Drainage Structure	NA	Y	Y	Y	Y	No - BD
W-0.6	W-121R	The Little Susitna River	247-41-10100: CHs, COs, Ks, Ps, Sp	Stream	Anadromous	105	Bridge	NA	Y	Y	Y	Y	No

Table 5.4-5
Fish-Bearing Streams the Northern Segments would Cross[a] (page 2 of 3)

Segment/ Crossing Location	Crossing Identification	Stream Name	Alaska Department of Fish and Game Anadromous Catalog Number[b]	Waterbody	Fish	Channel Width (feet)	Conveyance Type[c]	Conveyance Size[c]	Habitat[a] SP	R	M	OW	Potential Blockage[b]
Houston North Segment													
MP-179.9	HN-056	Unnamed		Stream	Resident	3	Culvert Extension	48 inches	--	Y	Y	--	Yes - US
MP-179.4	HN-061R	Unnamed		Stream	Resident	3	Culvert Extension	60 inches	Y	Y	Y	--	Yes - US
MP-179.0	HN-063R	Unnamed		Stream	Resident	1.7	Culvert Extension	36 inches	Y	Y	Y		Yes - US
MP-178.5	HN-065R	Lake Creek Tributary	247-41-10100-2231-3026: COr	Stream	Anadromous	6.3	Culvert Extension	48 inches	Y	Y	Y	--	Yes - US
MP-177.5	None	Lake Creek Tributary	247-41-10100-2231-3018-4011: COr	Stream	Anadromous	< 2	Culvert Extension	48 inches	--	Y	--	--	Yes - US & DS
HN-4.8	HNM-122R	Lake Creek Tributary	247-41-10100-2231-3018: COr	Stream	Anadromous	9	Culvert	72 inches	--	Y	--	--	Yes - US
HN-4.4	HNM-123	Lake Creek	247-41-10100-2231: COr, Sp	Stream	Anadromous	20	Drainage Structure	NA	--	Y	Y	Y	Yes - US & DS
HN-3.2	HN-067R	The Little Susitna River	247-41-10100: CHs, COs, Kp, Ps, Sp	Stream	Anadromous	97.5	Bridge	NA	Y	Y	Y	Y	No
Houston South Segment													
MP-175.0	HS-070R	The Little Susitna Tributary	247-41-10100-2255: COr	Stream	Anadromous	14	Culvert Extension	NA	--	Y	Y	Y	Yes - US
MP-174.3	HS-071R	The Little Susitna River	247-41-10100: CHp, COs, Ks, Ps	Stream	Anadromous	46.5	Bridge	NA	Y	Y	Y	Y	No
HS-1.0	HS-075R	The Little Susitna Tributary	0.4 mi upstream from lake with COr	Stream	Resident	18	Culvert	36 inches	--	Y	Y	--	Yes - US
Houston Segment													
H-9.6	H-040R	Inlet to Colt Lake		Stream	Resident	3.6	Culvert	48 inches	--	Y	Y	Y	No
H-6.3	H-044	The Little Susitna Tributary	247-41-10100-2150: COr	Stream	Anadromous	16	Drainage Structure	NA	--	Y	Y	Y	Yes - US
H-4.3	H-046	The Little Susitna Tributary	247-41-10100-2100: COr, Kr	Stream	Anadromous	1 to 3	Culvert	72 inches	--	Y	Y	Y	Yes - US & DS
H-2.8	H-047	Unnamed		Wetland	Resident	1 to 2	Culvert	48 inches	--	--	Y	--	No
H-1.2	H-049	Unnamed		Wetland	Resident	1 to 3	Culvert	24 inches	--	Y	Y	--	No
H-0.8	H-050R	The Little Susitna Tributary	247-41-10100-2090: Ps, COsr	Stream	Anadromous	14	Drainage Structure	NA	Y	Y	Y	Y	No

Table 5.4-5
Fish-Bearing Streams the Northern Segments would Cross[a] (page 3 of 3)

Segment/ Crossing Location	Crossing Identifica-tion	Stream Name	Alaska Department of Fish and Game Anadromous Catalog Number[b]	Waterbody	Fish	Channel Width (feet)	Convey-ance Type[c]	Convey-ance Size[c]	Habitat[a] SP	R	M	OW	Potential Blockage[b]
Big Lake Segment													
MP-170.7	BL-001R	Outlet Loon Lake		Stream	Resident	2.5	Culvert Extension	48 inches	--	Y	Y	--	Yes - US & DS
MP-170.1	BL-003	Outlet Cheri Lake	247-50-10330-2050-3025: COr	Stream	Anadromous	1.5	Culvert Extension	60 inches	--	Y	Y	--	Yes - US & DS
B-17.5	None	Inlet to Long Lake relocated channel	247-50-10330-2050-3025: COr	Stream	Anadromous	<1	Drainage Structure	20 feet	--	Y	Y	--	Yes – US & DS
B-17.1 to B-17.6	None	Inlet to Long Lake	247-50-10330-2050-3025: COr	Stream	Anadromous	<1	Stream Relocation	2,440 feet of relocation	--	Y	Y	--	Yes - US & DS
B-16.6	BL-007R	Inlet to Long Lake	247-50-10330-2050-3025: COr	Stream	Anadromous	6.5	Drainage Structure	NA	--	Y	Y	--	Yes - US & DS
B-15.9	BL-008	Little Meadow Creek	247-50-10330-2050-3050: CHp, COrs, Pp, Ss	Stream	Anadromous	28	Drainage Structure	NA	Y	Y	Y	Y	Yes - US & DS
B-15.2	BL-010R	Lucile Creek	247-50-10330-2050-3030: Sp, COr	Stream	Anadromous	11.5	Drainage Structure	NA	--	Y	Y	Y	Yes - US & DS
B-9.0	BL-019R	Fish Creek	247-50-10330: CHp, COrs, Kp, Ps, Sp	Stream	Anadromous	28	Drainage Structure	NA	Y	Y	Y	Y	Yes - US & DS
B-6.4	BL-022R	Goose Creek	247-50-10360: COsr, Kr	Stream	Anadromous	6	Drainage Structure	NA	--	Y	Y	Y	Yes - DS

[a] Sources: Johnson and Daigneault, 2008; Noel *et al*., 2008.

[b] Anadromous catalog codes: K = Chinook salmon, CH = chum salmon, CO = coho salmon, P = pink salmon, S = Sockeye salmon, p = present, r = rearing, s = spawning. Kr = Chinook rearing observed but not noted in ADF&G Anadromous Catalog. Habitat abbreviations: Rearing (R), Migration (M), and Over-wintering (OW) habitats for either or both anadromous and resident fish species; Spawning (SP) habitat evaluated for resident trout, Arctic grayling and Dolly Varden and anadromous salmon (i.e., gravels and upwelling suitable for spawning are present at crossing site).
Y = verified, -- = not present, P = probable. Potential Blockage abbreviations: BD = beaver dam, US = artificial - up stream, DS = artificial – down stream.

[c] Culverts are closed cylindrical structures; size is diameter. Culvert Extension is an extension of an existing culvert. Drainage structures could include open bottom box culverts, multi-plate culverts, pre-cast arches, or single or multiple short-span bridges; type and size will be determined during final design and permitting. Bridges are single or multiple 23-foot short-span bridges. (HDR Alaska, Inc. and TNH-Hanson, LLC, 2008; Pochop, 2008). NA = Not Available

[d] Spawning substrates, adult coho salmon and juvenile salmonids observed (Noel *et al*., 2008).

[e] Nominated for the Anadromous Stream Catalog based on data from survey (Noel *et al*., 2008).

Table 5.4-6
Summary of Fish-Bearing Streams the Northern Segments and Segment Combinations would Cross[a]

	Willow	Houston-Houston North	Houston-Houston South	Big Lake
Total Fish-Bearing Stream Crossings	**12**	**14**	**9**	**9**
Fish Communities				
Anadromous	6	8	5	8
Resident	6	6	4	1
Habitat				
Spawning	6	5	2	2
Rearing	12	13	8	9
Migration	12	12	9	9
Over-Winter	9	6	6	4
Potential Blockages				
None	5	5	5	0
Natural - Beaver Dams	3	0	0	0
Artificial - Up Stream	3	6	3	0
Artificial - Down Stream	1	0	0	1
Artificial - Up and Down Stream	0	3	1	8
Conveyance Structure				
Bridge	4	1	1	0
Culvert	5	10	6	2
Drainage Structure	3	3	2	6
Relocation	0	0	0	1

[a] Sources: ADF&G, 2009c; Johnson and Daigneault, 2008; Noel *et al.*, 2008.

Table 5.4-7 summarizes impacts to fish-bearing streams for each of the eight alternatives. The proposed alternatives would require between 10 and 18 crossings of streams containing fish or fish habitat and between 5 and 9 crossings of anadromous fish habitats. Most streams the alternatives would cross provide for seasonal movements of fish and provide rearing habitats. There are spawning and overwintering habitats at 14 and 21 of the 43 stream crossings, respectively (Table 5.4-5). Depending on alternative, between two and six streams at crossings provide spawning habitat for resident game fish or anadromous fish and between 4 and 9 streams at crossings provide overwintering habitat. The proposed alternatives would include from 0 to 4 bridges, 2 to 6 drainage structures, and 3 to 14 closed-bottom culverts. Proposed alternatives include crossings of between 4 and 10 streams with potential blockage from previous crossings that could include ineffective culverts (Table 5.4-7).

All alternatives would cross waters containing important habitat for sustaining recreational and commercial salmon fisheries (Table 5.4-5). The greatest number of salmon-bearing streams crossed by alternatives include the Willow Segment and the smallest number crossed by

Table 5.4-7
Summary of Fish-Bearing Streams Crossed by Alternatives[a]

	Mac West-Connector 1-Willow	Mac West-Connector 1-Houston-Houston North	Mac West-Connector 1-Houston-Houston South	Mac West-Connector 2-Big Lake	Mac East-Connector 3-Willow	Mac East-Connector 3-Houston-Houston North	Mac East-Connector 3-Houston-Houston South	Mac East-Big Lake
Total Crossings	**16**	**18**	**13**	**12**	**13**	**15**	**10**	**10**
Fish Communities								
Anadromous	7	9	6	8	6	8	5	8
Resident	9	9	7	4	7	7	5	2
Habitat								
Spawning	6	5	2	2	6	5	2	2
Rearing	16	17	12	12	13	14	9	10
Migration	15	15	12	11	13	13	10	10
Over-Winter	9	6	6	4	9	6	6	4
Potential Blockages								
None	9	9	9	3	5	5	5	0
Natural - Beaver Dams	3	0	0	0	3	0	0	0
Artificial - Up Stream	3	6	3	0	3	6	3	0
Artificial - Down Stream	1	0	0	1	2	1	1	2
Artificial - Up and Down Stream	0	3	1	8	0	3	1	8
Conveyance Structure								
Bridge	4	1	1	0	4	1	1	0
Culvert	9	14	10	5	6	11	7	3
Drainage Structure	3	3	2	6	3	3	2	6
Relocation	0	0	0	1	0	0	0	1

[a] Source: ADF&G, 2009c; Johnson and Daigneault, 2008; Noel *et al.*, 2008.

alternatives include the Houston-Houston South Segment Combination. Of the three potential crossing locations on the Little Susitna River, the Houston-Houston South Segment Combination crossing (MP-174.3) would require instream pilings and would affect spawning habitat for three salmon species; the Willow Segment crossing (W-0.6) would require three or four instream pilings and would affect spawning habitat for four species of salmon (Table 5.4-5). Alternatives that include the Big Lake Segment would cross Goose Creek, a large unique fen system that would likely have to be drained or filled to provide an area for construction, resulting in the loss of about 4 acres within the 200-foot ROW and likely extending outward within the 19-acre high-value wetland and juvenile rearing habitat.

The Alaska Department of Fish and Game considers Cook Inlet radiation sticklebacks and Pacific lamprey Species of Conservation Concern (ADF&G, 2006). Of the total 43 proposed fish-bearing stream crossings, 18 contain either sticklebacks, Pacific lamprey, or both (see Appendix F). Occurrence of sticklebacks and Pacific lamprey by alternative indicates that the Mac West-Connector 1-Willow Alternative would have the most occurrences of these fish species (10) and the Mac East-Connector 3-Houston-Houston North Alternative and the Mac East-Connector 3-Houston-Houston South Alternative would have the fewest (5) (see Appendix F).

Mac West-Connector 1-Willow Alternative

Construction of the Mac West-Connector 1-Willow Alternative would potentially impact 16 stream crossings that provide fish habitat (Table 5.4-7). Spawning habitat is present at 37 percent of the stream crossings and habitats appear suitable for overwintering at 56 percent of stream crossings. Most streams this alternative would cross (94 percent) provide passage for fish during seasonal migrations (Tables 5.4-3 and 5.4-5). ARRC has stated it would construct bridges at four of the seven anadromous fish stream crossings, construct drainage structures at one of the seven crossings, and would install culverts at two of the seven crossings (Tables 5.4-3 and 5.4-5). Two of the four bridges would require instream pilings within reaches of the Little Susitna River and Willow Creek with documented spawning habitat for four of five Pacific salmon (Table 5.4-5). ARRC would use drainage structures to cross two resident fish streams, and the remaining seven crossings would be culverts of various sizes. Most stream crossings for this alternative (75 percent) would be in undeveloped areas that do not have potential unnatural blockages from ineffective culverts or other crossing structures, although three streams have potential beaver dam blockages and four stream crossings near Parks Highway have potential upstream or downstream blockages (Table 5.4-7). This alternative would cross four waters important for sustaining recreational and commercial salmon fisheries in Southcentral Alaska, including Rodgers Creek, Willow Creek, Fish Creek (Susitna River tributary), and the Little Susitna River.

Mac West-Connector 1-Houston-Houston North Alternative

Construction of the Mac West-Connector 1-Houston-Houston North Alternative would involve 18 crossings of streams that provide fish habitat (nine resident fish streams and nine anadromous fish streams) (Tables 5.4-3 and 5.4-5). There is spawning habitat at 28 percent of the stream crossings and habitats appeared suitable for overwintering at 33 percent of stream crossings.

Most streams this alternative would cross (83 percent) provide passage for fish during seasonal migrations. ARRC has stated it would construct a bridge at the Little Susitna River crossing (HN-3.2) and would use three drainage structures to cross anadromous streams. The bridge over the Little Susitna River would require instream pilings within a reach with documented spawning habitat for three of five Pacific salmon (Table 5.4-5). ARRC would use culverts to cross the remaining five anadromous fish streams and the nine streams that support resident fish or fish habitats (Tables 5.4-3 and 5.4-5). Many stream crossings along this alternative (50 percent) would be in areas where development has created potential unnatural blockages from ineffective culverts or other crossing structures. This alternative would cross waters important for sustaining recreational and commercial salmon fisheries in Southcentral Alaska, including Lake Creek and the Little Susitna River, and many unnamed tributaries to these waters. Development of this alternative could change access to the Little Susitna River and Lake Creek in the Little Susitna State Recreation River near Parks Highway.

Mac West-Connector 1-Houston-Houston South Alternative

Construction of the Mac West-Connector 1-Houston-Houston South Alternative would involve crossing 13 streams that provide fish habitat (7 resident fish streams and 6 anadromous fish streams; Tables 5.4-3 and 5.4-5). There is spawning habitat at 15 percent of the stream crossings and habitats appear suitable for overwintering at 46 percent of stream crossings. ARRC has stated it would construct a bridge at the Little Susitna River crossing (MP-174.3) next to an existing bridge. The bridge over the Little Susitna River would require instream pilings within a reach with documented spawning habitat for three of five Pacific salmon (Table 5.4-5). ARRC would use two drainage structures to cross anadromous streams. ARRC would use culverts to cross the remaining three anadromous fish streams and the seven streams supporting resident fish or fish habitats (Tables 5.4-3 and 5.4-5). Most streams this alternative would cross (92 percent) provide passage for fish during seasonal migrations and provide rearing habitat. A few stream crossings along this alternative (31 percent) are in areas where development has created potential unnatural blockages from ineffective culverts. This alternative would cross waters important for sustaining recreational and commercial salmon fisheries in Southcentral Alaska, including the Little Susitna River and several unnamed Little Susitna tributaries.

Mac West-Connector 2-Big Lake Alternative

Construction of the Mac West-Connector 2-Big Lake Alternative would involve crossing 12 streams that provide fish habitat (4 resident fish streams and 8 anadromous fish streams). There is spawning habitat at 18 percent of the stream crossings and habitats appear suitable for overwintering at 36 percent of stream crossings. Most streams this alternative would cross (91 percent) provide passage for fish during seasonal migrations and all streams provide rearing habitat. ARRC has stated it would not construct bridges along this alternative. ARRC would use six drainage structures to cross anadromous streams. ARRC would use a culvert to cross one of the anadromous streams and would relocate 2,440 feet of anadromous stream channel into two sections of new 2,460-foot-long channels (Table 5.4-3 and 5.4-5). ARRC would cross the four streams that support resident fish or fish habitats using culverts (Table 5.4-3 and 5.4-5). Most streams this alternative would cross (73 percent) are in areas where development has created potential unnatural blockages from ineffective culverts (Table 5.4-7). This alternative would cross waters important for sustaining recreational and commercial salmon fisheries in the Big

Lake and Goose Creek drainages in Southcentral Alaska, including Little Meadow Creek, Lucile Creek, Fish Creek, and Goose Creek. The crossing of Goose Creek would be within a large unique fen system that would likely be drained or filled to provide an area for construction, which would result in the loss of about 4 acres within the 200-foot ROW and likely extend outward within the 19-acre high-value wetland and juvenile rearing habitat.

Mac East-Connector 3-Willow Alternative

Construction of the Mac East-Connector 3-Willow Alternative would involve crossing 13 streams that provide fish habitat. There is spawning habitat at 47 percent of the stream crossings and habitats appear suitable for overwintering at 69 percent of stream crossings. All streams this alternative would cross provide passage for fish during seasonal migration and provide rearing habitat (Tables 5.4-3 and 5.4-5). ARRC has stated it would construct bridges at four of the six anadromous fish stream crossings, and would construct a drainage structure and a culvert at the remaining two crossings (Tables 5.4-3 and 5.4-4, Figure 5.4-2). Two of the four bridges would require instream pilings within reaches of the Little Susitna River and Willow Creek with documented spawning habitat for four of five Pacific salmon (Table 5.4-5). ARRC would use drainage structures to cross two resident fish streams, and would use culverts of various sizes for the remaining five crossings. Most stream crossings along this alternative (61 percent) do not appear to have potential unnatural blockages from ineffective culverts, although three streams have potential beaver dam blockages and five stream crossings have potential upstream or downstream blockages (Table 5.4-7). This alternative would cross four waters important for sustaining recreational and commercial salmon fisheries in Southcentral Alaska, including Rodgers Creek, Willow Creek, Fish Creek (Susitna River tributary), and the Little Susitna River.

Mac East-Connector 3-Houston-Houston North Alternative

Construction of the Mac East-Connector 3-Houston-Houston North Alternative would involve crossing 15 streams that provide fish habitat (7 resident fish streams and 8 anadromous fish streams). There is spawning habitat at 33 percent of the stream crossings and habitats appear suitable for overwintering at 40 percent of stream crossings. Most streams this alternative would cross (87 percent) provide passage for fish during seasonal migrations. ARRC has stated it would construct a bridge at the Little Susitna River crossing (HN-3.2), and would use three drainage structures to cross anadromous streams (Figure 5.4-2). The bridge over the Little Susitna River would require instream pilings within a reach with documented spawning habitat for three of five Pacific salmon (Table 5.4-5). ARRC would use culverts to cross the remaining four anadromous fish streams and the seven streams supporting resident fish or fish habitats (Tables 5.4-3 and 5.4-5). Many stream crossings along this alternative (67 percent) would be in areas where development has created potential unnatural blockages from ineffective culverts (Table 5.4-7). This alternative would cross waters important for sustaining recreational and commercial salmon fisheries in Southcentral Alaska, including Lake Creek and the Little Susitna River, and many unnamed tributaries to these waters. Development of this alternative could change access to the Little Susitna River and Lake Creek in Little Susitna State Recreation River near Parks Highway.

Mac East-Connector 3-Houston-Houston South Alternative

Construction of the Mac East-Connector 3-Houston-Houston South Alternative would involve crossing 10 streams that provide fish habitat (5 resident fish streams and 5 anadromous fish streams). There is spawning habitat at 20 percent of the stream crossings and habitats appear suitable for overwintering at 60 percent of stream crossings. All streams this alternative would cross provide passage for fish during seasonal migrations and most (90 percent) also provide rearing habitat. ARRC would construct a bridge at the Little Susitna River crossing (MP-174.3) next to an existing bridge. The bridge over the Little Susitna River would require instream pilings within a reach with documented spawning habitat for three of five Pacific salmon (Table 5.4-5). ARRC would use two drainage structures to cross anadromous streams. ARRC would use culverts to cross the remaining two anadromous fish streams and the five streams supporting resident fish or fish habitats (Tables 5.4-3 and 5.4-5, Figure 5.4-2). Half of the stream crossings along this alternative are in areas where development has created potential unnatural blockages from ineffective culverts (Table 5.4-7). This alternative would cross waters important for sustaining recreational and commercial salmon fisheries in Southcentral Alaska, including the Little Susitna River and several unnamed Little Susitna tributaries.

Mac East-Big Lake Alternative

Construction of the Mac East-Big Lake Alternative would involve crossing 10 streams that provide fish habitat (2 resident fish streams and 8 anadromous fish streams). There is spawning habitat at 22 percent of the stream crossings and habitats appear suitable for overwintering at 44 percent of stream crossings. All streams this alternative would cross provide passage for fish passage during seasonal migrations and provide rearing habitat. ARRC would not construct bridges along this alternative. ARRC would use six drainage structures to cross anadromous streams. ARRC would use a culvert to cross one of the anadromous fish streams and would block a section of an anadromous fish stream with fill. ARRC would use culverts to cross the two streams supporting resident fish or fish habitats (Tables 5.4-3 and 5.4-5, Figure 5.4-2). All streams this alternative would cross are in areas where development has created potential unnatural blockages from ineffective culverts (Table 5.4-7). This alternative would cross waters important for sustaining recreational and commercial salmon fisheries in the Big Lake and Goose Creek drainages in Southcentral Alaska, including Little Meadow Creek, Lucile Creek, Fish Creek, and Goose Creek. The crossing of Goose Creek would be within a large unique fen system that would likely be drained or filled to provide an area for construction, resulting in the loss of about 4 acres within the 200-foot ROW and likely extending outward within the 19-acre high-value wetland and juvenile rearing habitat.

5.4.4.2 No-Action Alternative

Under the No-Action Alternative, ARRC would not construct and operate the proposed Port MacKenzie Rail Extension, and there would be no impacts to fisheries from the project.

5.5 Threatened and Endangered Species

This section describes protected species in the proposed Port MacKenzie Rail Extension study area and potential impacts from the project on those species. Section 5.1 describes the regulatory setting for protected species, Section 5.5.1 defines the study area, Section 5.5.2 describes the analysis methodology, Section 5.5.3 summarizes the affected environment (existing conditions), and Section 5.5.4 summarizes potential environmental consequences (impacts) to protected species from the proposed rail extension project. Appendix H provides the Biological Assessment of potential project-related impacts to Federal threatened and endangered species, as summarized in this section.

5.5.1 Study Area

The proposed Port MacKenzie Rail Extension would be within the Matanuska-Susitna Borough Susitna River valley, northwest of Anchorage on the west side of the Knik Arm. The study area was determined after SEA consulted with the U.S. Fish and Wildlife Service and National Marine Fisheries Service on the presence and location of any threatened or endangered terrestrial or aquatic species and critical habitat in the project area that the proposed project could directly or indirectly affect. After the consultation process, SEA determined that the proposed project could indirectly affect the endangered Cook Inlet beluga whale (*Delphinapterus leucas*). Therefore, the study area for analysis of potential impacts to the Cook Inlet beluga whale is the proposed anadromous fish-bearing streams the proposed rail line extension would cross and the area around Port MacKenzie that could experience increased vessel traffic as a result of the rail line extension.

5.5.2 Analysis Methodology

SEA based the analysis of potential indirect impacts to beluga whales from Port MacKenzie Rail Extension construction and operations on rail line crossings of streams that support anadromous fish and on induced shipping traffic at Port MacKenzie. SEA based the analysis of potential instream anadromous fish habitat on the review of stream crossing characteristics in Section 4.2; anadromous fish stream species presence and habitat-use data (Johnson and Daigneault, 2008); fish habitat data collected at or near proposed stream crossings during SEA field investigations in 2008 (Noel *et al.*, 2008); and proposed stream-crossing structures. SEA projected potential increases in shipping traffic at Port MacKenzie from information received from ARRC (ARRC, 2009). There is no available data for seasonal shipping; therefore, SEA assumed shipping to occur year-round with no seasonal variation.

5.5.3 Affected Environment

Beluga whales are small, white, toothed whales found in the Northern Hemisphere throughout arctic and subarctic waters and generally in shallow, coastal waters (National Marine Fisheries Service, 2008). The National Marine Fisheries Service designated the Cook Inlet beluga whale stock as depleted under the Marine Mammal Protection Act (65 FR 34590, May 31, 2000) and as endangered under the Endangered Species Act (73 FR 62919, October 22, 2008). Beluga whales of Cook Inlet are a discrete isolated population that remains in Cook Inlet year round (Hobbs *et* *al.*, 2008; Hobbs and Sheldon, 2008). Cook Inlet beluga whales are concentrated in the upper inlet generally near river deltas and bays in summer and fall, and they disperse offshore and move to mid inlet waters in winter (National Marine Fisheries Service, 2008).

The National Marine Fisheries Service (National Marine Fisheries Service, 2008) defines three habitat types that stratify Cook Inlet into three regions based on patterns of beluga whale habitat use (Figure 5.5-1).[1] Habitat Type 1 encompasses habitats with intensive beluga whale use from spring through fall; these are important foraging and nursery habitats. Type 1 habitat includes all of Cook Inlet northeast of a line drawn from 3 miles southwest of the Beluga River across to Point Possession. Habitat Type 2 is based on less concentrated spring and summer beluga whale use and known fall and winter use areas. Type 2 habitat is south of Type 1 habitat and north of a line at 60.250 north latitude. It also extends south along the west side of the inlet following the tidal flats into Kamishak Bay around to Douglas Reef, and includes an isolated section in Kachemak Bay. Habitat Type 3 encompasses the remaining portions of the beluga whale range in Cook Inlet; the southern boundary is an opening into the Gulf of Alaska approximately 53 miles across from Cape Douglas to Elizabeth Island. Type 1 habitat, in which Port MacKenzie is located, is believed to be the most valuable of the three habitat types based on frequency of use and its importance as feeding and calving habitats.

Lakes, rivers, and perennial and intermittent streams along the proposed rail line alternatives segments provide habitat for fish either throughout or during portions of the year. Study area waters can support spawning, foraging, rearing, refuge, and/or migratory use by anadromous fish important as forage for beluga whales. Notable fish-bearing waters in this area that the project could affect include the Little Susitna River, Fish Creek, Willow Creek, Rodgers Creek, Lake Creek, Goose Creek, Lucile Creek, Little Meadow Creek, and several unnamed tributary streams. Anadromous fish species commonly present in the proposed rail corridor include all five Pacific salmon – Chinook (king), chum (dog), coho (silver), pink (humpy), and sockeye (red) – and eulachon (hooligan) and Dolly Varden (Johnson and Daigneault, 2008).

The abundance of beluga whales in Cook Inlet decreased between 1994 and 1998, likely due to Native subsistence hunts (Hobbs *et al.*, 2008). From 1993 to 2007, most beluga whale sightings were concentrated north and east of the Beluga River and Point Possession (Hobbs *et al.*, 2008). Beluga whales have remained in the area that previously had the highest impact from hunting (on the north end of Cook Inlet, near Anchorage), and they have disappeared from peripheral habitats (in the southern end of the inlet). It is not known if the current contracted distribution is a result of changing habitat, predator avoidance, or a shift of a reduced population into preferred habitat areas (Hobbs *et al.*, 2008). In winter, beluga whales are more dispersed throughout Cook Inlet (Moore *et al.*, 2000). During the June and July abundance estimate surveys, the proportion of beluga whales using the Knik Arm has fluctuated between 0 to a little more than 62 percent of the observed individuals (see Appendix H).

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1 After SEA submitted a Biological Assessment for the Cook Inlet beluga whale (see Appendix H of this Draft EIS) to the National Marine Fisheries Service for review and concurrence or recommendations, National Marine Fisheries Service published a proposed designation of critical habitat for the Cook Inlet beluga whale on December 2, 2009 (74 FR 63080). The National Marine Fisheries Service is seeking public comments until March 3, 2010 on the proposed rule. The proposed Critical Habitat consists of Type 1 and Type 2 habitats.

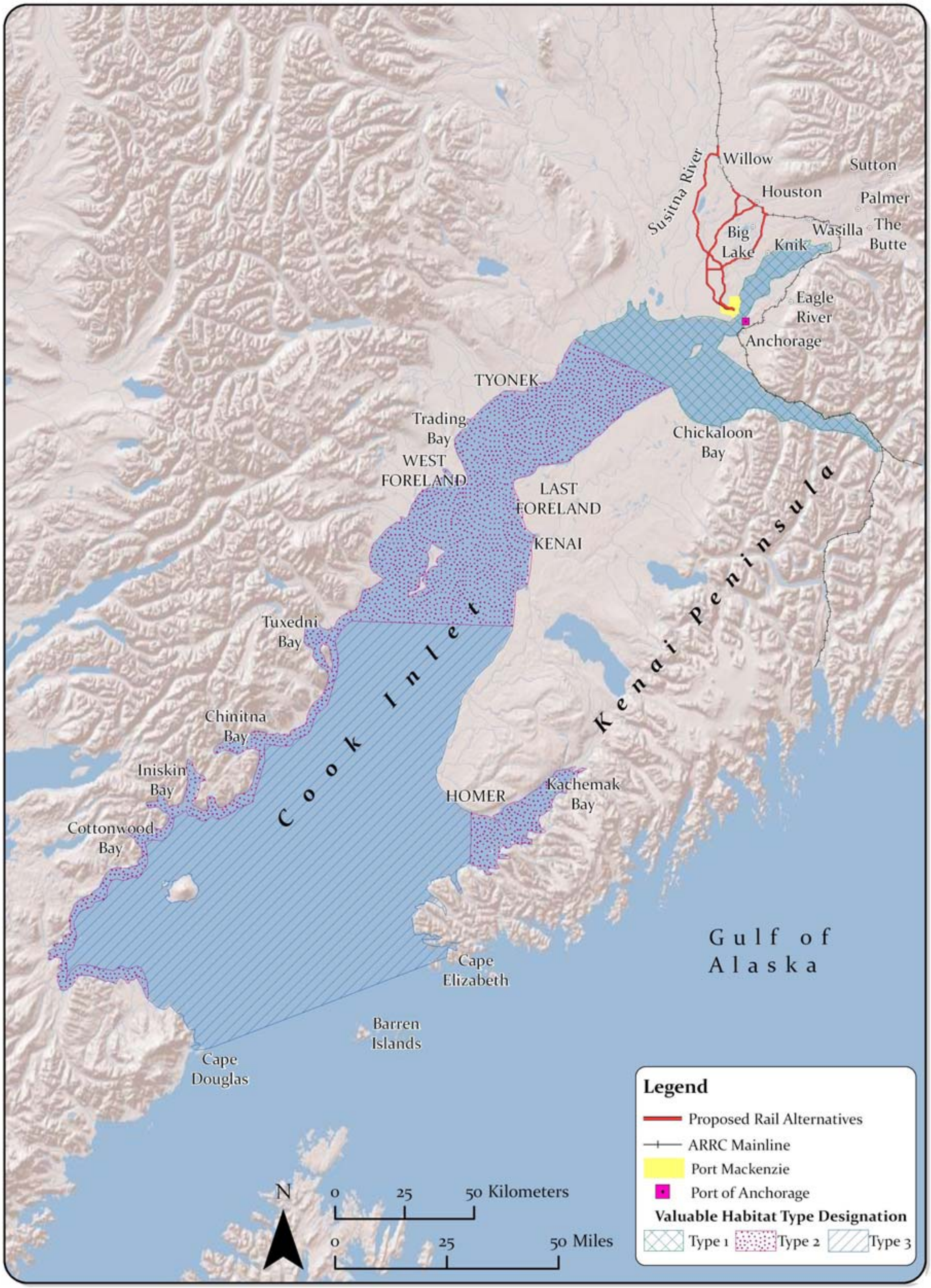


Figure 5.5-1. Habitat Areas (Types 1, 2, and 3) Identified for Cook Inlet Beluga Whales (National Marine Fisheries Service, 2008)

5.5.4 Environmental Consequences

There would be no direct impacts to beluga whales from proposed rail line construction because there would be no construction activities in waters of the Cook Inlet. As described in this section, SEA identified two potential indirect effects to beluga whales from proposed rail line operations – (1) impacts to forage fish resources for the beluga whale due to potential rail line stream crossings and (2) impacts to beluga whale presence in the Port due to increased noise and disturbance from increased ship traffic.

Depending on alternative, the proposed 30- to 45-mile rail line extension would cross from 5 to 9 streams that support anadromous salmon populations in the Willow Creek and Fish Creek-Susitna River drainages; the Little Susitna River drainage; Lucille Creek, Fish Creek, and Goose Creek-Knik Arm drainages; and several other small Cook Inlet drainages. Loss or alteration of instream and riparian habitats would result in reduced capacity of the habitats to produce anadromous fish. Blockage of fish movement could further limit available fish habitat, also resulting in reduced capacity of the habitat to produce anadromous fish. Because beluga whales compete with both commercial and recreational fisheries for available anadromous fisheries resources, and because the configuration of the Susitna River mouth appears to be critical to beluga whale feeding efficiency (National Marine Fisheries Service, 2008), small changes in available anadromous fish resources within Type 1 habitats of the upper Cook Inlet could have a disproportionate effect on beluga whales.

Rail line operations, including delivery of bulk materials to and from Port MacKenzie, could increase total vessel traffic at Port MacKenzie from an average of 50 ships per year from 2005 to 2008, to as many as 55 to 68 ships per year (ARRC, 2009). The increase of five ships per year is based on ARRC's estimate of five ships being diverted from the Port of Seward to Port MacKenzie. This is derived from assuming an average of two 60-car trains daily for four weeks prior to a vessel call at Port Mackenzie (to stockpile material for the vessel) over the course of 20 weeks, which would equate to five vessels (20 weeks ÷ 4 weeks per vessel call = 5 vessels). The increase of up to thirteen ships per year is based on the same calculation but assumes a full year of operations (52 weeks). Over the course of 52 weeks, with four weeks needed to stockpile material for each vessel call, there could be potentially thirteen vessels per year from the operation of the Port MacKenzie Rail Extension (52 weeks ÷ 4 weeks per vessel call = 13 vessels). For comparison purposes, the number of vessel calls per year at the Port of Anchorage between 2002 and 2008 totaled 227, 313, 224, 244, 178, 184, and 161 (DOT, 2009).

Increased vessel traffic would add to noise and disturbances in the immediate vicinity of Port MacKenzie at the entrance of Knik Arm. Added noise and disturbances could displace beluga whales from the Port area. However, ships used to transport materials delivered to and from Port MacKenzie by the rail extension would not produce noise in excess of 180 dB re: 1 μPa, which is defined as Level A harassment of marine mammals. While large ships generate some broadband noise, the majority of this sound energy would fall below the hearing range of beluga whales and is not expected to elicit behavioral reaction (National Marine Fisheries Service, 2009). Large vessel frequencies are outside the range of beluga whale hearing and vocal communications, and sound pressures would attenuate within short distances from the source to levels well below the Level B harassment threshold of 160 dB re: μPa.

With implementation of impact avoidance and minimization measures at anadromous stream crossings and for ship traffic servicing Port MacKenzie, SEA has determined that Port MacKenzie Rail Extension Project may affect, but is not likely to adversely affect the Cook Inlet beluga whale (see Appendix H).

5.5.5 No-Action Alternative

Under the No-Action Alternative, ARRC would not construct and operate the proposed Port MacKenzie Rail Extension, and there would be no impacts to threatened and endangered species from the project.

6. CULTURAL AND HISTORIC RESOURCES

6.1 Regulatory Setting

Applicable Federal, state and local regulations are discussed below.

6.1.1 Federal Regulations

The most relevant Federal laws for the evaluation of effects to cultural and historic resources are the National Environmental Policy Act (NEPA) [42 U.S.C. 4321 et seq.] and Section 106 of the National Historic Preservation Act (NHPA) [16 U.S.C. 470 *et seq*.] and its implementing regulations (36 Code of Federal Regulations [CFR] Part 800). NEPA requires a review of major Federal actions for impacts on the cultural environment. The NHPA requires Federal agencies to consider the effects of their undertakings on cultural resources that are listed on, or eligible for listing on the *National Register of Historic Places* (National Register). Section 106 applies when a project has been determined to be an undertaking, which includes a project, activity, or program funded in whole or part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on the behalf of a Federal agency, those carried out with Federal financial assistance, those requiring a Federal permit, license, or approval, and those subject to state or local regulation administered pursuant to a delegation or approval by a Federal agency (36 CFR 800.16(y)). If the undertaking would have an adverse effect on historic properties, the agency must continue to consult to resolve the adverse effects. Federal agencies follow the Section 106 process in reviewing project activities and prescribing appropriate actions to meet the requirements for compliance.

The Section 106 regulations define historic property as

> any prehistoric or historic district, site, building, structure, or object included in or eligible for inclusion in the National Register maintained by the Secretary of Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term also includes properties of traditional religious and cultural importance to an Indian Tribe or Native Hawaiian organization and that meet the National Register criteria (36 CFR 800.16(l)(1)).

In nominating a historic property to the National Register, consideration is given to both the significance and integrity of the property's historic qualities. For a cultural resource (e.g., districts, sites, buildings, structures and objects) to be eligible for listing on the National Register, it must possess integrity of location, design, setting, materials, workmanship, feeling and/or association (36 CFR 60.4).

Other relevant legislation that applies to cultural resources includes the Antiquities Act of 1906 (16 U.S.C. 431 *et seq.*); the Archaeological Resources Protection Act of 1979 (16 U.S.C. 470 *et seq.*); the National Trails System Act (Public Law 90-543); the American Indian Religious Freedom Act of 1978 (Public Law 95-341); Section 4(f) of the Department of Transportation Act (49 U.S.C. 303); the Archaeological and Historic Preservation Act of 1974 ("Moss-Bennett" Act); Executive Order 13007, *Indian Sacred Sites*; and the Native American Graves Protection and Repatriation Act (25 U.S.C. 3001-3013).

6.1.2 State Regulations

Alaska Statute 41, Chapter 35, addresses historic preservation issues on state-owned lands. If no Federal permits were required, this statute would be the prevailing legal authority for cultural resources in the undertaking.

6.1.3 Local Regulations

The Matanuska-Susitna Borough (MSB or the Borough) is an interested party in consultation, and has a regulatory responsibility under the NHPA. The MSB is a certified local government under the NHPA (16 U.S.C. 470a(c)) and therefore has the ability to manage its own historic resources. As part of its duties, the Borough must enforce the appropriate state or local historic properties legislation; establish and maintain an adequate and qualified historic preservation review commission; maintain a system for survey, inventory and review of historic properties in its jurisdiction; provide for adequate public participation in the local historic preservation program, including the process of recommending properties for nomination to the National Register; and satisfactorily perform the responsibilities delegated under the NHPA.

6.2 Study Area

The study area includes the area from the Susitna River east to Point MacKenzie, Knik, and the Parks Highway, including Houston and the area just north of Willow (Figure 6-1). This area encompasses historic trails and resource users, including dog sledders, all-terrain-vehicle users, and snowmachiners, who travel within and beyond the area to hunt, trap, camp, and participate in other recreational activities. For cultural resources, the study area may be broader than the area of potential effects in order to identify the context within which cultural resources may be evaluated for significance.

The area of potential effects is defined in the Section 106 regulations as: “the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of the undertaking and may be different for different kinds of effects caused by the undertaking.” (36 CFR 800.16(d)). The geographic area within which the proposed project could directly alter the character or use of a cultural resource includes the 200-foot-wide right-of-way (ROW) and the area of ground disturbance. Examples of direct alterations to cultural resources from proposed rail line construction or operations include physical destruction of or damage to all or part of the resource; removal of the resource from its original location; change in the character of the resource’s use or of physical features within the resource’s setting that contribute to its historic significance; or change in user access to traditional use sites or loss of cultural identity with a resource.

The geographic area within which the proposed project could indirectly alter the character or use of a cultural resource labeled “Project Area” on Figure 6-1, was set at a maximum of one mile on either side of the ROW centerline to establish a study area for the identification of historic properties that may be sensitive to visual or noise effects. One mile broadly encompasses the maximum extent for visual elements that have the potential to diminish the integrity of a property’s significant historic features, particularly in areas of low vegetation and flat

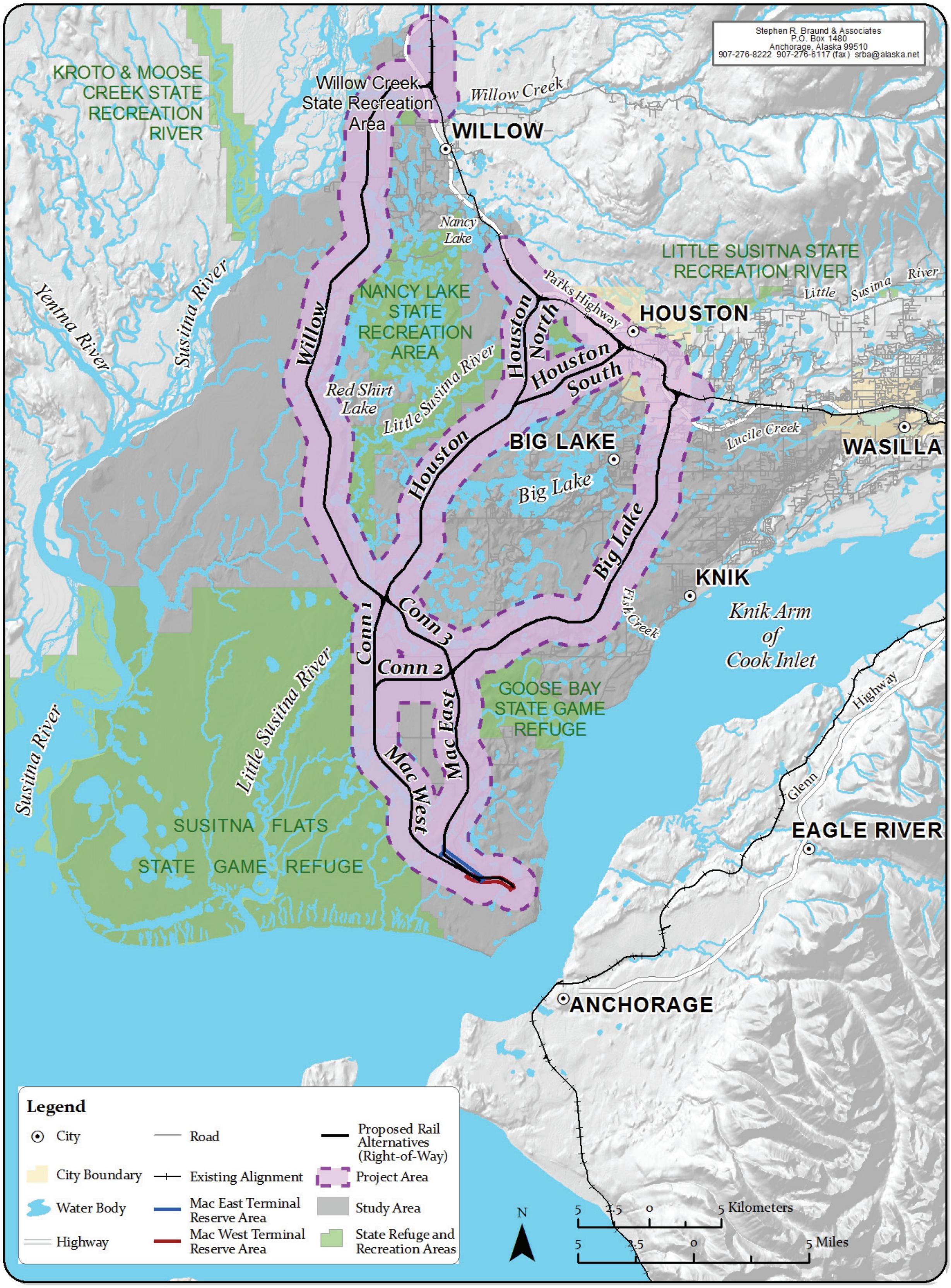


Figure 6-1. Port MacKenzie Rail Extension Study Area

topography. Other indirect alterations would typically have the potential to alter the character or use of a cultural resource much closer to the ROW centerline than one mile. Such alterations could be caused by the introduction of vibration, noise, or atmospheric elements, and vulnerability to erosion. The area within the 3 dBA noise increase contour can be quite large if the ambient sound level is sufficiently low, and for some alternatives, this distance was almost 1 mile (see Chapter 9). Historic trails and traditional-use areas in the study area may also be included in the area of potential effects.

6.3 Analysis Methodology

The Board's Section of Environmental Analysis (SEA) performed an initial literature review and consulted the Alaska Heritage Resources Survey database and other databases to identify known cultural resources in the study area (ADNR OHA, 2008a). A review of scoping documents indicated the prominence of snowmachine and all-terrain-vehicle use, which combines the trails historically used for dog sledding and skiing with modern recreational use. Some users described a history of all-terrain-vehicle and snowmachine use that goes back to 1960.

A cultural resources field survey by SEA in 2008 was limited to areas within the proposed 200-foot ROW, where direct effects to cultural resources would be most likely (SRB&A, 2008). SEA developed a probability model for guiding cultural resource surveys along the various rail line alternatives using available Geographic Information System data inputs (e.g., previously documented cultural resource locations, historic trails, waterways, and Dena'ina placenames) to generate maps identifying areas of low, moderate, and high probability for cultural resources. SEA used this probability model and information from the field survey to identify the alternatives that would have the least potential impact to cultural and historic resources. Areas with a greater likelihood of having cultural resources nearby include banks along streams, lakes, and other waterways; ridges and other promontories; other known sites and Dena'ina place names; and trails. Wetland areas are considered to have the lowest potential to have cultural resources. SEA selected a sample of the total number of miles of the proposed alternatives for the cultural resources survey.

A three-person survey crew performed the SEA field surveys. Crew members were spaced 20 meters (about 65 feet) apart and used handheld Global Positioning System units to guide them along transect routes following or paralleling the centerline of the ROW. The areas surveyed included all probability levels (low, moderate, and high) along the ROW to focus on high- and medium-probability levels and include a sampling of low-probability areas. The field crew surveyed 25.5 of the 115 miles of proposed alternatives (Figure 6-2). The survey resulted in the discovery of 36 cultural resources within 1 mile of the ROW that were deemed appropriate for inclusion in the Alaska Heritage Resources Survey. The State Historic Preservation Officer reviewed the field research design before the survey.

SEA also initiated government-to-government consultation with 10 Federally Recognized Tribes, tribal groups, and Alaska Native Regional Corporations. Consultation letters and meetings asked interested parties to report their concerns regarding cultural resources in the study area, as well as identify any cultural resources in the study area not documented during the literature review, the Alaska Heritage Resources Survey review and SEA field surveys. Cultural resources

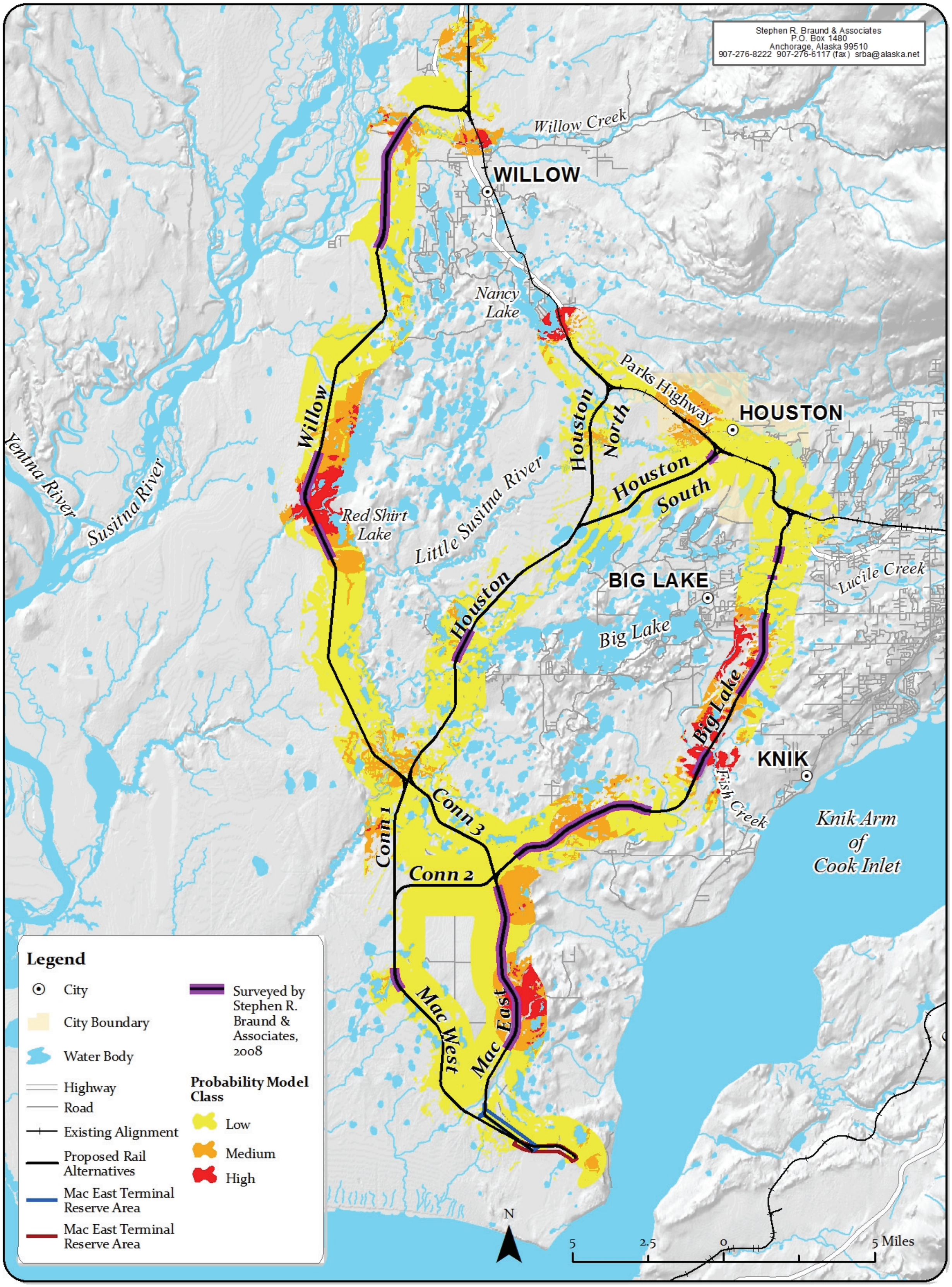


Figure 6-2. Probability Levels for Cultural Resources and 2008 Survey Areas

consultation included identification of any potential cultural landscapes or traditional cultural properties in the study area. Based on the literature review, information from the Alaska Heritage Resources Survey, consultation, and fieldwork, SEA identified cultural resources and mapped their locations in relation to the proposed alternatives. To encompass the extent of direct and indirect impacts that could affect the eligibility of cultural resources for inclusion on the National Register, SEA defined multiple areas of potential effect. The organization of the discussion of impacts is by northern and southern rail line segments and includes a description of any potential short-term (e.g., construction), long-term, and operations impacts on cultural resources.

All unsurveyed areas of the proposed ROW could contain cultural resources eligible for listing on the National Register, and surveyed areas could have buried archaeological or paleontological sites that are eligible but undiscovered.

6.4 Affected Environment

6.4.1 Prehistory

The study area was transformed by glaciers that retreated approximately 12,000 years before present, leaving behind a landscape dominated by postglacial landforms including complex ridge systems, outwash gullies and lakes, kettle lakes, moraines, eskers, and streams. The ridge systems consist of resistant rock and are connected to a system of moraines, kames, and eskers (formations of gravel, silt, and sand formed by ice or water movement in a glacier and left behind when the ice melted and the glacier retreated) (Dilley and Dilley, 2000).

After the ice retreated, the area was likely a desert-like zone with blowing dunes of glacially produced silt, large blocks of ice partially buried in glacial debris and a landscape of exposed rock and gravel with windblown loess deposits in the lee of winds coming off the retreating glaciers and up the rapidly forming Cook Inlet. Soon, however, a succession of plant types already present in the region would colonize the desert-like area and stabilize the soils. It is likely that mosses and lichens first colonized the area, stabilizing the soils and drawing in animals that consume these primitive life forms. Later, willows, alders, and other woody shrubs became established, created wind blocks, and entrained soil beneath vegetation and in root mats (Reger and Bundtzen, 1990).

After plants pioneered the region, it is likely that a variety of mammals and fish colonized the land and waters. People followed the large animals into the area and hunted them on the margins of the retreating glaciers These peoples were already accustomed to life in the glacial margins and arrived with a sophisticated suite of stone and organic tools, clothing, housing, social structure, and language (Reger and Bundtzen, 1990; Reger and Pinney, 1996).

6.4.1.1 Prehistoric Sites

Known sites in the Upper Cook Inlet area include Beluga Point on Turnagain Arm (Reger, 1996, 1998), sites in the Kenai Mountains (Reger and Pipkin, 1996), several sites in the Matanuska Canyon (West, 1996), a series of sites along the upper Susitna River (Dixon *et al.,* 1985) and two localities near Long and Ravine Lakes (Reger and Bacon, 1996; Robinson *et al.,* 1996). These sites evidence an early core-and-blade technology in which stone blades were struck from a core material and later worked and retouched into finished form. There have been no Paleo-Indian sites found in Southcentral Alaska with diagnostic type artifacts such as fluted points (chipped tools notched near the base for hafting) and burins (stone tool with characteristic flaked end used for engraving).

People using early core-and-blade technology likely hunted land animals in the Cook Inlet region. Elsewhere, core-and-blade technologies are found on the coast, probably the tools of marine-mammal hunters. By analogy to other radiocarbon dated sites in Alaska, Cook Inlet core-and-blade technologies date from 7,500 to 10,000 years ago (Reger, 2003). The interpretation of the period after these core-and-blade occupations is not clear, probably because several different culture groups with various stone-tool technologies were in the area at the same time. Some 4,000 to 5,000 years ago, notched stone points were used in the upper Susitna River basin. Reger (2003) describes a "distinctive, stemmed, chipped stone projectile point and a high-shoulder form of knife" from Beluga Point during this time. There are no slate tools, ground, polished or pecked, in the core-and-blade assemblages.

Approximately 4,200 years ago, people with ground slate spear points and knives camped at Beluga Point and probably in the upper Yentna River drainage (Dixon, 1993; Reger, 1981). Kachemak Culture people with a marine-oriented harvest technology spread over much of the Cook Inlet basin during the period 2,500 to 1,000 years ago. The Kachemak Culture was comprised of Eskimo people that originated in the Kodiak Archipelago and was characterized by elaborate and distinctive burial practices, notched cylindrical stones, fishing hooks, and other utilitarian items that allowed them to harvest from a marine environment (Langdon, 2002). Inland, the stratified Hewitt Lake site has a Riverine Kachemak component in the lower levels, while upper levels contain later Dena'ina components (Dixon, 1996). Riverine Kachemak people relied on salmon harvests, as evidenced by numerous small, notched pebble net sinkers. Ground slate was used for ulus (semi-lunate knives) and spear points. Chipped stone arrow points are common in these assemblages. These people were likely hunters and gatherers who followed game and plant resources with the seasons to support themselves. The Dena'ina, an Athabascan speaking culture, occupied the Cook Inlet area from approximately 1,500 years ago, and were characterized by semi-subterranean houses, tools of primarily bone and wood, and exploitation of both a marine and terrestrial subsistence environment (Reger, 2003).

6.4.1.2 Prehistoric Cultural Sequences

Based on the description of the known sites in Upper Cook Inlet, it is likely that prehistoric sites in the study area fall into one of the cultural sequences listed in Table 6-1. The description of the Hewitt Lake site (Dixon, 2003), indicates the possibility that beneath the Dena'ina sites nestled among the lakes, swamps, and streams of the Susitna lowland are older sites from Kachemak and earlier peoples who preceded them centuries and even millennia before.

6.4.2 History

European contact in the study area began in the late 18th century. During this time, Upper Cook Inlet was occupied by the Dena'ina, a group of Athabascan-speaking people, related by language

Table 6-1
Prehistoric Cultural Sequences in Upper Cook Inlet

Archaeological Phase/ Culture Group	Period	Description	Source
Early Core and Blade	7,500 to 10,000 years before present	Large core and blade technology	West, 1996
Notched points	4,000 to 5,000 years before present	Notched points from Upper Susitna, stemmed projectile points and a high shouldered knife at Beluga Point	Reger, 1996, 1998
Ground Slate	4,200 years before present	Ground slate spear points found at Beluga Point and the Upper Yentna River drainage	Reger, 2003
Riverine Kachemak	2,500 to 1,000 years before present	Ground slate points, knives, and spears; notched pebble net sinkers, and some chipped stone points.	Dixon, 1993; Reger, 1981
Dena'ina	1,500 years before present	Organic tool technology with little stone used. Copper pins and projectile points	Dixon, 1996; Reger, 2003
Chugach	800 years before present	Polished slate projectiles, knives, spear points. Occurs contemporaneously with Dena'ina materials	Reger, 2003

and lifeways to groups in Interior Alaska and more distantly to the Tlingit and Eyak of the northwest coast of North America (Townsend, 1981). The Athabascan languages originated in Central Siberia and spread throughout interior Canada and as far south as the Navajo and Apache in Arizona and New Mexico (Vajda, 2008). Outer Cook Inlet and the surrounding coasts and islands were the home of the Chugach Eskimo or *Sugpiat* people, more recent arrivals to the area and related to the *Yup'iit* of Southwest Alaska. These groups had complex relationships that combined some peaceful interactions with occasional warfare, slave and wife raiding, and sneak attacks on other groups (DeLaguna, 1975; Osgood, 1966).

6.4.2.1 Dena'ina Place Names and Trails

There are a number of Dena'ina trails and numerous Dena'ina language place names in the study area. Place names indicate the history of Dena'ina land use for those who used the lands and survived to be interviewed by linguists (Kari and Kari, 1982; Kari and Fall, 2003). Trails in the study area also include later Euro-American trails, which often were based on Dena'ina trails that preceded them. Trails to mineral lodes and claims often branched off existing Dena'ina trails, but in some cases were completely new trails cut and improved by miners and explorers. Appendix I, Table I-1, lists 88 Dena'ina place names, their English translations, a description of the sites and their associations, and code numbers corresponding to a map (Figure 6-3).

6.4.2.2 Russian America, 1740 to 1867

Early interactions in the late 1700s between the Dena'ina, the Russians, and other European groups were limited by the intense interest elsewhere in Alaska for sea otter pelts that were traded to China in exchange for tea, spices, chinaware, cotton, and silk. There were few sea otters in the Outer Cook Inlet and in Upper Cook Inlet when British explorers James Cook and George Vancouver visited in the 1770s (Beaglehole, 1967; Cook, 1967). French, British,

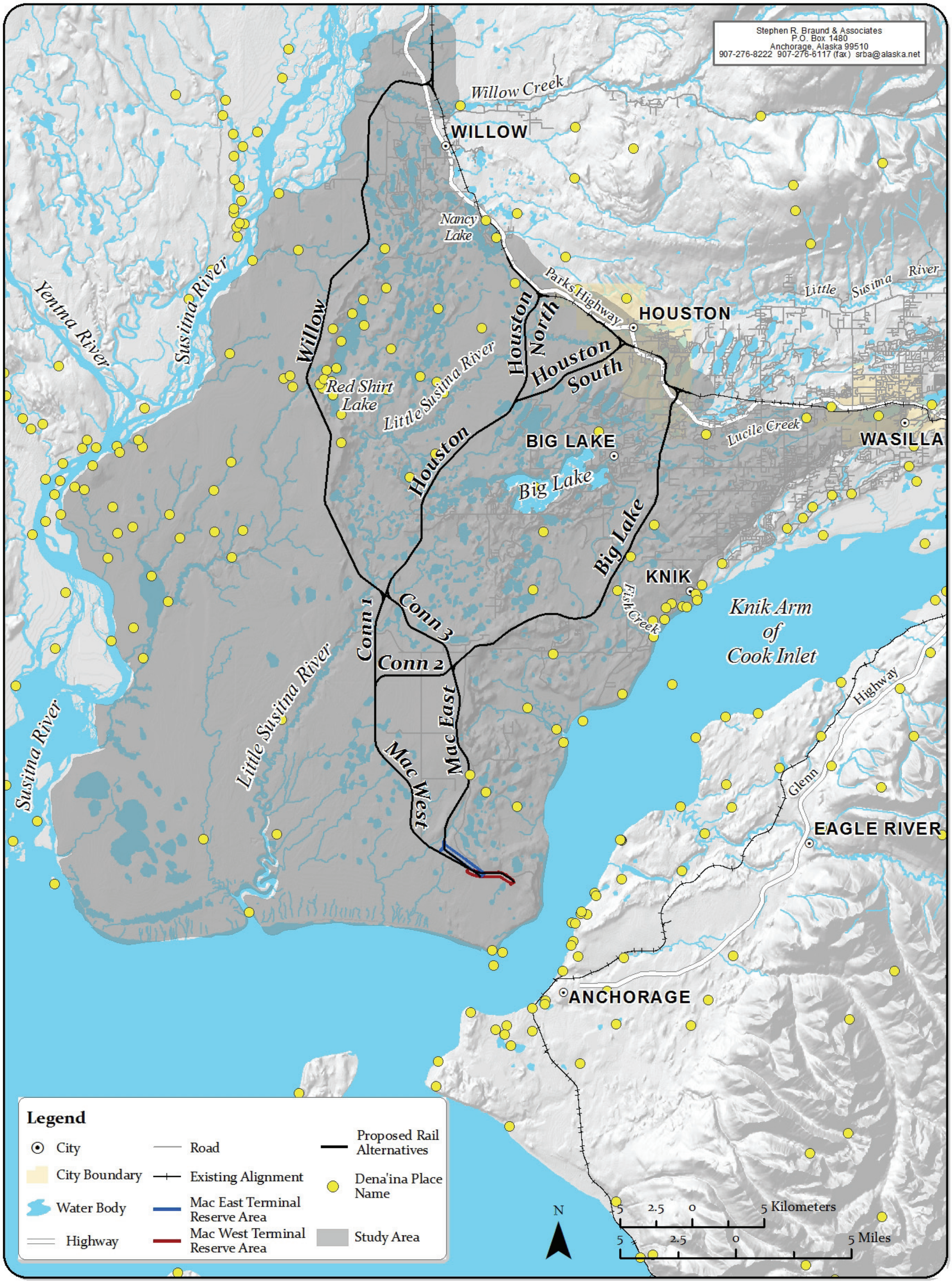


Figure 6-3. Locations of Dena'ina Place Names in and near the Study Area

Spanish, and American traders and explorers were encroaching on Russian territory by the 1790s and trading for otters and other pelts both in the waters of the Pacific and inland, where the Northwest Company, Hudson's Bay Company, and other fur traders had trading posts. After the limited number of sea otters in Cook Inlet were depleted, the Russians proceeded down the coast, building a base in California and taking crews of Aleut hunters as far south as Chile until the sea otters were depleted along the entire coast (Black, 2004; Solovjova and Vovnyanko, 2002; Wrangell, 1980).

With the sea otters depleted, the Russians began a period of otter management in their territory designed to rebuild the population and shifted their trading efforts to land furs, especially beaver, but including mink, bear, river otter, moose, and caribou hides (Black 2004; Wrangell 1980). These were traded within Alaska, with Russians serving as go-betweens for trade between Indians and Eskimos, and with China and Britain. The Russian fur trade companies designated local residents in each village to serve as managers for trade, or "toions," who kept track of the pelts stored for trade to the Russians and encouraged men to hunt for fur animals (Black, 2004; Solovjova and Vovnyanko, 2002). Once a year groups would come out of the interior by boat and trade pelts to the Russians in exchange for tea, sugar, flour, cloth, beads, axes and knives, and other goods such as pots, pans, and tea ware. People frequently converted sugar and flour to alcoholic beverages and held a party until these novel luxuries were depleted and people followed long-established trails back to their home territories. The Dena'ina used their central geographic position and network of trails to serve as middlemen traders between the Russians and the groups farther in the interior, gathering relatively great wealth in a short time (DeLaguna, 1975; Osgood, 1965; Townsend, 1981; Stafeev, 1985).

From 1741 to 1838, Europeans inadvertently introduced the first of many epidemic diseases that devastated Native populations throughout the Arctic (Fortuine, 1992). Smallpox, tuberculosis, measles, mumps, chicken pox, influenza, and other diseases would flare up and spread widely due to poor hygiene, wide travel, and winter crowding, killing perhaps more than half of all Native people in Alaska in one epidemic that started in 1838. To the present, there have been periodic epidemics that caused numerous deaths and long-term debilitating illnesses, ameliorated in the 1840s with the first vaccines and in the 1940s with the introduction of antibiotics.

During the late 18th Century, the Dena'ina and two neighboring groups occupied the Susitna Valley. Dena'ina from Cook Inlet had established trails through the Alaska Range to trade marine mammal fat with interior Dena'ina peoples and possibly the Upper Kuskokwim people on the western side of the Alaska Range. The neighboring Ahtna people of the Copper River basin were closely related to some Dena'ina bands and shared some territory near Talkeetna and in the Matanuska Valley past King Mountain with the Upper Cook Inlet Dena'ina (Kari and Fall, 2003). From these areas, the Ahtna would venture to Cook Inlet to trade with the Russians. The Russians called them Mednovtsie, people of the copper, for the native copper they often brought for trading. Many Ahtna people strategically married into Dena'ina families, as the Dena'ina were considered wealthy for their proximity to both marine mammal fat sources and European trade goods. The Russian Orthodox Church eagerly sought to incorporate the Ahtna into the church but had failed several times and lost clergy in conflicts with Ahtna bands (Kari, 1986; Znamenski, 2003). Farther up the Susitna Valley, Broad Pass connected to the Upper Tanana people, recipients of trade goods and marine mammal fat from the Dena'ina, but who were rarely inclined to travel through Dena'ina territory for trade.

6.4.2.3 Alaska Purchase and Territory, 1867 to 1958

Early Settlement, 1867 to 1915

In 1867, the United States purchased Alaska from Russia. Under the Treaty of Cession, the Dena'ina were to be treated as semi-settled peoples, equivalent to contemporary Indians (Black, 2004). However, during much of the early days of American administration there was no direct supervision or provision for government, schools, or other services. The U.S. Army had several small posts in Alaska, then the U.S. Navy administered the territory, and finally the Revenue Cutter Service, precursor to the U.S. Coast Guard, conducted court and provided medical care during cruises around the coast. Only after the first gold rushes in Canada, which spilled over into Alaska, was a territorial government formed to record land claims for mineral development (Bancroft, 1886; Naske and Slotnick, 1987). Ivan Petroff, an assistant to the noted American historian, Hubert Bancroft, was hired to perform a Census and summarize the resources of the territory in 1879 (Bancroft, 1886; Petroff, 1881, 1884).

Dena'ina people continued to interact primarily with fur traders who lived at widely spaced trading posts, including O. G. Herning, a fur trader at Knik. The Russian Orthodox Church, which had flourished among the Dena'ina, maintained a limited presence at Kenai, from where a traveling priest would sometimes make visits to the Susitna River villages (Kari and Fall, 2003; Potter, 1967; Znamenski, 2003). There were several conflicts between the fur traders, priests, and Dena'ina, and early officers of the court did not like to intervene (Znamenski, 2003).

The Gold Rush in the Klondike in 1898 was the first of several events that would change Alaska from an isolated, ignored outpost to an organized territory with allure for hunters, adventurers, and sportsmen. Government explorers like Herron (1901), Mendenhall (1900), Brooks (1911), and Glenn were accompanied by private explorers, hunters and mountain climbers like Browne (1913), Hawthorne (McKeown, 1951), and Studley (1911).

Gold prospecting created the next great influx of Euro-Americans into Upper Cook Inlet, beginning with discoveries on the Kenai Peninsula and Turnagain areas in 1891 (Buzzell, 1986). Soon, communities began to spring up to serve the provisioning needs of the Klondike and other gold rushes taking place throughout Alaska. In some cases, existing trading posts filled this need; in other cases, towns such as Knik and Susitna Station grew up along Cook Inlet. The community of Knik was the largest settlement in the Matanuska-Susitna Valley in the 1890s. At one time it had a population of 500, and included stores, hotels, restaurants, and churches. Knik served as a transfer point for passengers and freight from ocean-going steamers to smaller vessels or for overland travel. Some homesteads were established around Knik and the western end of the Matanuska-Susitna Valley during the first 20 years of the 20th Century. Fortner-Welch (2002) described the life of several prominent homesteading families, including bachelor homesteader, Herman Gronwoldt, who homesteaded at the east end of Big Lake. The establishment of Anchorage in 1915 as the Alaska Railroad construction headquarters and ship anchorage spelled the end of Knik's prosperity. By 1917, it was virtually abandoned.

Establishing Government, 1915 to 1939

American government did not reach Upper Cook Inlet with any lasting authority until the 1915 establishment of Anchorage at the site of what was then known as Knik Anchorage at the mouth of Ship Creek. From here, the farthest point of navigability for ocean-going ships in Knik Arm, materials for construction of the Alaska Railroad were unloaded and barged to shore. Connections were soon built to existing rail lines of the former Alaska Northern Railroad in Turnagain Arm. The government having purchased the failed private railroad to create the Alaska Railroad system and reach the coal fields of the Matanuska Valley, the ice-free port at Seward, and the interior river ports of Nenana and Fairbanks (Wilson, 1977). Many Dena'ina people living in the Susitna Valley sought employment on railroad construction crews because fur prices had crashed after the Alaska Commercial Company monopolized the trade and bought out competitors like the Western Fur and Trading Company. One advantage of working for the railroad was access to commissary goods brought in for the comfort and support of railroad workers but were familiar as trade goods to the Dena'ina. Another advantage was the employee rail pass, which allowed free travel on the railroad. Workers could spend the summer laying track along the line, then use their rail passes to travel to Talkeetna and beyond, to which they formerly had to walk or paddle (Kari and Fall, 2003). Others lived near the Matanuska Valley coal mines and worked there seasonally, but the coal mines closed as oil became the fuel of choice for Navy ships and better, hotter burning coal was mined near Nenana (Wade, 2002).

After the 1918 Spanish influenza devastated the remaining Native population of Upper Cook Inlet, the survivors resettled at what is today Tyonek. There had been several Tyonek village sites along that stretch of coast before then. The last Tyonek people settled around a miner's community, which was used as a port site for barging miner's gear to shore and boasted a post office, and became the refuge and orphanage for survivors of the worldwide epidemic (Kari and Fall, 2003). Families settled at Tyonek or in the Susitna Valley at or near traditional sites intersected by the railroad, where many men continued to work until the 1923 completion of the line to Fairbanks, and some stayed on as maintenance-of-way workers. This allowed seasonal travel through their homeland and integration into the cash economy for access to luxuries and necessities. Commercial fishing was another compromise between the need for money, the desire for gender-appropriate work, and the strong desire to maintain cultural traditions and practices and connections to their lands. A Native industrial school was built at Eklutna along the railroad, near the site of a former Dena'ina village, and Native people from all over the state attended and learned contemporary academic and industrial skills. Other Dena'ina people began to attend Indian schools at Wrangell and Sitka, and the Chemawa Indian School in Salem, Oregon. Some returned to their communities, but because of disease, death, or pressure to assimilate Native peoples into contemporary urban society, many did not return (Barnhardt, 2001; La Belle and Smith, 2005; Hirshberg and Sharp, 2005).

Increasing populations of European Americans in the Upper Cook Inlet area made it correspondingly difficult to maintain their traditional land use patterns, because homesteaders, settlers, and farmers began to colonize the promising lands of the Susitna and Matanuska Valleys. Following the construction of the railroad, the Federal Government subdivided lands for homesteads and farms, and in the 1930s began a New Deal-era program to resettle farmers from Minnesota to the area as a poverty reduction effort (Miller, 1975). The 1930s saw two ethnographic and archaeological surveys of the Dena'ina conducted by Frederica DeLaguna and

Cornelius Osgood, with some observations by Aleš Hrdlička, who traveled through Alaska several times studying the physical anthropology of its Native and immigrant peoples (DeLaguna, 1975, 1996; Hrdlička, 1943; Osgood, 1966).

World War II to Statehood, 1939 to 1958

The entry of the United States into World War II on December 7, 1941, caused far-reaching consequences throughout the Alaska Territory. Before the war, the Federal Government underestimated the Territory's strategic importance. By the end of the war, after the Japanese had attacked, occupied, bombed, and been routed from the Aleutian Islands, the Federal Government better understood the Territory's location and importance. Tens of thousands of military personnel served in the Territory, dozens of airfields were built, the AlCan (Alaska) Highway was constructed, and billions of dollars were spent on other civilian and military projects (Bush, 1984).

World War II also affected the area across from Anchorage on the west side of Knik Arm, an effect that still lingers. The Susitna Gunnery Range is an area with munitions and explosives of concern and unexploded ordnance. The military fired munitions from the vicinity of Cairn Point westward across Knik Arm. The area from Lake Lorraine and the shoreline, inland and northward along the Point MacKenzie access road, is reported to have had confirmed finds of munitions and explosives of concern and unexploded ordnance. The military also conducted various other training activities across the inlet, including survival training (Delkettie, 2008). During this period, military personnel used the area across the inlet, particularly the Big Lake area, as a recreational location for soldiers from Elmendorf Air Force Base and the U.S. Army's Fort Richardson.

Urbanization in Anchorage continued slowly, with Dena'ina people being pushed away from their former home sites in and near the city by development pressure, lack of property rights, and race-based discrimination. Dena'ina people were displaced from Anchorage before and during World War II, when a traditional fishcamp near Ship Creek (Tak'at), a location for the First Salmon ceremony and gathering place and potlatch site for local and non-local Native people, was buried by debris pushed over the bluff during the construction of Elmendorf Field beginning in 1940 (SRB&A, 2006). The expansion of Anchorage and additional removal of lands withdrawn for the military further displaced the Dena'ina people from long-used fish camps along Chester Creek, Ship Creek, Point Campbell, and Point Woronzof (Fall, 1981). Some Dena'ina continued to fish from Fire Island and others near Eklutna, but Anchorage was considered a dangerous and unfriendly place by its former seasonal residents (Kari and Fall, 2003).

6.4.2.4 Statehood, 1959 to 2008

Alaska officially became the 49th state on January 3, 1959. In 1964, voters created the Matanuska-Susitna Borough, which covers an area the size of the Commonwealth of Virginia, and Palmer became the Borough seat. Roads continued to be improved, with a major upgrade completed in 1965 when the new Knik River Bridge (new Glenn Highway) was completed. Houston was incorporated as a Third Class City in 1966. The Anchorage to Fairbanks road (Parks Highway) was completed in 1971, shortening the distance between the two cities by more than 100 miles (Glenn Richardson Highway Route) and creating a year-round all-weather road up the Susitna River valley to Cantwell and north. With these improvements in transportation and because of the large tracts of land available for subdivision, the Matanuska-Susitna Valley began to grow into a major population center, increasing from 6,509 people in 1970 to 59,322 in 2000 (ADOLWD, undated).

Among the last Dena'ina people to live a mixed traditional life on the land was Shem Pete, who lived in a cabin on Nancy Lake. He and his son Billy Pete were informants for a book documenting what the two men recalled of traditional life as they had lived it. Numerous Dena'ina place names are applied to the landscape in the project area based on this and other books documenting the Dena'ina presence in Upper Cook Inlet. Shem and Billy Pete were eventually forced off their land by land speculators who tricked them out of their rights to the land; they settled in Tyonek (Kari and Fall, 2003).

The 1971 Alaska Native Claims Settlement Act and the 1980 Alaska National Interest Land Claims Act changed Dena'ina land access and use permanently. The Alaska Native Claims Settlement Act was designed to transfer rights to lands taken by the Federal Government to Native peoples and to organize Alaska Natives into a suite of orporate entities instead of dependent but sovereign tribal entities, and extinguish their aboriginal land rights with the Federal Government. The Claims Settlement Act was enacted to settle the long-standing conflicts over land rights of Alaska Native people in the face of the discovery of the Prudhoe Bay oil deposits and the pending construction of the Trans-Alaska Pipeline System. The Alaska National Interest Land Claims Act was enacted to finalize land claims in Alaska, claim lands for parks and national monuments, extinguish the right of the President of the United States to select additional national monuments in Alaska, and adjust some terms of the Claims Settlement Act to ease some Native concerns and facilitate land management by state and Federal agencies (Williss, 1985). Some aspects of these two Acts continue to be points of contention between state, Native, and Federal parties, particularly land rights, subsistence preferences for rural residents, and access rights to different parcels using modern conveyances such as four wheelers, tracked vehicles, amphibious vehicles, snowmachines, and aircraft (STB, 2008).

With the residential development of the Matanuska-Susitna Valley continuing to increase, private property holdings and land use access in the Susitna Valley are growing issues. Since the 2000 Census, the Knik-Fairview Census Designated Place, a portion of which is in the study area, has had the greatest average annual growth rate (7.5 percent) of places in Alaska with 2,000 or more people, and the MSB continues to be the fastest growing area in the state, with an average annual growth rate of 4.1 percent (ADOLWD, 2008). Numerous subdivisions have been and are being built, and access to public land is being cut off by these developments and by landowners who want to maintain the rural character of the landscape in the face of residential and commercial development in the area. In recognition of the growing access and land use issues created by development, the MSB Assembly voted unanimously in December 2008 to create a special Knik Sled Dog and Recreation Special Land Use District to protect sled dog trails, some of which connect to the Iditarod National Historic Trail, from future development projects (Wellner, 2008).

6.4.3 Cultural Resources in the Project Area

Archaeological sites, historic sites, cultural landscapes, and traditional cultural properties are likely to be found or have been found within the study area, project area, and ROW in the course of research for the proposed Port MacKenzie Rail Extension.

Archaeological sites might consist of historic and prehistoric sites, and structures and deposits of material culture on the surface or buried with few or no written accounts of their existence.

Historic sites are trails, buildings and structures (cabins, houses, and other purposed structures) that have gained historic significance in and of themselves for design or other reasons, from association with famous or historically significant persons or events, or for representing specific architectural styles. As stated in the National Register Federal Program Regulations (36 CFR 60.4) the historic site must be more than 50 years old to be eligible for inclusion in the National Register, unless there are exceptionally significant attributes that contribute to the significance of the site.

Cultural landscapes and traditional cultural properties are properties that are definable to a delimited area or definable space and are significant to the cultural and historical practices of a community. The connection to and use of the property must be ongoing and continuing for it to be considered eligible for inclusion on the National Register. A cultural landscape is “a geographic area, including both cultural and natural resources and the wildlife or domestic animals therein, associated with a historic event, activity, or person or that exhibit other cultural or aesthetic values” (Page, Gilbert and Dolan 1998). Cultural landscapes represent a reflection of human adaptation and use of natural resources expressed through land organization, settlement patterns, land use, systems of circulation, and physical structures (NPS, 1998a). Examples of documented cultural landscapes include the Kennecott Mill Town landscape in Wrangell-St. Elias National Park, the Cedar Pass Developed Area in Badlands National Park, and the Tallgrass Prairie National Preserve cultural landscape. Traditional cultural properties are associated with living Native peoples who have a tradition of using the landscape that is continuous and presently active, and might be religious or secular in practice. Two key components of traditional cultural properties are that they are rooted in a community’s history and are important in maintaining the continuing cultural identity of the community (NPS, 1998b). For traditional cultural properties, if the long-term, continuous practices are blocked or made impracticable, the property can be delisted or made ineligible for listing when the practice no longer continues. Consulting parties did not identify any traditional cultural properties in the study area during government-to-government or NHPA Section 106 consultation for the proposed action.

6.4.3.1 Documented Cultural Resources

Prehistoric Cultural Resources

Figure 6-4 shows the documented cultural resources in the project area and their generalized locations in relation to the proposed rail line alternatives. There are 56 known prehistoric sites within 1 mile of the ROW, 29 of which were discovered during SEA’s field surveys in

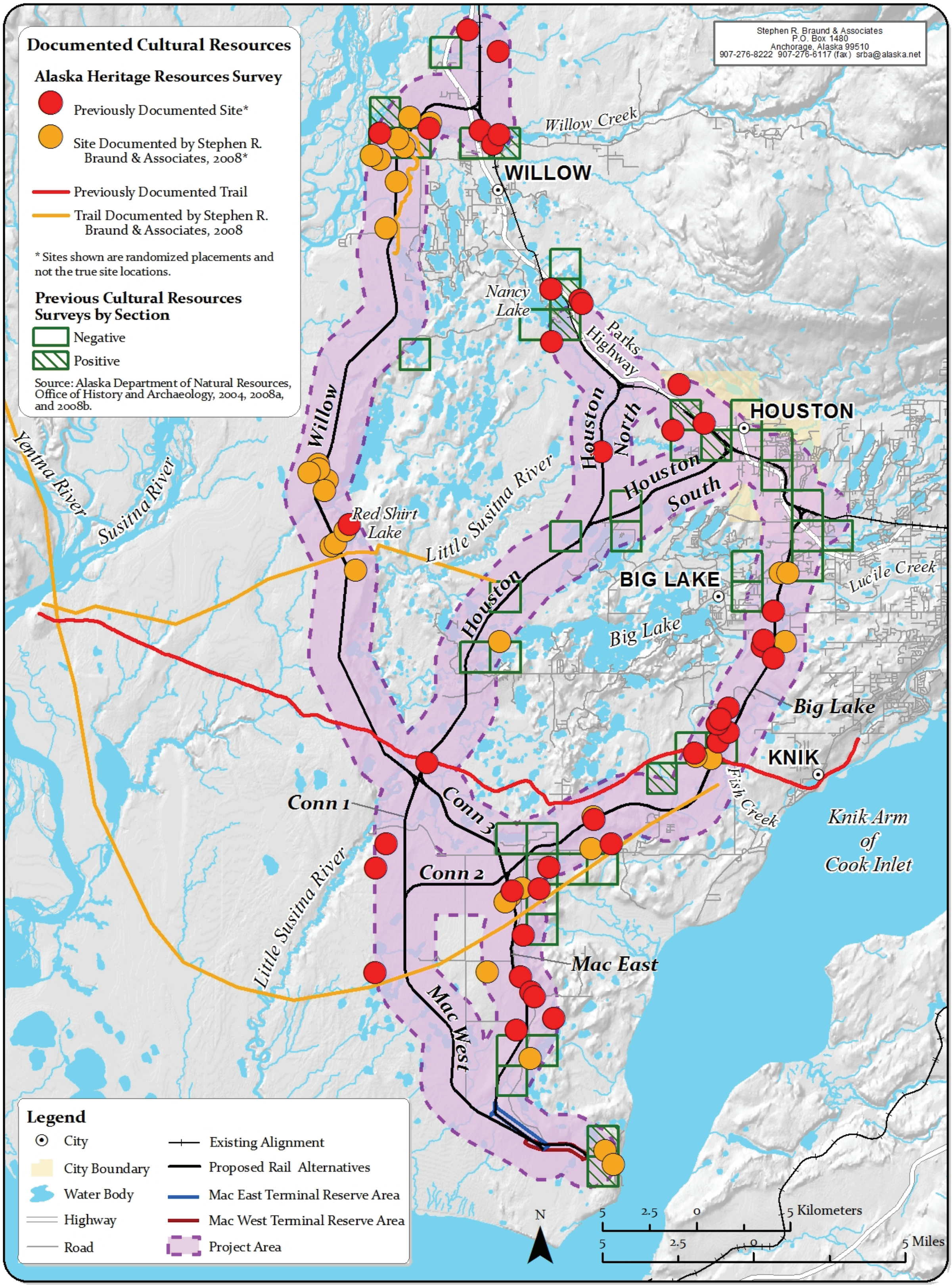


Figure 6-4. Documented Cultural Resources within the Proposed Port MacKenzie Rail Extension Project Area

September and October 2008 (Table 6-2). Most of the sites consist of what are called cache pits, which were used for storage, processing, or freezing foods, and large semi-subterranean house pits, called *nichił* in Dena'ina, used for permanent or winter homes. A determination of eligibility for inclusion in the National Register has not been conducted for any of the prehistoric sites. For more detailed descriptions of these prehistoric sites, see Appendix I.

Table 6-2
Alaska Heritage Resources Survey Sites in the Project Area

	Prehistoric	Historic	Total
Previously Documented Alaska Heritage Resources Survey Sites[a]	27	15	42
2008 Port MacKenzie Rail Extension Survey Documented Alaska Heritage Resource Sites	29	7	36
Totals	56	22	78

[a] Source: ADNR OHA, 2008a.

Historic Cultural Resources

There are 22 historic cultural resources within 1 mile of the proposed ROW (Table 6-2). Most of the historic cultural resources consist of historic structures, including bridges, roadhouses, cabins, and railroad stations. Seven of the historic sites listed were discovered during SEA's surveys for the proposed Port MacKenzie Rail Extension. These sites include two cabins, one shooting blind, and three trails. A determination of eligibility for inclusion in the National Register has not been made for any of the historic sites, except for a 1917 Alaska Railroad Corporation (ARRC) bridge at Mile Post 180.8 (determined not eligible) and 1917 ARRC bridge at Mile Post 187.7 (determined eligible). For more detailed descriptions of these historic sites, see Appendix I.

6.4.3.2 Cultural Landscapes

During a March 5, 2008 meeting with SEA, the State Historic Preservation Officer recommended that the assessment of cultural resources for the Port MacKenzie Rail Extension include an analysis of potential cultural landscapes for dog sledding, recreation, homesteading, and agriculture. The following sections briefly summarize the historical context of each of these potential cultural landscapes and based on the detailed review, provide a preliminary evaluation of their eligibility for inclusion in the National Register. SEA further evaluated the integrity of the dog sledding cultural landscape during the summer of 2009 through additional literature and archival reviews, a series of dog sledding-related interviews, and site visits to kennels and dog sledding clubs in the study area.

Dog Sledding

Description

Dog sledding first appeared in Cook Inlet with the Russian fur traders in the late 1700s and early 1800s. Before the arrival of the Russian fur companies in Cook Inlet, the Dena'ina hauled their belongings by packs or with sleds in the winter and only adopted the practice of using dogs to pull their gear on sleds after the Russian's arrival. The use of dog sleds for transportation and movement of supplies increased dramatically in Alaska, including in the Upper Cook Inlet area, with the gold rush in the late 19th Century and proved to be much more efficient than using horses or mules to haul supplies and mail during long winter months. As the miners came into the Cook Inlet area, small towns and trading posts grew as locations for miners to purchase supplies and to sell their gold and furs. Prospectors would often purchase their supplies of equipment and food in winter and transport them by dog sled to their mining claims farther north. Many miners also trapped for furs to support their prospecting pursuits and families. Knik and Susitna Station were two such hubs that appeared in the Upper Cook Inlet area during the late 1800s and early 1900s. During this gold rush era, besides using dogs to transport supplies or mail, dog races and freight-pulling contests first appeared, the most famous being the All-Alaska Sweepstakes, which first ran in 1908 and began and finished in Nome (Dean, 2005).

As more and more miners came into the Cook Inlet area, a network of dog sled trails, often following early Dena'ina footpaths or natural contours of the land, began to expand across the landscape. Transportation over the numerous wetlands, creeks, lakes, and ponds that cover much of the area between Knik Arm and the Susitna River was most feasible and efficient by dog sled during winter months when the waters froze and snow blanketed the landscape. In response to the need for an overland route to connect Nome to the "Outside" during winter months and in light of recent gold discoveries over 200 miles to the northwest of Knik in Interior Alaska's Innoko District, the U.S. Army's Alaska Road Commission appointed Walter Goodwin to blaze a trail in 1908 from Seward through Cook Inlet at Knik and on to Nome (BLM, 1986). After the discovery of gold in the Iditarod District, located just southwest of the Innoko District, in 1909, this trail later became known as the Iditarod Trail. By the end of the 1920s, the gold rush into the interior had ended and the airplane had begun to replace the dog sled as the major transporter of mail and supplies in Alaska (BLM, 1986). The advent and increasing popularity of snowmachines during the 1960s resulted in the mass abandonment of dog teams across Alaska and loss of much of dog sledding lore (Bowers, undated). Not until the 1970s and the emergence of the world famous Iditarod Race would dog sledding as a recreational activity transition from a local pastime to the official state sport and a focus of winter tourism in Alaska.

The emergence of dog sledding as a popular winter recreational and sporting activity in Alaska and other areas of the world can in part be attributed to certain people living in the Upper Cook Inlet area, including the study area, and associated events beginning in the 1940s. In 1948, Joe Redington Sr., later called the "Father of the Iditarod," moved to Alaska and filed for a homestead near Knik where he started "Knik Kennels" (Page, 2000). In 1967, Joe Redington Sr., Dorothy Page, and the Aurora Dog Mushers Club organized the first Iditarod Trail Seppala Memorial Race. The first running of the race ran between Knik and Big Lake for approximately 27 miles, of which 9 miles ran along the old Iditarod Trail (Iditarod Trail Committee, 2008). By 1973, the race extended from Anchorage to Nome, increased in popularity each year to become the premiere dog sled racing event it is today, and earned itself the name as the "Last Great Race on Earth." Without the contributions of people like Joe Redington Sr., Dorothy Page, and other early dog sledding enthusiasts, and events like the Iditarod Race, the existence of dog sledding as a popular recreational Alaskan pastime would likely not be what it is today, and dog sledding would merely be another chapter in the history of Alaska's development.

In the study area today, dog sledding continues to be a major winter recreational and sporting activity. A number of dog sled kennels operate in the study area, including Knik Kennels, originally started by Joe Redington, Sr., and Happy Trails Kennels, operated out of Big Lake by four-time Iditarod champion Martin Buser. A broad network of trails transecting the study area, both maintained and unmaintained, are used by a variety of users, including dog sledders, for winter recreational and sporting activities. The fame of the Iditarod Dog Sled Race, which originated in and still goes through the study area, has spread from its first Anchorage to Nome race in 1973 comprised of 35 all-Alaskan residents, to 96 contestants in 2008 representing people from Alaska, the Lower 48, and other countries.

The importance of the study area to the dog sledding landscape lies not only in the people and in the series of events related to dog sledding that occurred there, but also to the trails and other historical remains in the study area associated with dog sledding. These events, people, and trails link the historic period of the Iditarod Trail and the mail drivers, prospectors, and adventurers that traveled its route to the world-renowned Iditarod Dog Sled Race of today and the dog racers, recreational sledders, and fans from state, national and even worldwide locations who come to participate in and watch the "Last Great Race on Earth."

Consideration of Eligibility

Dog sledding, its associated trails, and other contributing resources (i.e., dog sledding features such as kennels, clubs, and old roadhouses that have integrity and relate to the periods of significance) in the study area have local, state-level and national significance as a cultural landscape under National Register Criterion A,B, and Criterion Consideration G for events and people related to the Iditarod National Historic Trail and Iditarod Race during the periods 1898 to 1925 and 1967 to 1978. A property can be eligible for the National Register under Criterion A if it was associated with events that have made a significant contribution to the broad patterns of our history and under Criterion B if it was associated with the lives of persons significant in our past. A property achieving significance within the past fifty years is eligible under Criteria Consideration G if it is of exceptional importance. Based on the results of SEA's 2009 dog sledding-related interviews and site visits to the study area, the recommended dog sledding cultural landscape has integrity because the landscape characteristics are present enough to convey the significance of dog sledding related to the Iditarod National Historic Trail and Iditarod Race.

For purposes of this analysis, dog sledding associated with the Iditarod National Historic Trail and Iditarod Race is considered a cultural landscape assumed eligible for inclusion in the National Register. The boundary for contributing resources to the dog sledding landscape extends beyond the study area and would include the remainder of the Iditarod National Historic Trail and other trails, kennels, and locations associated with the landscape's periods of significance. For the EIS however, the dog sledding landscape analysis was limited to the study area. Thus, a preliminary boundary for this landscape in the study area includes the trail network (including the historic trail and race) associated with the 1898 to1925 and 1967 to1978 periods of significance and the buildings, kennels, and locations that contribute to the significance of these periods, including the Aurora Dog Mushers Club, Knik Kennels, and Knik Museum and Dog Mushers Hall of Fame. Figure 6-5 shows the contributing trails and other contributing resources (e.g., kennels, buildings, old roadhouses) identified during the course of SEA's

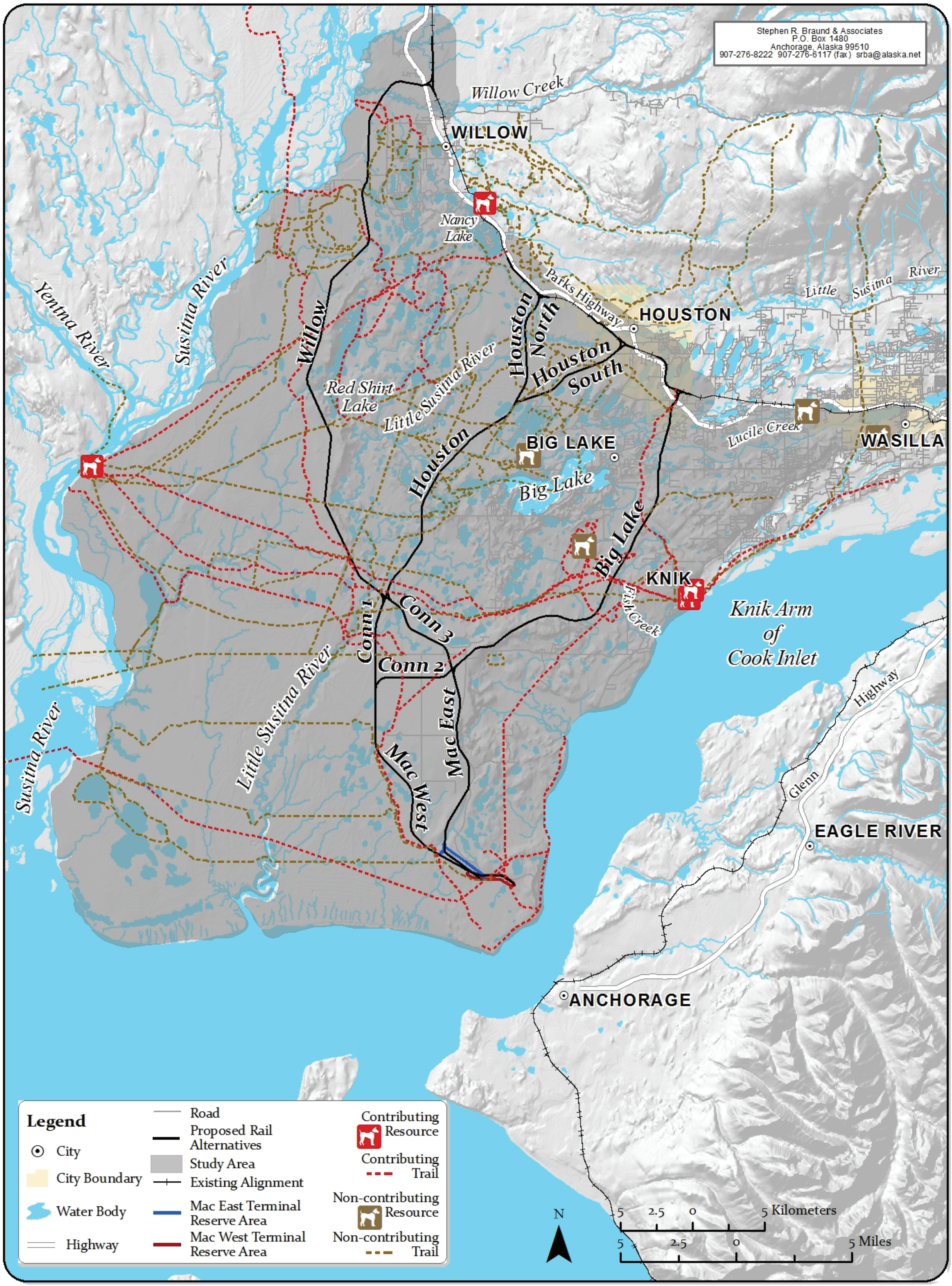


Figure 6-5. Dog Sledding Cultural Landscape

analysis that have integrity and are associated with the dog sledding landscape periods of significance. These 15 contributing trails include the Iditarod National Historic Trail, Iditarod Sled Dog Race Trail, Lucky Shot Trail, Corral Hill Trail, Flathorn Lake Trail, Nancy Lake-Susitna Trail, Red Shirt Lake-Nancy Lake Trail System, Herning Trail, Aurora Dog Mushing Club Trail System, the USGS Transmission Line Trail, and the five USGS Basemap Winter Trails in the study area. Non-contributing resources on Figure 6-5 include trails and other features which are associated with dog sledding but it is unknown at this stage of the research whether they relate to either period of significance or whether they retain integrity.

Recreation

Description

Long before the arrival of Europeans, Alaska Natives participated in cultural games, dancing, story telling, and other recreational activities requiring strength, endurance, agility, and concentration (ANKN, 2006). These activities reflected the skills and knowledge used on a daily basis by Native people to survive Alaska's harsh environment. Russians, and later Americans, brought with them their own forms of recreation. By the time of the great Alaska gold rush in the late 1890s, saloons and gambling halls provided miners an escape from the difficulties and often monotonous daily responsibilities of the miner's life. Dog sled races also appeared during this era as one form of winter recreation. Sporting activities such as baseball, tennis, and hockey became popular recreational activities. Rifle clubs also became popular during this time.

Knik, the largest town site in the study area during the gold rush era, offered many of the same recreational activities found in similar gold rush towns throughout Alaska. By 1915, recreational opportunities in Knik included three saloons, four hotels, a movie house, and a pool hall (MSB, 1985). The pool hall is only one of two buildings remaining from the original Knik town site and now serves as the Knik Museum and Dog Mushers Hall of Fame.

Another area popular with recreational users today and in the past is the Big Lake area. Construction of the U.S. Army's Fort Richardson near Anchorage began in 1940. The Fort served as an important staging area for military operations in Alaska during World War II. In addition to serving as a training area, the Big Lake area quickly became a favorite recreational location for Army and Air Force personnel, particularly for the excellent fishing opportunities. Beginning in the late 1940s and 1950s, several bars and lodges opened in the Big Lake area to cater to the weekend recreationalists. During the 1960s, the study area saw a large influx of recreational users. Paving the road from Wasilla to Big Lake allowed more and more people to easily access Big Lake and enjoy the recreational opportunities the area provided. Popular summer and winter recreational activities included fishing, boating, water skiing, dog sledding, cross-country skiing, and snowmachining.

Soon, Anchorage and Matanuska-Susitna Valley residents were also enjoying recreational opportunities in other nearby areas, such as the Nancy Lake State Recreation Area established in 1966. Too wet for cultivation and lacking an abundance of minerals, the Nancy Lake area escaped large-scale settlement and development and quickly became another prime location for recreation and nature enjoyment (ADNR DOPR, 2008).

Today, winter and summer recreational opportunities in the study area continue to draw residents and tourists. The 2,000-mile-long Iron Dog snowmachine race, which began in 1984, starts in Big Lake, continues to Nome, and ends in Fairbanks. In recent years, the Iditarod Sled Dog Race has also moved its restart location from Wasilla to Willow due to lack of snow cover. The Aurora Dog Musher Club, which hosted the first Iditarod Dog Sled Race, continues to operate in the study area and dog sledding kennels are found in all the communities in the study area, including Knik, Big Lake, Houston, and Willow. Ski, snowmachine, and dog sled trails crisscross the study area and ice fishing continues to be a popular winter activity on many of the lakes. In summer, recreational use shifts toward fishing the lakes, rivers, and creeks for salmon and other fish, and camping, boating, and other outdoor activities. Willow Creek and the Little Susitna River are two of the most popular salmon fisheries in the area. As the population in the Matanuska-Susitna area continues to grow, it is likely that recreational use in the study area will continue to grow and more individuals discover the multiple recreational opportunities available in the study area. The diversity of recreational activities that interest a broad range of users sustains the popularity of this region as a recreational location for Matanuska-Susitna and Anchorage residents. As long as this quality remains, this area will continue to be one of the primary recreational areas in Southcentral Alaska.

Consideration of Eligibility

Other than the potential recreational landscape of dog sledding identified above, there do not appear to be other recreational cultural landscapes in the study area that are eligible for inclusion in the National Register. The recreational historical context of the study area does not appear to have national or state significance. Many of the properties in the area that might be locally significant to the theme of recreation in the Big Lake area have existed for fewer than 50 years and do not show "exceptional importance." Eligibility for exceptional importance requires a property to be associated with the extraordinary importance of an event or to an entire category of resources so fragile that the survivors of any age are unusual (NPS, 1997). Furthermore, should any recreational properties be determined to have exceptional importance, the integrity of many of these locations is likely low due to residential developments over the past 50 years. The Nancy Lake State Recreation Area, while likely retaining much of its historical integrity due to prohibitions on development in the area, is fewer than 50 years old.

For purposes of this analysis, recreation is not considered a cultural landscape eligible for inclusion in the National Register.

Homesteading

Description

As settlement of the United States Territories spread westward into less-populated and developed areas, American families sought to own and work these lands to support families and to grow profitable crops. Congress rejected a number of homestead bills for more than a decade until May 20, 1862, when President Lincoln signed the Homestead Bill into law (Hibbard, 1965). The purpose of the Homestead Act of 1862 was to stimulate growth and development of agricultural regions throughout the United States (BLM, 1954). On May 14, 1898, Congress extended homesteading rights to Alaska.

During the gold rush to the Matanuska and Susitna Valleys in 1903, settlers and disheartened gold seekers began settling in the valleys (MSB, 1994). The community of Knik, once a small Dena'ina Athabascan village, became the site of a trade center in Cook Inlet when entrepreneur George Palmer established a trading post there in 1887. Knik, having Upper Cook Inlet's northernmost port and a direct link to the interior along the historic Iditarod Trail, supplied gold seekers with needed goods and services during the gold rush. By 1915, the population of the Knik area had diminished from a one-time high of 500 individuals to only 132 settlers (MSB, 1985). Although there were a number of homesteaders in the area, after the railroad bypassed the community in 1915 many settlers abandoned Knik and moved to other communities or established new communities along the proposed rail line, including Wasilla, Palmer, and Ship Creek located to the north and east of Knik Arm. By 1917, Knik was nearly empty.

With the exception of the then-bustling town of Knik, few settlers inhabited the Matanuska and Susitna Valleys between 1898 and 1915. After development of the railroad and establishment of Anchorage in 1915, homesteaders with forethought and marketable agricultural products tried to situate themselves near large market areas or along railroad stops to have a means to transport their products. Anchorage was the largest local market for fresh items from the Matanuska Valley, and with the railroad passing through the Wasilla and Palmer areas, the two areas grew quickly into sizable communities.

Figure 6-6 shows the Public Land Survey System sections between and immediately adjacent to the proposed rail line alternatives in which homesteaders received title to their land. The title or homestead patent was granted after the homesteader had fulfilled all the requirements of the Homestead Act. The first homesteader in this area received title to their land beginning in 1920, with only an additional eight homesteaders receiving title between 1920 and 1948 (BLM, 2008). Although Wasilla and Palmer increased in population due to access along the railroad, the study area experienced less of a settlement influx. The study area had few roads through which settlers could access the land and access to most areas was limited to dog sled trails. The few settlers who did establish homesteads settled in rail-stop communities such as Willow and Houston. It is not known how many settlers established homesteads in the study area and either never applied for or failed to receive title to the land.

There was an increase in homesteaders in the area claiming title to their land between 1949 and 1970 (Figure 6-7). The numbers in Figure 6-7 reflect the years in which settlers received title to the land, being at least 3 years beyond the time of arrival. This figure shows a notable increase in patented homesteads in the study area in 1949 and during the 1950s, with a substantial increase in the early to mid-1960s. The year 1963 represents the peak homestead activity in the study area, with 54 patents. The beginning of the increase in homesteads coincided with the end of World War II and an influx of veteran soldiers returning to homestead in the area. Increased access to Alaska and the Matanuska-Susitna Valley became available via the Alcan Highway, and Glenn and George Parks Highways during this time. Access to the Big Lake area was upgraded in 1951 from a bumpy jeep trail to a rough gravel road that was eventually paved in 1961. The improvements to the Big Lake road in both 1951 and 1961 increased access to the area for settlement and recreation.

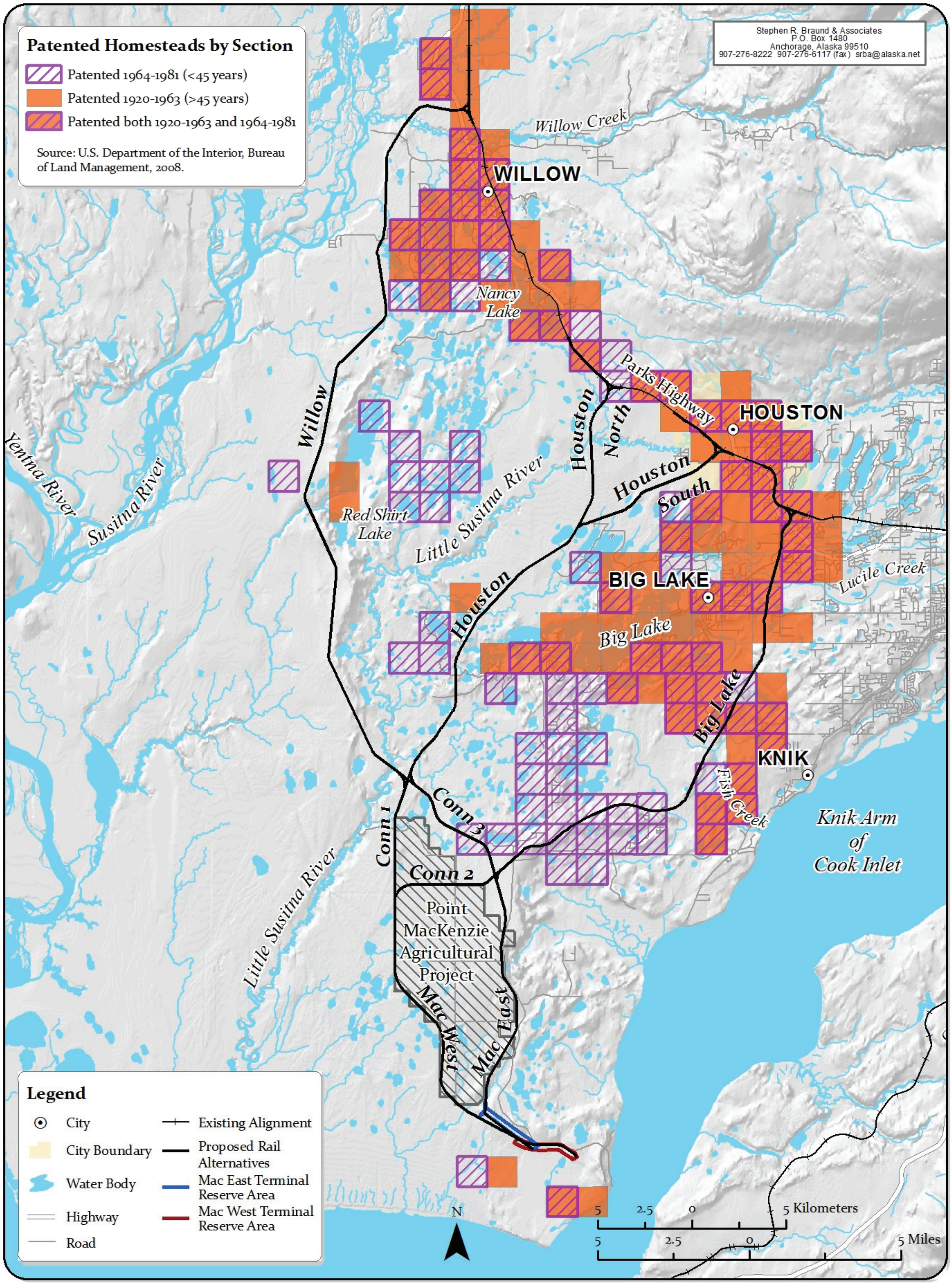


Figure 6-6. Patented Homesteads by Public Land Survey System Section, 1920 to 1981

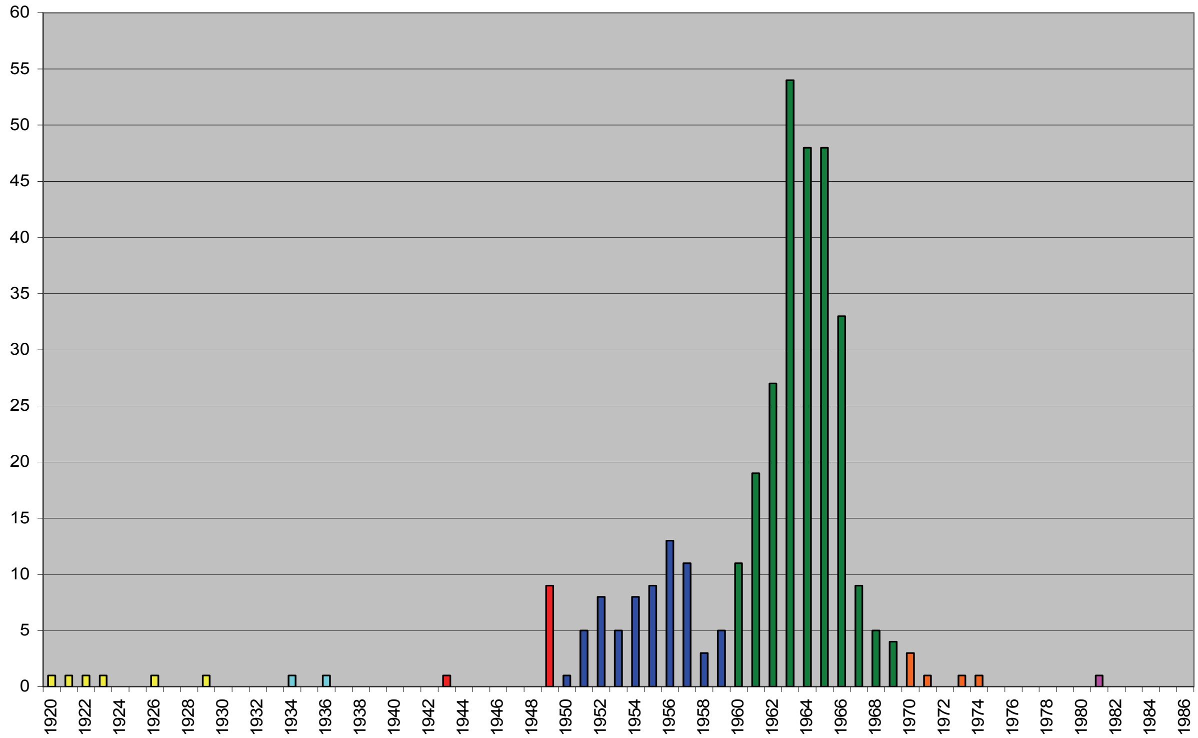


Figure 6-7. Patented Homesteads in the Study Area by Year

Homesteading in the area shown on Figure 6-6 decreased toward the end of the 1960s and into the 1970s. In 1967, only 9 homesteads received patents, down from 33 the previous year. The numbers of patented homesteads decreased each year until 1974. From that time, no homesteads received patents until 1981, the last year any homestead received a patent in the area between and immediately adjacent to the proposed rail line alternatives. The decline in homesteading coincided with the diminishing availability of large acre parcels along roads and the existing rail line.

Although the number of roads increased and homesteads extended farther beyond the railroad as the state built more roads in the Matanuska-Susitna Valley, much of the study area remained remote and inaccessible. The increase in the use of small airplanes aided homesteaders in reaching more remote areas. In 1977, Congress repealed the Homestead Act; however, the State of Alaska was exempt from the repeal of the Homestead Act until 1986 (BLM, 2001).

In total, 351 homesteads received patents in the Public Land Survey System sections between and immediately adjacent to the proposed rail line alternatives between 1920 and 1981. Of the 351 homesteads, 258 received patents during the 1960s. Today, as the Matanuska-Susitna Valley has developed into a suburb for people working in Anchorage, owners of homesteads and agricultural lands have sold and subdivided their land to accommodate the population growth. The economic returns are greater for selling the land for subdivision and development than selling the land as an intact homestead or developing it for agricultural purposes (Fowler, 1992).

Consideration of Eligibility

Preliminary analysis indicates that the homesteads in the area shown in Figure 6-6 do not appear eligible for inclusion in the National Register as a cultural landscape having state or national significance. When comparing the homestead settlement patterns in this area to those in the nearby Wasilla and Palmer areas, the Wasilla and Palmer areas are more representative of the United States and State of Alaska settlement patterns. Settlers claimed homesteads throughout the study area, built homes, and cultivated the land; however, these homesteads do not significantly contribute to the state or national historic contexts.

Individual homesteads in the study area might be eligible for inclusion in the National Register as a cultural landscape under Criterion A for their significance in the local historical context. These homesteads might be important in understanding the settlements of the Matanuska-Susitna Valley from 1948 through 1966, when a large number of homesteads received title. However, many homesteads and agricultural lands have since been sold and subdivided to accommodate population growth in the Matanuska-Susitna Valley. Thus, it is likely that the integrity of many homesteads in the study area is diminished.

For purposes of this analysis, homesteads are not considered a cultural landscape eligible for inclusion in the National Register.

Agriculture

Description

There has been little agriculture in the study area aside from the required cultivation of homestead lands. During Russian settlement of Alaska in the late 1700s and early 1800s, agriculture existed on a small scale to supplement Russian food needs. However, even with this agriculture, these settlers remained dependent on imported foods throughout their time in Alaska (Miller, 1975).

The building of the Alaska Railroad through the Matanuska-Susitna Valley, which began in 1915, brought an influx of settlers into the region. The railroad followed the northern reaches of the valleys from Wasilla to Houston to Willow, leaving large expanses of available homestead and agricultural lands to the south with no rail access. During these early years, most settlers in the study area established their homesteads along the railroad between Willow and Houston and eventually around Big Lake after access to that area improved. With inadequate transportation to move produce or crops to markets, commercial farmers were unable to make a profit. Aside from homesteaders growing small crops to feed themselves and their families, agriculture did not play any large role in the settlement of the study area. Agriculture did appear on a large scale in the Matanuska Valley in the mid 1930s with the creation of President Roosevelt's New Deal program. The New Deal, however, set aside most of these agricultural areas in the Matanuska Valley area around present-day Palmer and Wasilla.

In the early 1980s, the Point MacKenzie area eventually became host to the Point MacKenzie Agricultural Project (Figure 6-6) where 15,000 acres were divided into tracts for dairy farms, feed crops, and cattle ranches (Snodgrass *et al.,* 1982). Many of the farmers participated in the Point MacKenzie Dairy Project and sold their product to the Matanuska Maid milk processor in

Anchorage. Between 1985 and 1987, however, the state experienced a recession that adversely affected the farms when the price of milk dropped. Many farms eventually filed bankruptcy. Only two dairy producers in the Point MacKenzie Dairy Project were in business by 1992 (Fowler, 1992).

Consideration of Eligibility

Agriculture did not play an important role in the settlement and history of the study area. Aside from the agricultural project at Point MacKenzie in the 1980s, no substantial agricultural community ever became established in the study area. Most agricultural activities in the Matanuska and Susitna Valleys occurred and flourished in the Palmer and Wasilla areas to the east of the study area.

Because agriculture in the study area is not significant in the local, state, or national historic context, properties used for agriculture are not eligible for inclusion in the National Register as a cultural landscape. For purposes of this analysis, agricultural properties are not considered a cultural landscape eligible for inclusion on the National Register.

6.5 Environmental Consequences

All cultural resources found in the study area are assumed to be eligible for inclusion on the National Register unless otherwise noted. The determination of potential adverse impacts is based on whether the undertaking would result in effects to cultural resources sufficient to make the properties ineligible for inclusion in the National Register. This includes effects that would change the property's integrity of location, design, setting, materials, workmanship, feeling and/or association (36 CFR 60.4). As described in Section 6.4.3, there are several categories of cultural resources the project could affect, including archaeological sites, historic trails, buildings, structures and sites, and cultural landscapes. For those cultural resources found to meet National Register criteria within the area of potential effects, compliance with Section 106 regulations would also include an application of the criteria of adverse effect (36 CFR 800.5), as follows.

An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative.

Adverse effects on historic properties include, but are not limited to:

(i) Physical destruction of or damage to all or part of the property;

(ii) Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation and provision of handicapped access, that is not

consistent with the Secretary's Standards for the Treatment of Historic Properties (36 CFR part 68) and applicable guidelines;

(iii) Removal of the property from its historic location;

(iv) Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance;

(v) Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features;

(vi) Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and

(vii) Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long term preservation of the property's historic significance.

The NHPA Section 106 Programmatic Agreement (PA) being developed for this project (see Appendix J) would provide a mechanism to fully evaluate which properties are listed in or eligible for listing in the National Register, what their significant historic features are, and whether those properties would be adversely affected by the proposed project.

6.5.1 Proposed Action

6.5.1.1 Common Impacts

Construction of a rail line could possibly damage archaeological sites that cannot be avoided. Introduction of a rail line could have visual elements that reduce the integrity of the dog sledding cultural landscape. Rail operations, which are anticipated to be one to two trains per day, could introduce train noise effects to nearby structures of historic age. The dog sledding cultural landscape along the rail line could suffer long-term adverse effects due to trespassing concerns, and cultural privacy issues. In order for any of these potential effects to be considered adverse, the introduction of visual, atmospheric or audible elements would have to diminish the integrity of the property's significant historic features (36 CFR 800.5(2)(v)).

As concluded in Chapter 9, noise and vibration during construction and operations is not anticipated to be adverse. The estimated construction noise level would be below the Federal Transit Administration (FTA) criteria for an adverse impact. Similarly, estimated vibration levels from general construction activity would be below the FTA 0.20 inch per second fragile building damage criterion (FTA, 2006), so no building damage would be anticipated.

An increase of two trains per day along the existing main line would increase noise less than 3 dBA and would not cause adverse noise impacts. Based on the anticipated average train speed of 40 miles per hour on the proposed rail line, the contour for the FTA fragile building damage criterion would be 10 feet wide (5 feet on each side of the track centerline). There would be no buildings within 5 feet of the rail line, so there would be no damage to buildings due to vibration from rail line operations. For an average speed of 40 miles per hour, the vibration annoyance contour along the proposed rail line would be 80 feet from the track centerline. There would not be any receptors within that distance, which would be within the proposed rail line's 200-foot right-of-way. Therefore, there would be no vibration impacts from proposed rail line operations.

Archaeological Sites

Archaeological sites in the rail line ROW could be inadvertently or purposefully destroyed through surface and subsurface disturbances, primarily during construction. Therefore, these sites would lose their eligibility for listing in the National Register. Such disturbances would include soil removal or other operations that could cause erosion or contamination and could destroy the context of the archaeological site and its overall integrity. The numerous salmon streams in the area are host to archaeological sites in and adjacent to the streambeds. Proposed rail crossings of these streams, and changes in stream flow, could affect those archaeological sites.

Historic Trails, Structures, and Sites

Cabins and other structures, and historic sites within the ROW would be disturbed or destroyed. Historic and potentially historic trails would be blocked in the case of unofficial trails. Officially recognized trails would be grade-separated or relocated, facilitating free passage; however, the integrity of any historic trails would still be adversely affected through the introduction of auditory and visual effects. Historic properties within 1 mile of the ROW could be adversely affected and lose their context and integrity through visual and audible effects. The sight of a railroad in the viewscape would be an adverse effect, as would the noise of passing trains, and construction and support vehicles. Trail blockage of officially recognized and unofficial trails could occur during construction, and unofficial trails would be blocked during rail line operation. Depending on the timing of construction activities and/or locations of installed crossings, some trail routes may be altered. Changes to dog sled, snowmachine, and all-terrain vehicle routes could cause the loss of access to or use of the trails and associated historic landscapes and properties. All of the alternatives would cross the Iditarod National Historic Trail, thereby increasing the visual and auditory effects on the historic integrity of the trail and its ancillary network.

Cultural Landscapes

The dog sledding cultural landscape would be adversely affected to varying degrees through loss of visual integrity, cultural privacy, potential loss of or changes to access, increased numbers of visitors or users, and changes to traditional or culturally significant use of and connection to the property. It is likely that the proposed rail line would affect the dog sledding cultural landscape, because noise and visual effects would reduce the quality of this landscape for users. Officially recognized trails would be grade-separated, thereby reducing impediments to free passage. However, the integrity of any historic trails would still be adversely affected through the introduction of auditory and visual effects, and access across the study area by dog sledders who travel across unofficial trails that are contributing resources to the dog sledding landscape would be impeded. Furthermore, contributing trails (e.g., Corral Hill Trail) that would not be crossed could be adversely affected by the proposed rail line if the rail line blocks non-contributing trails (e.g., parts of the West Gateway Trail System) that are used to access the contributing trails (see Figure 6-5). Recreation, homesteading, and agriculture landscapes are not considered eligible for inclusion in the National Register, therefore no effects analysis is provided in this section because they are not historic properties.

6.5.1.2 Impacts by Rail Line Segment

Southern Segment Combinations

Mac West-Connector 1 Segment Combination

These segments would cross the historic Knik-Susitna Station mail trail (also known as the Iditarod National Historic Trail). There are six more known cultural resources outside the proposed ROW but within 1 mile of the centerline (Table 6-3). Much of these segments would cross wetlands and agricultural fields. Relatively little field survey was performed along this segment because wetlands and agricultural fields are considered to have a low probability for having cultural resources (Figure 6-2). Potential adverse effects could include diminishing the integrity of the historic trail, and potential indirect effects to an additional six known sites. An indirect impact to cultural resources would be one caused by proximity of the proposed rail line to cultural resources, which would result in the cultural resource being more vulnerable to damage by project personnel and/or rail line construction and operations. Six trails considered to be contributing resources to the dog sledding landscape would be intersected by the ROW for this segment combination (Table 6-3; Figure 6-5). One trail would be intersected more than once by this segment. Types of potential impacts to the contributing resources of the dog sledding landscape are discussed in 6.5.1.1 under *Cultural Landscapes* and would be the same for each segment combination except for the number of trails potentially affected.

Table 6-3
Southern Segments - Known Cultural Resources within the Project Area and Right-of-Way

Segment	Historic Trails Intersected by Right-of-Way	Known Cultural Resources within 200-Foot Right-of-Way	Additional Known Cultural Resources within Project Area[a]	Known Dog Sledding Contributing Resource Trails Intersected by Right-of-Way	Total
Mac West-Connector 1	1	0	6	6	13
Mac West-Connector 2	1	0	5	5	11
Mac East-Connector 3	1	4	11	1	17

[a] Outside the 200-Foot ROW but within 1 mile of the centerline. One mile equals the maximum extent for potential indirect auditory and direct visual effects, as described in Section 6.2.

Mac West-Connector 2 Segment Combination

These segments would cross the Knik-Susitna Station mail trail, and approach five additional known cultural resources outside the proposed ROW but within 1 mile of the centerline. Much of these segments would cross wetlands and agricultural fields. Relatively little field survey was performed along these segments because wetlands and agricultural fields are considered to have a low probability for having cultural resources (Figure 6-2). Potential adverse effects could include diminishing the integrity of one historic trial, and potential indirect effects to an additional five known sites. Five trails considered to be contributing resources to the dog sledding landscape would be intersected by the ROW for this segment combination (Table 6-3; Figure 6-5). One trail would be crossed multiple times by this segment.

Mac East-Connector 3 Segment Combination

These segments would cross the Knik-Susitna Station mail trail, and intersect four known cultural resources within the proposed ROW, and approach 11 known cultural resources outside the proposed ROW but within 1 mile of the centerline. Of the three southern segment combinations, this segment combination was surveyed the most because it has a relatively high probability for archaeological and historic sites (Figure 6-2). Potential adverse effects could include diminishing the integrity of one historic trail, the destruction or disturbance during construction of four known archaeological sites, and potential indirect impacts to 11 additional known cultural resources. One trail considered to be contributing resources to the dog sledding landscape would be intersected by the ROW for this segment combination (Table 6-4; Figure 6-5).

Table 6-4
Northern Segments - Known Cultural Resources within the Project Area and Right-of-Way

Segment	Historic Trails Intersected by Right-of-Way	Known Cultural Resources within 200-Foot Right-of-Way	Additional Known Cultural Resources within Project Area[a]	Known Dog Sledding Contributing Resource Trails Intersected by Right-of-Way[b]	Total
Willow	3	13	13	6	35
Big Lake	2	6	16	4	28
Houston-Houston North	1	0	7	2	10
Houston-Houston South	1	1	4	2	8

[a] Outside the 200-Foot ROW but within 1 mile of the centerline. One mile equals the maximum extent for indirect auditory and direct visual effects, as described in Section 6.2.
[b] Number may include historic trails identified under "Historic Trails Intersected by Right-of-Way" column

Northern Segment and Segment Combinations

Willow Segment

The Willow Segment would cross the Iditarod National Historic Trail and other trail systems, intersect 13 known cultural resources within the proposed ROW, and would approach an additional 13 known cultural resources outside the proposed ROW but within 1 mile of the centerline (Table 6-4). Field archaeology crews surveyed relatively few miles of this segment. However, the survey revealed numerous cultural resources within and near the ROW. This segment is also considered to have a high probability for containing cultural resources because it would cross relatively few wetland areas (considered to have low potential for cultural resources) and would be near areas considered to have a high probability for cultural resources, such as areas with previously documented cultural resources, Dena'ina placenames, trails, streams, lakeshores, and ridgelines (Figure 6-2). Potential adverse effects could include diminishing the integrity of three historic trail crossings, disturbing or destroying 13 known archaeological sites during construction, and potentially indirectly affecting 13 additional known cultural resources. Parts of this segment have a history as a trail route for Dena'ina people traveling overland from Cook Inlet to villages at Red Shirt and other lakes and on to Talkeetna and other more distant places (Kari and Fall, 2003). Six trails considered to be contributing resources to the dog sledding landscape would be intersected by the ROW (Table 6-4; Figure 6-5). Several trails would be intersected more than once by this segment.

Big Lake Segment

This segment would cross the Iditarod National Historic Trail once and the Knik-Susitna Station mail route twice, and intersect six known cultural resources within the proposed ROW, and approach 16 additional known cultural resources outside the proposed ROW but within 1 mile of the centerline. This segment, with a substantial amount of dry, well-drained ground and elevated ridgelines, had the most field survey of the northern segments and is considered to have a high potential for cultural resources (Figure 6-2). The survey of this segment revealed a total of eight previously undocumented cultural resources. Potential adverse effects could include diminished integrity of 3 trail crossings, 6 archaeological sites disturbed or destroyed, and 16 additional cultural resources indirectly affected. Four trails considered to be contributing resources to the dog sledding landscape would be intersected by the ROW (Table 6-4; Figure 6-5). Some of these trails would be crossed multiple times in different locations along the Big Lake segment.

Houston-Houston North Segment Combination

These segments would intersect one historic trail and would approach seven additional known cultural resources outside the proposed ROW but within 1 mile of the centerline. Except for a short survey along a portion of the Houston Segment (Figure 6-2), this alternative segment received no additional field survey. However, much of the segment crosses large areas of wetlands, which have low potential for cultural resources. A few high- to moderate-probability areas along this segment include the stream crossings and elevated hummocks and hills in the ROW, which might host cultural resources. Proposed rail line construction and operations along this segment could indirectly affect seven known archaeological sites that are outside the ROW. Two trails considered to be contributing resources to the dog sledding landscape would be intersected by the ROW (Table 6-4; Figure 6-5).

Houston-Houston South Segment Combination

These segments would intersect one historic trail, one known cultural resource, an old ARRC railroad bridge within the proposed ROW, and would approach four other known cultural resources outside the proposed ROW but within 1 mile of the centerline. The area has numerous all-terrain vehicle trails, but none are presently listed as historic or potentially historic. Field archaeologists surveyed a small portion of this segment. The northern portion of this area appears to have been profoundly affected by the Miller's Reach fire and the area is covered with charred, fallen spruces; the southern portion would cross large areas of wetlands considered to have a low potential for having cultural resources (Figure 6-2). Three of the known cultural resources near this segment are railroad associated, and additional railroad construction and activity would have no indirect adverse effect on these resources. Two trails considered to be contributing resources to the dog sledding landscape would be intersected by the ROW (Table 6-4; Figure 6-5).

Summary of Impacts by Alternative

Table 6-5 lists the eight rail line alternatives and the number of known cultural resources and dog sledding landscape contributing trails each could affect. The Mac East-Connector 3-Willow Alternative would affect the most known cultural resources and pass through areas with a high probability of having large numbers of undocumented cultural resources. The Mac West-Connector 1-Houston-Houston South Alternative would affect the fewest known cultural resources and pass through areas with a low probability (e.g., wetlands) of having large numbers of undocumented cultural resources (Figure 6-8).

Table 6-5
Summary of Impacts to Cultural Resources by Alternative[a]

Alternative	Historic Trails Intersected by Right-of-Way	Known Cultural Resources within the 200-Foot Right-of-Way	Additional Known Cultural Resources within Project Area[b]	Known Dog Sledding Contributing Resource Trails Intersected by Right-of-Way[c]	Total
Mac East-Connector 3-Willow	4	17	23	7	51
Mac West-Connector 1-Willow	4	13	18	11	46
Mac East-Big Lake	2	10	23	4	39
Mac West-Connector 2-Big Lake	2	6	19	9	36
Mac East-Connector 3-Houston-Houston North	2	4	17	3	26
Mac East-Connector 3-Houston-Houston South	2	5	14	3	24
Mac West-Connector 1-Houston-Houston North	2	0	12	8	22
Mac West-Connector 1-Houston-Houston South	2	1	9	8	20

[a] The numbers in Table 6-5 do not equal the sum of the numbers in Tables 6-3 and 6-4. The same cultural resource may have been within a mile of both a northern and southern segment and when the segments were combined in an alternative (as shown in Table 6-5) the cultural resource was only counted once.

[b] Outside the 200-Foot ROW but within 1 mile of the centerline. One mile equals the maximum extent for indirect auditory and direct visual effects, as described in Section 6.2.

[c] Number may include historic trails identified under “Historic Trails Intersected by Right-of-Way” column

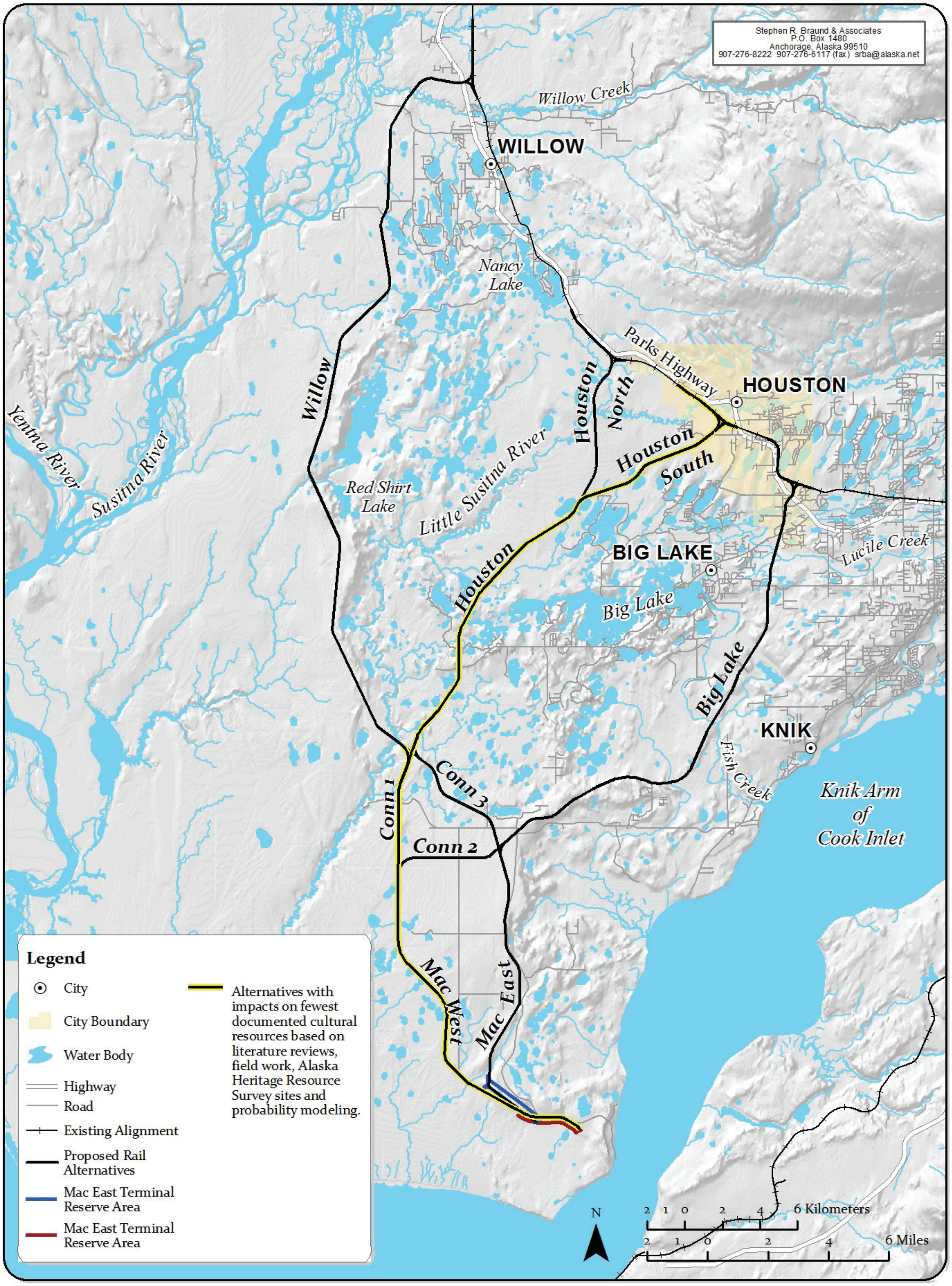


Figure 6-8. Alternative with Impacts on Fewest Documented Cultural Resources

Adverse effects to cultural resources could be mitigated by minor rerouting of any alternative that may be authorized by the Board, to avoid known cultural resources within the ROW. If avoidance is not possible, mitigation could include data recovery for archaeological sites, maintaining accessibility of historic trail crossings, implementing noise and vibration reduction measures, and minimizing visual impacts.

6.5.2 No-Action Alternative

Under the No-Action Alternative, ARRC would not construct and operate the proposed Port MacKenzie Rail Extension, and there would be no cultural resource impacts from the project.

Programmatic Agreement

SEA has developed a draft PA for the Port MacKenzie Rail Extension that would govern the completion of the Section 106 process (Appendix J). The regulations implementing Section 106 allow for the development of a PA when the effects on historic properties cannot be fully determined prior to approval of an undertaking (36 CFR 800.14.). The draft PA for the Port MacKenzie Rail Extension provides for the completion of the Level 2 identification survey if the Board authorizes the project. Additionally, the PA establishes responsibilities for the treatment of historic properties, the implementation of mitigation measures, and ongoing consultation efforts. Part of the ongoing consultation efforts related to the dog sledding cultural landscape will focus on further clarification and identification of features currently considered non-contributing resources for this EIS but requiring further investigation. As a part of this process, the integrity of these resources will become known and research will indicate whether they were constructed within the period of significance of the cultural landscape. If any additional contributing resources not identified in this EIS become known, potential effects will be assessed through the PA process. See *Tribal Consultation* below regarding how the results of consultation with the tribes will be incorporated into the PA and Section 106 process.

6.5.3 Tribal Consultation

Consultation with Native American tribes in the vicinity of the Port MacKenzie Rail Extension project area is ongoing. Consultation was initiated as part of the government-to-government consultation and coordination for this EIS process. A total of 10 Federally Recognized Tribes, tribal groups, and Alaska Native Regional Corporations have been contacted as part of the government-to-government consultation and coordination. Several consultation meetings to date regarding Section 106 consultation and cultural resource issues have occurred between SEA and the State Historic Preservation Office(r) (SHPO), Matanuska-Susitna Borough Historic Preservation Commission and Knik Tribal Council. As a result of the March 5, 2008 and February 24, 2009 consultation meeting with SHPO, four potential cultural landscapes of dog sledding, recreation, homesteading, and agriculture have been evaluated for eligibility to the NRHP and potential effects from the Port MacKenzie Rail Extension on eligible landscapes have been assessed for this EIS. Consultation meetings with the Knik Tribal Council and the Matanuska-Susitna Borough Historic Preservation Commission on February 27, 2009, April 3, 2009, and May 15, 2009 resulted in the identification of the additional potential Dena'ina cultural landscape. The May 15th consultation meeting also resulted in the suggestion to look at the dog sledding and Dena'ina landscapes in the broader theme of a potential transportation landscape in the study area. Evaluation of the study area as a transportation landscape is ongoing and its eligibility or ineligibility for listing in the National Register will be determined during the Section 106 process through the PA.

In response to the consultation requests, documentation of the potential Dena'ina landscape began in June 2009 with a series of interviews with Dena'ina respondents living near and within the study area. These interviews focused on identifying landscape characteristics that typified historic uses and questions regarding continued use of the study area as part of an ongoing Dena'ina cultural legacy. Landscape characteristics identified during this process included circulation features (e.g., trails and water routes), archaeological sites, land use, and cultural traditions. This documentation as well as evaluation of the integrity of identified Dena'ina landscape characteristics is ongoing. Any additional information about the landscape's potential eligibility that is acquired through consultation, research, or field investigation after the DEIS will be included in the FEIS. If the Dena'ina cultural landscape is determined eligible, potential effects would be analyzed and mitigated through the Section 106 process and PA mechanism.

7. SUBSISTENCE

Subsistence uses are central to the customs and traditions of many cultural groups in Alaska, including the peoples of Southcentral Alaska. Subsistence customs and traditions encompass processing, sharing, redistribution networks, and cooperative and individual hunting, fishing, and ceremonial activities. Both Federal and state regulations define subsistence uses to include the customary and traditional uses of wild renewable resources for food, shelter, fuel, clothing, and other uses (Alaska National Interest Lands Conservation Act, Title VIII, Section 803, and Alaska Statute (AS) 16.05.940[33]). The Alaska Federation of Natives not only views subsistence as the traditional hunting, fishing, and gathering of wild resources, but also recognizes the spiritual and cultural importance of subsistence in forming Native peoples' worldview and maintaining ties to their ancient cultures (AFN, 2005).

Subsistence fishing and hunting are traditional activities that help transmit cultural knowledge between generations, maintain the connection of people to their land and environment, and support healthy diet and nutrition in almost all rural communities in Alaska. The Alaska Department of Fish and Game (ADF&G) estimates that the annual wild food harvest in rural areas of Southcentral Alaska is approximately 1.7 million pounds, or 153 pounds per person per year (Wolfe, 2000). Subsistence harvest levels vary widely from one community to the next. Sharing of subsistence foods is common in rural Alaska and can exceed 80 percent of households giving or receiving resources (ADF&G, 2001). The term harvest and its variants – harvesters and harvested – are used as the inclusive term to characterize the broad spectrum of subsistence activities, including hunting, fishing, and gathering.

This chapter summarizes the regulations governing subsistence uses in the area of the proposed Port MacKenzie Rail Extension (Section 7.1), defines the study area (Section 7.2), describes the methods SEA used to analyze impacts to subsistence (Section 7.3), describes subsistence resources and uses in and around the project area (Section 7.4), and describes potential impacts to subsistence uses resulting from the Port MacKenzie Rail Extension (Section 7.5).

7.1 Regulatory Setting

Alaska and the Federal Government regulate subsistence hunting and fishing in the state under a dual management system. The Federal Government recognizes subsistence priorities for rural residents on Federal public lands, while Alaska considers all residents to have an equal right to participate in subsistence hunting and fishing when resource abundance and harvestable surpluses are sufficient to meet the demand for all subsistence and other uses.

7.1.1 Federal Regulations

The U.S. Congress adopted the Alaska National Interest Lands Conservation Act recognizing that "the situation in Alaska is unique" regarding food supplies and subsistence practices. The Act specifies that any decision to withdraw, reserve, lease, or permit the use, occupancy, or disposition of public lands must evaluate the effects of such decisions on subsistence use and needs (16 United States Code [U.S.C.] 3111-3126). In 2005, the U.S. Department of the Interior and the U.S. Department of Agriculture established a Federal Subsistence Board to administer the Federal Subsistence Management Program (70 *Federal Register* [*FR*] 76400). The Federal Subsistence Board, under Title VIII of the Alaska National Interest Lands Conservation Act and regulations at 36 Code of Federal Regulations (CFR) 242.1 and 50 CFR 100.1, recognizes and regulates subsistence practices for rural residents on Federal lands. Federal regulations recognize subsistence activities based on a person's residence in Alaska, defined as either rural or nonrural. Only individuals who permanently reside outside federally designated nonrural areas are considered rural residents and qualify for subsistence harvesting on Federal lands. However, Federal subsistence regulations do not apply to certain Federal lands, regardless of residents' rural designations. These include lands withdrawn for military use that are closed to general public access (50 CFR Part 100.3). However, because there are no Federal public lands within or near the proposed rail line project area, these regulations do not apply.

7.1.2 State Regulations

The Alaska Board of Fisheries and the Alaska Board of Game have adopted regulations enforced by the state for subsistence fishing and hunting on all State of Alaska lands and waters, and lands conveyed to Alaska Native Claims Settlement Act groups. State law is based on AS 16 and Title 5 of the Alaska Administrative Code (AAC) (05 AAC 01, 02, 85, 92, and 99) and regulates state subsistence uses. Under Alaska law, when there is sufficient harvestable surplus to provide for all subsistence and other uses, all residents qualify as eligible subsistence users. The state distinguishes subsistence harvests from personal use, sport, or commercial harvests based on where the harvest occurs, not where the harvester resides (as is the case under Federal law). More specifically, state law provides for subsistence hunting and fishing regulations in areas outside the boundaries of "nonsubsistence areas," as defined in state regulations (5 AAC 99.015). According to these regulations, a nonsubsistence area is "an area or community where dependence upon subsistence is not a principal characteristic of the economy, culture, and way of life of the area of community" (5 AAC 99.016). Activities permitted in these nonsubsistence areas include general hunting and personal use, sport, guided sport, and commercial fishing. There is no subsistence priority in these areas; therefore, no subsistence hunting or fishing regulations manage the harvest of resources. Nonsubsistence areas in Alaska include the areas around Anchorage, Matanuska-Susitna Valley, Kenai, Fairbanks, Juneau, Ketchikan, and Valdez (Wolfe, 2000).

The project area is comprised only of public and private lands, and the entire proposed Port MacKenzie Rail Extension would lie within the state-designated Anchorage-Matsu-Kenai nonsubsistence area (Figure 7-1). Therefore, all hunting and fishing activities in and around the potential rail extension alternatives are regulated under state sport, personal use, and commercial regulations.

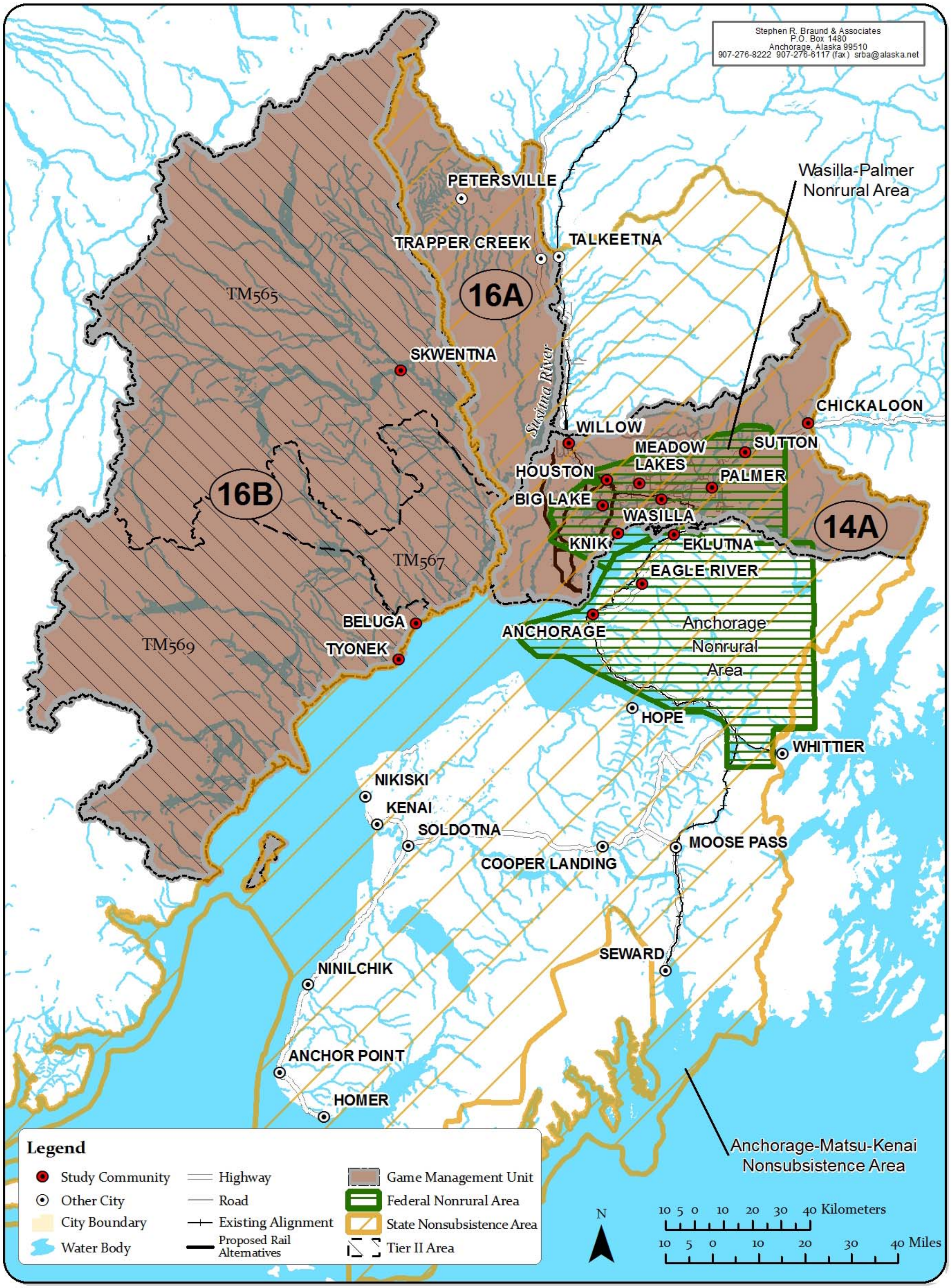


Figure 7-1. State of Alaska and Federal Subsistence Management Boundaries

7.2 Study Area

The subsistence study area for the Port MacKenzie Rail Extension includes communities that might harvest subsistence resources in or near the project area, use project area lands to access other lands for wildlife harvests, or harvest resources that migrate through the project area and are later harvested in other areas. These communities include the Municipality of Anchorage (Eklutna, Chugiak, Eagle River, Rainbow, Indian, Bird Creek, Girdwood, and Portage), Beluga, Big Lake, Houston, Meadow Lakes, Palmer, Skwentna, Sutton, Tyonek, Wasilla, and Willow (Figure 7-2). The study area also includes federally recognized "Native Entities within the State of Alaska," as listed in 73 *FR* 66, nearest the project area – Chickaloon Native Village, Eklutna Native Village, Knik Tribe, and Native Village of Tyonek. These tribes could have traditional and current resource uses, including customary and traditional, educational, or ceremonial uses in or near the project area. The project area includes eight alternatives, the longest consisting of the Mac West, Connector 1, and Willow segments, and the shortest consisting of the Mac East and Big Lake segments, paralleling Knik-Goose Bay Road and Port MacKenzie Road to the Port site. For purposes of this analysis, the project area also includes those lands between and immediately adjacent to the proposed alternatives (Figure 7-1).

7.3 Analysis Methodology

Because there is no subsistence harvesting in the project area under either state or Federal subsistence regulations, the description of the affected environment in Section 7.4 focuses on Game Management Unit (GMU) 16B. GMU 16B is located west of the Susitna River and approximately 15 to 20 miles from the proposed rail line. GMU 16B is the area nearest the proposed rail extension that is managed for subsistence harvests, has subsistence resources that may migrate into the area from project area lands, and has subsistence users from study area communities which use the project area lands to access this GMU (Figure 7-1). GMUs are state management areas defined by ADF&G, each with its own set of regulations governing the harvest limit and timing of hunts for various wildlife species in that unit. Many of the GMUs are further divided into subunits with additional regulations. Except for GMU 16B, all other lands open to subsistence are far away from the project area and subsistence impacts would not be expected. In addition, any potential impacts from the proposed rail line on resources that migrate through the project area to areas other than west of the Susitna River are subject to considerable non-project influences, given the existing impacts to subsistence resources created by developed areas (for example, the communities of Big Lake, Houston, Wasilla, and Palmer) near the project area. Therefore, the following sections focus on subsistence uses by communities in lands west of the Susitna River within GMU 16B. In addition to subsistence uses in GMU 16B, traditional uses of federally recognized Native entities within the State of Alaska who use the study area are examined. Although these traditional use areas are now in a nonsubsistence area, these Native entities have a traditional connection to the land and still consider their use of the land as subsistence. Federal provisions under 16 U.S.C. 3111-3126 require the evaluation of effects on subsistence uses, and while these traditional uses by the Native entities are no longer regulated under subsistence regulations, they are still considered subsistence by the Native people, and it is useful to acknowledge these traditional activities.

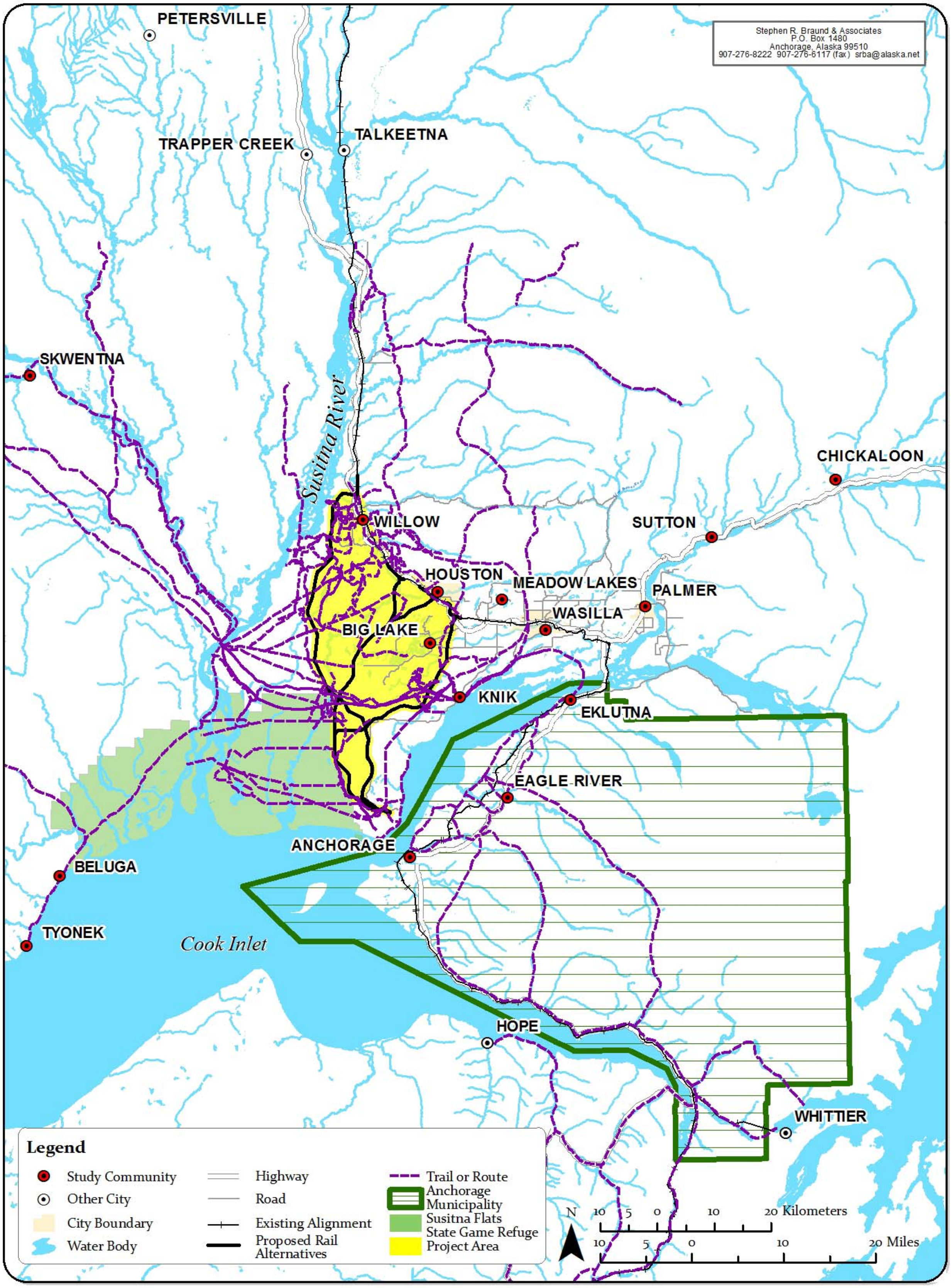


Figure 7-2. Study Area Communities and Trails/Routes

This chapter analyzes construction and operations potential impacts. Chapter 16 describes potential cumulative impacts. The evaluation of potential impacts to subsistence includes the following variables: use areas, user access, resource availability, and competition. These variables are key components of subsistence that can be used to characterize subsistence uses of a particular area or region and to measure impacts to these uses. This evaluation includes an analysis of these four variables for potentially affected communities in the study area. SEA used several assumptions for each variable, as follows:

- Subsistence use areas – Because the project area is in a state-designated nonsubsistence area, subsistence regulations do not apply. GMU 16B is the closest unit where hunting and fishing activities are regulated as subsistence. Therefore, there would be the potential for a direct effect on subsistence uses only if a community's subsistence use area is within GMU 16B. The farther a community's subsistence use area is from the project area, the lower the potential for a direct impact on residents' subsistence uses. Information that defines the use areas for several of the communities addressed in this analysis was collected more than 20 years ago, and although these are the best available data, they might not represent the full extent of those use areas today.

- User access – Alaska Railroad Corporation (ARRC or the Applicant) regulations would prohibit the general public from crossing the rail line except at designated crossing areas. Changes to access to an area could result in residents no longer accessing areas where they have traditionally harvested subsistence resources or could cause users to travel farther and spend more time and money to meet their harvest needs.
- Resource availability – ADF&G sport hunting and fishing regulations and community subsistence harvest data provide information on the types of resources subsistence users harvest in the region and the timing and location of resource harvests. Successful subsistence harvests depend not only on continued access to subsistence resources. The resources must also be available in adequate numbers to be harvested. Furthermore, subsistence resources should be in healthy conditions and available in areas where residents have traditionally harvested them. An unhealthy or depleted resource could cause users to travel farther, hunt longer, or turn to store-bought food to meet their harvest needs.
- Competition – Changes in access can result in changes in competition for resources. A change in access could reduce competition in the potentially affected area and introduce additional competition in new areas because harvesters can no longer access previously used hunting or fishing areas. A decrease in resource availability could result in increased competition among harvesters as they try to meet their harvest needs from a depleted or displaced resource stock. ADF&G harvest ticket records provide data that can be used to show the level of competition among users for moose in GMU 16B. Of all available harvest records, moose, with just over 800 total successful harvests reported over the last 5 years in GMU 16B, provides the most complete documented indicator of resource competition in the area. By comparison, Dall sheep hunts resulted in reports of only 22 successful harvests in GMU 16B over the last 5 years. In general, depictions of competition based on harvest ticket records are most representative for non-Native communities. Andersen and Alexander (1992) explain that in Interior Alaska, harvest ticket reports have proven effective in recording urban-based, non-Native harvests, but are less successful in recording Native

harvests because many Natives view harvest tickets as in-season enforcement tools rather than post-season reporting mechanisms. Therefore, ADF&G Division of Wildlife Conservation Area Management biologists generally factor unreported harvests, even in urban areas, into their population models because not all Alaska residents comply with the harvest reporting requirements.

7.4 Affected Environment

The Port MacKenzie Rail Extension project area lies within ADF&G's Anchorage-Matsu-Kenai nonsubsistence area (5 AAC 99.015(a)(3), shown in Figure 7-1. Therefore, under state definitions, all harvests of wildlife and fish in or near the project area do not qualify as subsistence activities and are instead managed under general sport hunting regulations, or by personal use or sport fishing regulations. As discussed Section 7.3, this analysis focuses on subsistence uses within GMU 16B, the lands managed for subsistence that are nearest the project area. The project area is in ADF&G's GMU 14, subunit 14A (see Figure 7-1). ADF&G GMU 14A and Knik Arm drainage regulations govern sport hunting, and sport and personal use fishing in the project area. Section 13.1 provides additional descriptions of wildlife and fish harvests within and near the project area under these regulations.

All residents outside the federally designated Wasilla-Palmer and Anchorage nonrural areas are considered rural and are eligible for subsistence harvesting on Federal lands (Figure 7-1). However, there are no Federal public lands in or near the project area, and any harvests of fish or wildlife on project area lands do not qualify as Federal subsistence activities. The Federal wildlife subsistence regulations for GMU 14A list all harvests of wildlife in that subunit as either having no Federal open season or no Federal subsistence priority.

7.4.1 Subsistence Use Areas

Fourteen communities were identified for this subsistence analysis based on their proximity to the Port MacKenzie Rail Extension project and documented subsistence uses in and near GMU 16B.

Few of the communities in the study area have had comprehensive documentation of their subsistence use areas. Past documentation of subsistence use areas has focused on rural communities, which depend more on subsistence resources than do urban communities. As a result, there are few use-area data for communities in the study area. Communities with documented use areas include Beluga, Chickaloon, Eklutna, Skwentna, and Tyonek (Figure 7-3).

Figure 7-3 shows the "all resources" use areas for these communities within the study area. The map of subsistence use areas shows the project area overlaid on each community's documented subsistence use areas (where is available) and their locations in relation to the Anchorage-Matsu-Kenai nonsubsistence area. Beluga, Tyonek, and Skwentna have subsistence use areas in GMU 16B. Figure 7-3 also shows western Susitna basin residents' 1984 trapping areas, which were primarily in GMU 16B.

The Eklutna traditional use areas are in the project area; the Chickaloon use areas are all 15 miles or more from the project area (Figure 7-3). There are no available data for subsistence use areas

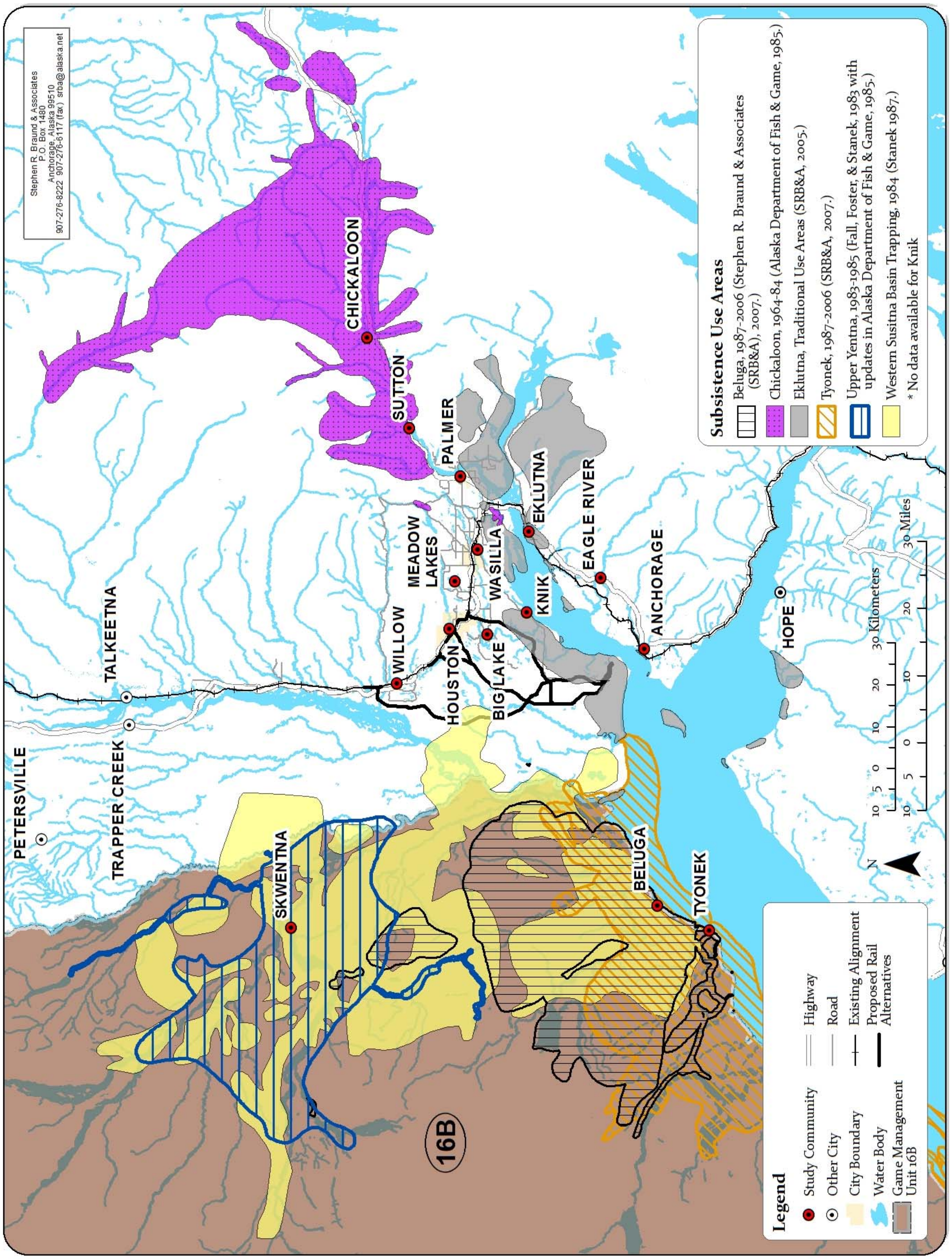


Figure 7-3. Study Communities' Subsistence Use Areas

for Knik, the Federally Recognized Tribe closest to the project area. While the general areas might be the same, information about the Skwentna and Chickaloon use areas are more than 20 years old and might not accurately reflect their current uses.

Because there is no subsistence priority in and near the project area, the Eklutna Native Village and Knik Tribe also participate in ADF&G educational fishery programs in waters between Point MacKenzie and the Little Susitna River, adjacent to Fire Island, Goose Bay to Fish Creek, Eklutna River, and adjacent to the Knik and Eklutna villages. These programs educate people about historic, contemporary, or experimental methods for locating, harvesting, handling, or processing fishery resources (5 AAC 93.235).

Tier II Permit: A special permit issued when there is not an adequate surplus of a resource to satisfy all subsistence needs. Permit applications are scored based on a harvester's answers to questions regarding their dependence on the game for their livelihood and the availability of alternative resources (ADF&G, 2008a). GMU 16B has three Tier II moose permit hunts (TM565, TM567, and TM569), each with its own geographically defined area within the unit (see Figure 7-1). TM569, along the western shore of Cook Inlet south of Beluga, is farthest from the project area and therefore not included in the analysis.

Although other communities (for example, the Municipality of Anchorage, Big Lake, Houston, Meadow Lakes, Palmer, Sutton, Wasilla, and Willow) do not have mapped data showing their subsistence use areas, other data from ADF&G Tier II moose harvest permits for GMU 16B do show use of GMU 16B by these communities within the study area. As shown in Table 7-1, 136 individuals qualified for the TM565 and TM567 Tier II moose permits in GMU 16B during 2007. The four communities with the highest percentages of harvesters, accounting for 91 individuals or nearly 70 percent of all harvesters, were the Municipality of Anchorage, Wasilla, Skwentna, and Palmer.

Table 7-1 and Figure 7-3 show that GMU 16B is used not only by individuals residing within GMU 16B for subsistence uses, but also by subsistence users living within the Anchorage-Matsu-Kenai nonsubsistence area. Communities with use areas close to the project area or a high percentage of Tier II moose harvesters within Unit 16B include Beluga, Skwentna, Tyonek, the Municipality of Anchorage, Wasilla, and Palmer.

7.4.2 Resource Availability

Subsistence resources that migrate through or use the project area may later be harvested by subsistence users in nearby state-designated subsistence areas. However, except GMU 16B, the distance from the project area to designated subsistence areas is considerable; in most cases these lands are more than 50 miles away from the Port MacKenzie Rail Extension project area (see Figure 7-1).

Of all subsistence resources, moose, bear, furbearers, and waterfowl are the resources most likely to migrate through the project area and be later harvested in areas to the west of the Susitna River in GMU 16B. Compared to moose, both bear and furbearer species traditionally do not contribute a high percentage to the overall subsistence harvest of residents in Southcentral Alaska. Trapping furbearers for furs and income, however, is considered a component of

Table 7-1
2007 Game Management Unit 16B TM565 and TM567 Tier II
Moose Harvesters by Community[a]

Community	Success Rate (percent of moose harvesters)	Number of Harvesters	Percent of Total Harvesters (all communities)[b]
Municipality of Anchorage	39	54	40
Wasilla	68	19	14
Palmer	56	9	7
Skwentna	89	9	7
Alexander Creek	83	6	4
Big Lake	50	6	4
Meadow Lakes	50	4	3
Sutton	25	4	3
Trapper Creek	50	4	3
Tyonek	33	3	2
Knik	50	2	1
Soldotna	50	2	1
Sterling	0	2	1
Talkeetna	100	2	1
Willow	50	2	1
Beluga	100	1	1
Chickaloon	100	1	1
Kenai	0	1	1
Ninilchik	100	1	1
Point MacKenzie	100	1	1
Petersville	100	1	1
Valdez	0	1	1
Totals	**53[c]**	**136**	**100**

[a] Source: ADF&G, undated.
[b] Percentages rounded.
[c] Seventy-two of 136 moose hunters were successful.

subsistence because it provides money with which residents can purchase subsistence-related supplies and equipment.

Moose seasonally migrate to calving, rutting, and wintering areas and their range of movement can vary from only a few miles to more than 60 miles, depending on their location and habitat environment (ADF&G, 2007a). In the Susitna River region, the average range of moose during a study period from 1976 to 1984 was approximately 30 miles, whereas in the Alaska and Yukon Territory of the Brooks Range, the moose range was approximately 76 miles (Mauer, 1998). Because they are large, relatively abundant, and highly valued as game meat, moose provide a large portion of edible harvests for subsistence users in Southcentral Alaska. For example, in 1983, moose comprised 15,000 of the total 15,301 pounds of land mammal harvests by Tyonek residents during that year (ADF&G, 2008b). According to ADF&G harvest ticket data, moose is the most hunted of large land mammals in GMUs 14A, 16A, and 16B (Table 7-2). The migratory range of furbearers varies widely depending on the species and habitat environment. Species with the largest home range include wolf, wolverine, coyote, and lynx. Because of their large home range, there is a greater potential that subsistence uses of these species outside the direct project area could be affected. In Alaska, the home range of these species can cover

Table 7-2
Harvests of Large Land Mammals in Game Management Units
Near the Proposed Port MacKenzie Rail Extension, 2005 through 2007[a,b,c]

Data Year	Moose	Caribou	Sheep	Goat
2007	611	13	41	0
2006	774	4	43	10
2005	810	6	50	7
Totals	**2,195**	**23**	**134**	**17**

[a] Source: ADF&G, 2008c.
[b] Based on ADF&G harvest ticket data.
[c] In Alaska, a harvest ticket is required in most areas for general hunts for deer, moose, caribou, and sheep. The tickets are available free from license vendors, must be carried in the field, and are validated by cutting out the day and month immediately upon taking game. Harvest ticket records, sent to ADF&G by harvesters describe the date, location, and success of hunts.

anywhere from several miles to more than 100 miles of territory (ADF&G, 2007a). See Section 5.2 for more information related to habitat and distribution of the resources discussed in this section.

Waterfowl annually migrate through the study area beginning in early spring and returning during fall. Except for the residents of Tyonek, who might harvest waterfowl during their spring migration, waterfowl harvests for the remainder of users in the study area are restricted to the fall season. Waterfowl harvests beginning in early fall are an important subsistence activity in the study area. A substantial portion of waterfowl harvests in the study area occur in the Susitna Flats State Game Refuge, which is directly west of the project area and encompasses the flats surrounding the mouth of the Susitna River (Figure 7-1). The ADF&G estimates that approximately 10 percent of all waterfowl harvests in Alaska occur in the Susitna Flats, with a total of more than 15,000 ducks and 500 geese taken each year (ADF&G, 2008d).

7.4.3 Subsistence Access

Subsistence users may use trails that cross the project area, particularly during the winter months, to reach harvest areas located in GMU 16B (Figure 7-2). Most access across the project area to lands west of the Susitna River occurs during winter by snowmachine because summer travel is restricted by numerous wetlands and water crossings, including the Susitna River. Subsistence resources open for harvest in GMU 16B during winter are furbearers, fish, upland birds, and bull moose. A 2007 ADF&G Furbearer Management Report for GMU 16B summarized trapper transport methods within the unit for the past 10 years (ADF&G, 2007b) as follows: "Most Unit 16 trappers use snowmachines to access their trapping areas. Boats were used much more commonly for beaver and aircraft are used more frequently for wolverine than for any other species. The lack of roads in the unit limits the use of highway vehicles."

The winter bull moose hunt in GMU 16B is a Tier II permit hunt. Table 7-3 summarizes the travel methods in 2007 for the TM565 and TM567 hunts.

As shown in Table 7-3, most subsistence users (67 percent) reported using snowmachines to access the Tier II moose hunt areas; 18 percent used airplanes. No more than 4 percent of harvesters reported use of any other travel method. See Table 7-1 for the list of communities traveling to these Tier II moose hunt areas.

Table 7-3
2007 Travel Methods for Tier II TM565 and TM567 Moose Hunts in Game Management Unit 16B[a]

Travel Method	Total Harvesters	Percent of Total Harvesters (all communities)
Snowmachine	91	67
Airplane	25	18
Boat	5	4
Unspecified	4	3
Three or Four Wheeler	4	3
Highway Vehicle	2	1
Other/Unknown	2	1
Airboat	1	1
Horse/Dog Team	1	1
Off-Road Vehicle	1	1
Totals	**136**	**100**

[a] Source: ADF&G, undated.

7.4.4 Competition

Harvesters from the study communities might already experience competition for subsistence resources in areas outside the Anchorage-Matsu-Kenai nonsubsistence area. The nearest area to the project where subsistence regulations apply is GMU 16B, where hunting is permitted for all Alaskan residents. Subsistence activities within GMU 16B are evident in documented use areas and moose harvest permits for more than 20 communities. Thus, residents from the study area communities hunting in GMU 16B not only compete with one another but with hunters from other Alaskan communities. Table 7-4 lists the number of harvesters and success rates by community for moose in GMU 16B from 2003 through 2007.

Table 7-4
Game Management Unit 16B Moose Harvesters by Community, 2003 through 2007[a]

Community[b]	Success Rate (percent of moose harvesters)	Total Harvesters	Percent of Total Harvesters (all communities)[c]
Municipality of Anchorage	28	1,246	46
Wasilla	26	343	13
Palmer	28	130	5
Soldotna	33	123	4
Kenai	36	119	4
Skwentna	37	82	3
Tyonek	24	68	2
Alexander Creek	42	50	2
Beluga	50	38	1
Willow	29	34	1
Other	37	505	18
Totals	**30**[d]	**2,738**	100

[a] Source: ADF&G, undated.
[b] Only communities reporting five or more hunters in each of the study years are specifically identified. Communities reporting fewer than five hunters are included in Other.
[c] Percentages rounded.
[d] Eight-hundred-twenty-one of 2,738 moose hunters were successful.

As shown in Table 7-4, almost half of moose harvesters in GMU 16B live in the Municipality of Anchorage. The remaining harvesters come from other population centers (such as Wasilla, Palmer, and Soldotna) or from communities whose residents live within the GMU 16B boundary. Because of the large number of communities that rely on GMU 16B for harvests of moose, the potential for competition among communities and subsistence users is relatively great.

7.5 Environmental Consequences

This section describes potential impacts to subsistence as a result of the proposed Port MacKenzie Rail Line Extension.

7.5.1 Proposed Action

Under the proposed action, all rail line alternatives would result in impacts to subsistence. While the magnitude of potential impacts could vary by alternative, the type of potential impacts would be generally the same regardless of rail line alternative. Section 7.5.1.1 describes construction impacts; Section 7.5.1.2 describes operations impacts.

As noted above, impacts to subsistence uses outside the nonsubsistence area would be similar regardless of alternative. The magnitude of direct impacts to wildlife associated with the proposed rail line could vary depending on alternative. Section 5.2 describes those potential impacts. Because the entire project would be in a state nonsubsistence area and there are no Federal public lands in the project area, no harvests of wildlife and fish resources in or directly outside the project area qualify as subsistence activities under either state or Federal regulations. Any harvests of wildlife and fish resources in or near the project area by nearby community residents would be regulated as sport hunting and fishing or personal use fishing. Chapter 5 describes impacts to wildlife and fish resources.

While the Port MacKenzie Rail Extension Project lies in a nonsubsistence area, certain subsistence resources that use GMU 16B could migrate through the project area. The potential impacts to these migrating resources could result in changes to their distribution, abundance, or health in GMU 16B. In addition, any potential access impacts created by the proposed rail line could affect subsistence users trying to cross the project area to reach GMU 16B. Competition for subsistence resources in GMU 16B could increase or decrease depending on the project’s impact on resource availability or user access. Because community subsistence use areas do not directly overlap the project area, there would be no direct effect to communities’ subsistence use areas.

If a community does not use project area lands to access GMU 16B or use resources that move or migrate through the project area, then the project would not directly affect that community’s user access and resource availability. However, even if a community does not use or harvest resources that migrate through the project area, competition could be directly affected because changes in access created by the rail line could cause harvesters to begin using other communities’ subsistence use areas, subsequently increasing the number of harvesters competing for resources in those places. Impacts on user access would affect study communities east of the proposed rail line that would use project area lands to travel west into GMU 16B, particularly the closest communities of Big Lake, Houston, Knik Tribe, Meadow Lakes, Palmer, and Wasilla (see Figure 7-2). The first members of the Knik Tribe lived in the Knik area, and although there are no data for Knik Tribe user access in the study area, their user access could be affected given their proximity to the project area and traditional use of the project area. Impacts to resource availability would most affect the study communities within GMU 16B, including Beluga, Skwentna, and Tyonek, because those communities harvest most of their subsistence resources from GMU 16B. Direct effects stemming from changes to user access and resource availability would least affect the study communities of the Municipality of Anchorage, Chickaloon, Eklutna, Sutton, and Willow.

7.5.1.1 Construction Impacts

During construction, the proposed Port MacKenzie Rail Extension could directly affect subsistence user access and resource availability. Impacts to user access could most affect Big Lake, Houston, Knik Tribe, Meadow Lakes, Palmer, and Wasilla because those communities are close to the rail alternatives; impacts to resource availability could most affect Beluga, Skwentna, and Tyonek because members of those communities harvest most of their subsistence resources in GMU 16B. These impacts would occur for the duration of the construction activity and primarily in areas of active construction.

Construction activities in the rail line right-of-way (ROW) could temporarily block subsistence user access across project area lands into areas west of the Susitna River. There are numerous wetlands and waterways that impede summer travel across the project area, so this impact could most affect travel during winter. While user access could be affected regardless of rail line alternative, construction of the Mac East-Big Lake Alternative would affect the fewest users because all residents in the study area to the west of the alternative would have continued unobstructed access to lands west of the Susitna River.

According to Section 5.3, impacts to resource abundance and distribution from construction would be short-term and of minor consequence to subsistence species. Thus, there would be little to no impacts on subsistence species resource availability.

7.5.1.2 Operations Impacts

The Port MacKenzie Rail Extension could result in impacts to subsistence user access. ARRC regulations barring public access across the rail line except at authorized crossing locations would control user access across the project area. Under this regulation, some subsistence users' access to lands west of the Susitna River managed under subsistence regulations (such as GMU 16B) would be changed and concentrated in fewer locations. The Mac West-Connector 1-Willow Alternative could change access for the greatest number of subsistence users; the Mac East-Big Lake Alternative could change access for the fewest number of subsistence users. The farther west the alternative, the more users would be potentially affected; more communities would have to use rail line crossings to reach GMU 16B. Although grade crossings at public and private roads and officially recognized trails would maintain existing access along some established routes, user access to other areas across the rail line would be more limited. As previously stated, impacts to user access could most affect Big Lake, Houston, Knik Tribe, Meadow Lakes, Palmer, and Wasilla because those communities are close to the rail alternatives.

Port MacKenzie Rail Extension operations impacts could directly affect subsistence resource availability. As previously stated, impacts to resource availability would most affect harvesters from Beluga, Skwentna, and Tyonek because they harvest most of their subsistence resources in GMU 16B. Moose and other mammals might travel along the rail line's vegetation-free ROW, which could result in more train-animal collisions and potentially reduce overall resource availability in the area. As described in Section 5.3, an estimated mortality of 6 to 7 moose per year would occur as a result of moose-train collisions, and migratory moose could experience a disproportionate level of mortality due to movements across the proposed rail line.

There would be indirect impacts to Eklutna Village traditional use areas in the project area because they overlap the project area. There could be indirect impacts to Knik Tribe traditional use areas because the tribe is near the project area and has a long history of subsistence use in the area. Although these use areas are now in a nonsubsistence area, Eklutna and Knik tribal members might still have a traditional connection to the lands, and rail line operations could add to a sense of loss and outsider intrusion into these traditional harvest areas.

Reduced ease of access to use areas arising from the proposed rail line could result in indirect effects such as potential increased costs and risks incurred in traveling to less familiar and more distant harvest areas. Competition for resources in GMU 16B could decrease if the rail line reduced the number of harvesters crossing the rail line to reach areas west of the Susitna River.

7.5.2 No-Action Alternative

Under the No-Action Alternative, ARRC would not construct and operate the proposed Port MacKenzie Rail Extension, and there would be no changes to subsistence resources or user access from the project.

8. CLIMATE AND AIR QUALITY

This chapter describes climate and air quality in the project area of the proposed Port MacKenzie Rail Extension and potential impacts to climate and air quality from project alternatives. Section 8.1 describes applicable regulations. Section 8.2 discusses the methodology the Section of Environmental Analysis (SEA) used to assess potential impacts. Section 8.3 describes the climate and air quality study area. Section 8.4 describes the existing climate and air quality in the vicinity of the proposed Port MacKenzie Rail Extension. Section 8.5 describes the potential impacts of emissions from rail line construction and operations.

8.1 Regulatory Setting

This section describes Federal Government and State of Alaska regulatory requirements related to air quality, and identifies the regulating agencies responsible for air quality management and the regulations relevant to the air quality analysis. There are no regulatory requirements for greenhouse gas emissions.

8.1.1 Federal Regulations

Surface Transportation Board (STB or the Board) regulations (49 Code of Federal Regulations [CFR] 1105.7[e][5]) set thresholds for analyzing anticipated impacts to air quality. When a case before the Board would result in an increase in rail traffic of at least eight trains per day on any segment of rail line affected by a project, then STB regulations require quantification of the anticipated effect on air emissions. Under the proposed action, the Alaska Railroad Corporation (ARRC or the Applicant) would construct and operate a proposed rail line from 30 to 45 miles long, depending on alternative. ARRC anticipates operating only two trains per day over the proposed rail line. Nevertheless, SEA elected to analyze potential impacts to air quality from proposed rail line construction and operations, and used conformity thresholds to determine whether estimated increases in emissions would be *de minimis*.[1]

U.S. Environmental Protection Agency (USEPA) regulations specify the maximum acceptable ambient concentration level for six primary or "criteria" air pollutants – ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), respirable particulate matter (PM), and lead (Pb). As defined by the Clean Air Act Amendments of 1990 (42 United States Code [U.S.C.] 7409), there are two types of National Ambient Air Quality Standards (NAAQS) for these six air pollutants. Primary NAAQS set limits to protect public health and secondary standards set limits to protect public welfare. The Alaska Department of Environmental Conservation (ADEC) has adopted the same standards for Alaska (Alaska Administrative Code

[1] Although the USEPA General Conformity Rule is not directly applicable to Board actions, it nevertheless provides useful thresholds for measuring potential impacts to air quality from a proposed project before the Board. The General Conformity Rule defines a "conforming" project as one that conforms to the approved State Implementation Plan's overall objective of eliminating or reducing the severity and number of air quality violations in a state, and achieving expeditious attainment of the NAAQS; does not cause or contribute to new NAAQS violations in the area; and does not increase the frequency or severity of existing NAAQS or impede required progress toward attainment. The General Conformity Rule establishes emissions thresholds, or *de minimis* levels, for use in evaluating the conformity of a project. If the net emission increases due to a project would be less than these thresholds, the project is presumed to conform and no further conformity evaluation is warranted. The General Conformity Rule is codified at 40 CFR Part 51, Subpart W.

[AAC] Title 18, Chapter 50.010, Ambient Air Quality Standards). Table 8-1 lists and describes the primary and secondary standards.

Table 8-1
National and Alaska Ambient Air Quality Standards[a]

	Primary Standard (Public Health)			Secondary Standard (Public Welfare)		
Pollutant[b]	**Level[c]**	**Averaging Time**	**Form**	**Level**	**Averaging Time**	**Form**
O_3	80 ppb	8 hours	3-year average of annual fourth-highest daily maximums	Same as primary standard		
PM_{10}	150 $\mu g/m^3$	24 hours	Not to be exceeded more than once per year on average over 3 years	Same as primary standard		
$PM_{2.5}$	35 $\mu g/m^3$	24 hours	3-year average of the 98th percentile 24-hour concentrations	Same as primary standard		
	15 $\mu g/m^3$	Annual	3-year average of annual averages			
CO	35 ppm	1 hour	No more than once per year	No secondary standard		
	9 ppm	8 hours	No more than once per year			
SO_2	140 ppb	24 hours	No more than once per year	0.5 ppm	3-hour	No more than once per year
	30 ppb	Annual	Not to be exceeded			
NO_2	53 ppb	Annual	Not to be exceeded	Same as primary standard		
Pb	0.15 $\mu g/m^3$	3-month rolling average	Not to be exceeded over a 3-year period	Same as primary standard		

[a] Source: 40 CFR Part 50.
[b] O_3 = ozone, NO_2 = nitrogen dioxide, CO = carbon monoxide, SO_2 = sulfur dioxide, $PM_{2.5}$ = particulate matter with an aerodynamic diameter less than 2.5 microns, PM_{10} = particulate matter with an aerodynamic diameter less than 10 microns, Pb = lead.
[c] ppm = parts per million; $\mu g/m^3$ = micrograms per cubic meter.

The USEPA has designated certain lands as mandatory Class I areas because air quality is considered a special feature of those areas. Class I areas have special protection under the Clean Air Act Prevention of Significant Deterioration Program. In general, if a new stationary source would be within 62 miles of a Class I area, potential impacts of the source on that Class I area must be determined. The nearest Class I areas to the proposed rail line project area are the Tuxedni Wilderness Area at a distance of 120 miles and the Denali National Park Wilderness Area at a distance of 125 miles. Because the proposed Port MacKenzie Rail Extension would not be a stationary source and would be beyond the 62-mile distance threshold, SEA did not analyze potential impacts on Class I areas.

8.1.2 State Regulations

The proposed Port MacKenzie Rail Extension would be in an attainment area for all criteria air pollutants. Therefore, no additional state air quality regulations would apply.

8.2 Analysis Methodology

SEA evaluated the potential impacts of increased emissions of NAAQS air pollutants plus greenhouse gas emissions in three steps. First, SEA identified and characterized the emission sources that would result from proposed rail line construction and operations. Second, SEA aggregated these emission sources to obtain estimated total emissions per year for construction and estimated total emissions per year for operations for each NAAQS air pollutant plus greenhouse gases. SEA estimated air emissions for the longest alternative and for the maximum average train length of 80 cars anticipated by the Applicant. Third, SEA compared the increase in estimated emissions with the *de minimis* conformity thresholds.

8.3 Study Area

The various alternatives for the proposed rail line all fall within the Matanuska-Susitna Borough (MSB or the Borough) and would run between the Port MacKenzie District and the ARRC main line, connecting at a point along ARRC's existing main line between Mile Post 188.9 north of Willow and Mile Post 170.3 near Wasilla. Given the relatively small projected annual emissions from the project, the relevant study area for analyzing impacts to air quality is confined to the immediate vicinity of the project.

8.4 Affected Environment

SEA relied on current climate characterizations along the proposed Port MacKenzie Rail Extension for information on existing conditions. Three principal sources of climate information are available for the project area. Near the northern end of the project area, data are available for summer for Houston and for winter from the Matanuska Agricultural Experimental Station near Palmer. For the southern portion of the project area, climate information is available for Anchorage, which is approximately 5 miles south of Port MacKenzie, across Knik Arm.

The dominant climate for all of Southcentral Alaska, including the project area, can be classified as a maritime climate, meaning that summers and winters are milder than normally seen in continental (interior) climates of similar latitude. Average temperatures range from 60.4 degrees Fahrenheit (°F) in July to 13.9 °F in January in the northern portion of the study area, while the southern portion is more moderate, with average temperatures from 58.5 °F in July to 15.2 °F in January. Precipitation is relatively uniform from November through June, and increases during the summer and early fall.

The area around Houston and the Matanuska Agricultural Experimental Station has a maritime climate typical of coastal Alaska, which is characterized by short moderate summers, long cool winters, moderate precipitation, and high humidity. Average monthly temperatures (WRCC, 2008) in the area range from 13 ºF in January to 60 ºF in July, with an average annual temperature of 36 ºF. The all-time low temperature recorded was -45 ºF; the highest was 92 ºF. Thunderstorms are infrequent and occur only during the summer. Average annual precipitation is approximately 15 inches on the eastern side of Matanuska Valley and upward of 24 inches on the western side. Most of precipitation falls during summer and early fall. Average monthly precipitation ranges from a low of less than 0.5 inch in April to peaks in September ranging from 2 to 4 inches. Average annual snowfall is approximately 48 inches, but more than twice this amount falls some years.

Average monthly temperatures in Anchorage (WRCC, 2008) over the 30-year period 1971 through 2000 ranged from 15.1 ºF in January to 58.5 ºF in July, yielding a yearly average temperature of 36.1 ºF. The all-time low temperature recorded was -34 ºF; the highest was 82 ºF. Average monthly precipitation ranges from 0.52 inch in April to 2.93 inches in August. Annual average precipitation is 16.1 inches. Most precipitation occurs as rain during summer, with some additional rainfall during fall. Average snowfall over 56 winters (1951 through 2006) was 71.9 inches, with a maximum of 132.6 inches occurring during the winter of 1954–1955. Heavy fog occurs during November through February, with 4 to 6 days each month having 0.25 mile or less visibility.

Prevailing wind direction from April through September is from the south. During the other months, the prevailing wind is from the north, with an average speed of about 6.5 miles per hour. The highest average wind speeds occur during spring, May being the windiest with an average speed of 8.7 miles per hour. Thunderstorms are infrequent but do occasionally occur in June and July, with an average of less than one in June or July.

Alaska's air monitoring program focuses on three of the six criteria pollutants regulated through the NAAQS – CO, and both coarse (PM_{10}) and fine ($PM_{2.5}$) particulate matter. Available air quality data from the vicinity of the proposed rail line are available for the Municipality of Anchorage and for the MSB. Anchorage air quality monitoring includes monitoring for CO, PM_{10}, and $PM_{2.5;}$ PM_{10} and $PM_{2.5}$ are also monitored for the Matanuska-Susitna area in Butte. SEA anticipates that existing air pollutant levels in the immediate area of the proposed rail line are lower than at either the Anchorage or Butte sites because human activities and associated emissions are considerably lower.

The Matanuska-Susitna area is in the process of transitioning from a rural/agricultural area to one that includes developed areas that extend suburban Anchorage. The Matanuska-Susitna area has historically experienced occasional periods in which 24-hour average $PM_{2.5}$ concentrations have exceeded 35 micrograms per cubic meter. While increased road paving has helped reduce the levels of road dust across the valley, high winds off the Matanuska River drainage (in winter and early spring) and the Knik River drainage (in late spring and summer), along with increased population and the associated motor vehicle activity, does occasionally increase the 24-hour average $PM_{2.5}$ concentration levels above 35 micrograms per cubic meter. To further understand and address air quality in the Borough, ADEC established two new monitoring sites, one in downtown Palmer and one at the Wasilla fire station. These began collecting and archiving PM_{10} and $PM_{2.5}$ measurements in October 2008.

At present, the Municipality of Anchorage operates five air monitoring stations in the municipality. None of these monitoring sites exceeded the ambient CO, PM_{10}, $PM_{2.5}$ standards from 2005 through 2007 (USEPA, 2008). Over the same period, the Butte monitoring site did not show an exceedance for PM_{10} or $PM_{2.5}$, but the 24-hour $PM_{2.5}$ 3-year (2005 through 2007) average of 28.4 micrograms per cubic meter is within 20 percent of the standard. Table 8-2 lists the maximum pollutant levels measured from 2005 through 2007 for the Anchorage and Butte monitoring sites.

Table 8-2
Measured Ambient Air Concentrations for Anchorage and Butte, Alaska (2005 through 2007)[a]

Monitoring Station	Measured Concentrations[b]					
	1-Hour CO 2nd Highest Maximum			8-Hour CO 2nd Highest Maximum		
	2005 (ppm)	2006 (ppm)	2007 (ppm)	2005 (ppm)	2006 (ppm)	2007 (ppm)
Anchorage	8.1	8.4	12.5	4.8	6.1	5.3
	24-Hour $PM_{2.5}$ 98th percentile			Annual Average $PM_{2.5}$		
	2005 (µg/m^3)	2006 (µg/m^3)	2007 (µg/m^3)	2005 (µg/m^3)	2006 (µg/m^3)	2007 (µg/m^3)
Anchorage	17.9	26.9	14.5	6.9	6.3	4.9
Butte	25.2	40.0	20.1	6.5	7.5	5.6
	24-Hour PM_{10} 2nd highest			Annual Average PM_{10}		
	2005 (µg/m3)	2006 (µg/m^3)	2007 (µg/m^3)	2005 (µg/m^3)	2006 (µg/m^3)	2007 (µg/m^3)
Anchorage	145.0	105.0	98.0	41.0	25.0	25.0
Butte	111.0	79.0	48.0	23.0	14.0	12.0

[a] Source: USEPA, 2008.
[b] CO = carbon monoxide; $PM_{2.5}$ = particulate matter with an aerodynamic diameter less than 2.5 microns; PM_{10} = particulate matter with an aerodynamic diameter less than 10 microns; ppm = parts per million; µg/m^3 = micrograms per cubic meter.

8.5 Environmental Consequences

8.5.1 Proposed Action

8.5.1.1 Common Impacts

Construction Impacts

SEA developed an emissions estimate for proposed rail line construction. To be conservative, SEA estimated construction emissions for the alternative that would require the most rail construction (i.e., Mac East-Connector 1-Willow Alternative, the longest potential route at 46 miles). Because only limited preliminary engineering information is available for the types of construction equipment and activity levels needed to implement the proposed project, SEA estimated construction-related emissions based on construction emission estimates developed in the detailed analysis for the *Eielson Branch Realignment Air Quality Assessment Study* (Sierra Research, 2006).

Table 8-3 lists the results of the estimated construction emissions compared to the most recently available (2001) MSB total emission inventory (USEPA, 2008). As shown in the table, construction-related emissions would be expected to be a small fraction of the Borough's total annual emissions during the assumed construction period of 2 years. Estimated nitrogen oxides (NO_x), PM_{10}, and $PM_{2.5}$ construction-related emissions would range from 0.1 to 1.9 percent of Borough total annual emissions for each pollutant. These emissions would be distributed over the approximately 46 miles of proposed rail line. The estimated emissions would be well below the *de minimis* conformity thresholds (100 tons per year for each pollutant), indicating their relatively small potential impact. Further, estimated construction emissions would be temporary (limited to the construction period). Estimated rates of fugitive dust emissions include the use of watering during construction in summer to limit fugitive dust emissions.

Table 8-3
Estimated Construction Emissions along the Proposed Port MacKenzie Rail Extension[a] and the Matanuska-Susitna Borough 2001 Emissions Inventory

	Emission Quantities (metric tons per year)[b]					
Emission Sources	**VOCs**	**CO**	**NO_x**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**
Port MacKenzie Rail Extension						
Construction Exhaust	4.1	28.3	44.2	4.9	4.9	0.03
Construction Fugitive Dust	0.0	0.0	0.0	18.7	7.0	0.00
Total Construction[c]	**4.1**	**28.3**	**44.2**	**23.6**	**11.9**	**0.03**
Matanuska-Susitna Borough[d]						
Off Highway (2001)	1,054	18,435	1,954	52	40	62
Highway Vehicles (2001)	977	4,197	224	37	34	32
Other Sources (Point and Area)	705	4,347	179	15,268	2,787	70
Total Matanuska-Susitna Borough[c]	**2,736**	**26,979**	**2,357**	**15,357**	**2,861**	**164**

[a] Based on Sierra Research, 2006; most similar construction as segment "B."
[b] VOCs = volatile organic compounds; CO = carbon monoxide; NO_x = nitrogen oxides; PM10 = particulate matter with an aerodynamic diameter less than 10 microns; $PM_{2.5}$ = particulate matter with an aerodynamic diameter less than 2.5 microns; SO_2 = sulfur dioxide.
[c] Measurements are in metric tons per year. Totals assume construction takes place over a 2-year period and that the length of proposed rail line construction would be 46.0 miles.
[d] Based on USEPA estimated inventory for Matanuska-Susitna Borough from the National Emissions Inventory (USEPA, 2008).

Operations Impacts

SEA also developed a conservative emission estimate for proposed Port MacKenzie Rail Extension operations based on the longest rail line alternative. SEA estimated emissions assuming an average of one round-trip (two one-way trips) freight rail train per day with three locomotives, 80 rail cars, with a loaded weight of 125 tons per car and unloaded weight of 30 tons per car (ARRC, 2008b and ARRC, 2008a, Appendix J). SEA also assumed that freight trains would begin operating along the proposed rail line in 2012 (ARRC, 2008, Section 3.4) or later using ultra-low sulfur diesel fuel. (Effective December 1, 2010, all diesel fuel sold in Alaska is required to be ultra-low sulfur diesel). SEA obtained all base emission factors (grams per brake-horsepower-hour) from the USEPA Regulatory Support Document, Appendix O (USEPA, 1998) for line-haul Class I locomotives, except the base emission factor for SO_2, which was not available from this source. SEA used an SO_2 factor from *Development of Railroad Emission Inventory Methodologies* (Sierra Research, 2004). SEA also used this study to identify appropriate bulk freight use fuel efficiency – 1061.2 ton-miles per gallon – for a rail line operating over similar grades (that is, 1 percent or less) and carrying predominately bulk materials such as wood, coal, and gravel.

Table 8-4 lists the estimated annual average rail line operations emissions. These estimated emissions are small fractions of MSB annual off-highway vehicle emissions (see Table 8-3). In addition, the estimated emissions would be distributed over approximately 46 miles of rail line. Emissions of NO_x would represent the largest fraction in comparison with the off-highway vehicle emissions, at approximately 2 percent of existing off-highway emissions in the Borough. In addition, as an indicator of the relatively small emission amounts, the emission totals for each of the pollutants would be well below the *de minimis* conformity thresholds of 100 tons per year for each pollutant. Finally, to the extent that commodities from Interior Alaska that would be transported to Port MacKenzie over the proposed rail line would otherwise be transported to the Ports of Anchorage or Seward, emissions associated with rail line transport of those commodities would be reduced because of the shorter rail haul distance.

Table 8-4
Estimated Annual Average Operations Emissions (metric tons per year) along the Proposed Port MacKenzie Rail Extension[a]

Emission Sources	VOCs	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2
Freight Train Operations	1.9	6.3	33.7	1.2	1.2	0.12

[a] VOCs = volatile organic compounds; CO = carbon monoxide; NO_x = nitrogen oxides; PM_{10} = particulate matter with an aerodynamic diameter less than 10 microns; $PM_{2.5}$ = particulate matter with an aerodynamic diameter less than 2.5 microns; SO_2 = sulfur dioxide.

As discussed in Chapter 2, the proposed rail line extension would include a terminal reserve (rail yard) at the end of the line in the Port MacKenzie District. The rail yard would provide for receiving, sorting, temporary storage, and distribution of commodities shipped on the rail line. Possible activities at the facility would include receiving inbound trains, switching rail cars, loading and unloading cars, storing commodities, and building and departing outbound trains. Other activities could include arriving/departing track maintenance equipment and operation of a switch locomotive and cargo handling equipment.

Based on the assumption that the rail yard would provide services to support one 80-car train per day, the number of rail cars handled per year would be about 29,200 per year. There is a rail yard with similar capacity in Commerce, California – Commerce Eastern Rail Yard. This facility had an average of 72 rail cars per train in 2004, but with nearly 4 trains arriving per day, a detailed emission inventory has been assembled (Environ, 2006). Scaling for the smaller number of rail cars the Port MacKenzie Rail Extension rail yard is anticipated to handle, it is estimated that PM emissions would total about 0.48 metric ton per year, which would be a fraction of the emissions from operations along the proposed rail line. Other air pollutants would show similar fractions of the operations emissions. Again, these emissions would be well below the *de minimis* conformity threshold of 100 tons per year. In addition, the terminal reserve would not be close to any residences or schools.

To provide a further comparison of the relative change in rail line operations emissions, SEA estimated existing highway traffic emissions along an 0.5-mile segment of the George Parks Highway at three locations where the proposed rail line would connect with the existing rail line via the Willow, North Houston, or Big Lake segments and compared those emissions with the estimated emissions from proposed rail line operations over an equivalent distance. SEA obtained the average number of vehicle miles traveled over this section of roadway for each area from the Alaska Department of Transportation (ADOT&PF, 2008) for 2006 and then projected forward to 2012 using an arterial growth rate of 0.6 percent per year (FHWA, 2007). SEA estimated highway traffic emissions along this segment of roadway using this vehicle–traffic-volume information and emission factors (grams per mile) from the USEPA MOBILE6.2 model (which estimates emission rates for the on-road fleet of vehicles, considering such factors as fleet age, miles driven, type of fuel, vehicle engine size, engine technology, and ambient temperature) (USEPA, 2003) for 2012. The emission factors SEA used were based on Matanuska-Susitna-specific mobile emission inputs using an average of the winter and summer seasons' vehicle registration information based on the MOBILE6.2 inputs developed for the Kink Arm Crossing Air Quality Technical Report (ADOT, 2006).

Table 8-5 lists the estimated annual emissions from rail line operations over a 0.5-mile segment of the proposed Port MacKenzie Rail Extension compared to estimated vehicle emissions along a comparable length of George Parks Highway at the three connection locations for the Willow, North Houston, and Big Lake segments. These results show that estimated rail emissions would be a small fraction of the highway emissions for all three segments, with the exception of NO_x and particulate matter – this is due to the comparatively high NO_x and PM emission rate for diesel-fueled locomotives.

Table 8-5
Estimated Annual Highway Emissions Compared to Proposed Port MacKenzie Rail Extension Operations Emissions (metric tons per year)[a]

Emission Sources	VOCs	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2
Willow Segment Connection[b]	0.43	8.5	0.41	0.028	0.018	0.004
North Houston Segment Connection[c]	0.61	12.0	0.58	0.039	0.026	0.006
Big Lake Segment Connection[d]	0.79	15.0	0.74	0.050	0.033	0.008
Freight Train Operation	0.02	0.07	0.37	0.014	0.013	0.001

[a] VOCs = volatile organic compounds; CO = carbon monoxide; NO_x = nitrogen oxides; PM_{10} = particulate matter with an aerodynamic diameter less than 10 microns; $PM_{2.5}$ = particulate matter with an aerodynamic diameter less than 2.5 microns; SO2 = sulfur dioxide.
[b] Annual average traffic along 0.5-mile stretch of George Parks Highway near Willow (1,459 vehicle miles traveled, 2012).
[c] Annual average traffic along 0.5-mile stretch of George Parks Highway near North Houston (2,075 vehicle miles traveled, 2012).
[d] Annual average traffic along 0.5-mile stretch of George Parks Highway near Big Lake (2,659 vehicle miles traveled, 2012).

SEA expects that air pollutant emissions from truck traffic would decrease on roads leading to Port MacKenzie and on Parks Highway, to the extent that transportation activity by truck would be shifted to rail.

Greenhouse gas emissions associated with the proposed action would be overwhelmingly carbon dioxide (CO_2) emissions. Table 8-6 lists estimated CO_2 emissions associated with proposed rail line construction and operations. Construction emissions would be limited to the 2-year construction period; there would be operations emissions in subsequent years. By way of

Table 8-6
Annual Average Emissions of Greenhouse Gases Associated with Proposed Port MacKenzie Rail Extension Construction and Operations

Emission Sources	CO_2[a] (metric tons per year)
Rail Line Construction (2-year construction period)	3,141
Freight Train Operations	2,606

[a] CO_2 = carbon dioxide.

comparison, the 2005 annual CO_2 emissions from rail line operations for all of Alaska are estimated to be 120,000 metric tons per year (ADEC, 2008). Proposed rail line operations would represent a 2-percent increase in Alaska rail CO_2 emissions. For the state as a whole, this would represent an increase in CO_2 emissions of less than 0.01 percent (ADEC, 2008). Rail line operations would represent about an 0.0001-percent increase in the U.S. annual (2006) average emission rate of approximately 6 billion metric tons of CO_2 (USEPA, 2008). The U.S. emission rate represents about 24 percent of the total global CO_2 emission rate. Also, SEA would expect CO_2 emissions from existing highway activity to decrease as a result of the proposed rail line to the extent that transportation activity by truck would be shifted to rail.

Based on the findings described above, SEA concluded that estimated emission increases from proposed rail line construction or operations would be minimal in the context of existing conditions, and that any potential impacts to climate and air quality would be low under any of the alternatives evaluated.

8.5.1.2 Impacts by Alternative

Impacts to climate and air quality under the proposed action would be minimal for the longest alternative and would be even less for the shorter alternatives.

8.5.2 No-Action Alternative

Under the No-Action Alternative, ARRC would not construct and operate the proposed Port MacKenzie Rail Extension. Truck-to-rail diversion of freight and any associated reduction in emissions of NAAQS air pollutants and greenhouses gases would not occur.

9. NOISE AND VIBRATION

This chapter describes the Surface Transportation Board's (STB or the Board) Section of Environmental Analysis' (SEA) analysis of potential noise and vibration impacts to humans from construction and operation of the Proposed Port MacKenzie Rail Extension. Section 9.1 describes the noise and vibration regulatory setting. Section 9.2 describes the analysis methodology. Section 9.3 describes the affected environment for noise and vibration and provides noise measurement data. Section 9.4 describes potential noise and vibration impacts, including modeled noise contours and estimated numbers of receptors (i.e., noise-sensitive locations) potentially affected.

9.1 Regulatory Setting

Federal laws, regulations, and guidelines that specify requirements and provide guidance on noise and vibration impacts analysis include:

- STB environmental regulations at 49 Code of Federal Regulations (CFR) 1105.7
- Noise Control Act of 1972 (42 United States Code [U.S.C.] 4910)
- Federal Railroad Administration (FRA) Guidelines (Report Number 293630-1, December 1998)
- Occupational Safety and Health Administration Occupational Noise Exposure Hearing Conservation Amendment (29 CFR 1910.95)
- U.S. Environmental Protection Agency (USEPA) Railroad Noise Emission Standards (40 CFR 201)
- FRA Railroad Noise Emission Compliance Regulations (49 CFR 210)
- FRA Final Rule on the Use of Locomotive Horns at Highway-Rail Grade Crossings (49 CFR Parts 222 and 229)
- Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06, May 2006)

STB's environmental review regulations for noise analysis (49 CFR 1105.7e(6)) have the following thresholds:

- An increase in noise exposure as measured by a day-night average noise level (DNL) of 3 A-weighted decibels (dBA) or more
- An increase to a noise level of 65 DNL or greater

If the estimated noise level increase at a location would exceed either of these thresholds, SEA identifies and estimates the number of affected noise-

> **Day-night average noise level (DNL or L_{dn})**: The energy average of A-weighted decibels (dBA) sound level over a 24-hour period; includes a 10 decibel adjustment factor for noise between 10 p.m. and 7 a.m. to account for the greater sensitivity of most people to noise during the night. The effect of nighttime adjustment is that one nighttime event, such as a train passing by between 10 p.m. and 7 a.m., is equivalent to 10 similar events during the daytime.
>
> **A-weighted decibels (dBA)**: A measure of noise level used to compare noise from various sources. A-weighting approximates the frequency response of the human ear.

sensitive receptors (such as residences, schools, libraries, retirement communities, and nursing homes) and quantifies the noise increase. The two STB thresholds (greater than 3 dBA increase and greater than 65 DNL) are implemented separately to determine an upper bound of the area of potential noise impact. However, noise research indicates that both thresholds must be met or exceeded to cause an adverse noise impact (STB, 1998a; Coate, 1999). That is, noise levels would have to be greater than or equal to 65 DNL and increase by 3 dBA or more to result in an adverse noise impact.

No State of Alaska or local regulations exist that govern railroad noise and vibration.

9.2 Study Area

The proposed Port MacKenzie Rail Extension could be in relatively developed or undeveloped portions of the Matanuska-Susitna Borough (MSB or the Borough), depending on the alternative, in the area between the Susitna River to the west, the Knik Arm to the south and east, and the Talkeetna Mountains to the north. SEA focused the study of potential noise impacts to humans on those areas where noise-sensitive receptors would be located in the vicinity of a rail line alternative.

9.3 Analysis Methodology

This section describes the methods SEA used to determine if the rail line alternatives would result in a 3 dBA or greater increase in noise levels, railroad noise levels (due to wayside noise and locomotive warning horn) that would equal or exceed a 65 decibel DNL, or vibration impacts. Appendix K provides the equations and further describes the methods SEA used to perform the noise and vibration analysis.

Ambient noise: The sum of all noise (from human and naturally occurring sources) at a specific location over a specific time.

Wayside noise: Train noise adjacent to a rail line that comes from sources other than the locomotive horn, such as engine noise, exhaust noise, and noise from steel train wheels rolling on steel rails

Equivalent sound level (L_{eq}): The energy-averaged sound pressure level averaged over a specified unit of time, frequently 1 hour.

SEA used an environmental noise computer program (Computer Aided Noise Abatement) and wayside and horn reference levels from previous studies to generate noise level contours. The overall noise model results are sensitive to horn noise, locomotive and railcar noise, train length, and train speed. SEA used information on train length and speed provided by the Alaska Railroad Corporation (ARRC or the Applicant). SEA based wayside noise estimates on information compiled for previous SEA analyses, including the Conrail Acquisition Environmental Impact Statement (STB, 1998a) and the Draft Environmental Assessment for the Canadian National/Illinois Central Railway Acquisition (STB, 1998b). SEA used data on horn noise compiled by the FRA (1999). SEA used these sources because of the size of the noise measurement databases, statistical reliability, and other factors.

To establish a baseline for determining if there would be a 3 dBA or greater increase in noise, SEA measured ambient noise in the study area.

SEA estimated noise exposure that would result from rail line operations in terms of DNL using future operations plans and information on distances and noise propagation paths to sensitive receptors. SEA estimated noise exposure that would result from construction in terms of equivalent sound level (L_{eq}).

SEA estimated the number of noise-sensitive receptors within the 65 DNL noise contours for the alternatives or where the DNL would increase by at least 3 dBA. SEA used digital aerial photographs and Geographic Information Systems software to identify and estimate the number of noise-sensitive receptors within the 65 DNL noise contour for future train volumes. The result of this analysis was an estimate of the total number of sensitive receptors likely to be exposed to 65 DNL or greater and the number of receptors where the DNL would increase by at least 3 dBA because of the alternatives. The accuracy of the estimated numbers of potentially affected receptors is limited by the resolution and age of the available aerial photographs, and the interpretation or identification of structures in these photographs.

For the reasons discussed in Chapter 1 of this Draft EIS, SEA's analysis of potential impacts includes the potential impacts on Section 4(f) properties, including a state game refuge and state recreation areas (see Appendix M of this Draft EIS). As a result, on behalf of FRA, SEA analyzed the potential noise impacts on Section 4(f) properties using FRA/FTA methods (FRA, 2005). Train noise potentially could disturb visitors within game refuges and recreation areas. Because noise impact analyses using fixed receptor locations may not be representative of potential area-wide impacts, SEA estimated the area within Section 4(f) properties where the potential noise impact would be considered "severe" based on FRA criteria[1] and compared the estimated affected area within each Section 4(f) property to the total area of each property (i.e., the percent of the total area of each Section 4(f) property that could be affected). For this analysis, SEA used FRA source noise levels (SEL), which are slightly different than the historical source terms typically used in SEA analyses that are described in the paragraphs above. SEA also used FRA's method of estimating ambient noise level based on population density using U.S. Census population data in GIS format, because of its suitability in determining ambient noise levels over large geographic areas, such as those covered by the Section 4(f) properties. In general, the calculated ambient noise levels are lower (and therefore more conservative) than the actual on-site measured ambient noise levels.

SEA based the analysis of potential vibration impacts on published train and construction equipment vibration data and FTA methods.

9.4 Affected Environment

Existing noise conditions vary considerably within the study area. In general, existing ambient sound levels are higher in populated areas than in unpopulated areas. In areas with low ambient sound levels (such as remote areas), rail noise could be more noticeable than in areas with higher ambient sound levels.

[1] Based on FRA criteria, noise levels that would cause a "severe" impact depend on the ambient noise level and the type of land use. For this analysis, the Section 4(f) properties were considered to be in land use Category 3 (for primarily daytime and evening use) except for camping areas, which were considered to be a Category 1 (where quiet is an essential element in their intended purpose). For Category 3, a "severe' impact would occur where the noise level would increase by 20 dBA. For Category 1, a "severe" impact would occur where the noise level would increase by 15 dBA. (FRA, 2005)

In the southern part of the study area toward Port MacKenzie, ambient noise levels are influenced by the local population and related human activities and by air traffic to and from Ted Stevens Anchorage International Airport. Ambient noise levels are higher due to these sources; therefore, rail noise would be less noticeable than in quieter areas. Along the northern edge of the study area, noise levels are influenced by the Parks Highway, the existing rail line, and the activities of area residents and visitors.

To characterize the existing noise environment, SEA measured ambient sound levels in the vicinity of potential receptors throughout the study area for 24 hours at 15 locations from July 22 through July 30, 2008. Table 9-1 lists those sound measurements.

Table 9-1
Measured Ambient Sound Levels in the Proposed Port MacKenzie Rail Extension Study Area

Segment	Location Identification	Latitude/Longitude	DNL (dBA)[a]
Big Lake	BL1	N61° 35’ 02.5” W149° 44’ 45.8”	54
Big Lake	BL2	N61° 33’ 52.0” W149° 45’ 03.3”	52
Big Lake	BL3	N61° 31’ 52.1” W149 45’ 01.8”	54
Big Lake	BL5	N61° 26’ 48.0” W149° 53’ 05.7”	51
Big Lake	BL6	N61° 25’ 45.8” W149° 58’ 35.0”	53
Willow	W1	N61° 47’ 15.7” W150° 05’ 11.8”	45
Willow	W2	N61° 43’ 29.1” W150° 09’ 44.3”	49
Houston	H1	N61° 30’ 49.6” W150° 04’ 05.7”	45
Houston	HS1	N61° 37’ 03.2” W149° 50’ 29.3”	47
Houston	HS2	N61° 34’ 55.3” W149° 55’ 42.3”	47
Mac East	ME1	N61° 22’ 32.2” W150° 02’ 45.2”	55
Mac West	MW1	N61° 22’ 39.7” W150° 07’ 28.0”	57
Mac West	MW2	N61° 20’ 24.3” W150° 04’ 28.0”	57
Connector 2	C2-1	N61° 25’ 03.1” W150° 04’ 26.6”	50
Connector 3	C3-1	N61° 26’ 03.3” W150° 02’ 43.5”	54

[a] DNL = day-night average sound level; dBA = A-weighted decibels.

Ambient sound levels measured in the vicinity of the Big Lake Segment fall within the USEPA “small town residential” category (see Figure 9-1). Ambient sound levels measured in the vicinity of the Willow and Houston segments are lower than those for small town residential because of very low population density. Population density is also low near Connector Segments 2 and 3, but ambient sound levels are somewhat higher in the vicinity of these segments because of aircraft noise in the area. Ambient sound levels in these areas fall within the small town residential category. SEA did not take sound measurements in the vicinity of the Houston North Segment and Connector Segment 1 because no nearby receptors were identified.

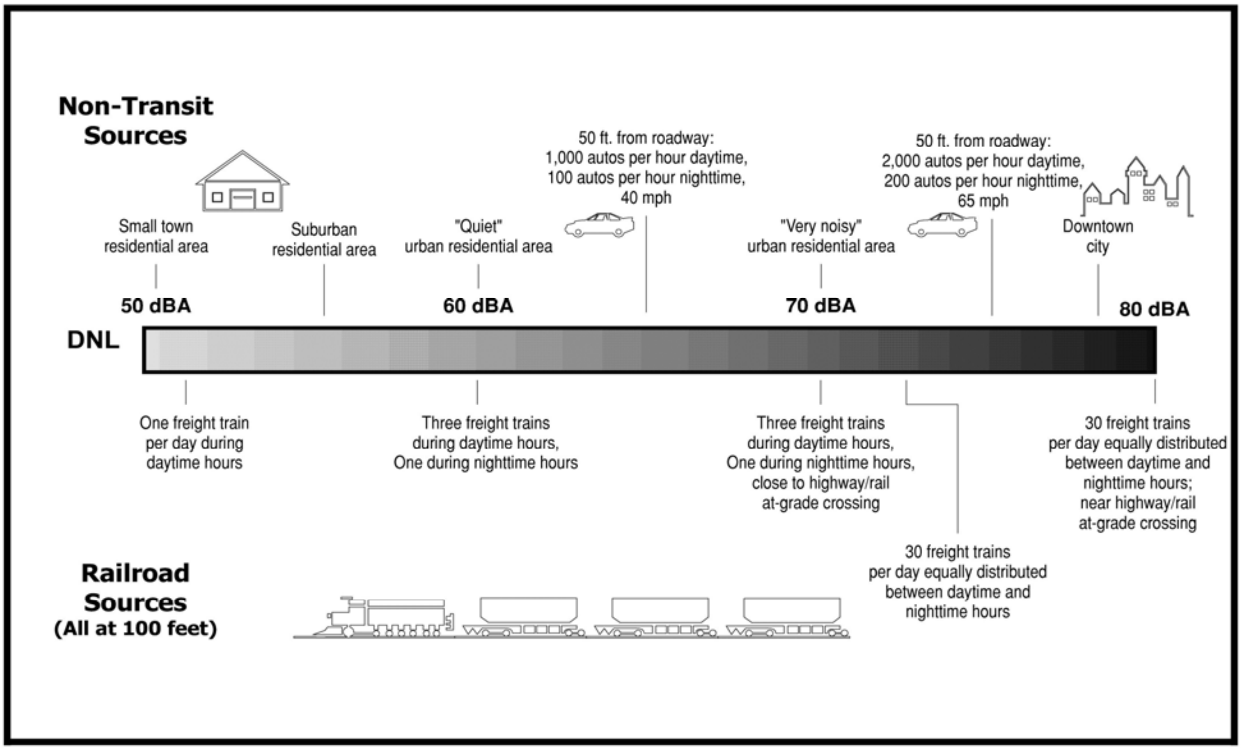


Figure 9-1. Typical Day-Night Average Noise Levels (USEPA, 1974)

9.5 Environmental Consequences

9.5.1 Proposed Action

9.5.1.1 Construction Noise and Vibration

SEA used the FTA general assessment method (FTA, 2006) to evaluate potential impacts from construction noise and vibration. This method is used when the details of the construction schedule are not known. Using this method, the two noisiest pieces of general construction equipment are identified and it is assumed that both pieces of equipment would be operating simultaneously. Table 9-2 shows the assumed two noisiest pieces of general construction equipment (heavy truck and bulldozer), corresponding noise levels, and combined noise level. Table 9-2 also shows the noise level for an impact pile driver – the noisiest piece of specialized construction equipment – which is analyzed separately below. The combined noise level for general construction equipment is then estimated at the receptor nearest each segment, and compared with the assessment criteria in Table 9-3, which are the noise levels above which there could be adverse community reaction (FTA, 2006).

In addition, representative vibration-producing general construction equipment are identified, and based on FTA data corresponding vibration levels at the nearest receptor are estimated. SEA selected a bulldozer for the analysis of vibration from general construction equipment because this equipment is commonly used for rail construction projects and it produces relatively high vibration levels.

Table 9-2
Construction Equipment Noise Levels (dBA)[a]

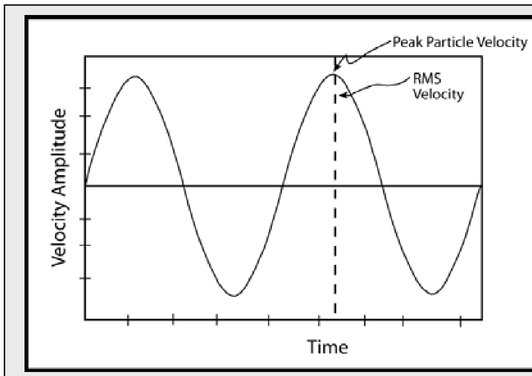
Equipment	Noise Level at 50 Feet[b]
1 Heavy truck	88
2 Bulldozer	85
3 1 and 2 combined	90
4 Pile driver (impact style)	101

[a] dBA = A-weighted decibels.
[b] Source: FTA 2006

Table 9-3
Federal Transit Administration Construction Noise Criteria[a]

Land Use	Daytime 1-Hour L_{eq}[b] (dBA)[c]	Nighttime 1-Hour L_{eq} (dBA)
Residential	90	80
Commercial	100	100
Industrial	100	100

[a] Source: FTA, 2006
[b] L_{eq} = equivalent sound level
[c] dBA = A-weighted decibels.



Peak Particle Velocity (PPV)

There are two types of potential impacts from rail-related ground vibration – annoyance to humans and damage to buildings. Each of these two types of potential impacts is evaluated using a different measure – peak particle velocity (PPV) for building damage and root-mean square (RMS in the adjoining figure) velocity for human annoyance. PPV is the maximum instantaneous positive or negative peak of the vibration signal, measured as a distance per unit of time (such as millimeters or inches per second). This measurement has been used historically to evaluate shock-wave type vibrations from actions like blasting, pile-driving, and mining activities, and their relationship to building damage. Root-mean-square velocity is an average, or smoothed vibration amplitude, commonly measured over one-second intervals. It is expressed on a log scale in velocity decibels (VdB) referenced to 0.000001×10^{-6} inch per second and is not to be confused with noise decibels. It is more suitable for addressing human annoyance and characterizing background vibration conditions because it correlates better with human response to ground vibration.

Table 9-4 presents estimated general construction (combined) noise levels and bulldozer vibration levels by rail line segment. As shown, the estimated construction noise level would be below the FTA criteria in Table 9-3 and, thus, below the level at which there would be an adverse impact. Similarly, estimated vibration levels from general construction activity would

Table 9-4
Estimated Construction Noise and Vibration Levels

Segment	Distance to Nearest Receptor (feet)	Bulldozer Vibration (PPV[a] [inches per second])	Construction Noise Level (dBA)[b]
Big Lake	177	0.004724	79
Houston North[c]	–	–	–
Houston South	213	0.003579	77
Houston	2,129	0.000113	57
Willow	398	0.001401	72
Connector 3	200	0.003933	78
Mac East	770	0.000521	66
Mac West	209	0.003682	77
Connector 2	3,400	0.000056	53
Connector 1	2,700	0.000079	55

[a] PPV = peak particle velocity.
[b] dBA = A-weighted decibels.
[c] There are no receptors near this segment.

be below the FTA fragile building damage criterion of 0.20 inch per second (FTA, 2006), so no building damage due to vibration from construction of the proposed rail line extension would be anticipated. Vibration due to general construction might be perceptible in some locations, but the frequency of vibration events would be low (and temporary) and below building damage and human annoyance levels.

There could be pile driving during construction of bridges over water bodies or at rail/roadway crossings. SEA estimated pile-driving noise and vibration levels at the nearest receptors for ARRC-proposed bridge locations. Table 9-5 shows the estimated noise and vibration levels at three bridge locations planned for grade separations at rail/roadway crossings and two bridge locations for stream crossings. These noise and vibration levels assume impact pile driving; use

Table 9-5
Estimated Pile-Driving Noise and Vibration Levels at ARRC-Proposed Bridge Locations along the Port MacKenzie Rail Extension

Segment	Road or Stream Crossing	Distance to Nearest Receptor (feet)	Pile Driving PPV[a] (inches per second)	Pile Driving Noise Level (dBA)[b]
Big Lake	Parks Highway	500	0.0170	81
Big Lake	Big Lake Road	596	0.0130	79
Big Lake	Hollywood Road	480	0.0180	81
Mac East	Holstein Avenue	2,340	0.0017	68
Houston South	The Little Susitna River	960	0.0064	75
Willow	Rodgers Creek	3,000	0.0012	65

[a] PPV = peak particle velocity.
[b] dBA = A-weighted decibels.

of other techniques, such as vibratory or sonic pile driving, could result in lower noise and vibration levels. No receptors were identified near the other ARRC-proposed bridges, so no noise impacts would be expected at these other locations.

ARRC has proposed drainage structures for crossing some water bodies; the specific type of structure would be determined during final design and permitting if the proposed rail line is authorized by the Board. ARRC has indicated that such structures could include bridges (ARRC, 2008a). Because bridge construction could involve pile driving, SEA also analyzed potential noise and vibration impacts at these locations. Table 9-6 lists the calculated noise and vibration levels. No receptors were identified near the other ARRC-proposed locations for drainage structures, so no noise impacts would be expected at these other locations.

Table 9-6
Estimated Pile-Driving Noise and Vibration Levels at Potential Bridge Locations along the Port MacKenzie Rail Extension

Segment	Crossing Identification	Distance to Nearest Receptor (feet)	Pile Driving PPV[a] (inches per second)	Pile Driving Noise Level (dBA)[b]
Willow	W-112	2,929	0.0012	66
Big Lake	BL-005	744	0.0094	78
Big Lake	BL-007R	632	0.0119	79
Big Lake	BL-008R	530	0.0156	80
Big Lake	BL-010	830	0.0079	77
Connector 1	C1-027	2,800	0.0013	66

[a] PPV = peak particle velocity.
[b] dBA = A-weighted decibels.

ARRC has indicated that there could be construction activity at night. Estimated noise levels during pile driving could equal or exceed the FTA criteria for nighttime construction shown in Table 9-3 at three locations – bridges at crossings of the Parks Highway and Hollywood Road (see Table 9-5) and a potential bridge location on the Big Lake Segment (see Table 9-6). If pile driving would occur at these locations, the activity would be temporary and noise levels would exceed FTA criteria only if conducted during nighttime hours.

Estimated construction vibration levels (based on pile driving and bulldozing activities) would be below the FTA 0.20 inch per second fragile building damage criterion. Therefore, no building damage due to vibration from construction of the proposed rail line extension would be expected. Construction vibration might be perceptible in some locations, but the frequency of vibration events would be low (and temporary) and below annoyance standards.

9.5.1.2 Noise from Operations

Rail operations noise is composed of diesel locomotive engine and wheel/rail noise (collectively referred to as wayside noise) as well as locomotive warning horn sounding at at-grade rail-highway crossings. Wayside noise is primarily a function of train speed, train length, and number of locomotives. For all rail line alternatives, SEA estimated rail-related noise levels based on a train with three locomotives pulling 80 cars at an average train speed of 40 miles per hour. The Applicant's December 5, 2008, petition for exemption (ARRC, 2008b) indicates that anticipated train traffic would include trains ranging from 40 to 80 cars. To be conservative, SEA assumed 80 cars per train for this analysis. SEA assumed that each locomotive would be 74 feet long, rail cars would be on average 60 feet long, and overall train length would be approximately 5,000 feet. Given these assumptions and the Applicant's projection of two train trips per day (which could occur randomly at any time during a 24-hour period), the distance from the rail line to the 65 DNL wayside noise contour would be 80 feet, and the distance to the 65 DNL horn noise contour would be 215 feet. Beyond these contours, train-related noise would be less than 65 DNL.

Figures 9-2 through 9-8 show 65 DNL and 3 dBA increase contours for alternative rail segments that have sensitive receptors in the vicinity of the proposed rail line. Figures do not include noise contours for the Houston North Segment and Connector Segments 1 and 2 because no sensitive receptors were identified in the immediate vicinity of these proposed segments. Similarly, noise contours are not shown for rail yard activities at the terminal reserves at the southern end of the Mac East and Mac West segments because no sensitive receptors were identified in the immediate vicinity and so no noise impacts would be anticipated. SEA calculated the DNL and the 3 dBA increase contours using the ambient sound measurements listed in Table 9-1 to characterize the existing (baseline) noise conditions. The area within the 3 dBA increase contour can be quite large if the ambient sound level is sufficiently low. An example of this can be seen along the Houston South Segment, where measured sound levels were relatively low.

SEA used Geographic Information Systems software to count receptors identified (based on aerial photographs) within the calculated noise contours. Table 9-7 presents the resulting receptor count information.

As defined by STB's regulation, an adverse noise impact resulting from railroad operation would occur if project noise levels meet or exceed 65 DNL and increase by at least 3 dBA DNL. Table 9-7 shows that no receptors near any of the build alternatives would experience an adverse noise impact due to operation of the proposed rail extension (i.e., meet or exceed 65 DNL and increase by at least 3 dBA DNL). Because of the relatively low ambient noise level and proximity to receptors, the 3 dBA increase contour associated with the Big Lake Segment would include 16 receptors, Willow would include 5 receptors, Houston South would include 8 receptors, and Mac West would include 2 receptors. Because of relatively low ambient noise levels in these areas, train noise would be more noticeable than in other areas with higher ambient noise levels. Even though these segments contain receptors that would experience an increase of 3 dBA, and because noise levels would be below 65 DNL for all identified potential receptors, there would be no adverse noise impacts associated with any of the build alternatives.

Because the Big Lake Segment would involve a change in the location of a grade crossing on the existing ARRC main line, SEA also analyzed the potential noise impact to sensitive receptors in the vicinity of the existing grade crossing that would be eliminated (at Cheri Lake Drive) and the proposed new crossing that would be constructed (at Ray Street). SEA found that the proposed change in the grade crossing location would cause a minor change in noise impacts. Specifically, SEA estimates that the grade crossing relocation would reduce train noise to levels below 65 DNL for four receptors that currently experience levels at or above 65 DNL, while

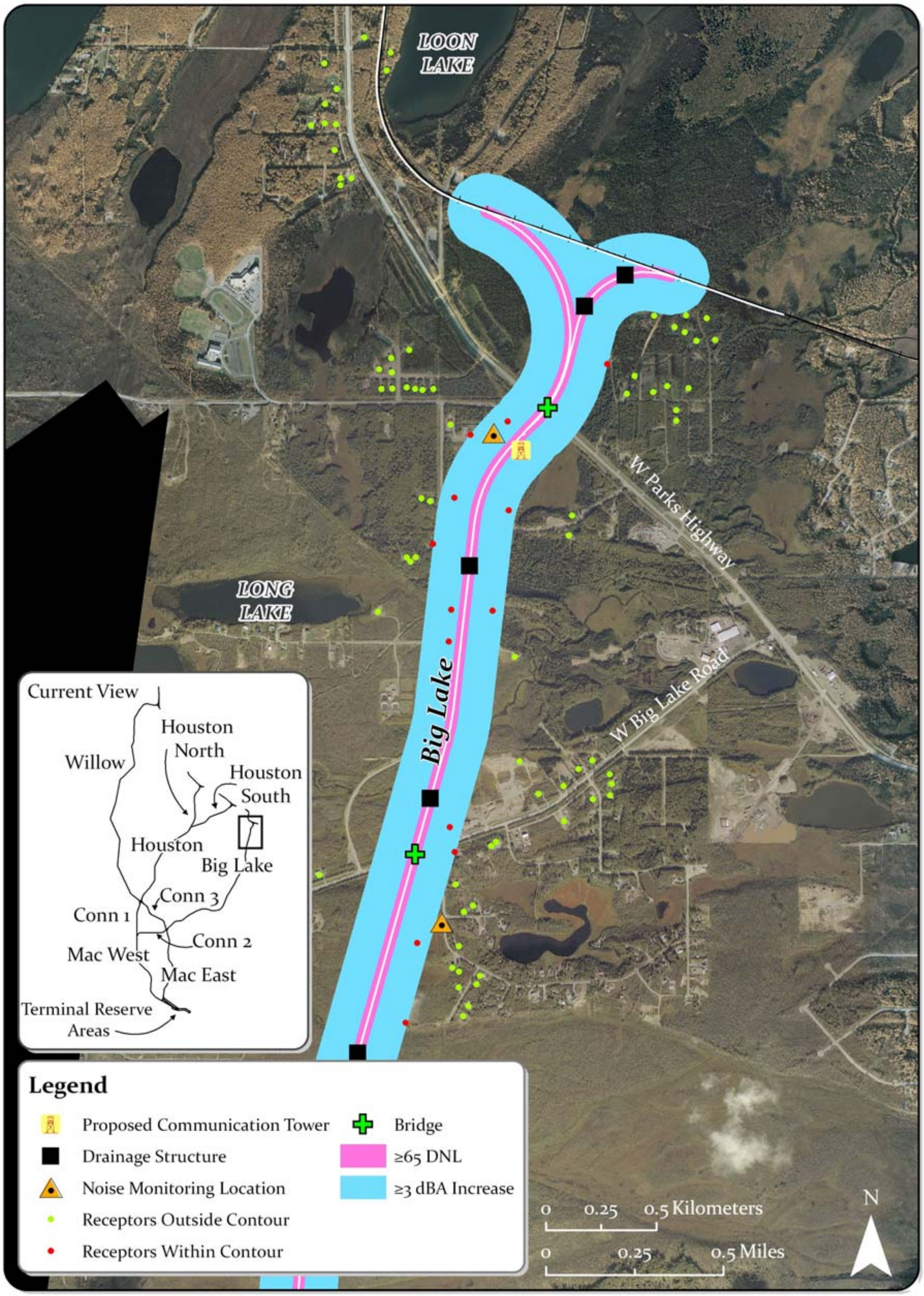


Figure 9-2. Big Lake Segment at Parks Highway – 3 dBA Increase and 65 DNL Contours

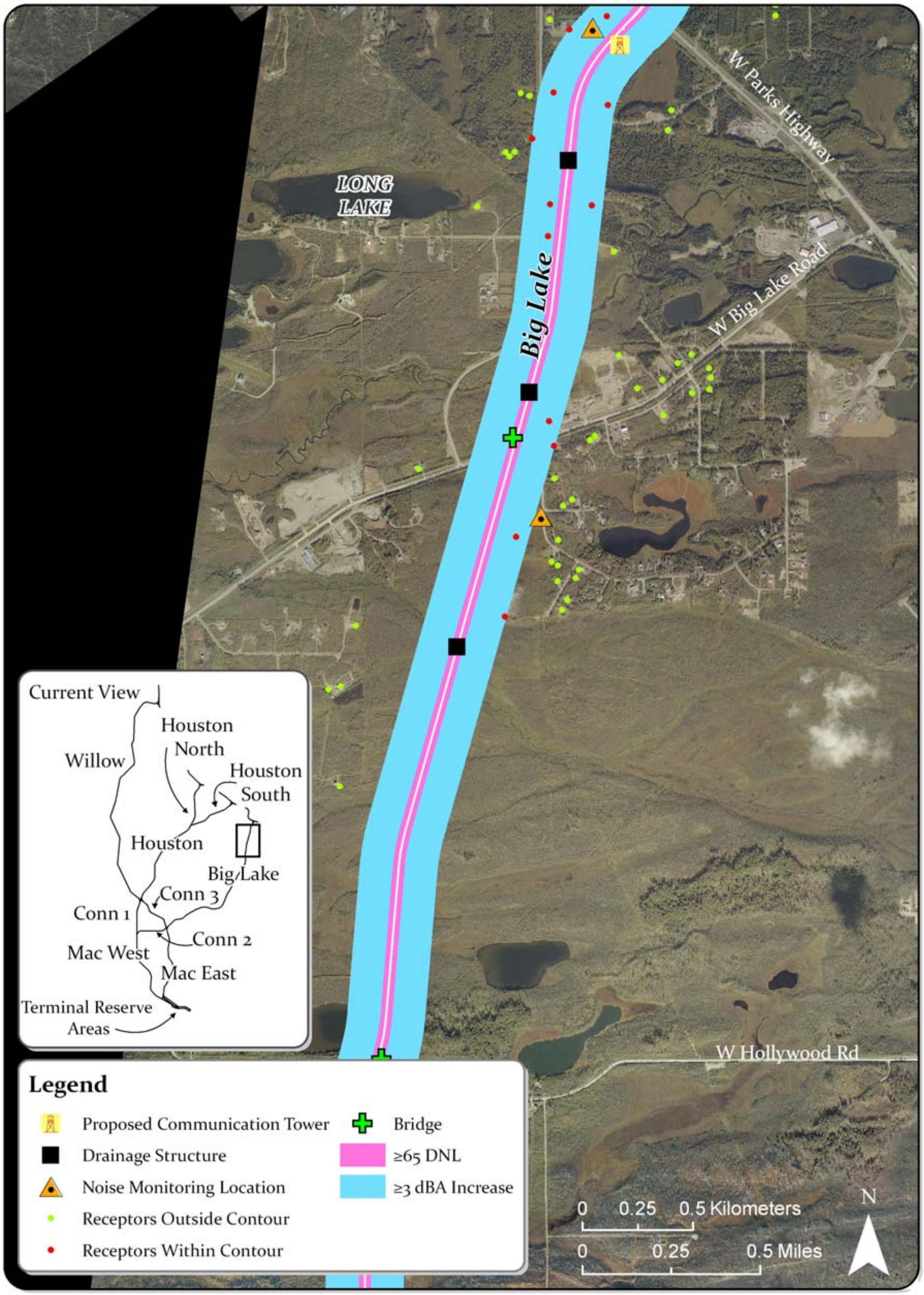


Figure 9-3. Big Lake Segment at West Hollywood Road – 3 dBA Increase and 65 DNL Contours

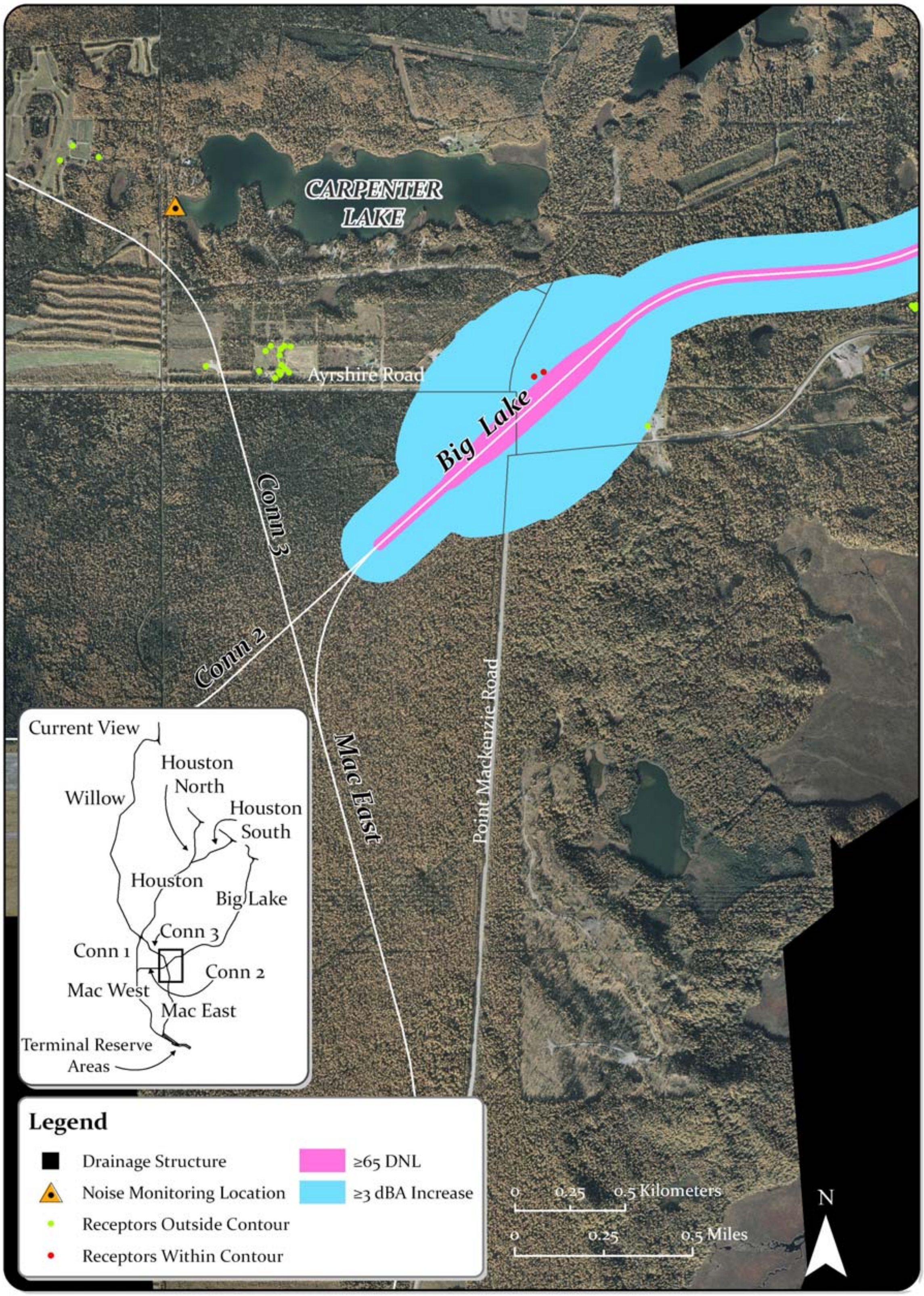


Figure 9-4. Big Lake Segment at Point MacKenzie Road – 3 dBA Increase and 65 DNL Contours

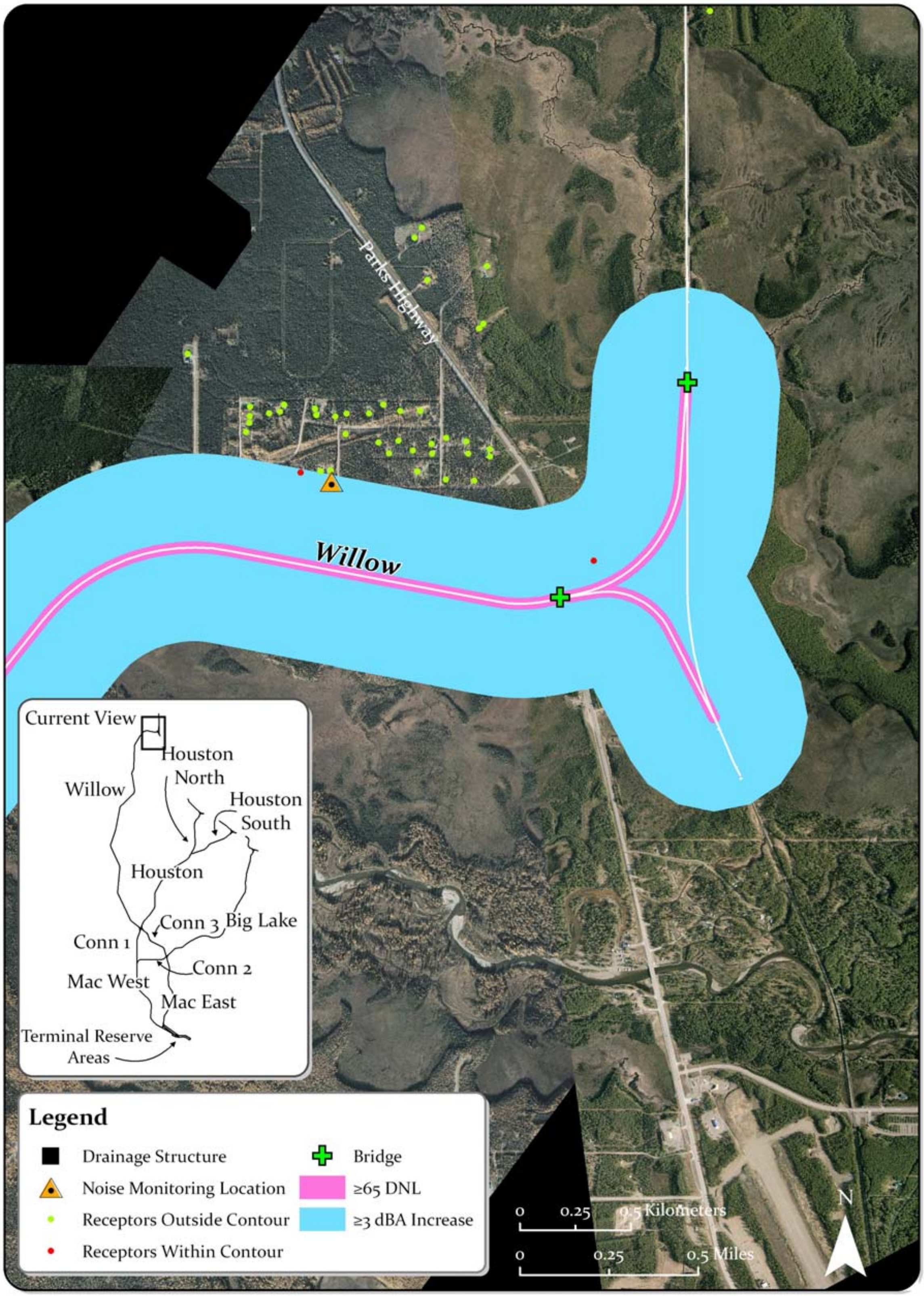


Figure 9-5. Willow Segment at Parks Highway – 3 dBA Increase and 65 DNL Contours

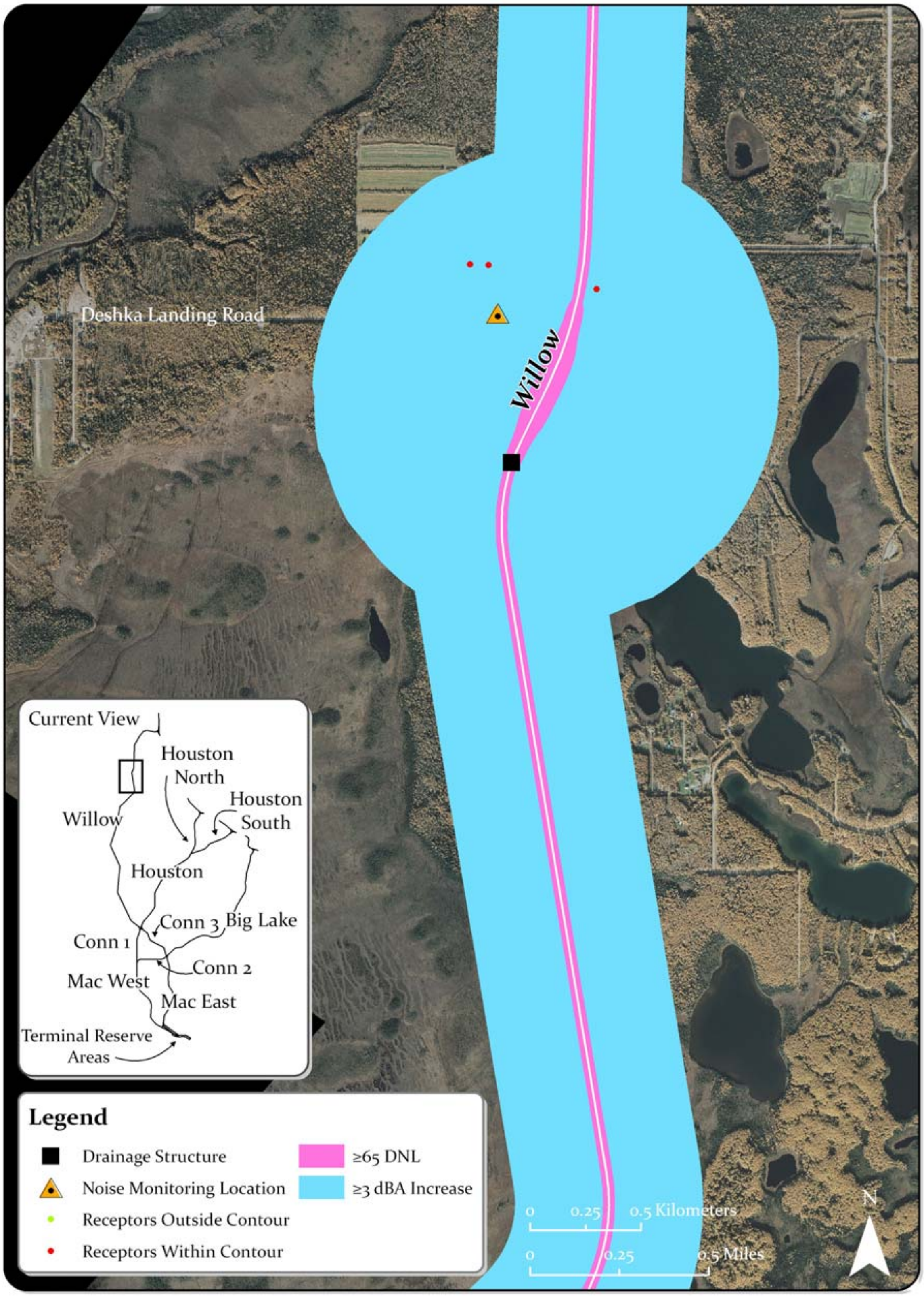


Figure 9-6. Willow Segment at Deshka Landing Road – 3 dBA Increase and 65 DNL Contours

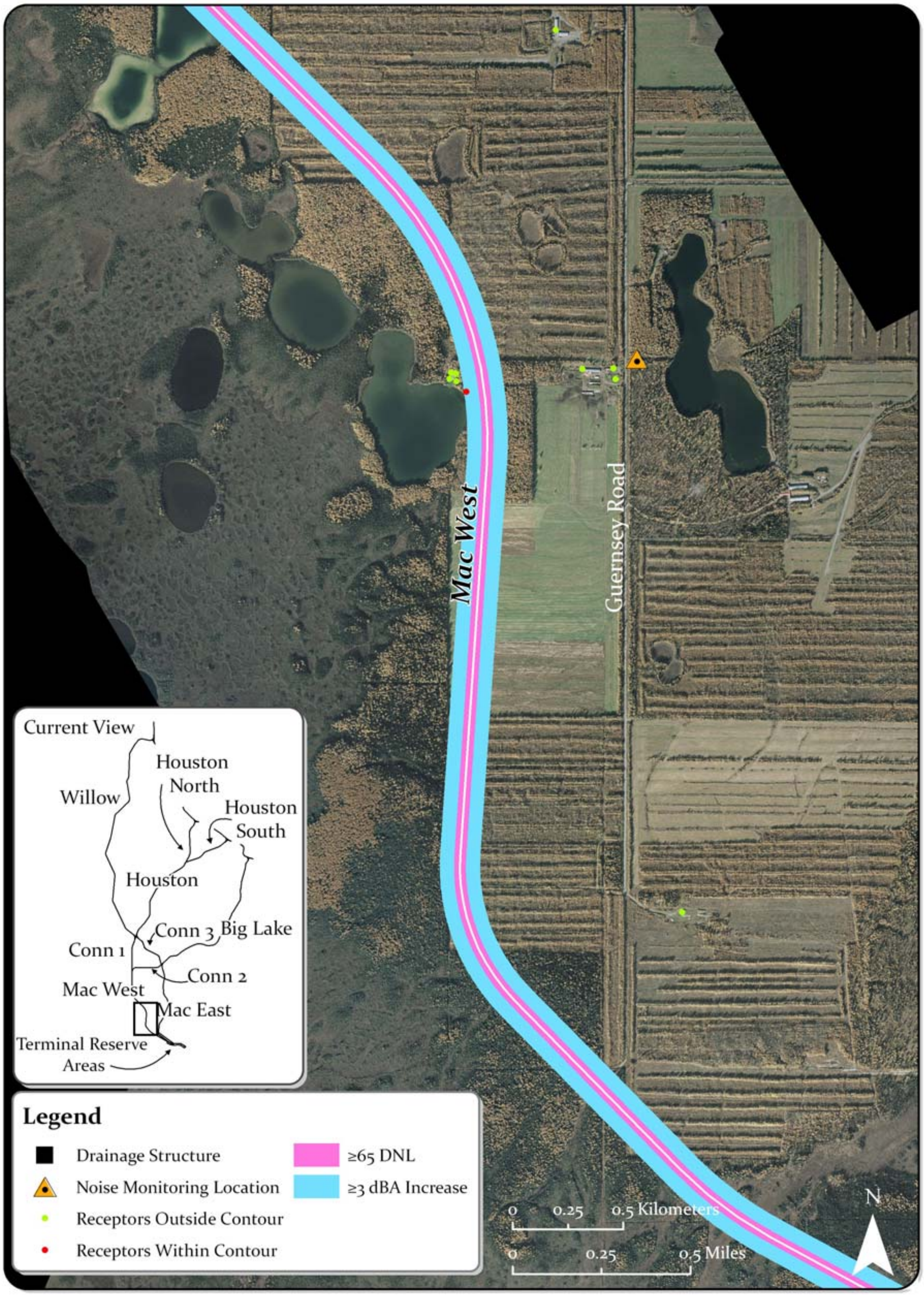


Figure 9-7. Mac West Segment west of Guernsey Road – 3 dBA Increase and 65 DNL Contours

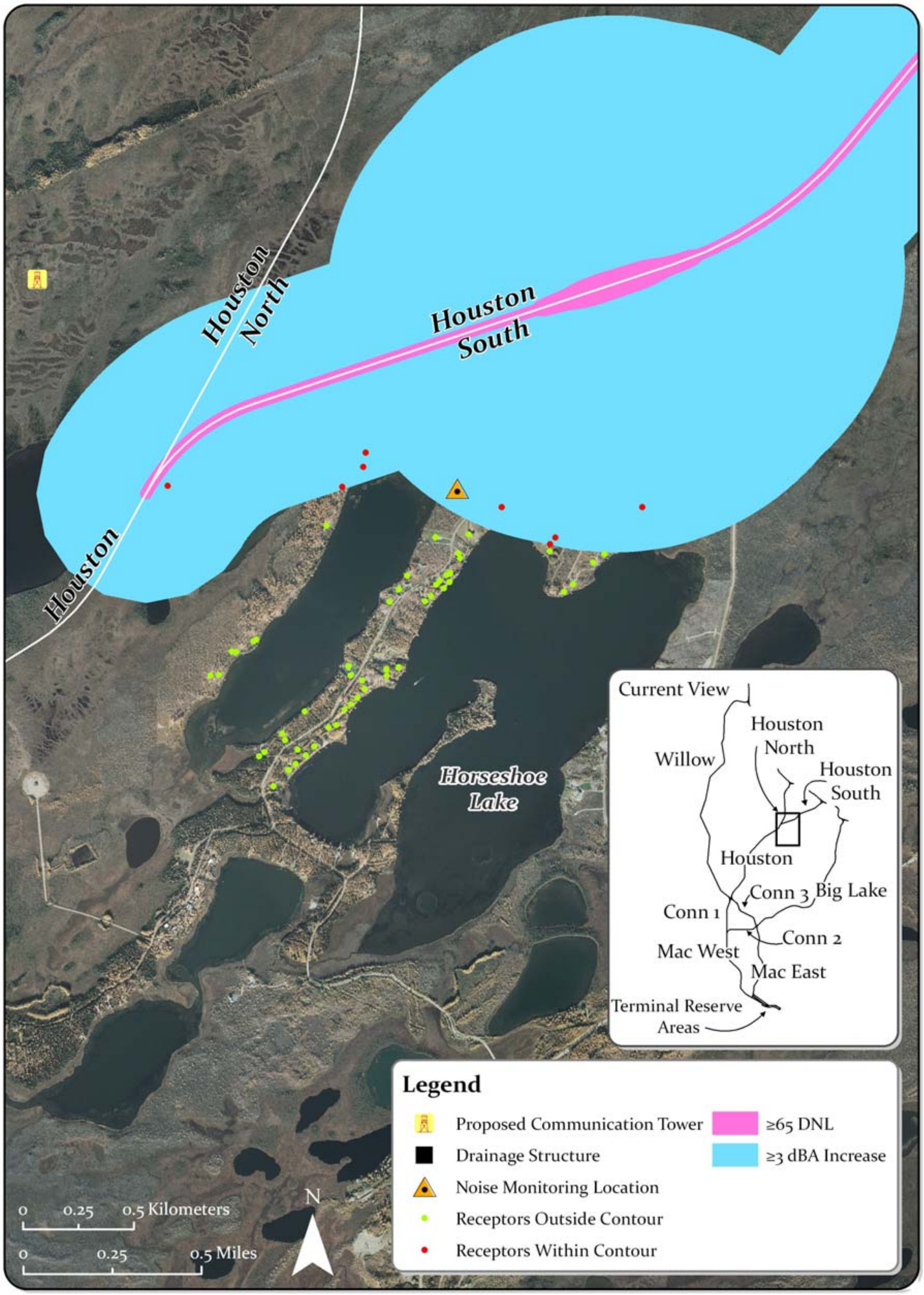


Figure 9-8. Houston South Segment near Horseshoe Lake – 3 dBA Increase and 65 DNL Contours

Table 9-7
Noise Receptor Counts for the Proposed Port MacKenzie Rail Extension – Rail Operations

Segment	65 DNL[a]	Plus 3 dBA[b]
Big Lake	0	16
Willow	0	5
Houston North	0	0
Houston South	0	8
Houston	0	0
Mac East	0	0
Mac West	0	2
Connector 1	0	0
Connector 2	0	0
Connector 3	0	0

[a] DNL = day-night average sound level.
[b] dBA = A-weighted decibels.

increasing the noise level to 65 DNL or greater for one receptor that currently experiences train noise levels below 65 DNL. The estimated increase in noise level for the one newly exposed receptor would be 6 dBA assuming (to be conservative) that the train traffic to and from Port MacKenzie would be additional traffic on the existing main line.

At this time, it is not known whether rail traffic to and from Port MacKenzie over the proposed rail line, if approved by the Board and constructed and operated by ARRC, would result in additional rail traffic on the existing ARRC main line or whether the Port MacKenzie traffic would have otherwise been shipped on the ARRC system to another destination such as Anchorage or Seward. If all of the Port MacKenzie rail traffic were to be new rail traffic, an increase of two trains per day would be an approximately 20 percent increase relative to the existing rail traffic on the main line. The increase in noise along the existing main line from this additional rail traffic would be less than 3 dBA, the STB DNL threshold, and would not cause adverse noise impacts. At least a doubling of rail traffic would be required for the DNL to increase by 3 dBA or more.

The results of SEA's analysis of the potential noise impacts on Section 4(f) properties are provided in Table 9-8. As shown, all project alternatives that include the Willow Segment would result in potential noise impacts to the Little Susitna State Recreation River, the Susitna Flats State Game Refuge, the Willow Creek State Recreation Area, and the Nancy Lake State Recreation Area. None of these refuges and recreation areas are anticipated to experience noise impacts as a result of either the Mac East-Connector 3-Houston-Houston South or Mac East-Big Lake alternative. The estimated acreage of potential noise impacts within the Willow Creek State Recreation Area is approximately 9 percent of the total acreage of the state recreation area, while the acreage of potential noise impacts within the Little Susitna Recreation River would range from 3 percent (for alternatives that include the Willow Segment) to 4 percent (for alternatives that include the Houston North Segment) of the recreation river. All other estimated

Table 9-8
Estimated Areas of Potential Noise Impact within Section 4(f) Properties (Acres)

Alternative	Willow Creek State Recreation Area	Nancy Lake State Recreation Area	Susitna Flats State Game Refuge	Little Susitna State Recreation River
Mac West – Connector 1 – Willow	334	219	1,762	450
Mac West – Connector 1 – Houston-Houston North	0	0	1,489	769
Mac West – Connector 1 – Houston–Houston South	0	0	1,489	0
Mac West – Connector 2 – Big Lake	0	0	992	0
Mac East – Connector 3 – Willow	334	219	273	450
Mac East – Connector 3 – Houston–Houston North	0	0	0	769
Mac East – Connector 3 – Houston–Houston South	0	0	0	0
Mac East – Big Lake	0	0	0	0

potential noise impacts would affect less than 1 percent of the total acreage of the Nancy Lake State Recreation Area and the Susitna Flats State Game Refuge, although the total acreage potentially affected would be greatest within the Susitna Flats State Game Refuge, ranging from 992 to 1762 acres, depending on the alternative.

9.5.1.3 Vibration from Operations

Based on the anticipated average train speed of 40 miles per hour on the proposed rail line and assuming a crest factor (the difference between average and peak vibration levels) of four, the building damage contour for the FTA fragile building damage criterion of 0.20 inch per second would be 10 feet wide (5 feet on each side of the track centerline). There would be no buildings within 5 feet of the rail line, so no there would be no damage to buildings due to vibration from rail line operations.

For an average speed of 40 miles per hour, the vibration annoyance contour along the proposed rail line, using the FTA infrequent event criterion of 80 VdB, would be 80 feet from the track centerline. There would not be any receptors within that distance, which would be within the proposed rail line's 200-foot right-of-way. Therefore, there would be no vibration impacts from proposed rail line operations.

9.5.2 No-Action Alternative

Under the No-Action Alternative, ARRC would not construct and operate the proposed Port MacKenzie Rail Extension, and there would be no noise or vibration impacts.

10. ENERGY RESOURCES

This chapter describes potential impacts to energy resources from the proposed Port MacKenzie Rail Extension. Energy resources include fuel that would be consumed as a result of the proposed action and utility and pipeline corridors potentially affected.

10.1 Regulatory Setting

Council on Environmental Quality regulations (40 Code of Federal Regulations [CFR] 1502.16 (e)) for implementing the National Environmental Policy Act of 1969 state that proper consideration must be given to the energy requirements and conservation potential of various alternatives of a proposed project as well as mitigation measures.

Surface Transportation Board (STB) procedures for implementing environmental laws (49 CFR 1105.7) require an analysis of a project's potential impacts to transportation of energy resources, recyclable commodities, overall energy efficiency, and diversions from rail to motor carrier.

10.2 Analysis Methodology

The Section of Environmental Analysis (SEA) analyzed the impact of proposed Port MacKenzie Rail Extension alternatives on existing energy distribution infrastructure – namely, pipelines and transmission lines – by identifying crossings between each alternative and pipeline and transmission line rights-of-way. SEA also investigated whether energy resources or recyclable commodities were expected to be transported by the Port MacKenzie Rail Extension.

SEA analyzed energy requirements for the proposed rail line, and compared fuel usage by trains to fuel consumption and availability in the region. In addition, SEA considered whether any diversion of freight between modes of transportation would be expected.

10.3 Study Area

The Port MacKenzie Rail Extension alternatives are all within Matanuska-Susitna Borough (MSB or the Borough) and would link Port MacKenzie to the Alaska Railroad's (ARRC or the Applicant) main line. This is the relevant study area for analyzing crossings with existing energy distribution infrastructure. For analyses of potential impacts related to energy requirements, diversion of freight between modes of transportation and transportation of energy resources and recyclables, the study area is the State of Alaska, because the source and transportation modes of fuel to be consumed by the project would not be limited to the MSB.

10.4 Affected Environment

10.4.1 Project Area

Populations along the ARRC main rail line are served by the Alaska Railbelt Electrical Grid; the Matanuska Electric Association provides electricity. A major transmission line originates in the Beluga Power Plant near Tyonek and reaches a bulk substation just south of the Port MacKenzie

District. It then crosses the District to another bulk substation in Knik-Fairview, from which a secondary line travels roughly parallel to the ARRC main rail line to Willow and points north.

A pipeline carrying natural gas from Beluga to Wasilla also crosses the project area, west to east, along Ayshire Avenue. The pipeline follows just north of Port MacKenzie Road until it reaches Knik Goose Bay Road.

10.4.2 State of Alaska

Proposed rail line construction and operations would require the consumption of diesel fuel for construction equipment and locomotives. Rural areas in Alaska depend on diesel fuel and heating oil for power and heating, and often must barge or fly fuel in from refineries in Alaska or the lower 48 states to be stored in tank farms for use after freeze-up (Alaska Energy Authority, 2007). In 2006, Alaska’s consumption of distillate fuel (including diesel fuel used in trucks, locomotives, and agricultural machinery, and fuel oil used for space heating and electric power generation) was almost 14 million barrels, which amounts to 0.9 percent of U.S. consumption of distillate fuel (DOE, 2006).

10.5 Environmental Consequences

10.5.1 Proposed Action

10.5.1.1 Common Impacts

Construction

The construction period is expected to last for 2 years, during which ARRC would use various forms of equipment, such as excavators, trucks, bulldozers, and cranes to perform such activities as clearing and grubbing, grading, infrastructure and track construction, and site cleanup. Energy consumption during the construction period would be temporary and would place minimal additional demand on the local energy supply. Therefore, the impact of energy consumption during proposed rail line construction would be low.

Operations

During rail line operations, energy requirements would primarily be for operation of trains. SEA estimated approximate fuel consumption for train operations for the longest alternative (Mac West-Connector 1-Willow, 46 miles) assuming one round-trip (two one-way trips) freight rail train per day with three locomotives, 80 rail cars, with a loaded weight of 125 tons per car and unloaded weight of 30 tons per car (ARRC, 2008b and ARRC, 2008a, Appendix J). Travel both ways would consume less than 215,000 gallons per year, or less than 0.05 percent of the annual statewide consumption of distillate fuel of 585 million gallons (13,936 thousand barrels times 42 gallons per barrel [DOE 2006]). Although additional diesel consumption would be originated at the terminal reserve area and track sidings, the total demand for diesel generated by the Port MacKenzie Rail Extension would remain a very small share of the annual statewide consumption of distillate fuel.

While a variety of commodities, including recyclable commodities and energy resources such as coal and natural gas, have been considered as possible materials to be shipped along the proposed rail line, the exact commodities to be shipped is unknown at this time. As a result, the impact of the proposed rail line on the transportation of energy resources and recyclable commodities remains unknown.

No diversion from rail to motor carrier traffic is anticipated as a result of proposed rail line operation. Because moving freight by rail is generally more efficient than moving freight by truck (Federal Railroad Administration, 2009), SEA expects energy consumption to decrease, to the extent that truck traffic to and from Port MacKenzie would be replaced by rail transportation.

10.5.1.2 Impacts by Alternative

Construction

All alternatives would cross the energy transmission line that traverses the Port MacKenzie District. The Big Lake, Houston South, and Houston North segments would cross the secondary energy transmission line that departs from the bulk substation in Knik-Fairview (following north along the ARRC main line) near the main rail line. ARRC would need to ensure that industry standards are met and disruption minimized if any relocations or alterations to pylons (the towers supporting the lines) were needed, and would need to coordinate any alterations with line owners.

Connector 1 and 3 segments and the Big Lake Segment would cross the Beluga-Wasilla natural gas pipeline. Application of appropriate construction industry standards should minimize any chance of disruption during construction. SEA does not anticipate any disruption to this pipeline or short-term effects on pipeline safety as a result of proposed rail line construction.

Operations

Train operation energy requirements depend on distance and grade, among other factors. Estimates provided by the Applicant in the Preliminary Environmental and Alternatives Report (ARRC, 2008a, Appendix J) show energy consumption varying within a 25% margin around the median energy consumption for all alternatives.

Connector 1 and 3 segments and the Big Lake Segment would cross the Beluga-Wasilla natural gas pipeline. SEA does not anticipate any disruption to this pipeline or long-term effects on pipeline safety as a result of proposed rail line operations.

10.5.2 No-Action Alternative

Under the No-Action Alternative, ARRC would not construct and operate the Port MacKenzie Rail Extension. Truck-to-rail diversion of freight and any associated reduction in fuel consumption would not occur.

11. TRANSPORTATION SAFETY AND DELAY

This chapter describes the analysis of potential transportation safety and delay impacts from the proposed Port MacKenzie Rail Extension. Section 11.1 describes the regulatory setting, Section 11.2 describes the analysis methodology, Section 11.3 describes the affected environment (existing conditions), and Section 11.4 describes potential environmental consequences (impacts) under the proposed action and the No-Action Alternative.

11.1 Regulatory Setting

Several agencies within the U.S. Department of Transportation (USDOT) – including the Federal Highway Administration (FHWA) and the Federal Railroad Administration (FRA) – have safety-related roles with respect to highway-rail grade crossings. All traffic control devices installed at railroad facilities involving Federal aid projects must comply with FHWA's Manual on Uniform Traffic Control Devices (23 Code of Federal Regulations [CFR] Part 655, Subpart F), and on certain projects where Federal-aid funds are used for the installation of warning devices, must include automatic gates and flashing light signals. The FRA has issued rules under its railroad safety authority that impose minimum maintenance, inspection, and testing standards for grade crossing warning devices (49 CFR Parts 234-36). Generally, however, states have jurisdiction over grade crossing safety issues, including the selection and placement of warning devices (Railroad-Highway Grade Crossing Handbook [FHWA, 2007]). Thus, the Surface Transportation Board's Section of Environmental Analysis (SEA) analyzed grade separation of highway/rail crossings based on FHWA guidelines, including the Alaska Traffic Manual, which provides guidelines for improvements in grade crossing warning devices (ADOT&PF, 2005). The guidelines include consideration of delay, highway classification, average daily traffic, number of trains per day, and train speed at grade crossings.

Several Federal agencies have established requirements for hazardous materials transportation on rail lines, and for emergency planning and spill response for hazardous materials. These agencies include the USDOT, the U.S. Environmental Protection Agency (USEPA), and the Occupational Safety and Health Administration (OSHA). USDOT rules include requirements for shipping and packaging containers for hazardous materials, emergency response information, and training. The USDOT's FRA has authority to ensure the safe movement of rail traffic. Regulatory and enforcement powers of FRA are found at 49 CFR Parts 200 through 240. USDOT's Pipeline and Hazardous Materials Safety Administration has established design standards and requirements, found at 49 CFR Parts 171 and 179, for railcars used to transport hazardous materials. USEPA rules address spill prevention and cleanup. Most USEPA rules address only fixed facilities, rather than transport activities. However, USEPA rules at 40 CFR Part 263, Standards Applicable to Transporters of Hazardous Waste, specify immediate response actions, discharge cleanup, and other requirements for transporters of hazardous waste. Finally, OSHA rules at 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, specify emergency response and clean-up operations for releases, or substantial threats of releases, of hazardous substances.

11.2 Analysis Methodology

Because the Alaska Railroad Corporation's (ARRC or the Applicant) stated purpose for the proposed action is to provide rail service between Port MacKenzie and Interior Alaska, SEA evaluated each alternative for the proposed action from Port MacKenzie to a common point on the existing ARRC main line where the Willow Segment would connect. Therefore, some alternatives include the use of existing crossings along the mainline between the point where the alternative would connect to the mainline and the point where the Willow Segment would connect to the mainline. The analysis assumes that about 11 trains per day currently operate along this segment on the main rail line.

SEA evaluated grade crossing safety at existing grade crossings by estimating future accident frequency under the No-Action Alternative and the proposed action using the FRA Personal Computer Accident Prediction System (FRA, 2007). The analysis accounted for accident history and frequency of trains at grade crossings, volume of vehicle traffic, existing safety devices at grade crossings, and other factors to determine the potential impacts of an increase in rail traffic. The quantitative analysis of accident frequencies at existing public grade crossings considered the existing rail traffic volumes included in Accident Prediction System, and the additional proposed rail traffic. Estimates of annual average daily traffic for each road crossing were calculated for 2012 and used in the analysis. Appendix L provides more information about the methods SEA used to analyze impacts at grade crossings.

Calculation of projected accident frequencies was limited to existing public grade crossings. Because new grade crossings that would result from the proposed rail line lack historical accident data, it was not possible to apply the Personal Computer Accident Prediction System to calculate crossing-specific projected accident frequencies for these crossings. To provide an approximate upper bound of predicted accident frequency for the new at-grade crossings, SEA calculated predicted accident frequency for (1) the crossing with the highest annual average daily traffic (AADT) whose planned warning device is crossbucks and (2) the crossing with the highest AADT whose planned crossing would have gates. This was done by using similar existing crossings along the ARRC main line as proxies for accident history.

Finally, SEA calculated a hazard index for each crossing. The hazard index, which is the product of AADT, daily train traffic, and a crossing protection factor, provides a comparison among the alternatives of the relative likelihood of train-vehicle collisions at grade crossings.

At-grade crossings can be a source of delay for motorists because trains have priority of movement. SEA analyzed potential delay at grade crossings by calculating the estimated delay that road vehicles would experience at grade crossings as a result of rail traffic due to the proposed action. For each grade crossing analyzed, SEA calculated the time that each crossing would be blocked for each train-crossing event and the average number of vehicles that would be delayed by each crossing event. SEA also calculated the average delay for all vehicles using each crossing in a 24-hour period and the total delay for all crossings associated with each alternative.

ARRC anticipates transporting bulk materials and containers on the proposed rail line and has not indicated any plans to carry hazardous materials. SEA considered the potential impacts of occasional shipments based on analysis previously conducted for rail transport of fuel and other hazardous materials in other cases.

Appendix L includes a list of data sources and a more detailed explanation of the methodology SEA used to estimate potential grade crossing safety and delay impacts of the proposed action.

11.3 Affected Environment

The proposed project could have a potential impact on the local transportation system, primarily at the road-rail at-grade crossings. New at-grade and grade-separated road crossings would be created, and there would be the potential for additional accidents involving trains and vehicles at new at-grade crossings. Vehicular traffic could also be delayed at new at-grade crossings as trains pass by.

The existing transportation system in the project area consists of a network of local roads with some arterial and collector roads, including Hollywood Road, Burma Road, and Ayrshire Avenue. Table 11-1 summarizes AADT for at-grade crossings analyzed as part of one or more of the alternatives. These AADT values are well below roadway capacities, so motorists currently experience minimal if any delay on these roads. Crossings that would be grade separated are not included because vehicle traffic on these roads would not be affected by proposed rail line operations.

Table 11-1
At-Grade Crossings

Rail Line Segment	Road Name	Estimated AADT in 2012 (vehicles/day)
Mac West	S. Guernsey Road	102
Connector 1	Little Su River Road	154
Connector 2	S. Guernsey Road	102
Connector 3	Ayrshire Avenue	579
Connector 3	W. Carpenter Lake Road	58
Willow	W. Deshka Landing Road	166
Willow	Willow Creek Parkway	396
Houston	W. Susitna Parkway	363
Houston	W. Papoose Twins Road	164
Houston South	W. Millers Reach Road	154
Big Lake	S. Burma Road	637
Big Lake	Homestead Road	102
Big Lake	Homestead Road	102
Big Lake	S. Larrys Lane	102
Big Lake	W. Calonder Way	51
Big Lake	W. Larae Road	102
Existing mainline	Cheri Lake Drive	205
Existing mainline	N. Lynx Lake Road	102
Existing mainline	W. Twitty Avenue/Nancy Lake Landing	102
Existing mainline	Willow Station Road	412
Existing mainline	Willow Fishhook Road	740

In the past 10 years, there have been three incidents involving at-grade crossings in Matanuska-Susitna Borough (MSB), with a total of two injuries and no fatalities. None of these incidents occurred at the existing crossings included in Table 11-1. Besides the three incidents involving at-grade crossings in MSB between 1999 and 2008, there was one fatal trespass-related accident in 2005 that was unrelated to a grade crossing (FRA, 2008). None of these incidents involved hazardous materials. ARRC transports hazardous materials on the existing mainline and is involved in emergency preparedness training with local communities, including how to respond in case of a train accident or a hazardous material incident (ARRC, 2006, 2007). The Alaska Department of Transportation & Public Facilities (ADOT&PF) does not have formal emergency management standards for rail line emergency management. If a rail line accident affected the road system, ADOT&PF would initiate emergency response according to its 2006 Incident Field Operations Guide (ADOT&PF, 2008).

11.4 Environmental Consequences

11.4.1 Proposed Action

11.4.1.1 Grade Crossing Safety

Table 11-2 lists predicted accident frequency for the existing at-grade crossings along the ARRC mainline between the point where the Big Lake Segment would connect to the main line and the point where the Willow Segment would connect to the main line. At the crossing with the highest predicted accident frequency for existing conditions, Willow Fishhook Road, the predicted accident frequency would increase from 0.018508 to 0.019486, reducing the predicted interval between individual accidents from 54 to 51 years.

Table 11-2
Predicted Accident Frequency

	Predicted Accidents per Year		Years between Accidents	
Road [a]	**No Action**	**Alternatives (except those using the Willow Segment)**	**No Action**	**Alternatives (except those using the Willow Segment)**
N. Lynx Lake Road	0.015093	0.016025	66	62
W. Twitty Avenue/Nancy Lake Landing	0.015093	0.016025	66	62
Willow Station Road	0.015937	0.016800	62	59
Willow Fishhook Road	0.018508	0.019486	54	51

[a] Cheri Lake Drive is excluded from this table because the Applicant proposes to relocate this crossing for alternatives involving the Big Lake Segment, which would make it a new rather than an existing crossing, and it would not be crossed by rail traffic associated with the other alternatives.

Because predicted accident frequency at at-grade crossings is calculated using historical accident data, crossing-specific predicted accident frequencies could not be calculated for new at-grade crossings associated with the alternatives. ARRC has proposed to equip proposed at-grade crossings with roads having AADT of more than 500 with active warning devices such as flashing lights and gates, while those with AADT of less than 500 would be marked with passive warning devices such as crossbucks and stop signs. To provide an approximate upper bound of predicted accident frequency for the new at-grade crossings, SEA estimated predicted accident frequency for the crossings with the highest AADT in each of these two categories by using similar existing crossings in the study area as proxies. South Burma Road, on the Big Lake Segment, has a projected AADT of about 640 vehicles per day, and it would be equipped with flashing signs and gates. The predicted accident frequency for this combination of conditions would be 0.00763 accident per year, which is the equivalent of one accident every 131 years. Willow Creek Parkway, on the Willow Segment, would have an AADT of about 400 vehicles per day and would be equipped with crossbuck signs. The predicted accident frequency for this combination of conditions would be 0.008742 accident per year, or one accident every 114 years.

The hazard index provides another mechanism for comparing the likelihood of collisions between trains and vehicles at grade crossings. SEA calculated a hazard index for each crossing to provide a comparison among the alternatives with respect to grade crossing safety. Table 11-3 summarizes the number of crossings (at grade and separated) and the total hazard index (sum of hazard indexes for each crossing) for each alternative. The last column indicates the ratio between total hazard index for each alternative and the lowest hazard index calculated for any of the alternatives. Appendix L provides detailed inputs and the calculated hazard index for each crossing.

Table 11-3
Hazard Index Summary

Alternative	Number of Crossings: At Grade	Number of Crossings: Separated	Total Hazard Index	Ratio
Mac East-Connector 3-Willow	4	3	1368	1.00
Mac West-Connector 1-Willow	4	1	1638	1.20
Mac East-Connector 3-Houston-Houston North[a]	8	3	1919	1.40
Mac West-Connector 1-Houston-Houston North[a]	8	1	2189	1.60
Mac East-Connector 3-Houston-Houston South[a]	9	3	2226	1.63
Mac West-Connector 1-Houston-Houston South[a]	9	1	2496	1.82
Mac East-Big Lake[a]	11	7	1729	1.26
Mac West-Connector 2-Big Lake[a]	13	5	2139	1.56

[a] Includes part of the existing ARRC main line.

A shown in Table 11-3, the alternative with the highest hazard index – Mac West-Connector 1-Houston-Houston South – has an index about 80 percent higher than the alternative with the lowest index (Mac East-Connector 3-Willow). Although the two alternatives that include the Big Lake Segment would have the most at-grade crossings, their hazard index is lower than those that include the Houston South Segment because their associated crossings have relatively lower AADT or additional crossing protection or both. Therefore, even with fewer crossings, Mac West-Connector 1-Houston-Houston South has the greatest likelihood of train-vehicle collisions based on the hazard index.

Rail line construction would occur mostly in relatively remote and rural areas. During rail line construction, new access roads, if needed, to construction staging areas would originate from nearby intersections with existing public roads. Equipment and materials needed for construction of the proposed rail line would be transported by rail and road, with the relative use of road and rail depending on the construction schedule and the approach selected by the construction contractor. SEA anticipates that the increased rail traffic during the construction period would be less than during operations (that is, less than 2 trains per day), and potential impacts on safety also would be less.

11.4.1.2 Grade Crossing Delay

Vehicle delay at grade crossings varies depending on roadway and rail traffic volumes, the number of roadway lanes, train length, and train speed. Table 11-4 summarizes estimated grade crossing delay from proposed rail line operations. All alternatives would have a very small impact on road delay at grade crossings, with a maximum increase of about 7 minutes of delay per day (total for all vehicles collectively) for any of the alternatives.

Table 11-4
Grade Crossing Delay

	Number of vehicles delayed per day (vehicles per day)		Average Delay per Stopped Vehicle (minutes per vehicle)		Total delay in a 24-hour period for all vehicles collectively (minutes)	
Alternative	**No Action**	**Proposed Action**	**No Action**	**Proposed Action**	**No Action**	**Proposed Action**
Mac East-Connector 3-Willow	-	2	-	1	-	2
Mac West-Connector 1-Willow	-	3	-	1	-	3
Mac East-Connector 3-Houston-Houston North	20	26	1	1	20	25
Mac West-Connector 1-Houston-Houston North	20	27	1	1	20	26
Mac East-Connector 3-Houston-Houston South	20	26	1	1	20	26
Mac West-Connector 1-Houston-Houston South	20	27	1	1	20	27
Mac East-Big Lake	23	31	1	1	22	30
Mac West-Connector 2-Big Lake	23	30	1	1	22	29

At the existing crossing with the highest total daily delay, Willow Fishhook Road, the number of vehicles delayed would increase from 11 to 13 delayed vehicles per day. This represents an increase from 0.5 to 0.7 percent of all vehicles traveling through that particular crossing. At the new crossing with the highest total daily delay, South Burma Road on the Big Lake Segment, about two vehicles per day would experience an average delay of 1 minute as a result of the proposed action. Because approximately 640 vehicles would pass through that crossing each day, an estimated 0.3 percent of vehicles per day would experience delay due to the proposed action. Because all other rail segments included in the proposed action would have shorter delays, SEA anticipates that the effect of the proposed action on grade crossing delay would be minimal. Trail users could also experience delays as a result of proposed rail line operations under any of the alternatives where trail users would need to take an alternative route as a result of the closure of an unofficial trail. However, where the rail line would cross officially recognized trails, ARRC proposed to provide grade-separations or relocations where practicable and there would be no delays. Section 13.1 addresses potential impacts to trail users.

Motorists could also experience delay at new grade crossings during construction of the proposed rail line. Delays during construction of grade crossings would be temporary. SEA anticipates that the increased rail traffic during the construction period, due to transport of construction material, would be less than during operations, and potential delay impacts would also be less.

11.4.1.3 Rail Safety

ARRC anticipates transporting bulk materials and containers on the proposed rail line and has not indicated any plans to carry hazardous materials. SEA previously has analyzed rail transport of hazardous materials in situations involving transportation of flammable and/or toxic materials in areas with relatively high population densities and overall train traffic, and found the potential impacts to be low (SEA, 2002). Thus, SEA concludes that potential impacts of hazardous materials transport, were it to occur, would be minimal.

11.4.2 No-Action Alternative

Under the No-Action Alternative, ARRC would not construct and operate the proposed Port MacKenzie Rail Extension. Therefore, there would be no new grade crossings, no increase in rail traffic as a result of the project and therefore no changes to rail safety and delay. Truck-to-rail diversion of freight and any associated reduction in truck traffic would not occur.

12. NAVIGATION RESOURCES

This section describes navigation resources and navigable waterways (navigable streams) that could be affected by construction and operation of rail line crossing structures along the proposed Port MacKenzie Rail Extension. Section 12.1 describes the regulatory setting for navigation, Section 12.2 defines the study area, Section 12.3 describes the analysis methodology, Section 12.4 describes the affected environment (existing conditions), and Section 12.5 describes potential environmental consequences (impacts) to navigation resources from the proposed rail line

12.1 Regulatory Setting

Federal, State of Alaska, and local agencies regulate project activities that have a potential to impact navigable waterways. Federal and state agencies have made navigability determinations regarding waterways in the project area. Navigability determinations are implemented through laws and regulations, as described in Section 12.1.1.

12.1.1 Federal Regulations

12.1.1.1 U.S. Coast Guard

The U.S. Coast Guard authorizes and issues permits for construction of bridges and causeways across navigable waterways in accordance with the General Bridge Act of 1946 (33 United States Code [U.S.C.] 525 *et seq.*) and Section 9 of the Rivers and Harbors Act (33 U.S.C. 401). U.S. navigable waterways, as they pertain to the Coast Guard permitting process, are defined in 33 Code of Federal Regulations (CFR) Part 2.05-25, and include:

(1) Territorial seas of the United States;

(2) Internal waterways of the United States that are subject to tidal influence; and

(3) Internal waterways of the United States not subject to tidal influence that:

  (i) Are or have been used, or are or have been susceptible for use, by themselves or in connection with other waterways, as highways for substantial interstate or foreign commerce, notwithstanding natural or man-made obstructions that require portage, or

  (ii) A governmental or non-governmental body, having expertise in waterway improvement, determines to be capable of improvement at a reasonable cost (a favorable balance between cost and need) to provide, by themselves or in connection with other waterways, highways for substantial interstate or foreign commerce.

This regulatory definition of navigability has been expanded by legal precedent to include historic and modern use for recreation and tourism (e.g., fishing or sightseeing) or by inflatable rafts (*Alaska v. United States*, 662 F.Supp.455 [D. Alaska 1986]; *Alaska v. Ahtna, Inc.*, 892 F.2d 1401 [9th Cir. 1989]).

Bridges and causeways over waterways meeting the definition of navigable cannot legally be constructed without prior Coast Guard approval of the plans for and locations of such structures. The Coast Guard has stated that certain crossings of waterways and their side channels discussed in this chapter would require individual bridge permits pursuant to Section 9 of the Rivers and Harbors Act.

12.1.1.2 U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers requires permits and authorizations for the placement of structures or work in or affecting U.S. navigable waterways. Corps of Engineers regulations also define U.S. navigable waterways for the purpose of regulating the discharge of dredge or fill material into these waterways. The Corps of Engineers definition of navigability is similar to that of the U.S. Coast Guard, pursuant to 33 CFR Part 329.4, as follows:

> Navigable waterways of the United States are those waterways that are subject to the ebb and flow of the tide and/or are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. A determination of navigability, once made, applies laterally over the entire surface of the waterbody, and is not extinguished by later actions or events which impede or destroy navigable capacity.

In addition, Section 10 of the Rivers and Harbors Act (33 U.S.C. Section 403) requires authorization from the Corps of Engineers for the construction of any structure in, over, or under any U.S. navigable water, the excavation/dredging or deposition of material in these waters or any obstruction or alteration in "navigable water" (USACE, 2008).

12.1.2 State Regulations

The Alaska Constitution contains numerous provisions embracing principles of the Public Trust Doctrine that require the state to exercise authority to ensure that the right of the public to use navigable waters for navigation, commerce, recreation, and related purposes is protected. In Alaska, the Public Trust Doctrine extends beyond those submerged lands to which the state holds title to include all navigable waters. The state's waters are themselves reserved to the people for common use (ADNR, 2008a).

The Alaska Constitution (Article VIII, Sections 1, 2, 3, 6, 13, and 14) and Alaska Statutes (AS) 38.05.127 and 38.05.128 contain some of the provisions that are the legal basis for applying the Public Trust Doctrine in Alaska. In Alaska, this doctrine guarantees the public's right to engage in activities such as commerce, navigation, fishing, hunting, trapping, and swimming, while also providing for the protection of areas for ecological study (ADNR, 2008b).

The Alaska Constitution provides that "free access to the navigable or public waters of the state, as defined by the legislature, shall not be denied to any citizen of the United States or resident of the state, except that the legislature may by general law regulate and limit such access for other beneficial uses or public purposes." The Alaska Supreme Court has concluded "the provisions in Article VIII [of the Constitution] were intended to permit the broadest possible access to and use of state waters by the general public" (*Wernberg v. State*, 516 P. 2d 1191, 1198-9). The Alaska legislature has broadly defined the navigable and public waters available for public use in AS 38.05.965. Moreover, the legislature has endorsed a broad interpretation of the Public Trust Doctrine in Article VIII of Alaska's Constitution in finding that:

> Ownership of land bordering navigable or public waters does not grant an exclusive right to the use of the water and any rights of title to the land below the mean high water line are subject to the rights of the people of the state to use and have access to the water for recreational purposes or any other public purposes for which the water is used or capable of being used consistent with the public trust (Sec. 1, Ch. 82, SLA 1985).

12.1.2.1 Alaska Department of Natural Resources

The Alaska Department of Natural Resources (ADNR) issues permits and authorizations governing construction and other activities in or associated with navigable and public waterways pursuant to Alaska law (AS 38.05.128), which mandates:

> A person may not obstruct or interfere with the free passage or use by a person of any navigable water unless the obstruction or interference is: authorized by a Federal agency and a state agency; authorized under a Federal or state law or permit; exempt under 33 U.S.C. 1344(f) (Clean Water Act); caused by the normal operation of freight barging that is otherwise consistent with law; or authorized by the commissioner after reasonable public notice.

ADNR is also responsible for determining the need for and reviewing the designs of bridges, culverts, and other drainage structures. ADNR issues determinations regarding the navigability of waterways as set out in Alaska law (AS 38.05.965), defining navigable water as:

> Any water of the state forming a river, stream, lake, pond, slough, creek, bay, sound, estuary, inlet, strait, passage, canal, sea or ocean, or any other body of water or waterway within the territorial limits of the state or subject to its jurisdiction, that is navigable in fact for any useful public purpose, including but not limited to water suitable for commercial navigation, floating of logs, landing and takeoff of aircraft, and public boating, trapping, hunting waterfowl and aquatic animals, fishing, or other public recreational purposes.

ADNR is in the process of establishing a statewide method to determine the navigability of Alaska streams. At present, the ADNR has a provisional map of navigable waterways based on U.S. Army Corps of Engineers, U.S. Coast Guard, and U.S. Bureau of Land Management (BLM) determinations. BLM navigability determinations were made on Federal lands prior to conveyance of those lands to Alaska upon statehood. ADNR provides current and historical documentation on whether navigation has been possible.

Alaska law (AS 38.05.127) also mandates the circumstances under which navigability will be determined and safeguards public access to navigable waterways:

> Before the sale, lease, grant, or other disposal of any interest in state land adjacent to a body of water or waterway, the commissioner [of natural resources] shall determine if the body of water or waterway is navigable water, public water. Upon finding that the body of water or waterway is navigable or public water, provide for the specific easements or rights-of-way necessary to ensure free access to and along the body of water, unless the commissioner finds that regulating or limiting access is necessary for other beneficial uses or public purposes.

ADNR planning documents for the project area also include guidance regarding bridge clearance on navigable waterways for boats, wildlife, and riders on horseback, and along the banks of navigable rivers and lakes. Section 13.2 identifies and describes these planning documents

12.1.3 Local Agencies

Alaska boroughs and cities have the authority to provide for planning, platting, and land use regulations defined by Alaska laws (AS 29.35 and 29.40). The Matanuska-Susitna Borough (MSB or the Borough), as a second class borough, is required to provide for area-wide planning, platting, and land use regulations The Borough may delegate these powers to a city within the Borough (AS 29.40.010).

The MSB Coastal Zone Management District (ADNR, 2006a) covers the entire proposed Port MacKenzie Rail Extension project area. All rail line alternatives, including proposed crossings of navigable and public waterways would be subject to consistency review under the Alaska Coastal Management Program, the MSB Coastal Management Plan, and the Coastal Management Plan's associated Point MacKenzie Area Which Merits Special Attention Plan (adopted by the MSB in 1993 and amended in 2006) (ADNR, 2006b). Section 13.1.1.3 describes the MSB Coastal Management Plan in more detail.

12.2 Study Area

The navigation resources study area is in the Susitna River Valley and occupies an area from Point MacKenzie north to Little Willow Creek between the Susitna River, Cook Inlet, Knik Arm, and the existing Alaska Railroad Corporation (ARRC or the Applicant) main line. The study area includes several designated and possibly navigable waterways the rail line would cross.

12.3 Analysis Methodology

The analysis of potential impacts to navigation resources utilizes data and information available from the Coast Guard, Army Corps of Engineers, ADNR, BLM, MSB, and ARRC. SEA also reviewed documents, maps, aerial photos, and imagery from these and other sources to determine the location of navigable waterways. SEA contacted regulatory agency staff to verify information or gather additional information. SEA field crews visited the project area during summer and fall 2008 to assess the areas where ARRC proposes crossing structures as part of proposed rail line construction. Crossing structures would consist of bridges and culverts. Crossing structures identified as "drainage structures" would be determined by the Applicant during the final design process and could include multi-plate culverts, pre-cast arches, and single or multiple short-span bridges. Field crews identified and characterized streams during these field investigations. Analysis of data from regulatory agencies, new field data, and ARRC data using Geographic Information System technology has produced reports and maps illustrating potential impacts to navigable waterways that could be caused by proposed project infrastructure.

12.4 Affected Environment

Table 12-1 lists ADNR-identified navigable and potentially navigable waterways in the study area that the proposed rail line segments would cross.

Table 12-1
Navigable and Potentially Navigable Waterways the Proposed Port MacKenzie Rail Extension Segments would Cross[a] (page 1 of 2)

Water Body	Bureau of Land Management Navigation Status	State of Alaska Navigation Status	U.S. Coast Guard Navigation Status	U.S. Army Corps of Engineers Navigation Status
The Little Susitna River	Navigable through T18N, R1W, S.M.	Navigable through T18N, R1W, S.M.	Navigable to Schrock Road Bridge	Navigable to Schrock Road Bridge
Willow Creek	Not navigable	Determination needed; (50-foot public easement from mean high water line)	Navigable	Navigable to Parks Highway Bridge
Little Willow Creek	Not navigable	Determination needed; (50-foot public easement from mean high water line)	Entire waterway navigable	No determination
Fish Creek Draining Redshirt Lake	Not navigable	Determination needed; recreation use documented	Navigable	No determination
Fish Creek Draining Big Lake	No determination	Navigable per letter in file	No determination	Not navigable
Little Meadow Creek	No determination	Determination needed	No determination	No determination
Lucille Creek	Not navigable	Determination needed	No determination	No determination
Goose Creek	No determination	Determination needed; (50-foot public easement from mean high water line)	No determination	No determination
Lake Creek	Not navigable	Determination needed; recreational use documented	Navigable	No determination

Table 12-1
Navigable and Potentially Navigable Waterways the Proposed Port MacKenzie Rail Extension Segments would Cross[a] (page 2 of 2)

Water Body	Bureau of Land Management Navigation Status	State of Alaska Navigation Status	U.S. Coast Guard Navigation Status	U.S. Army Corps of Engineers Navigation Status
Rodgers Creek	Not navigable	Determination needed; recreation use documented	No determination	No determination
Unnamed Water Body	Navigable	Navigable	Navigable	Navigable
Tributary to Little Willow Creek (crossing for flood overflow from Little Willow Creek)	Not navigable	Determination needed; (50-foot public easement from mean high water line)	No determination	No determination
Tributary to Little Susitna River – from Horseshoe Lake	Not navigable	Determination needed	No determination	No determination
Tributary to Little Susitna River – draining area south of Diamond Lake	Not navigable	Determination needed	No determination	No determination
Tributary to Lake Creek	Not navigable	Determination needed	No determination	No determination
Tributary to Rolly Creek	Not navigable	Determination needed	No determination	No determination

[a] Source: ADNR, 2008c.

The proposed rail line segments would include 30 stream crossings that have been determined to be or that might be considered navigable waterways. The stream crossings described in Table 12-2 include all crossings classified as *navigable*, where one or more agencies has made a determination of navigability, or *possible*, where characteristics of a navigable stream are present but there has not been an agency determination regarding navigability. The waterways the proposed rail line segments would cross that are designated as *possible* are in areas where streams might be candidates for a determination of navigable, but neither the Coast Guard, Army Corps of Engineers, ADNR, nor BLM have determined them to be so. Typically, the Coast Guard and ADNR will provide a determination of navigability on streams when the design of the crossings is complete for review prior to permit approvals. As required by the General Bridge Act of 1946, ARRC would submit final designs for all crossing structures and crossing locations to the Coast Guard for review prior to the start of construction. Based on this information, the Coast Guard would make a final determination regarding its jurisdiction for particular crossings.

Table 12-2
Navigable and Possible Navigable Stream Crossings by Rail Line Segment[a] (page 1 of 2)

Rail Line Segment	Mile Post	Water Body Name	Drainage Structure Type[b]	Number of Drainage Structures	Stream Width (feet)	Bank Width (feet)	Navigable Status
Southern Segments							
Connector 1 **(Total)**	C1-2.6	Tributary to the Little Susitna River	Culvert	**1**	2.0	d	Possible
Mac West	MW-11.0	Unnamed Stream	Culvert	1	11.0	17.0	Possible
Mac West	MW-4.6	Tributary to Cook Inlet	Culvert	1	0.0[c]	d	Possible
Mac West **(Total)**				**2**			
Mac East **(Total)**	ME-4.5	Unnamed Stream	Culvert	**1**	6.0	d	Possible
Northern Segments							
Willow	MP-190.3	Tributary to Little Willow Creek	Bridge	1	12.3	50.0	Possible
Willow	MP-189.0	Rogers Creek	Bridge	1	36.3	d	Navigable
Willow	W-24.0	Willow Creek	Bridge	1	97.5	180.0	Navigable
Willow	W-20.9	Tributary to Susitna River	Culvert	1	7.4	11.4	Possible
Willow	W-16.7	Tributary to Rolly Creek	Culvert	1	32.0	124.0	Possible
Willow	W-14.4	Tributary to Rolly Creek	Culvert	1	1.0 to 2.0	d	Possible
Willow	W-10.0	Fish Creek	Drainage Structure	1	15.0	10.0	Possible
Willow	W-0.6	The Little Susitna River	Bridge	1	d	d	Navigable
Willow **(Total)**				**8**			
Big Lake	B-18.3	Inlet to Long Lake	Drainage Structure	1	<1	d	Possible
Big Lake	B-17.4	Unnamed Stream	Drainage Structure	1	d	d	Possible
Big Lake	B-16.6	Inlet to Long Lake	Drainage Structure	1	6.5	10.0	Possible
Big Lake	B-15.9	Little Meadow Creek	Drainage Structure	1	28.0	100.0	Possible
Big Lake	B-15.2	Lucille Creek	Drainage Structure	1	11.5	11.5	Possible
Big Lake	B-15.1	Tributary to Lucile Creek	Culvert	1	0.0[c]	d	Possible
Big Lake	B-14.8	Wetland	Culvert	1	0.0[c]	d	Possible
Big Lake	B-14.3	Wetland	Culvert	1	1.0 to 2.0	d	Possible
Big Lake	B-9.0	Fish Creek	Drainage Structure	1	d	d	Possible
Big Lake	B-6.4	Goose Creek	Drainage Structure	1	6.0	d	Possible

Table 12-2
Navigable and Possible Navigable Stream Crossings by Rail Line Segment[a] (page 2 of 2)

Rail Line Segment	Mile Post	Water-body Name	Drainage Structure Type[b]	Number of Drainage Structures	Stream Width (feet)	Bank Width (feet)	Navigable Status
Northern Segments (continued)							
Big Lake **(Total)**				**10**			
Houston	H-9.6	Outflow of Muleshoe Lake	Culvert	1	3.6	4.0	Possible
Houston	H-6.3	Tributary to the Little Susitna River	Drainage Structure	1	16.0	16.0	Possible
Houston	H-4.3	Tributary to the Little Susitna River	Culvert	1	d	d	Possible
Houston	H-0.8	Outflow of Diamond Lake	Drainage Structure	1	d	d	Possible
Houston North	HN-3.2	Little Susitna River	Bridge	1	97.5	108.0	Navigable
Houston North	HN-4.4	Lake Creek	Drainage Structure	1	d	d	Navigable
Houston North	HN-4.8	Tributary to Lake Creek	Culvert	1	20.0	22.0	Possible
Houston-Houston North **(Total)**				**7**			
Houston	H-9.6	Outflow of Muleshoe Lake	Culvert	1	3.6	4.0	Possible
Houston	H-6.3	Tributary to the Little Susitna River	Drainage Structure	1	16.0	16.0	Possible
Houston	H-4.3	Tributary to the Little Susitna River	Culvert	1	d	d	Possible
Houston	H-0.8	Outflow of Diamond Lake	Drainage Structure	1	d	d	Possible
Houston South	MP-174.3	The Little Susitna River	Bridge	1	46.5	112.5	Navigable
Houston-Houston South **(Total)**				**5**			

[a] Sources: ADNR, 2008c (Navigability); ARRC, 2008 (Crossings); Noel *et al.*, 2008 (Stream Data).
[b] Drainage structure types have been proposed by the Applicant for each crossing location and include bridges, culverts and drainage structures. Those crossing structures that are designated as "drainage structures" would be determined by the Applicant during the final design process and could include multi-plate culverts, pre-cast arches, and single or multiple short-span bridges.
[c] No defined stream channel present.
[d] No available data.

Table 12-2 lists potential rail line crossings of navigable streams. The table also lists proposed crossings of streams that are identified as possible navigable and would require a determination of navigability. The table lists rail line crossings of streams by segment and Mile Posts, and lists the stream name, stream data, and numbers and types of drainage structures proposed. Figure 12-1 depicts proposed crossings of navigable and possible navigable streams.

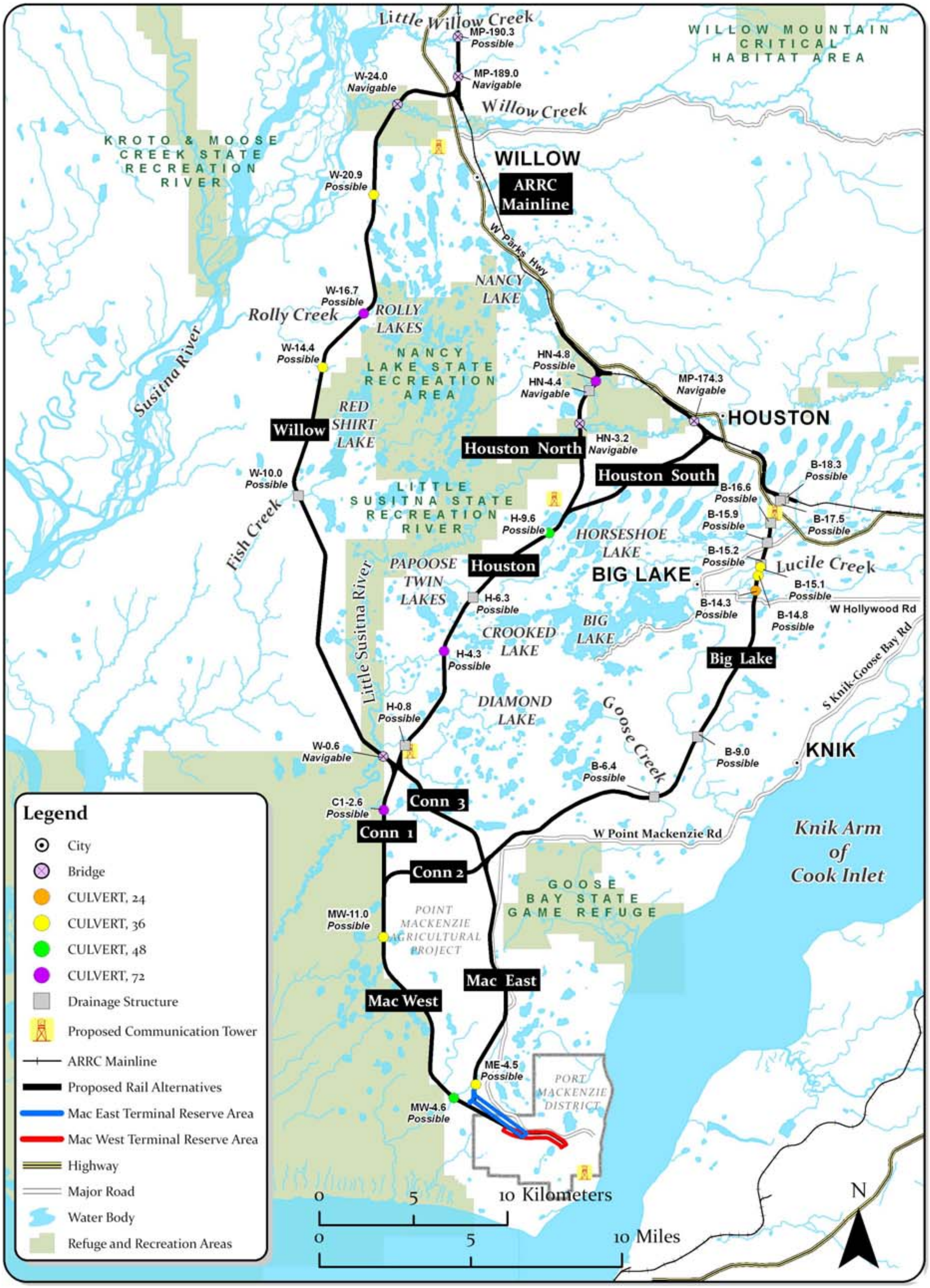


Figure 12-1. Navigable Waters near the Proposed Port MacKenzie Rail Extension

12.5 Environmental Consequences

12.5.1 Proposed Action

12.5.1.1 Common Impacts

Common impacts are those that could occur throughout the project area and would not be associated with any specific rail line segment. The descriptions of impacts are general and based on existing preliminary information regarding planned bridges, culverts and drainage structures. The final design of these facilities would be determined only during the permitting and agency review processes. Therefore, the impact determinations for the facilities and structures identified in this section are based on the available project information.

Construction Impacts

Construction impacts to navigation resources would be associated with facilities that were adjacent to and crossing navigable rivers and streams and their associated tributaries. Bridges proposed at larger rivers and streams would include one or more spans of 28-foot standard ARRC deck girder bridges. Drainage structures could include pre-cast arches and single or multiple short-span bridges that could be designed to accommodate navigation of certain watercraft, but culverts would generally not be designed to accommodate navigation. Bridge lengths and the design of all drainage structures would be determined during the final design process and permitting, which would require closer examination of stream-crossing sites. Potential impacts during construction of bridges and drainage structures include the following:

- Navigability along waterways located within the actual rail line right-of-way (ROW) would be temporarily impeded by construction materials and equipment during the construction process. The construction zone would exclude the public for safety and trespass reasons. These impediments would affect navigability along public waterways and all types of water transportation, including boats, float planes, winter dog sleds, motorized vehicles (e.g., automobiles, all-terrain vehicles, snow machines), and others.
- The proposed construction of bridges over navigable waterways could result in temporary closure to navigability of waterways. In addition, normal bridge construction activities (e.g., setting piers and construction equipment operation) could temporarily impede navigation.

12.5.1.2 Impacts by Rail Line Segment

Connector 2 and 3 Segments would not include crossings of navigable or possible navigable streams. All other segments would include such crossings, as described below.

Southern Segments

Mac West-Connector 1 Segment Combination

The Mac West-Connector 1 Segment Combination would intersect the flow path of multiple unnamed smaller streams that drain adjacent lakes and convey local surface water to navigable waterways, including the Little Susitna River and Cook Inlet. The segment combination would include three culverts that would cross possible navigable waterways. Two of the three culverts (C1-2.6 and MW-4.6) would cross streams with widths of 2 feet or less. In addition, no defined stream channel is present at MW-4.6. If these streams were later classified by regulation as navigable waterways prior to the Applicant completing related permitting, design of crossing structures would be modified in order to ensure navigability through compliance with Federal and state regulations, standards, and specifications for crossings of navigable waterways. As a result, while navigability could be temporarily impacted during construction of crossing structures, final design of structures would be required to retain navigability.

Mac West-Connector 2 Segment Combination

The Mac West-Connector 2 Segment Combination would intersect the flow path of multiple unnamed smaller streams that drain adjacent lakes and convey local surface water to navigable waterways, including the Little Susitna River and Cook Inlet. The segment combination would include two culverts that would cross possible navigable waterways. One of the culverts (MW-4.6) would cross a stream with no defined stream channel. If these streams were later classified by regulation as navigable waterways prior to the Applicant completing related permitting, design of crossing structures would be modified in order to ensure navigability through compliance with Federal and state regulations, standards, and specifications for crossings of navigable waterways. As a result, while navigability could be temporarily impacted during construction of crossing structures, final design of structures would be required to retain navigability.

Mac East-Connector 3 Segment Combination

The Mac East-Connector 3 Segment Combination would extend from Port MacKenzie north along the eastern boundary of the Point MacKenzie Agricultural Project. It appears that this segment combination would follow the drainage boundary of regions flowing to Cook Inlet and the Little Susitna River. The segment combination would include one culvert crossing a possible navigable waterway. If these streams were later classified by regulation as navigable waterways prior to the Applicant completing related permitting, design of crossing structures would be modified in order to ensure navigability through compliance with Federal and state regulations, standards, and specifications for crossings of navigable waterways. As a result, while navigability could be temporarily impacted during construction of crossing structures, final design of structures would be required to retain navigability.

Northern Segments

Willow Segment

The Willow Segment would intersect the flow path of multiple unnamed smaller streams, possible navigable streams, and navigable streams that drain adjacent lakes, watersheds, and major watersheds. The segment would include one bridge, three culverts, and one drainage structure crossing possible navigable waterways. One of the culverts (W-14.4) would cross a stream with a width of 2 feet or less. If these streams were later classified by regulation as navigable waterways prior to the Applicant completing related permitting, design of crossing structures would be modified in order to ensure navigability through compliance with Federal and state regulations, standards, and specifications for crossings of navigable waterways. As a result, while navigability could be temporarily impacted during construction of crossing structures, final design of structures would be required to retain navigability. The segment would cross three navigable streams – the Little Susitna River, Rogers Creek, and Willow Creek. The proposed bridges would not impact navigation if vertical and horizontal clearances below the bridges provided adequate clearance for boats to pass unimpeded. Specifications for planned bridge clearances are not yet available.

Big Lake Segment

The Big Lake Segment would cross Little Meadow Creek, Lucile Creek, Fish Creek, Goose Creek, and multiple unnamed streams. The segment would include three culverts and seven drainage structures crossing possible navigable waterways. All three culverts (B-15.1, B-14.8, and B-14.3) would cross streams with widths of 2 feet or less. In addition, one of the drainage structures (B-18.3) would cross a stream with a width of less than 1 foot. This segment would also relocate approximately 2,500 feet of stream channel between B-17.1 to 17.6 to a 2,400 foot long channel at B-18.3 with unknown channel dimensions. If these streams were later classified by regulation as navigable waterways prior to the Applicant completing related permitting, design of crossing structures would be modified in order to ensure navigability through compliance with Federal and state regulations, standards, and specifications for crossings of navigable waterways. As a result, while navigability could be temporarily impacted during construction of crossing structures, final design of structures would be required to retain navigability.

Houston-Houston North Segment Combination

The Houston-Houston North Segment Combination would cross the Little Susitna River, Lake Creek, and five unnamed tributaries. The segment combination would include one bridge on the navigable Little Susitna River, one drainage structure on the navigable Lake Creek, and three culverts and two drainage structures crossing possible navigable waterways. One of the culverts (H-9.6) would cross a stream with a width of less than 4 feet. The proposed bridge across the Little Susitna River and the drainage structure on Lake Creek would not impact navigation if vertical and horizontal clearances below the bridge and drainage structure provided adequate clearance for boats to pass unimpeded. Specifications for planned bridge and drainage structure clearances are not yet available. If these streams were later classified by regulation as navigable waterways prior to the Applicant completing related permitting, design of crossing structures would be modified in order to ensure navigability through compliance with Federal and state regulations, standards, and specifications for crossings of navigable waterways. As a result, while navigability could be temporarily impacted during construction of crossing structures, final design of structures would be required to retain navigability.

Houston-Houston South Segment Combination

The Houston-Houston South Segment Combination would cross the navigable Little Susitna River and four possible navigable unnamed tributaries. As in the previous segment, one of the culverts planned along this segment (H-9.6) would cross a stream with a width of less than 4 feet. The proposed bridge across the Little Susitna River would not impact navigation if vertical and horizontal clearances below the bridge provided adequate clearance for boats to pass unimpeded. Specifications for planned bridge clearances are not yet available. If these streams were later classified by regulation as navigable waterways prior to the Applicant completing related permitting, design of crossing structures would be modified in order to ensure navigability through compliance with Federal and state regulations, standards, and specifications for crossings of navigable waterways. As a result, while navigability could be temporarily impacted during construction of crossing structures, final design of structures would be required to retain navigability.

12.5.1.3 Summary of Impacts by Alternative

Table 12-3 provides a comparative summary of navigable stream crossings by rail line alternative. Impacts to navigation from each potential crossing would be negligible if structures crossing navigable streams provided vertical and horizontal clearances adequate for watercraft to pass unimpeded. Specifications for planned bridge and drainage structure clearances are not yet available. However, structures crossing navigable streams would have to be designed and constructed in compliance with Federal and state regulations, standards, and specifications for crossings of navigable waterways (see Section 12.1). Depending on alternative, the proposed rail line ROW would intersect from 0 to 3 navigable waterways and from 5 to 12 possible navigable waterways.

Table 12-3
Summary of Impacts to Navigation by Rail Line Alternative

	Mac West-Connector 1-Willow	Mac West-Connector 1-Houston-Houston North	Mac West-Connector. 1-Houston-Houston South	Mac West-Connector 2-Big Lake	Mac East-Connector 3-Willow	Mac East-Connector 3-Houston-Houston North	Mac East-Connector 3-Houston-Houston South	Mac East-Big Lake
Navigable Crossings	3	2	1	0	3	2	1	0
Possible Navigable Crossings[a]	8	8	7	12	6	6	5	11
Totals	**3 to 11**	**2 to 10**	**1 to 8**	**0 to 12**	**3 to 9**	**2 to 8**	**1 to 6**	**0 to 11**
Major Navigable Stream Crossings	The Little Susitna River, Rogers Creek, Willow Creek	The Little Susitna River, Lake Creek	The Little Susitna River	None	The Little Susitna River, Rogers Creek, Willow Creek	The Little Susitna River, Lake Creek	The Little Susitna River	None

[a] Possible Navigable Crossings occur where the characteristics of a navigable stream are present and the waterway might be a candidate for a determination of navigable, but neither the Coast Guard, Army Corps of Engineers, ADNR, nor BLM have determined them to be so.

Both the Mac West-Connector 2-Big Lake and Mac East-Big Lake alternatives could be constructed without crossing any waterways currently designated as navigable. Of those waterways whose navigability is as yet undetermined, the Mac West-Connector 2-Big Lake Alternative would cross 12 possible navigable waterways and Mac East-Big Lake Alternative would cross 11 possible navigable waterways. The Mac West-Connector 1-Willow and Mac East-Connector 3-Willow alternatives each cross three waterways currently designated as navigable. Of those waterways whose navigability is as yet undetermined, Mac West-Connector 1-Willow would also cross eight possible navigable waterways, and Mac East-Connector 3-Willow would cross six.

12.5.2 No-Action Alternative

Under the No-Action Alternative, ARRC would not construct and operate the proposed Port MacKenzie Rail Extension, and there would be no impacts to navigation from the project.

13. LAND USE

This chapter describes the regulatory settings, study areas, analysis methodologies, affected environments (existing conditions), and potential environmental consequences (impacts) to land use, recreation, and hazardous materials sites under the proposed action and the No-Action Alternative. Section 13.1 addresses land use not related to recreation uses. Section 13.2 addresses land used for recreation and summarizes the analysis of effects to properties protected under Sections 4(f) of the U.S. Department of Transportation Act of 1966 (49 United Sates Code [U.S.C.] Section 303 and 23 U.S.C. Section 138); and Section 6(f)(3) of the Land and Water Conservation Fund Act of 1964 (Public Law 88-578, 16 U.S.C. 460l-4). Appendix M provides the full Section 4(f) and 6(f) evaluation. Section 13.3 describes potential impacts related to hazardous materials and hazardous waste sites.

13.1 Land Use

13.1.1 Regulatory Setting

13.1.1.1 Federal Regulations

There is no Federal land with the potential to be affected by the proposed Port MacKenzie Rail Extension. However, the following Federal land use regulations apply: Farmland Protection Policy Act (Public Law 97-98/ 7 U.S.C. 4201 *et seq.*) and Coastal Zone Management Act (Public Law 92-583/16 U.S.C. 1451-1456).

No prime, unique, or farmland soils of statewide importance were identified within the study area. Most locally important soils, as designated by the Matanuska-Susitna Borough (MSB), are within the Point MacKenzie Agricultural Area between the Mac West and Mac East segments. Chapter 3, Topography, Geology, and Soils, addresses compliance with the Farmland Protection Policy Act.

All proposed rail line alternatives would include construction in Alaska's coastal zone (ADNR, 2008). The Coastal Zone Management Act of 1972 and implementing regulations at 15 CFR Part 930 require Federal agency activities with reasonably foreseeable effects on coastal zones to be consistent with state programs approved under Federal coastal management programs. The state agency that implements or coordinates a state's federally approved coastal management program is responsible for Federal consistency reviews.

13.1.1.2 State Regulations

Alaska Statute (AS) 38.04.065, Land Use Planning and Classification, and 11 Alaska Administrative Code (AAC) 55.010-55.030 require that the Alaska Department of Natural Resources (ADNR), with local governmental and public involvement under AS 38.05.945, adopt, maintain, and, when appropriate, revise regional land use plans that provide for the use and management of State of Alaska-owned land. Section 13.1.4.4 describes state plans applicable to the study area, including the Susitna Area Plan, the Susitna Basin Forestry Guidelines, and the Willow Sub-Basin Area Plan.

ADNR implements Alaska's federally approved coastal management program and is responsible for consistency reviews of Federal agency activities. ADNR has indicated that the Board's issuance of authorization to construct and operate a rail line (if the Board decides to do so in this case) does not require review by ANDR for consistency with the Alaska Coastal Management Program (ACMP).[1] Rather, ADNR would review the proposed rail line for ACMP consistency in the context of other Federal licenses or permits that are subject to review under Subpart D of 15 CFR 930, after a design has been finalized and permit applications have been submitted (ADNR, 2010).

13.1.1.3 Local Regulations

AS 29.35 and AS 29.40 define the authority of cities and boroughs to provide for planning, platting, and land use regulations. Planning powers are either mandatory or optional, depending on the classification of the city or borough. As a class two borough, the MSB is required to provide for planning, platting, and land use regulations on an area-wide basis (both inside and outside cities) within the Borough in accordance with AS 29.40. The MSB may delegate these powers to a city within the Borough (AS 29.40.010).

The MSB Planning Commission was established to perform the area-wide functions of planning, platting, and zoning. The Commission's recommendations are then transmitted to the Matanuska-Susitna Borough Assembly, a body of elected district representatives that sets policy and exercises legislative power within the Borough. According to MSB Chapter 15.24, Assembly, Zoning Functions, the Assembly has the authority, with the Planning Commission's recommendation, to establish building and land use regulations and create districts (MSB 15.24.015). With the assistance of the Planning Commission, the Assembly prepares and revises a comprehensive Borough-wide development plan. The MSB also has broad powers pursuant to AS 19.30.151(b). The MSB uses both Borough-wide and special-use district ordinances. MSB-wide ordinances employ setback standards, including a 75-foot waterbody setback adopted by voter initiative; sanitary solid waste disposal sites; and mobile home park standards. Special-use districts are tailored to local communities' special conditions and are unique to the geographic boundary of each community. Local communities may redefine a particular Borough-wide measure through their special-use district ordinances (MSB, 2005a). To improve the level of compliance with existing code, the MSB provides regulatory information to persons proposing development. Before the development activity begins, the owner or developer signs a Statement of Acknowledgement of Existing Land Use Regulations, as provided in MSB Title 17.

The MSB has delegated powers regarding land use regulations, planning, and zoning to the cities of Houston, Palmer, and Wasilla. Section 13.1.4.4 summarizes applicable land use plans and policies for cities and other entities in the Borough that also lie in the study area.

The MSB Coastal Zone Management District and the associated MSB Coastal Management Plan cover the entire study area, and the MSB Coastal Management Plan's associated Point

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[1] A decision by the Board to authorize construction and operation of the proposed rail line would meet the definition of a Federal license or permit at 15 CFR 930.15. Such a decision by the Board is not included in the list of Federal permits subject to ACMP review by ADNR. Under 15 CFR 930.54, ADNR is not required to review a Federal license or permit for consistency if it is not so listed and has elected not to do so (ADNR, 2010).

MacKenzie Area Which Merits Special Attention Plan (which the MSB adopted in 1993 and amended in 2006, MSB, 2006a) also applies to the southern portion of the study area.

13.1.2 Study Area

The land use study area is in the Susitna River Valley and extends between the Susitna River, Cook Inlet, Knik Arm, and the existing Alaska Railroad main line (see Figure 2-2).

13.1.3 Analysis Methodology

To identify potential impacts to land use and ownership under the proposed action, SEA consulted land ownership maps, aerial photography, land management plans and regulations, and other information available in the public domain. The term “structure” was used in cases where it was not possible to determine with certainty that the structure is a residence. SEA evaluated consistency of the proposed project with existing land use objectives for areas within 5 miles of the 200-foot right-of-way (ROW), referred to as “in proximity to” the rail line alternatives.

13.1.4 Affected Environment

13.1.4.1 Existing Land Ownership

Land owners in the study area include the State of Alaska, Federal Government, MSB, Alaska Mental Health Trust, University of Alaska, private citizens, and Native Alaskans/Native Alaskan Corporations. Table 13.1-1 lists the amount of land, by owner classification, the proposed rail line segments could affect.

Federal

There is no federally owned land within the proposed rail line ROW and few federally owned parcels within the study area. Federal land within the study area includes a post office near Willow Lake and several parcels on Flat Lake near Big Lake.

State of Alaska

There are approximately 370 acres of state-owned land within the proposed rail line ROW. Public land in the study area includes land the ADNR Division of Mining, Land, and Water manages for multiple purposes, including recreation, hunting, and fishing. State parks, wildlife refuges, and recreation areas in proximity to the ROW include Willow Creek State Recreation Area, Nancy Lake State Recreation Area, Little Susitna State Recreation River, Little Susitna Public Use Facility, Susitna Flats State Recreation Area, Goose Bay State Game Refuge, Fish Creek Park, Big Lake North State Recreation Site, Big Lake South State Recreation Site, and Rocky Lake State Recreation Site. The Alaska Department of Fish and Game and the ADNR Division of Parks and Outdoor Recreation own and manage most of this land. See Section 13.2 for more information on state recreation sites and potential impacts to recreational use.

Table 13.1-1
Land Ownership (acres) within the 200-Foot Right-of-Way of Proposed Port MacKenzie Rail Extension Rail Line Segments[a]

Segment	MSB	City of Houston	Mental Health Trust Authority	Public Roads (MSB[b] and State)	Native Corporation	No Data[c]	Private	Public University	State	*Total*[d]
Big Lake	150	1	5	47	48	16	244	7	2	521
Connector 1	41	0	0	<1	0	33	32	0	6	113
Connector 2	0	0	0	<1	34	1	30	0	24	90
Connector 3	68	0	0	1	17	3	35	0	0	123
Houston	43	0	97	4	12	17	11	44	22	251
Houston North	0	0	34	21	0	79	24	0	38	197
Houston South	8	0	48	22	72	1	59	0	0	210
Mac East	235	0	92	<1	57	0	73	0	12	469
Mac West	300	0	11	<1	0	52	131	<1	0	493
Willow	222	0	4	46	6	98	75	0	266	715
Grand Total	***1066***	***1***	***292***	***143***	***246***	***300***	***713***	***51***	***370***	***3183***

[a] Source: MSB, 2007a.
[b] MSB = Matanuska-Susitna Borough.
[c] Assumed to be State of Alaska- and MSB-owned public land because the source of data is the MSB Tax Assessor codes. Public land would not appear on these codes.
[d] Totals might not equal sums of values due to rounding.

Timber harvest and mining are also allowed by permit in certain areas. The primary areas designated for timber harvest in proximity to the ROW are the southern-most tip near the proposed rail line in the vicinity of the Port MacKenzie District, and some public land adjacent to the intersection of the Iditarod Historic Trail and the Little Susitna River (ADNR, 1991). The primary areas designated for mining are the Alaska Mental Health Trust Lands north of Big Lake and east of Susitna Flats State Game Refuge (see the next paragraph for more information).

Alaska Mental Health Trust Authority Lands

Approximately 292 acres of land are under the ownership of the Alaska Mental Health Trust Authority, a public corporation established in 1994. The Trust Authority contracts with the ADNR to manage Trust Authority-owned land, and income derived from Trust Authority land is used to fund a comprehensive integrated mental health program for the citizens of Alaska. Resource categories managed by the Trust Authority Land Office include coal, gas, materials, minerals, oil, real estate, and timber. Mining of minerals, coal, oil, and gas is permitted on much of the Trust Authority's land. In proximity to the proposed rail line ROW, mining of minerals, coal, oil, and gas is permitted in the extensive Trust Authority land northwest of Big Lake. Oil and gas mining is also permitted throughout the Trust Authority land west of Port MacKenzie, and in the larger Trust Authority land northwest of Knik. Mining of minerals and coal is also permitted in selected areas in the vicinity of Port MacKenzie and Knik (AMHT, 2006).

University of Alaska Land

The University of Alaska owns and manages approximately 150,000 acres (University "trust land") in Alaska, approximately 51 acres of which are within the proposed rail line ROW. University trust land is for the use and benefit of the University and is not considered State of Alaska public domain land. The University develops, leases, and sells land and resources to generate funds for its Land Grant Trust Fund.

Matanuska-Susitna Borough

MSB owns approximately 1,066 total acres of land within the ROW of the proposed rail line across all of the proposed rail line segments. The MSB acquired land within the study area through tax foreclosures, purchases, and donation. In addition, the State of Alaska provides Alaskans local governance and use of public land through transfer of public land to municipalities such as MSB under the Municipal Entitlement Act. There is MSB-owned Municipal Entitlement land throughout the study area; however, this land is concentrated in the vicinity of the Port MacKenzie District and the MSB land south of Big Lake. MSB uses its Municipal Entitlement land for a variety of purposes, including the generation of revenue through sales, leases, and permits; to provide sites for public facilities; and to offer public recreational opportunities.

Private Land

Private land in the vicinity of the proposed rail line is characterized as forested and some agricultural, and development is typically low-intensity, residential. Development typically occurs near area lakes and ponds and linearly along highways. There are areas of private land in the vicinity of the proposed rail line east of the northern portion of the Willow Segment, around

Big Lake, and agricultural land associated with the Point MacKenzie Agricultural Area between the Mac West and Mac East segments.

Alaska Native Corporations

Alaska Native Corporations owns approximately 246 acres of land within the proposed rail line ROW. Native Corporations administer the land and financial resources awarded under the Alaska Native Claims Settlement Act. Native Corporation land is often used for subsistence purposes or developed or sold to generate revenue for the Corporation. Within the study area, this land is typically held in large tracts, and consists of parcels owned by Cook Inlet Region, Inc., a regional Native Corporation, and Knikatnu, Inc., a village Native Corporation.

Native Land (Native Allotments)

A Native Allotment is land given to an authorized individual Indian, Aleut, or Eskimo in Alaska under the Native Allotment Act of 1906. The Alaska Native Allotment Act was repealed in 1971 with the passage of Alaska Native Claims Settlement Act. This land is different from Native Corporation private land discussed above. There are five Native Allotments within 4 miles of the proposed rail line alternatives. None of these allotments overlap the alternatives.

13.1.4.2 Existing Land Use

A large percentage of the land in the study area is undeveloped; however, in recent years the MSB has been the fastest growing area in the State of Alaska, with much of the population concentrated in Knik-Fairview, Wasilla, and Meadow Lakes (MSB, 2006b). The study area supports a combination of public recreation uses and wildlife habitat on public land, low-density residential uses, light industrial uses, commercial enterprises, commercial and noncommercial aviation uses, forestry, agriculture, and mineral and timber resource development.

Land in the area is commonly used for sport hunting and fishing and for traditional hunting, fishing, and gathering. Recreational use of land in the area by MSB and Anchorage residents and tourists is high, and wildlife habitat and water features are extensive (38 percent of land use). According to the Susitna Forestry Guidelines (1991), forestry and timber harvesting are some of the designated uses of public land, particularly west in the vicinity of the Port MacKenzie District and near the intersection of the Iditarod Historic Trail and the Little Susitna River.

Land in proximity to the rail line ROW includes portions or all of the Port MacKenzie District, which occupies 8,940 acres at the southern tip of the MSB; the Point MacKenzie Agricultural Project, which is the largest contiguous agricultural area in Alaska; the Susitna Flats State Game Refuge, the Goose Bay State Game Refuge; the Willow Creek State Recreation Area; the Little Susitna State Recreation River; and the Nancy Lake State Recreation Area.

13.1.4.3 Existing Zoning

Matanuska-Susitna Borough

The MSB has zoning, land use, and building regulations. All land development in the Borough is subject to MSB Title 17.01, Acknowledgment of Existing Land Use Regulations. The MSB does have platting authority and a Code Compliance Division. The State Fire Marshal is the State Building Official (MSB, 2003a). While the MSB does not have a Borough-wide zoning code, it regulates land use through special land use districts, residential land use districts, and other mechanisms.

City of Houston

The City of Houston [population 1,202 (U.S. Census Bureau, 2000)] includes about 22.4 square miles in the MSB between Big Lake and Wasilla. Houston is primarily a residential community with some commercial uses along Parks Highway and light industrial uses along the Alaska Railroad Corporation (ARRC) existing main line. Land designated for public and institutional use is set aside for schools and other public uses. The City of Houston Land Use Ordinance describes existing land uses in the City. Houston's land use districts were established by MSB Title 17 (17.40.405) on December 15, 1987, and amended by Houston Ordinance 90-032 on May 1, 1990, Ordinance 98-046 on June 2, 1998, and Ordinance 98-085 on July 21, 1998.

Port MacKenzie District

The MSB has plans for the 8,940-acre (about 14-square-mile) Port MacKenzie District to provide services for bulk commodity import, export and storage (fuel, timber, sand and gravel, peat, grain), a floatplane base to serve Anchorage air taxi and private pilots, and a public boat launch ramp for companies and individuals based in Anchorage and statewide. In addition, the Port MacKenzie District includes land that could be developed for commercial, industrial, and recreational uses.

Point MacKenzie Agricultural Area

The Point MacKenzie Agricultural Area covers 14,893 acres (about 23 square miles) for the purpose of dairy farming and general agricultural use. The Matanuska-Susitna Borough Agricultural Land Sale Programs Summary, updated August 24, 2004 (MSB, 2004), describes the history and process for the conveyance of this land for agricultural purposes. Land titles are subject to a recorded declaration of covenants, conditions, and restrictions to promote agricultural use. The covenants, conditions, and restrictions limit improvement sites, residential locations, and subdivision of the original farm unit. They also restrict use of some resources, such as gravel, to on-site development. The anticipated economic feasibility of the land's productivity for agricultural pursuits has not been realized. In 1997, AS 38.05.321 was amended to ease restrictions on the subdivision of agricultural land. The statute allows farmers to subdivide their land into smaller farm parcels so that the resulting lots could be sold with the right to construct housing.

13.1.4.4 Existing Land Use Plans

Table 13.1-2 summarizes existing land use and land management plans applicable to the study area. SEA reviewed the plans to determine if the proposed project would be consistent with the plans. Section 13.2 addresses recreational land use plans.

Table 13.1-2
Summary of Applicable Land Use Plans and Documents (page 1 of 3)

Land Use Plan/ Document	Author/ Agency[a]	Date[b]	Relationship with the Proposed Action
State Plans			
State of Alaska Coastal Management Program	ADNR	2006	"Land and water uses and activities that may be addressed by a coastal district plan and subject to that plan [include]…transportation routes and facilities" (p. A27). "Uses of state concern (AS 46.40.210(12)) are defined to include…facilities serving statewide or interregional transportation and communication needs" (p. A108) "…[T]ransportation, and communication facilities are extensively regulated by state and Federal statutes. Unreasonable restriction or exclusion of such facilities by local ordinance would likewise be impermissible under state law" (p. A34). "Under the 11 AAC 112.280, Transportation routes and facilities standard, a transportation route or facility will not be approved unless the Applicant demonstrates compliance with the avoid, minimize, or mitigate sequencing process regarding the three listed impacts: alterations in surface and groundwater drainage patterns, disruption in known or reasonably foreseeable wildlife transit, and blockage of existing or traditional access" (p. A59).
Susitna Area Plan	ADNR, ADF&G, MSB, USDA	1985	"A right-of-way has been established by DOT/PF [the Alaska Department of Transportation & Public Facilities] as part of a route (the Goose Bay extension) to link the McGrath and Beluga areas to lands east of Susitna River by either road or rail. The right-of-way originates at the Parks Highway or Alaska Railroad and travels west across the Susitna River in the vicinity of Alexander. On the west side of the Susitna River, one spur would head northwest through Rainy Pass towards McGrath. The second spur would travel south through the Game Flats to Beluga" (p. 262).
Willow Sub-Basin Plan	ADNR, MSB, and ADF&G	1982	"The ADOT/PF [Alaska Department of Transportation & Public Facilities] has located an approximate alignment for a transportation corridor (road or railroad) to the Beluga Coal Fields, including alternate alignments to the Susitna River" (p. 28). "A north-south connection between Pt.MacKenzie and Houston has been proposed by various agencies…it is likely that a corridor through the area would be for railroad only and not include a conventional road" (p. 31).
Southeast Susitna Area Plan - DRAFT	ADNR	January 2008	The Plan revises the entire Willow Sub-Basin Area Plan (1982) and a portion of the South Parks Highway Subregion of the Susitna Area Plan. According to the ADNR Web site, this plan was adopted in April 2008 and supersedes the Willow Sub-Basin Area Plan. While this plan does not specifically reference land use for development of a rail line, it does categorize the Southeast Susitna Area into several land use parcels and indicates the management intent of each parcel. Several parcels in proximity to the rail line are designated under this plan for alternate uses such as for public recreation, timber harvest, and the use of the Iditarod Historic Trail.
Susitna Basin Forestry Guidelines	ADNR	1991	The Forestry Guidelines indicate, "the goals of the timber sale program are to make timber available for existing timber harvesting and processing businesses, and to expand harvesting and processing to provide additional jobs and income while being compatible with other designated uses of the area" (p. 7). There is state land in proximity to the rail line where forestry is one of the designated uses.

Table 13.1-2
Summary of Applicable Land Use Plans and Documents (page 2 of 3)

Land Use Plan/ Document	Author/ Agency[a]	Date[b]	Relationship with the Proposed Action
Matanuska-Susitna Borough Regional Plans			
MSB Comprehensive Development Plan Update[b]	MSB	2005 (*2005a*)	Goal (E-3) "Create an attractive environment for business investment" (p. 6). Policy E3-3 "Enhance the transportation infrastructure to reduce travel times and improve transport efficiencies and safety" (p. 6). Goal (T-1) "Develop an integrated surface transportation network that facilitates the efficient movement of people, goods, and services throughout the Borough and region" (p. 8). Policy T1-4 "Develop and effective multi-modal transportation plan that provides recommendations for all modes of transportation including surface, air, waterborne, rail, public transit and trails, pipeline, electrical, and communications" (p. 8).
Matanuska-Susitna Borough Long-Range Transportation Plan, Draft Final Report[b]	MSB	February 2007 (*2007b*)	Rail Transportation (p. 2-8) – Goal: "Develop and operate a rail system to benefit Mat-Su's population and economy." Objective: "Extend a rail connection from the Alaska Railroad Main line to Port MacKenzie."
Matanuska-Susitna Borough Rail Corridor Study[b]	MSB	2003 (*2003b*)	The purpose of the MSB Rail Corridor study was to determine a mix of railroad and highway options for surface access to Port MacKenzie. The study analyzes several "corridors." It includes a list of Federal and state regulatory and permitting requirements, and list of state and local plans. The study provides a discussion of the land use affected environment and environmental consequences.
Matanuska-Susitna Borough Public Facilities Plan	MSB	1984 – currently being updated	No specific mention of future rail corridor or plans for rail connections.
Matanuska-Susitna Borough Coastal Management Plan[b]	MSB	2006 (*2006c*)	4.3.5 Transportation and Utilities (p. 15) Goal 1: "To encourage economic development and coordination of short and long-term transportation and utility plans within the MSB coastal zone." Objective B: "Prepare road and rail access plans for currently non-accessed areas where there are resources of significant economic potential such as mining, forestry, recreation, and fish and game." Objective C: "Identify and reserve material sites (i.e., sand and gravel) for road, railroad, airport, and port development."
Matanuska-Susitna Borough Community Plans			
City of Houston Comprehensive Plan[b]	MSB	Amended 2003 (*2003c*)	Community Objectives include: "Strengthen and broaden the economic base of Houston by encouraging the continued growth and development of the tourism industry, service industries, transportation-related industries, and natural resource development industries in the Houston area" (p. 7). Industrial Land Use Objectives include: "Design transportation routes to and from industrial areas to avoid mixing residential and industrial vehicular traffic. No industrial traffic should flow through residential areas" (p. 9). "Houston can … work toward encouraging the development of the transportation infrastructure critical to the development of a natural resource extraction industry" (p. 25).

Table 13.1-2
Summary of Applicable Land Use Plans and Documents (page 3 of 3)

Land Use Plan/ Document	Author/ Agency[a]	Date[b]	Relationship with the Proposed Action
MSB Community Plans (cont'd)			
Big Lake Comprehensive Plan	MSB	1996 – currently being updated	Regional Transportation Goal: "To support regional development though transportation improvements within the community. Recommendations: …Support improvement of existing transportation links to provide feasible access to Point MacKenzie. Support construction of new transportation links to provide feasible access to Point MacKenzie. Development of the railroad is supported within a corridor west of Papoose Lakes..." (p. 20).
Meadow Lakes Comprehensive Plan[b]	MSB	2005 (*2005b*)	The Big Lake Segment would lie just to the west of the Meadow Lakes community council boundary. "Circulation-related Comp Plan Goals include: …Plan For Continuing Railroad Use; Maintain Opportunities for Transit, including Rail and Carpools" (p. ix). No specific mention of a rail link to the Port MacKenzie area.
Knik-Fairview Comprehensive Plan	MSB	1997	No mention of railroad. Transportation planning discussed in the document only considers road development.
Willow Comprehensive Plan[b]	MSB	Working Draft Aug 2008 (*2008a*)	No mention of rail corridors or goals for rail travel or rail links.
Fish Creek Management Plan[b]	MSB	Final Draft July 2008 (*2008b*)	Area Wide Goals & Guidelines for the Railroad Corridor: "The Alaska Railroad Corporation (ARRC) has proposed a railroad route to connect Point MacKenzie with the Parks Highway railway north of Wasilla. The alternative routes proposed include one that goes north and south through the Moraine Unit of the Fish Creek area. The State and Borough should work with ARRC to design and develop any railroad corridors through the Fish Creek area to ensure compatibility with this plan" (p. 27).
Point MacKenzie Comprehensive Plan[b]	MSB	Draft Vision Statement and Goals, May 2008 (*2008c*)	"Goals of the Point MacKenzie Comprehensive Plan include: …Work with railroad to provide a passenger and freight loading area in the northern area of the community" (p. 1). No mention of rail corridor connection the Port to existing rail lines.
MSB Specialty/Functional Plans			
Point MacKenzie Port Master Plan	MSB	1999	"A rail connection will be required to make the shipment of coal and other bulk commodities such as timber and gravel possible and would also facilitate use of the facility as a general cargo port" (p. 3-4). "…[I]f necessitated by higher volumes of coal or timber export, development of a rail connection from the Alaska Railroad near Houston to Point. MacKenzie…" (p. 4-13).
Point MacKenzie Area Meriting Special Attention Management Plan	MSB	2006	Issue 1: Improved Access: "…Point MacKenzie is distant from Anchorage by road…The development of a railroad connection to the Alaska Railroad system is also crucial to full utilization of a port facility" (p. 7). Goal 1: "To support the development of, or improvement to existing, intermodal surface transportation systems that serve the Port, including but not limited to road, marine, railroad, and pipeline modes" (p. 8). Goal 3: To promote a cost-effective, convenient, well-integrated transportation system that provides safe, convenient, and environmentally sound access that links Point MacKenzie with the local community and the region" (p. 8).

[a] ADF&G = Alaska Department of Fish and Game; ADNR = Alaska Department of Natural Resources; MSB = Matanuska-Susitna Borough; USDA = U.S. Department of Agriculture.
[b] Year in parentheses indicates how document is referenced in Chapter 20.

13.1.5 Environmental Consequences

13.1.5.1 Proposed Action

SEA analyzed the consistency of the project with existing land use and management plans (see Table 13.1-2). Review of land use and management plans in the study area revealed roadway improvements from Port MacKenzie to Houston, a subdivision, the MSB-proposed Port MacKenzie Town Center, and the expansion of the Big Lake Airport, which the proposed rail line construction could affect. In addition, the proposed rail line would affect land currently used or planned for low-density residential development, agriculture, timber harvesting, and mining.

SEA considered the project's potential to influence or redirect development trends in the study area. While land uses outside the 200-foot ROW could be changed by the landowner as allowed by building or zoning rules and could be influenced by development trends in the area, the proposed rail line extension would offer only freight transport and access to the rail line and associated facilities would be restricted to rail use; and therefore, SEA does not foresee induced development or changes in land use outside the ROW as a result of the proposed project. Further, substantial portions of the study area are state owned and designated for public recreational purposes. Development trends would be less likely to influence these areas.

Common Impacts to Land Use

The MSB and the State of Alaska own most of the land the proposed Port MacKenzie Rail Extension would directly affect (see Table 13.1-1). ARRC would acquire the land within the proposed rail line ROW from existing land owners, which includes the Alaska Mental Health Trust Authority, Public University, and Native Corporations in addition to the MSB and State of Alaska. If the Board's authority were granted, the railroad would have the right to acquire ROW through condemnation pursuant to state condemnation laws. That land would then shift to ARRC management for rail line operations and maintenance, and any non-rail uses within the ROW would be only by ARRC-issued entry permits. Once the ROW was legally established on MSB, State of Alaska, and private land, any occupancy, use, or crossing of the ROW without an ARRC-issued entry permit would be considered trespass. ARRC would purchase Native Corporation lands. All State of Alaska, Alaska Mental Health Trust Authority, and MSB land within the ROW would shift to use as a rail line. At present, this land is managed for the mining of minerals, coal, oil, and gas. Whether the proposed rail line might affect potential future mining on this land would depend on the resource extraction technique and the vertical location of the resource. All surrounding State of Alaska land uses would remain unchanged. The Alaska Mental Health Trust Authority land outside the ROW would continue to be managed as defined by the Trust Authority. All alternatives cross lands owned by the above-mentioned entities. Rail line construction and operations could temporarily block access roads and other access points such as driveways. However, road users would be notified of temporary road closures and other construction-related activities so that alternative routes could be planned.

State of Alaska land in the study area is used for recreation, hunting, and fishing. Mining and timber harvest are also allowed by permit. Section 13.2 describes impacts to recreation activities; impacts to timber harvesting are discussed below. Crossing of the proposed ROW to reach timber harvest areas, mining claims, or land disposal areas could be allowed under the ARRC entry permit program.

The Iditarod Historic Trail traverses the study area and intersects the Willow, Houston, and Big Lake segments. See Section 13.2, Parks and Recreational Resources, for impacts to the Iditarod Historic Trail.

Existing land use for a small portion of land in proximity to the proposed ROW would be permanently changed, and any non-rail activities within the proposed ROW would require an ARRC-issued entry permit. While construction activities could affect access to farms and residential areas in the study area, restrictions would be temporary and access would be restored upon completion of rail line construction.

There are timber resources in the deciduous, evergreen, and mixed forests of the study area. White spruce, black spruce, paper birch, balsam poplar, and aspen in these forests have potential commercial value as saw logs, poles, and firewood. The primary areas designated for timber harvest in proximity to the ROW are the southern-most tip of the proposed rail line in the vicinity of the Port MacKenzie District, and some areas adjacent to the intersection of the Iditarod Historic Trail and the Little Susitna River. There are additional timber resources throughout the study area. The rail line segments with the greatest acreages of forested areas are the Willow Segment, the Big Lake Segment, and the Mac East Segment, though these are not specifically designated as timber resources to be harvested for commercial and personal uses (ADNR, 1991). Portions of the study area in proximity to the Mac West Segment, Connector 2 Segment, and Connector 3 Segment, and the northern half of the Big Lake Segment and west to the Houston South Segment have limited forest land. Table 13.1-3 lists the acres of forest that would be cleared within the proposed rail line 200-foot ROW. There has been no timber survey to quantify the volume of commercial timber in the area that would be cleared. The Applicant has not developed specific plans for timber salvage from land that would be cleared for the rail line ROW. For ROW areas on public or MSB land, applicable land management plans, policies, and regulations require that timber with commercial or personal use values be salvaged from land that is to be cleared for other uses such as mining and transportation or utility corridors, where feasible and prudent (ADNR, 1991). Similar provisions for timber salvage on other non-Federal and non-public land that would be cleared for the rail line ROW would ensure that timber resources affected by the project were properly utilized.

Construction Impacts to Land Use

Rail line construction activities would occur in a designated 200-foot rail line ROW. Rail line construction and operations would change, affect, or curtail existing land uses in the ROW by changing existing land use designations, permanently or temporarily, to designation as a rail line. The area in the ROW cleared for construction but not needed for permanent structures would be restored to conditions consistent with rail line maintenance requirements.

In addition to the rail line, ARRC would develop associated facilities to support construction activities. The location of construction staging areas and temporary associated facilities to support construction activities would be decided during the design phase and would vary depending on the segments constructed. Where possible, ARRC has indicated it would site

Table 13.1-3
Forested Land (acres) within the 200-Foot Right-of-Way by Rail Line Segment[a]

Segment	Deciduous Forest	Deciduous Forest Closed	Deciduous Forest Open	Deciduous Forest Woodland	Evergreen Forest	Evergreen Forest Closed	Evergreen Forest Open	Mixed Forest	Mixed Forest Closed	Mixed Forest Open	Mixed Forest Woodland	All Forests[b]
Big Lake	3	114	15	<1	<1	43	2	3	115	5	0	300
Connector 1	0	1	0	0	1	33	1	1	23	<1	0	60
Connector 2	0	<1	0	0	<1	12	<1	2	19	<1	0	34
Connector 3	0	12	<1	0	<1	40	0	<1	49	<1	0	101
Houston	<1	47	1	0	1	63	1	<1	42	1	0	157
Houston North	5	31	11	0	0	19	<1	1	26	4	0	98
Houston South	<1	8	2	0	0	2	1	<1	5	2	0	205
Mac East	13	121	9	<1	<1	47	0	6	186	8	0	390
Mac West	10	36	4	<1	1	76	<1	4	139	2	0	272
Willow	5	228	20	<1	<1	89	<1	4	270	7	<1	625
Grand Total	***36***	***598***	***62***	***1***	***5***	***424***	***5***	***22***	***874***	***31***	***<1***	***2242***

[a] Source: USGS, 2001; Homer *et al.*, 2004.
[b] Totals might not equal sums of values due to rounding.

construction staging areas inside the 200-foot ROW. Impacts to land use from these staging and construction areas would be temporary because ARRC would remove them and rehabilitate the areas after completing construction of the rail line and associated facilities.

Permanent facilities would include a terminal reserve area at the southern terminus of the proposed rail line extension. New communications towers would also be required for the project. New permanent access roads to communications towers might be required, depending on the characteristics of specific sites. In addition, ARRC would construct an 8,000-foot double-ended siding to the north of the proposed tie-in point with the main line. The siding would allow train passage and access to rail services. The arrangement of the track siding and tie-in would be a “wye” connection. The siding would be placed, where possible, on tangent sections of the alignment and would be in the 200-foot ROW. An existing recreation trail and associated trailhead parking lot cross the area planned for the terminal reserve. In addition, the terminal reserve area could result in conversion of the use of the Mental Health Trust Authority land near Point MacKenzie, which is currently managed for the mining of minerals, coal, oil, and gas. Depending on the resource extraction technique and the vertical location of the resource, the siting of the terminal reserve might not affect potential future mining on this land.

Operations Impacts to Land Use

No passenger service is proposed. SEA does not foresee that introduction of new freight rail service as part of the proposed project would stimulate changes in existing land uses or shift development patterns along the rail line. Rather, commercial uses, such as resource extraction, would utilize the existing road network to transport goods to and from the study area and proximity to the mainline and existing businesses along the main line to market the goods. Existing land ownership and use of the terminal reserve area and communications tower and track siding locations would be permanently changed to allow for these facilities associated with rail line operations and maintenance.

Impacts to Land Use by Alternative Segment and Segment Combinations

Southern Segments and Segment Combinations

Mac West-Connector 1 Segment Combination

Construction activities would affect approximately 493 acres of land along the Mac West Segment (see Table 13.1-1). The affected area would include about 300 acres of MSB land, 11 acres of Mental Health Trust Authority land, less than 1 acre of University of Alaska land, and 131 acres of private land. There are no available data for ownership of the remaining 52 acres, but SEA assumes this is State of Alaska public land because this land is within the Point MacKenzie Agricultural Area and Susitna Flats State Game Refuge.

For approximately 8 miles, the Mac West ROW would cross or closely border private land. It is likely that all 131 acres of private land is in agricultural use, which the MSB considers to be locally important for agricultural purposes, and rail line construction would convert this land to railroad use. SEA coordinated with the U.S. Department of Agriculture Natural Resources Conservation Service regarding impacts to locally important farmland soils from the proposed rail line. There is no “prime and unique” farmland as defined by the Natural Resources

Conservation Service in the vicinity of the proposed rail line. See Chapter 3, Geology and Soils, for a more detailed discussion of the Natural Resources Conservation Service farmland evaluation process.

The Mac West Segment's 200-foot ROW would either cross or be close to undeveloped or light industrial development for the remainder of the ROW.

There is some residential development along the Mac West Segment. The ROW would come within about 150 feet and within about 289 feet, respectively, of two individual residences. Access to these residences could be affected during construction because the ROW would cross the driveway or access route to the homes.

Construction activities would affect approximately 113 acres of land along Connector 1 (see Table 13.1-1). The affected area would include about 41 acres of MSB land, 32 acres of private land, and 6 acres of state land. There are no available data for ownership of the remaining 33 acres, which SEA assumes to be State of Alaska or MSB land. All land within the ROW would be permanently set aside for the rail line and ARRC would manage that land. ARRC would purchase or lease about 32 acres of private land.

Most of the land Connector 1 would affect is undeveloped. The segment would affect about 34 acres of land currently in agricultural use. SEA coordinated with the Natural Resources Conservation Service regarding impacts to locally important farmland soils the proposed rail line could affect. There are no residences in the vicinity of the Connector 1 ROW. The segment would cross the Iditarod Historic Trail. See Section 13.2 for a description of potential impacts to the Iditarod Historic Trail and other trails in the area.

Mac West-Connector 2 Segment Combination

Impacts from the Mac West Segment would be as previously described.

Construction activities would affect approximately 90 acres of land along Connector 2 (see Table 13.1-1). This land within the ROW would be permanently set aside for the rail line and ARRC would manage the land. The affected area would include about 34 acres of Native Corporation land, 24 acres of State of Alaska land, and 30 acres of private land. No data is presently available for ownership of the approximately 1 remaining acre, but SEA assumes this is public land.

The Connector 2 ROW would cross through or abut State of Alaska, Native Corporation, and private land used for agricultural purposes. Approximately 55 acres of agricultural land would be affected. The remaining areas are undeveloped and would not be affected outside the ROW. There are no structures in the Connector 2 Segment ROW.

Mac East-Connector 3 Segment Combination

Construction activities would affect approximately 469 acres of land along the Mac East Segment (see Table 13.1-1). The affected area would include about 235 acres of MSB land, 92 acres of Mental Health Trust Authority land, 57 acres of Native Corporation land, 12 acres of State of Alaska land, and 73 acres of private land.

Within the rail line ROW, the Mac East Segment would require taking 1 structure to the west of Port Access Road. Connector 3 would require taking 2 structures on one lot of Native Corporation land within the ROW just north of Ayrshire Road. There are several more structures within about 400 feet of Connector 3. The southern portion of Connector 3 is undeveloped Native Corporation land.

The Mac East Segment would border Point MacKenzie Road. The Mac East Segment ROW would affect 1 acre of agricultural land. The remainder of the segment's 200-foot ROW would either cross or be close to undeveloped or light industrial development

The MSB drafted a Vision Statement and Goals for the Point MacKenzie Comprehensive Plan that includes locating and constructing a Town Center for the Point MacKenzie community. The concept for the Town Center would include mixed-use, pedestrian-oriented development such as meeting locations, restaurants, and commercial establishments. While exact location, planning, and funding for the Town Center has not yet been secured, in a letter to SEA dated November 18, 2008, the MSB Planning Department identified a site near the intersection of Point MacKenzie Road and Burma Road as a potential future location for the Town Center. This location would be in proximity to the proposed Mac East Segment, and would directly conflict with the proposed Big Lake Segment. In a letter dated January 14, 2009, ARRC indicated it would consider ways to shift the Mac East Segment to the west to lessen potential impacts to the proposed development. In addition, the MSB has indicated that final planning and placement of the Town Center is contingent on the location of rail line construction. See the discussion for the Big Lake Segment for potential impacts to construction of the proposed Town Center.

The Mac East-Connector 3 Segment Combination ROW could also be in proximity to a series of roadway improvements that would eventually connect Port MacKenzie to Houston and enable residents in Point MacKenzie to more easily access the more populous areas to the north (MSB, 2009). The proposed roadway improvements would connect Big Lake Road to Burma Road through realignment of two segments of two-lane divided highway along Burma and Big Lake Roads and would require the upgrade of Point MacKenzie Road. While the Point MacKenzie Road upgrade has already been completed, the full extent of the roadway improvements are not likely to be complete for 5 to 6 years (Sworts, 2009).

There is some residential development in the area. The Mac East Segment ROW would cross directly through one residence and associated out buildings and storage areas. Those buildings and storage areas are at the northeast edge of a cultivated field, immediately west of Point MacKenzie Road. The ROW would also come within about 600 feet of two residences – one to the west of the ROW and one to the east. The rail line would not affect access to either residence.

Construction activities would affect approximately 123 acres of land along Connector 3 (see Table 13.1-1). The affected area would include about 68 acres of MSB land, 17 acres of Native Corporation land, and 35 acres of private land. SEA assumes the remaining 3 acres are publicly owned. The northern portion of Connector 3 would be in mostly undeveloped MSB land. As the connector turned east and southeast, it would cross State of Alaska land that on aerial photography appears to have been cleared for future development. The ROW would cross a small access road. Connector 3 might intersect a small portion of public land currently managed for timber harvest; any land within the ROW could be affected because the land would shift to use as a rail line (ADNR, 2008). Rail line operations through this area could affect potential future development of the land because of access restrictions and incompatible land use.

Northern Segments and Segment Combinations

Willow Segment

Rail line construction activities would affect approximately 715 acres of land along the Willow Segment (see Table 13.1-1). The affected area would include about 222 acres of MSB land, 4 acres of Mental Health Trust Authority land, about 6 acres of Native Corporation land, 266 acres of State of Alaska land, and 75 acres of private land. There are no available data for ownership of the remaining 98 acres, but SEA assumes this is State of Alaska or MSB land. Most of the land is publicly owned, but ARRC would purchase or lease about 81 acres of private and Native Corporation land.

Most of the land the Willow Segment would cross is undeveloped. Much of the surrounding land use is State of Alaska land that is designated for public recreational purposes. North and east of Red Shirt Lake, the segment would cross State of Alaska land where forestry is designated as a co-primary land use (ADNR, 1991). The Willow Segment would intersect a small portion of public land currently managed for public recreation; any land within the ROW would shift to use as a rail line.

Near the southern end of the segment, there are two residences or cabins within 800 feet of the ROW. As the alignment approaches Deshka Landing Road, there is a subdivision on several lakes that is accessed by Crystal Lake Road, Crystal Shores Road, Crescent Court, and Clover Road. Approximately five structures on the western edge of the subdivision are between 1,300 to 1,800 feet from the ROW. There are other structures in the vicinity of Deshka Landing Road. One is within 130 feet of the ROW; one is about 700 feet from the ROW. Just east of the Parks Highway crossing, there is one residence within 300 feet.

Big Lake Segment

Construction activities would affect approximately 521 acres of land along the Big Lake Segment (see Table 13.1-1). The affected area would include about 150 acres of MSB land, about 1 acre of municipal land, 5 acres of Mental Health Trust Authority land, 48 acres of Native Corporation land, 7 acres of University land, 2 acres of State of Alaska land, and 244 acres of private land. There are no available data for ownership of the remaining 16 acres, but SEA assumes this is State of Alaska or MSB land. Most of this land (282 acres) is private or Native Corporation land.

Most of the private land along the Big Lake Segment is developed for residential or recreational use. Near New Homesteader Avenue, the segment would pass through Native Corporation land that is being logged.

After the segment turns north, it would cross through mostly undeveloped land. There is a small private airport to the west of the segment as it approaches the more populated northern area surrounding Big Lake. MSB has indicated its goal to identify public land surrounding the airport and included in the airport approach zones and reserve them for airport protection and expansion (MSB, 1996, 2009). Despite this goal, no planning or funding for airport expansion is currently in place. The runway is perpendicular to the Big Lake Segment, its eastern end about 100 feet west of the ROW. Rail operations would not be compatible close to the airstrip and ARRC would potentially have to purchase the property. There are approximately 10 structures within 2,000 feet of the ROW in the vicinity of the airstrip.

Within the rail line ROW, the Big Lake Segment would require taking a total of approximately 17 residences and 3 structures. This includes approximately 10 structures located near the western shore of Loon Lake, 1 structure immediately south of Hollywood Road, and 1 structure approximately 1,300 feet south of Hollywood Road. The segment would also cross a nonresidential area requiring the taking of structures south of Calonder Way. Immediately south of the La Rae Road crossing, the segment would bisect one area requiring the taking of three structures.

As discussed in the description of impacts for the Mac East Segment, the MSB drafted a Vision Statement and Goals for the Point MacKenzie Comprehensive Plan that includes locating and constructing a Town Center for the Point MacKenzie community. While the MSB has not identified an exact location, completed detailed planning, or secured funding for the Town Center, in a letter to SEA dated November 18, 2008, the MSB Planning Department identified a site near the intersection of Point MacKenzie Road and Burma Road as a potential future location for the Town Center. The proposed Big Lake Segment would cross the area of the intersection of Point MacKenzie Road and Burma Road. However, if the Big Lake Segment were licensed, the Applicant has stated that it would work with MSB to find another location for the Town Center. The MSB selected the potential future location for the Town Center based on the availability of essential infrastructure and its proximity to the only grocery store in Point MacKenzie. In a letter dated January 14, 2009, ARRC stated that, unlike the situation with the Mac East Segment, the topography to the north and east of the proposed Town Center is such that avoidance of the planned development does not appear to be practicable.

Houston-Houston North Segment Combination

Construction activities would affect approximately 251 acres of land along the Houston Segment (see Table 13.1-1). The affected area would include about 43 acres of MSB land, 97 acres of Mental Health Trust Authority land, 12 acres of Native Corporation land, 44 acres of University land, 22 acres of State of Alaska land, and 11 acres of private land. SEA assumes the remaining 17 acres are public land.

Nearly all of the land this segment would affect is undeveloped Trust Authority, State of Alaska, and University land. There are no structures in proximity to the Houston Segment. Trust Authority lands in the vicinity of the Houston-Houston North Segment Combination are currently managed for the mining of minerals, coal, oil, and gas. Trust Authority land within the ROW could be affected because it would shift to use as a rail line. However, continued use of the land for resource extraction would depend on the resource extraction technique and the vertical location of the resource (AMHT, 2006). The Houston-Houston North Segment Combination might also intersect a small portion of public land currently managed for timber harvest; any land within the ROW could be affected because they would also shift to use as a rail line (ADNR, 2008).

Construction activities would affect approximately 197 acres of land along the Houston North Segment (see Table 13.1-1). The affected area would include about 34 acres of Mental Health Trust Authority land, 38 acres State of Alaska land, and 24 acres of private land. There are no available data for ownership of the approximately 79 remaining acres, and SEA assumes this is State of Alaska or MSB land.

The entire area of the Houston North Segment is undeveloped and expected to remain undeveloped because the segment would cross portions of the Little Susitna State Recreational River Area. The segment would not cross any roads and there are no structures in proximity to the proposed ROW. Already in the construction stage, the trail is eventually intended to traverse the entire length of Parks Highway from Wasilla to Willow Creek (MSB, 2003c). See Section 3.4.2 for further discussion on trail and recreation crossings and potential impacts.

Houston-Houston South Segment Combination

Impacts along the Houston Segment would be as previously described.

Construction activities would affect approximately 210 acres of land along the Houston South Segment (see Table 13.1-1). The affected area would include about 8 acres of MSB land, 48 acres of Mental Health Trust Authority land, 72 acres of Native Corporation land, and 59 acres of private land. There are no available data for ownership of the approximately 1 remaining acre, and SEA assumes this is State of Alaska or MSB land.

Most of this segment would cross undeveloped land. However, there are three residences within about 1,100 feet of the ROW in the Horseshoe Lake area near the southern terminus of the segment. There are three additional residences within about 1,600 feet of the ROW. Farther north along the segment, there is a communications tower/cleared site within 400 feet of the ROW. The rail line would cross the access road to the site. If ARRC did not construct a crossing at the access road to the site, use of the site for its existing purpose could be affected. There is a private airstrip (Reids Landing) off of Miller's Reach Road to the west of the segment. The runway is perpendicular to the segment and the eastern end of the airstrip is within 1,800 feet of the proposed ROW. However, rail line operations would not likely affect use of the airstrip because of its distance from the proposed segment.

Summary of Impacts by Alternative

Tables 13.1-4 and 13.1-5 summarize impacts to land ownership and use for each of the eight rail line alternatives. The Mac West-Connector 1-Houston-Houston North Alternative would impact the least amount of private land (210 acres) and cross mostly undeveloped land. Overall, this alternative would impact the fourth lowest total number of acres (1,054 acres) after the Mac East-Big Lake Alternative (990 acres), the Mac East-Connector 3-Houston-Houston North Alternative (1,040 acres), and the Mack East-Connector 3-Houston-Houston South Alternative (1,053 acres). However, the Mac East-Big Lake Alternative would impact many more acres of private land (317), and would require taking 18 residences and 3 structures within the 200-foot ROW. The Mac West-Connector 2-Big Lake Alternative would require taking 17 residences and

3 structures, and the Mac East-Connector 3-Willow and Mac East-Connector 3-Houston-Houston South alternatives would directly impact one residence and two structures each.

The Mac West-Connector 1-Houston-Houston South Alternative would impact the fifth lowest amount of total acres (1,067 acres). The Mac West-Connector 1-Houston-Houston South Alternative ROW would border land used for agricultural purposes along the Mac West Segment and Connector 1, but would not directly cross any land presently in agricultural use. Sixty-four acres of private land is in agricultural use, which the MSB considers to be locally important for agricultural purposes, and rail line construction would convert the land to railroad use.

The Mac East-Connector 3-Houston-Houston North Alternative would impact only 142 acres of private land and a total of 1,040 acres. This alternative would cross mostly undeveloped land along Connector 3, the Houston Segment, and the Houston North Segment, and residential land along Mac East and Willow segments. The Mac East-Connector 3-Houston-Houston North Alternative would border agricultural land and would directly cross about 2 acres of this land.

13.1.5.2 No-Action Alternative

Under the No-Action Alternative, ARRC would not construct and operate the proposed Port MacKenzie Rail Extension, and there would be no impacts to land use and ownership from the project. Restricted-use covenants that various governing bodies have put in place for rail line development could likely be lifted, thus allowing for other types of use and development.

Table 13.1-4
Summary of Impacts to Land Ownership (acres) by Alternative[a]

Impact[b]	Mac West-Connector 1-Willow	Mac West-Connector 1-Houston-Houston North	Mac West-Connector 1-Houston-Houston South	Mac West-Connector 2-Big Lake	Mac East-Connector 3-Willow	Mac East-Connector 3-Houston-Houston North	Mac East-Connector 3-Houston-Houston South	Mac East-Big Lake
Total Acres	1,322	1,054	1,067	1,105	1,308	1,040	1,053	990
Private Land Ownership								
Private Land	238	198	232	405	183	142	177	317
Native Corporation Land	6	12	85	82	79	86	158	105
Total Private Land [c]	244	210	317	487	262	228	335	422
Matanuska-Susitna Borough Land	563	384	391	450	525	346	353	385
State of Alaska Land	272	67	28	26	277	72	34	14
Mental Health Trust Authority Land	15	143	157	16	96	224	238	97
Public University Land	<1	44	44	7	0	44	44	7
Other Public Land[d]	46	26	27	49	47	27	28	49
Total Public Land	896	663	647	549	945	713	696	552

[a] Sources: MSB, 2007a; USGS, 2001; Aero-Metric, Inc., 2007,2008.
[b] Acres affected are only those within the 200-foot right-of-way.
[c] Totals might not equal sums of values due to rounding.
[d] Includes public roads, city land, and land for which there are no data but are assumed to be public.

Table 13.1-5
Summary of Impacts to Land Use by Alternative[a] (page 1 of 2)

Impact	Mac West-Connector 1-Willow	Mac West-Connector 1-Houston-Houston North	Mac West-Connector 1-Houston-Houston South	Mac West-Connector 2-Big Lake	Mac East-Connector 3-Willow	Mac East-Connector 3-Houston-Houston North	Mac East-Connector 3-Houston-Houston South	Mac East-Big Lake
Number of Residences or Structures within the 200-foot right-of-way	0	0	0	17 residences, 3 structures	1 residence, 2 structures	1 residence, 2 structures	1 residence, 2 structures	18 residences, 3 structures
Forested Land[b] (acres)	941	574	496	606	1,093	721	643	678
Undeveloped Land Present?	Yes, along all segments.	Yes, Houston and Houston North both nearly all undeveloped.	Yes, along all segments.	Yes, along all segments.	Yes, along all segments.	Yes, especially along Connector 3, Houston, and Houston North.	Yes, along all segments.	Yes, along both segments.
Agricultural Land Present?	Yes, 66 acres of agricultural land in ROW	Yes, 64 acres of agricultural land in ROW	Yes, 64 acres of agricultural land in ROW	Yes, 94 acres of agricultural land in ROW	Yes, 7 acres of agricultural land in ROW	Yes, 5 acres of agricultural land in ROW	Yes, 5 acres of agricultural land in ROW	Yes, 1 acres of agricultural land in ROW
Residential Land Present	Yes, along Mac West and Willow.	Yes, along Mac West only.	Yes, along Mac West and Houston South.	Yes, several subdivisions along the Big Lake Segment, including proposed Mystery Subdivision.	Yes, along Mac East and Willow.	Yes, along Mac East and Connector 3	Yes, along Mac East, Connector 3, and Houston South	Yes, several subdivisions along the Big Lake Segment, including proposed Mystery Subdivision.

Table 13.1-5
Summary of Impacts to Land Use by Alternative[a] (page 2 of 2)

Impact	Mac West-Connector 1-Willow	Mac West-Connector 1-Houston-Houston North	Mac West-Connector 1-Houston-Houston South	Mac West-Connector 2-Big Lake	Mac East-Connector 3-Willow	Mac East-Connector 3-Houston-Houston North	Mac East-Connector 3-Houston-Houston South	Mac East-Big Lake
Other Impacts	Access to timber resources north and east of Red Shirt Lake would be affected; Willow could prevent or alter development of road between Port MacKenzie and Houston.	Radio tower 2,000 feet from right-of-way.	Two radio towers 2,000 feet and 400 feet from right-of-way; private airstrip within 1,800 feet of right-of-way.	Would cross land that is being logged; private airstrip within 100 feet of right-of-way; could prevent or alter planned airport expansion near Big Lake Segment and the development of proposed bike and roadside trails.	Willow could prevent or alter development of road between Port MacKenzie and Houston; Mac East could alter placement of the proposed Port MacKenzie Town Center.	Some light industrial development; radio tower 2,000 feet from right-of-way; Mac East could alter placement of the proposed Port MacKenzie Town Center.	Some light industrial development; two radio towers 2,000 feet and 400 feet from right-of-way; private airstrip within 1,800 feet of right-of-way; Mac East could alter placement of the proposed Port MacKenzie Town Center.	Some light industrial development; would cross land that is being logged; private airstrip within 100 feet of right-of-way; could prevent or alter planned airport expansion near Big Lake Segment and the development of proposed bike and roadside trails; Big Lake and Mac East segments could alter placement of the proposed Port MacKenzie Town Center.

[a] Sources: MSB, 2007a; USGS, 2001; Aero-Metric, Inc., 2007, 2008; Homer *et al*., 2004.
[b] Segment-level data does not sum to alternative-level data as a result of the method used to calculate the rail line routes. Connector segment acreages were calculated by summing both possible "arms" of each connector segment (the arms necessary to connect the segment to either the Willow or Houston segments). Alternative acreages were calculated by generating a smooth path from the respective Mac Terminal to either the Willow or Houston segment, and thus include only the one, necessary connector "arm" (as the extra "arm" connecting to the other segment would not be necessary if that route was built).

13.2 Parks and Recreation Resources

This section describes parks and recreation resources that the proposed Port MacKenzie Rail Extension could affect. These resources include park lands and recreational activities – boating, hunting, fishing, wildlife viewing, hiking, winter sports, and a variety of others. Section 13.2.1 describes regulations governing parks and recreation resources; Section 13.2.2 describes the study area; Section 13.2.3 describes the methodology used to analyze impacts to parks and recreation resources; Section 13.2.4 describes the affected environment (existing conditions); Section 13.2.5 describes potential environmental consequences (impacts); and Section 13.2.6 summarizes the U.S. Department of Transportation Act of 1966 Section 4(f) and the Land and Water Conservation Fund Act Section 6(f) evaluations.

13.2.1 Regulatory Setting

13.2.1.1 Federal Regulations

Bureau of Land Management

- Iditarod National Historic Trail Comprehensive Management Plan (BLM, 1986) – This is a Congressionally mandated management plan for the collection of trail resources collectively known as “Iditarod National Historic Trail.” Under the Plan, no one agency or organization manages the entire trail; instead the plan calls for cooperative management by local, state, and Federal agencies. The plan establishes a common guide used to promote the preservation, enjoyment, use, and appreciation of the trail. It also identifies trails and sites comprising the historic trail system, and recommends possible management actions for protecting significant segments, historic remnants, and artifacts for public use and enjoyment. The BLM coordinates the cooperative management of Iditarod National Historic Trail land and is the primary point of contact for matters involving the entire trail. BLM duties under the Plan include reviewing for appropriateness and consistency any draft regulations affecting segments of the National Trail. State, city, municipal, or borough land managers responsible for trail segments or historic sites identified in the Plan are encouraged to enter into cooperative agreements with the Federal Government, and collaboratively define actions that are consistent with the Plan’s management objectives on a segment-by-segment or site-by-site basis (BLM, 1986).
- Revised Statute 2477 (Mining Law of 1866) – This law promoted the settlement of the American West in the 1800s and provided access to mining deposits on Federal lands. Congress adopted Revised Statute 2477 as part of the Mining Law of 1866. Revised Statute 2477 granted rights-of-way for the construction of highways across public land not reserved for public uses. The statute was repealed in 1976 with enactment of the Federal Land Policy and Management Act, but Congress did not terminate valid rights-of-way existing on the date the Act was enacted (GAO, 2004). The Alaska Department of Natural Resources (ADNR), Division of Mining, Land and Water has researched more than 2,000 routes and determined that approximately 647 historic routes qualify under Revised Statute 2477 (ADNR, 2008a). Once established, a Revised Statute 2477 right-of-way cannot be abandoned by non-use or removed without undergoing a legal easement-vacation process. By statute, the Alaska

legislature must approve an application to vacate a Revised Statute 2477 right-of-way if there is no reasonable, comparable alternative right-of-way or means of access.

U.S. Department of Transportation

The U.S. Department of Transportation (USDOT) regulation known as "Section 4(f)" is not applicable to the Surface Transportation Board (STB or the Board) actions, however, it is applicable to the proposed Port MacKenzie Rail Extension (project) through the involvement of the Federal Railroad Administration (FRA).[1] Section 4(f) was originally established in the U.S. Department of Transportation Act of 1966 (49 United States Code [U.S.C.] Section 1653(f) and later recodified as 49 U.S.C. 303. In 2005, Congress enacted legislation that required the USDOT to issue additional regulations that clarify 4(f) standards and procedures (USDOT, 2005). These new regulations were finalized in March, 2008, at 23 Code of Federal Regulations (CFR) 774. Section 4(f) mandates that the Secretary of Transportation shall not approve any transportation project requiring the use of publicly-owned parks, recreation areas or wildlife and waterfowl refuges, or significant historic sites, regardless of ownership, unless (1) there is no prudent and feasible alternative to using that land and (2) the program or project includes all possible planning to minimize harm to the public park, recreation area, wildlife or waterfowl refuge, or significant historic site, resulting from that use.

Section 6009(a) of the Safe, Accountable, Flexible, Efficient Transportation Equity Act of 2003: A Legacy for Users (SAFETEA-LU), amended existing Section 4(f) legislation to simplify the processing and approval of projects that have only *de minimis* impacts on resources protected by Section 4(f). A *de minimis* finding refers to a finding that a project would have little or no influence to the activities, features, and/or attributes of the Section 4(f) resource. This revision provides that once USDOT determines that the transportation use of any Section 4(f) property would result in a *de minimis* impact on that property, after consideration of any impact avoidance, minimization, and mitigation or enhancement measures, an analysis of avoidance alternatives is not required and the Section 4(f) evaluation process is complete for that resource.

Appendix M of this EIS includes the complete Section 4(f) evaluation, which is summarized in Section 13.2.6.

National Park Service

Section 6(f) of the Land and Water Conservation Fund (16 U.S.C. 4601 *et seq.*) applies to all public areas that have received Conservation Fund monies to acquire or develop public recreation facilities. Section 6(f)(3) requires that these areas be maintained perpetually in public outdoor recreation use, unless the National Park Service approves substitution property of reasonably equivalent usefulness and location and of at least equal fair market value. This statute would apply for any land that has received Conservation Fund assistance that could be converted to use through implementation of the proposed action.

[1] The lead agency for the Port MacKenzie Extension is the STB. FRA is a cooperating agency in the NEPA process. Section 4(f) does not apply to the STB, so the FRA acts as lead agency in regard to the Section 4(f) analysis.

Appendix M includes the complete Section 6(f) evaluation, which is summarized in Section 13.2.6.

13.2.1.2 State Regulations

Alaska Department of Natural Resources

Section 13.1 describes the land use and management plans listed below in more detail; the table in Section 13.1.4.4 summarizes those plans.

- Susitna Area Plan (ADNR, 1985, amended 1993) – This is the guiding document for the ADNR management of state lands in the vicinity of the study area. However, the Southeast Susitna Area Plan (described next) provides specific management policies for the study area, as defined in Section 13.2.2.
- Southeast Susitna Area Plan (ADNR, 2008b) – This plan establishes land use designations, management intent, and management guidelines for more than 250,000 acres of state uplands, shorelands, and tidelands in the lower Susitna Valley, and encompasses the entire study area. It includes discussion of fish and wildlife habitat and harvest areas; recreation, tourism and scenic resources; shorelands and stream corridors; and public access, among others. It revises the entire Willow Sub-Basin Area Plan (1982) and a portion of the South Parks Highway Subregion of the Susitna Area Plan.
- Fish Creek Management Plan (ADNR, 1984, amended 1987) – This is a joint land management plan between the ADNR and the MSB for an area between the Little Susitna River and the Susitna River, generally north of Susitna Flats State Game Refuge and southwest of Nancy Lake State Recreation Area. The plan designates site-specific land use allocations for the area, and pertains to both state and MSB lands in accordance with the joint planning and adoption process. It includes resource descriptions and management policies for transportation, fish and wildlife, and recreation, among others.
- Susitna Basin Recreation Rivers Management Plan (ADNR, 1991) – This plan governs land and water management practices for state-owned lands along the Little Susitna State Recreation River, including water and riparian habitats and a 1-mile-wide corridor of land surrounding the rivers. The plan includes goals and management practices for recreation, fish and wildlife habitat, and public access, among others.
- Nancy Lake State Recreation Area Master Plan (ADNR, 1983) – This is the management document for Nancy Lake. It provides information about natural and cultural resources in the area, regional recreation resources, and visitor use and projections. It also analyzes resource areas and provides management and development recommendations for the recreation area.
- Alaska Recreational Trails Plan (ADNR, 2000) – This plan is a resource that provides guidance for volunteers and trail advocates in working with landowners and land managers to "save, secure and improve existing trails, develop new trails, deal with conflicts among diverse trail users vying for limited space and dollars, and to improve trailhead parking, sanitation and information." The plan thoroughly describes statutory regulations for legal access and trail protection.

- Riparian buffers – ADNR Regulation 11 Alaska Administrative Code (AAC) 51.045 establishes the ADNR right to reserve an access easement of at least 50 feet from either side of a mean high water line for all rivers determined to be public or navigable water, before ADNR grants a lease or conveys land adjacent to inland waters.
- Access to water – ADNR Regulation 11 AAC 38.05.127 defines the ADNR role to provide public access along and to public or navigable waters prior to lease, sale, grant, or other disposal of state interest.
- Generally allowed trails – ADNR Regulation 11 AAC 96.020 allows individuals to construct and maintain trails up to 5 feet wide on state land. Individuals are not required to report the location or purpose of this type of trail to the ADNR, so there are no detailed records of them. They are considered a legal public use.
- Section line easements – ADNR Regulation 11 AAC 51.025 establishes that the ADNR will reserve a 50- to 100-foot public easement along section lines before selling, leasing, or otherwise disposing of the surveyed land estate, unless and until it is vacated under 11 AAC 51.065. The Alaska Recreational Trails Plan describes the section line as the center of the dedicated right-of-way, and if a section line qualifies under law and has not been vacated, a publicly owned section line easement exists north-south and east-west every mile. The regulation also establishes a policy that section line easements leading to public waterbodies not be vacated (ADNR, 2000).

Alaska Department of Fish and Game

Susitna Flats State Game Refuge Management Plan (ADF&G, 1988) – This plan provides long-range management guidance for the Susitna Flats State Game Refuge. It provides goals, objectives, and policies to guide management activities, including discussion of public access, hunting, fishing, and other recreation activities as they relate to Alaska Department of Fish and Game (ADF&G) wildlife management goals.

This analysis does not review the guiding management plan for Goose Bay State Game Reserve, because the Reserve is east of the Mac East Segment and it would not be affected by the proposed rail line.

The ADF&G sets seasons and hunting bag limits for Game Management Unit 14A, which includes the entire study area. Sportfishing regulations and catch limits are set annually for the Southcentral Alaska Knik Arm Drainage Area, which encompasses the study area. The ADF&G Division of Sportfishing designates specific rules and regulations for the major fishing rivers the proposed rail line could cross – the Little Susitna River, Willow Creek, and Fish Creek (draining Big Lake).

13.2.1.3 Local Regulations

Matanuska-Susitna Borough

- Matanuska-Susitna Borough Comprehensive Plan (MSB, 1970, amended 2005) – This plan provides goals and policy recommendations aimed at addressing future growth and land management. It includes discussions of goals and policies for transportation and parks and open space, among others. The plan emphasizes maintaining the quality of parks, open space, and natural resource quality as key features that draw people to the area to live and recreate. The plan includes local community planning areas, which in turn have produced their own local area plans that provide more specific goals and policy guidance for these areas. For the study area, these local plans include the Big Lake Comprehensive Plan (1996, currently being amended), Knik-Fairview Comprehensive Plan (1997), City of Houston Comprehensive Plan (amended 2003), Willow Comprehensive Plan (1970, currently being updated), Meadow Lakes Comprehensive Plan (2005), Fish Creek Management Plan (final draft July 2008), and the Point MacKenzie Comprehensive Plan (draft vision statement and goals May 2008).

- Matanuska-Susitna Borough Recreational Trails Plan (MSB, 2000, amended 2007) – This plan outlines the MSB goals and policies for the study and management of primitive, unpaved, backcountry recreational trails. The plan evaluates and maps principal trail corridors in the MSB, sets priorities for trail development, identifies and analyzes major hindrances to trail development and preservation, and evaluates public demand for trails and trail development.

13.2.2 Study Area

The study area is north of Anchorage across the Knik Arm, and stretches north to Parks Highway and the Cities of Wasilla, Houston, and Willow. The landscape is primarily forest, with numerous wetland areas, lakes, and rivers. It includes several designated recreation areas, including Willow Creek State Recreation Area, Nancy Lake State Recreation Area, Little Susitna State Recreation River, and two state recreation sites on the northern and southern shores of Big Lake. Many recreational trails cross the area, and there are varied recreation opportunities available to the public. The area is well suited for both winter and non-winter outdoor recreation activities. In general, there is more private property and greater population density toward the eastern portion of the study area (in the vicinity of Big Lake) and to the north near the communities adjacent to Parks Highway than in the southern and western portions of the study area. The degree of development in these areas affects the recreation resources available, with more open space and trails resources in the less-developed areas.

Figures 13.2-1 through 13.2-6 show the general area and specific recreation resources along the proposed rail line segments. The figures include officially recognized and unofficial trails that were digitally available. Trails shown on Figures 13.2-1 through 13.2-3 could also be used for snowmachining, but are not shown on Figures 13.2-4 through 13.2-6, which are based on detailed information submitted in a public comment (Gaffey unpublished data, 2007). Officially recognized trails have been specifically established within currently adopted plans by ADNR and/or MSB or are established within these plans at the time of construction or ROW conveyance (whichever occurs first), and are located on state or MSB property, or their locations are provided for by recorded ROW or easement.

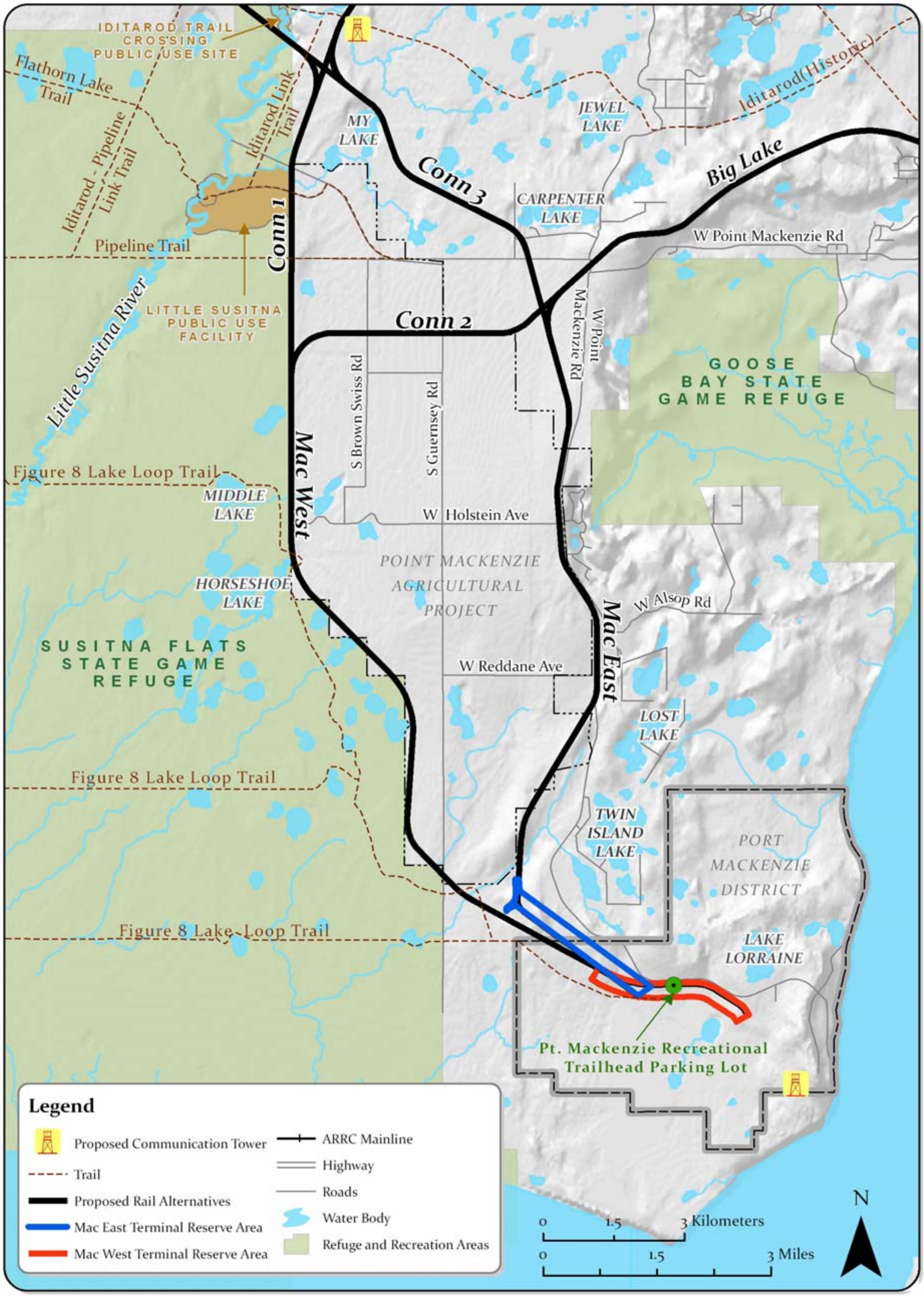

Figure 13.2-1. Recreation Resources along the Mac East, Mac West, and Connector Segments

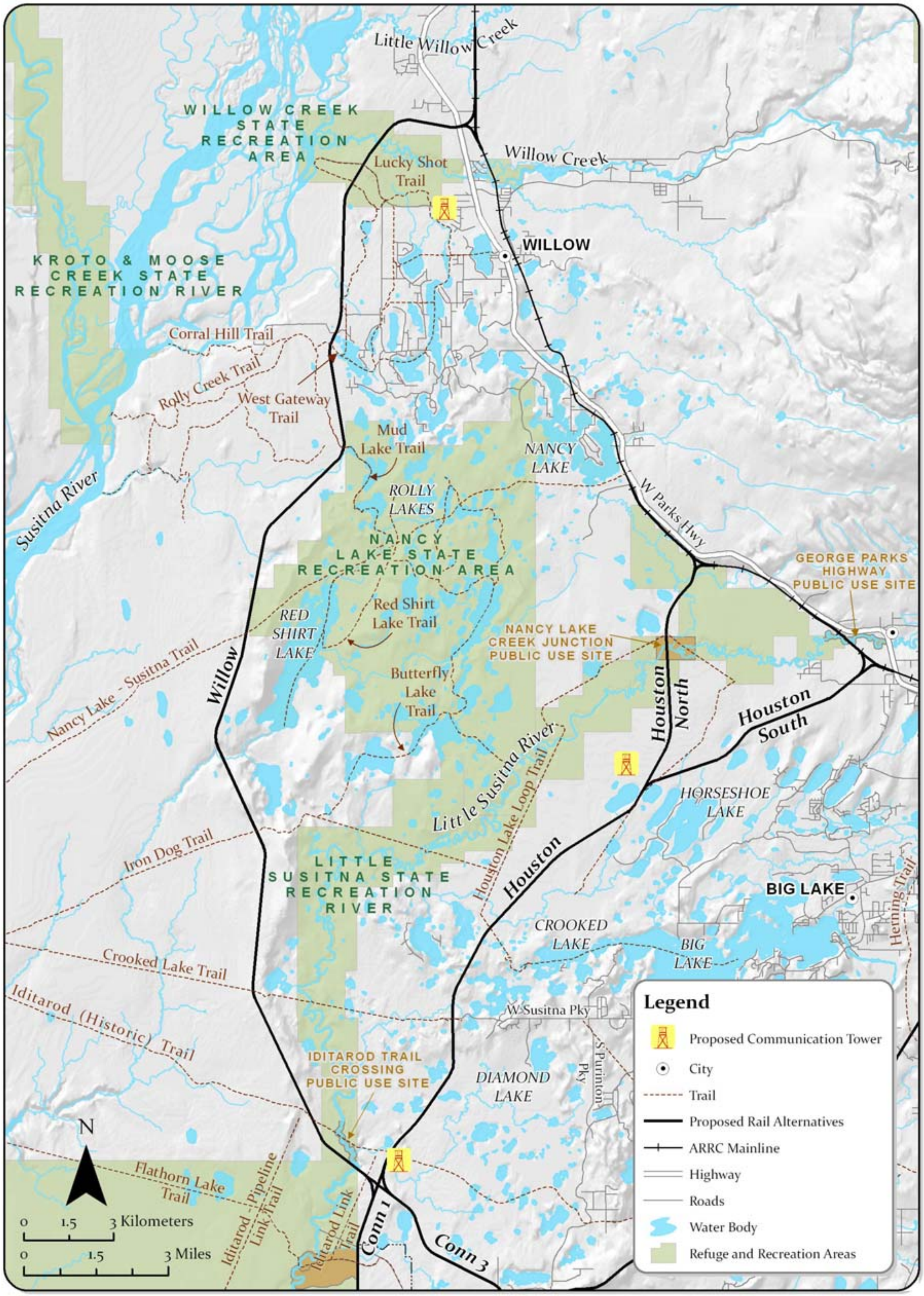

Figure 13.2-2. Recreation Resources along the Willow, Houston, Houston North, and Houston South Segments

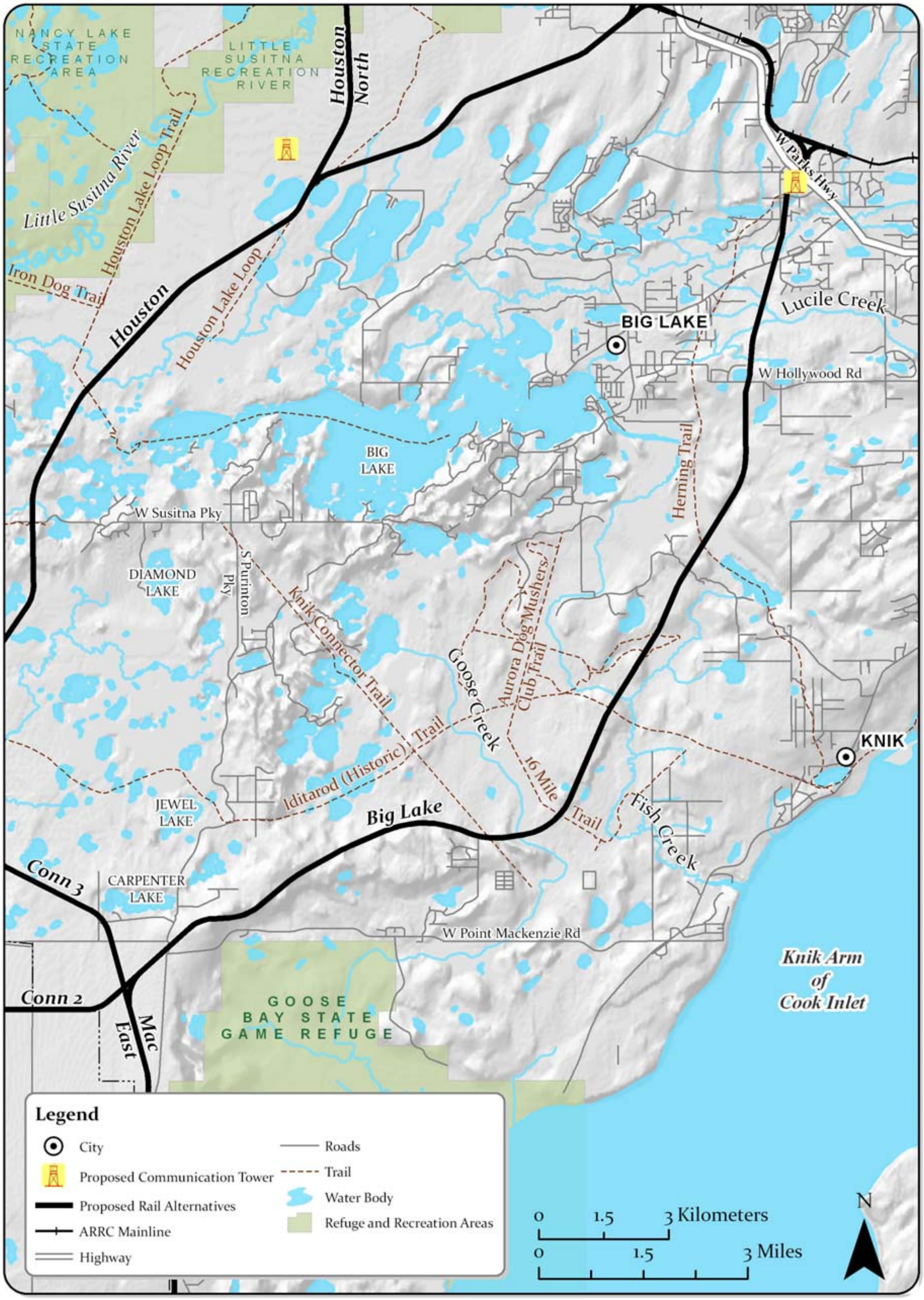

Figure 13.2-3. Recreation Resources along the Big Lake Segment

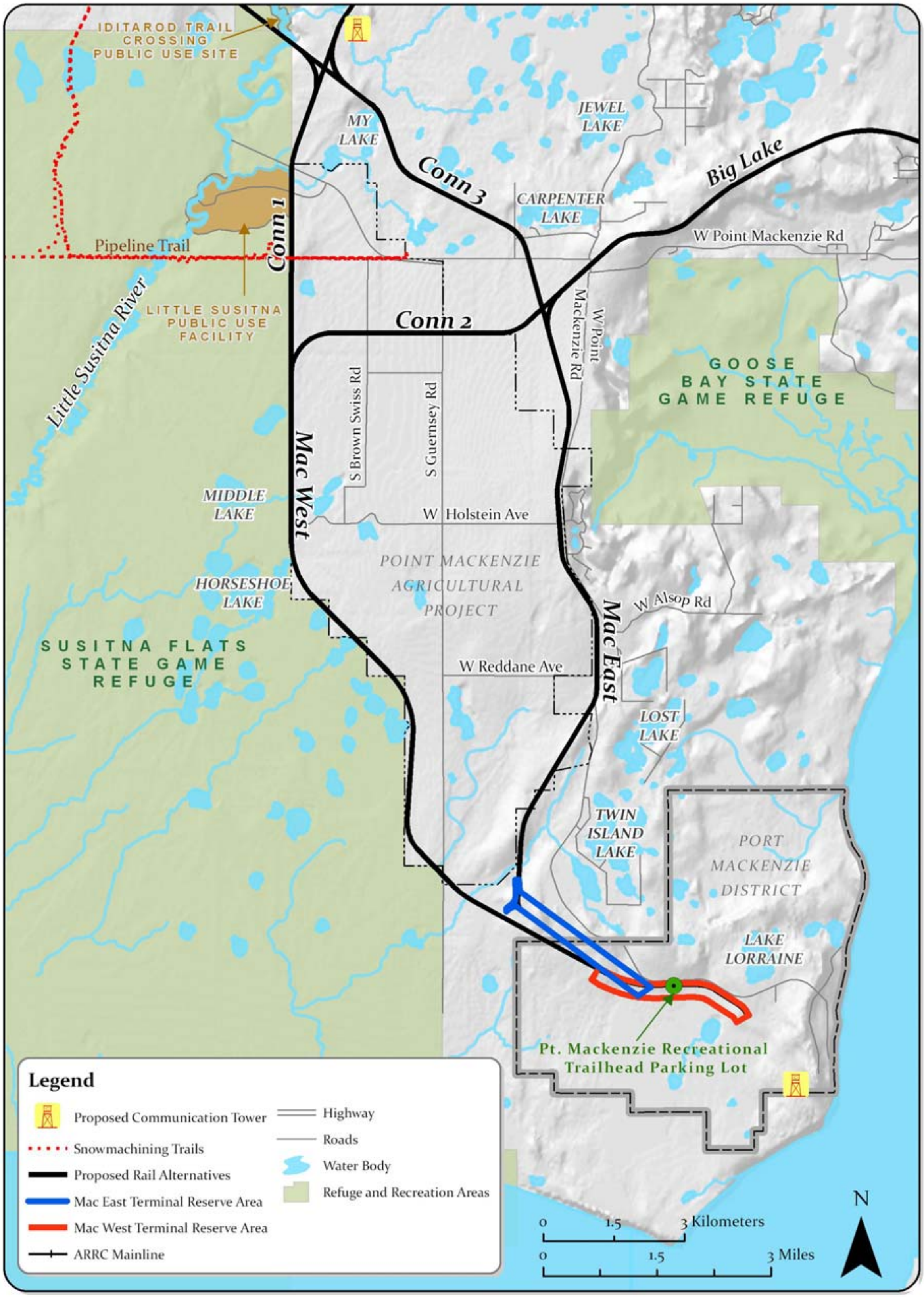

Figure 13.2-4. Snowmachining Trails along the Mac East, Mac West, and Connector Segments

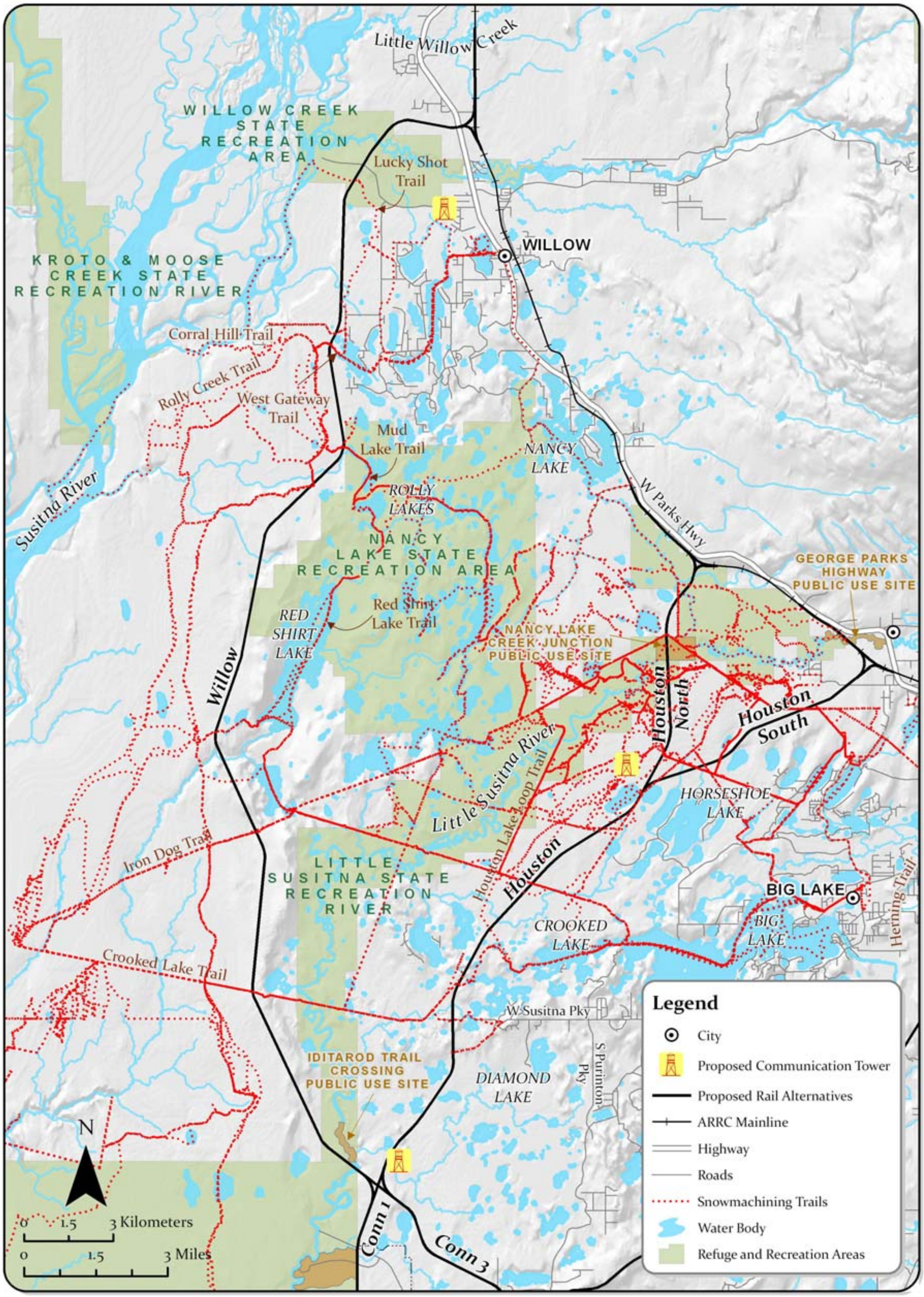

Figure 13.2-5. Snowmachining Trails along the Willow, Houston, Houston North, and Houston South Segments

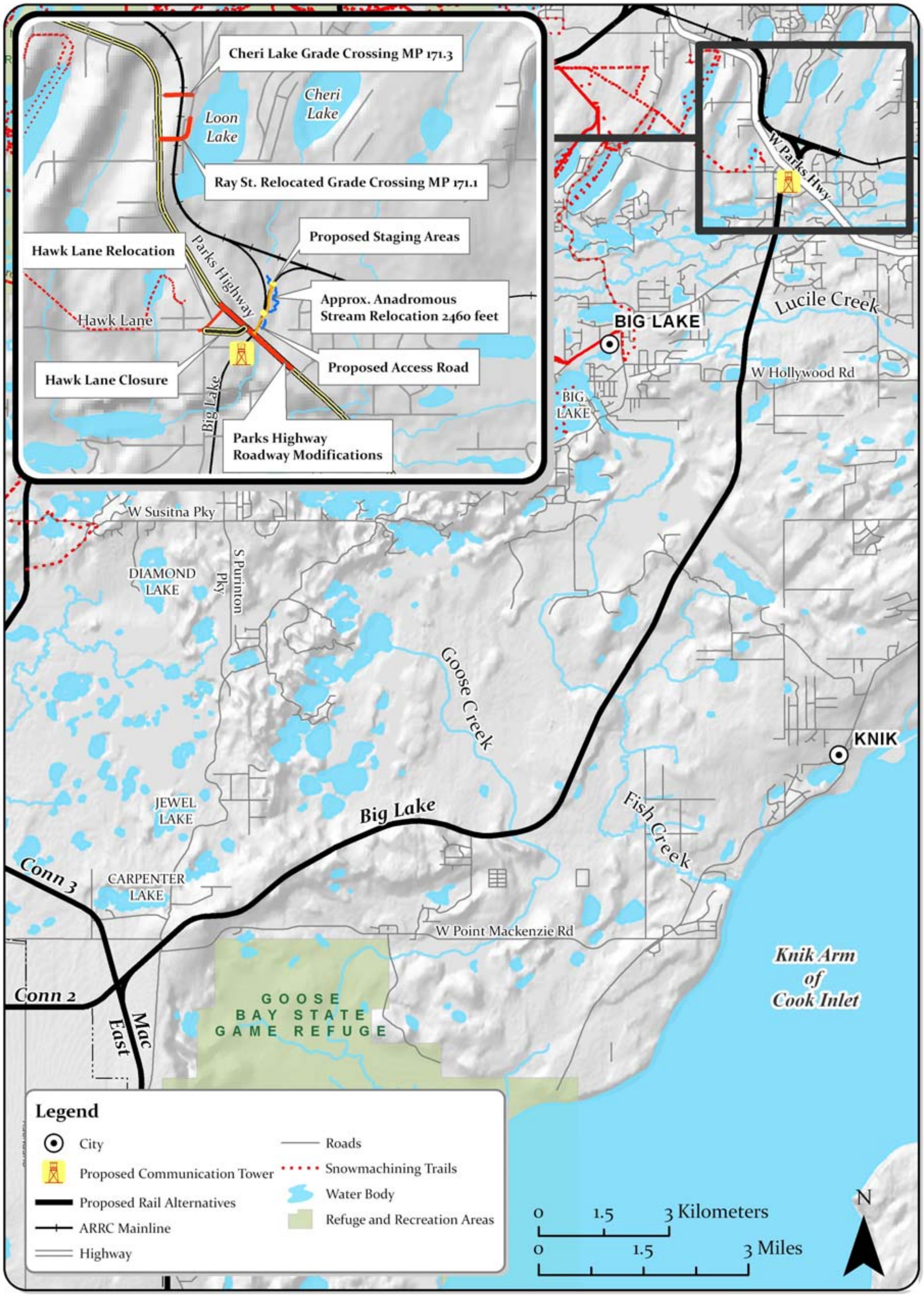

Figure 13.2-6. Snowmachining Trails along the Big Lake Segment

13.2.3 Analysis Methodology

This analysis utilized recreation data available from the ADNR, MSB, BLM, and ADF&G. SEA reviewed plans and documents to identify site-specific recreation activities (such as parks and actively planned recreation areas), the nature of dispersed-use recreation activities (such as fishing or hunting), and surface land use designations for general state and MSB lands. The analysis incorporated a review of existing Alaska Railroad Corporation (ARRC) project descriptions (up-to-date at the time of the analysis) and analysis of recreation resource map features using the Geographic Information System. The review included meetings and telephone conversations with land use managers for all of the aforementioned agencies.

SEA reviewed maps of the rail line segments in coordination with land managers to identify potentially affected areas and key recreation access points and paths.

13.2.4 Affected Environment

13.2.4.1 Federal Recreation Facilities

Iditarod National Historic Trail is managed as a joint endeavor between the BLM and state and local agencies. The Historic Trail was established in 1978 when the National Trails System Act of 1968 was amended to include National Historic Trails. The trail connects Seward, Alaska, with Nome, Alaska, more than 900 miles to the northwest. The original trail and hundreds of miles of branching trails comprise the Iditarod National Historic Trail System. The term "Iditarod" is now principally associated with the famous Iditarod Sled Dog Race, but the trail system also hosts numerous other races, such as the Iron Dog Snowmachine Race, many shorter sled dog races and Iditarod Race qualifying competitions, and the Iditasport endurance races for runners, skiers, and mountain bikers (BLM, 1986), in addition to widespread non-competition usage. The trail system also includes a number of historic sites associated with the trail, such as road houses and cabins.

A portion of the Iditarod National Historic Trail crosses the study area east to west, generally south of the Big Lake area and north of the Point MacKenzie Agricultural Project and Susitna Flats State Game Refuge. According to the Willow Sub-Basin Area Plan (ADNR, 1982), the trail has been certified with a 1,000-foot wide corridor (500 feet to either side of the trail centerline) on state and MSB lands.

13.2.4.2 State Recreation Areas and Facilities

Willow Creek State Recreation Area

This popular area is at the northern end of the study area, west of Parks Highway near the City of Willow. The Willow Creek State Recreation Area is approximately 3,000 acres in size. The park encompasses almost all of Willow Creek from Parks Highway to its confluence with the Susitna River. Willow Creek receives intensive sport fishing activity, especially during the king salmon season. Recreation activities available in the area include fishing, camping, floating/boating, winter trails, wildlife viewing, and hunting. Willow Creek receives approximately 42,000 visitors per year, with most of the visits occurring during non-winter months. Winter usage focuses primarily on trail use (ADNR, 2007). The area includes a portion of the West Gateway Trails System, a highly developed grouping of trails used for a variety of winter trail sports, dog sledding in particular. The West Gateway Trails System is frequently the restart point for the Iditarod Sled Dog Race.

Nancy Lake State Recreation Area

The 22,685-acre Nancy Lake State Recreation Area is west of Palmer Highway between the cities of Willow and Houston. This popular and easily accessible recreation area is characterized by interconnected lakes and rolling landscapes. Some of the recreation activities available include canoeing, picnicking, fishing, hiking, camping, dog sledding, skiing, snowshoeing, and snowmachining. The Little Susitna State Recreation River passes through the southeast portion of the Nancy Lake State Recreation Area, and canoers can portage to Nancy Lake to utilize the ample water trail system within the park. The Nancy Lake State Recreation Area receives approximately 40,000 visitors per year, with highest use in the summer (ADNR, 2007). There are also known cultural and historic sites in the vicinity of the Nancy Lake State Recreation Area (ADNR, 1983).

Little Susitna State Recreation River

Because of easy access and the quality of the fishery, the Little Susitna State Recreation River is a very popular fishing and boating resource. Peak recreation periods coincide with the king and coho salmon runs on the river (generally May to September), and salmon fishing is restricted to the lower portion of the river (south of Parks Highway, which coincides with the section within the study area). The Little Susitna River is home to the second largest coho harvest in the state (ADF&G, 2004). The most popular fishing area on the river is near Little Susitna Access Road, which provides entry to the Little Susitna Public Use Facility at the northeast corner of the Susitna Flats State Game Refuge. Other access points include Parks Highway, Miller’s Reach Road, and the mouth of the Little Susitna River at Point MacKenzie (which boaters reach by crossing the Knik Arm from Anchorage). There is camping along the river at the Little Susitna Public Use Facility, Nancy Lake Creek Junction Public Use Site, a City of Houston Campground at Parks Highway, and at numerous, undeveloped campsites. There is also significant moose and black bear hunting in the river corridor. Boats on the river include canoes, kayaks, rafts, and powerboats. Floaters frequently put in at Parks Highway and float to the Nancy Lake portage or to the Little Susitna Public Use Facility. Powerboats access the river from the Little Susitna Public Use Facility. Motorized and nonmotorized boats alternate use on weekends during summer (ADNR, 1991). There are an estimated 2,000 to 3,000 float trips on the river each year (ADNR, 2007).

Trails

Table 13.2-1 lists the trails that SEA has identified as officially recognized trails on state lands. The data in Table 13.2-1 reflect officially recognized trails within the sections of land through which the proposed rail line would pass. The trails listed in Table 13.2-1 are a subset of a highly developed regional trail system throughout the study area. These trails are used for a variety of motorized and nonmotorized activity in all seasons, or serve as means to access lakes, rivers, hunting areas, or other recreation resources. In the study area, some trails follow seismic lines.

In addition to providing local recreation opportunities, Matanuska-Susitna Valley trails serve as a major recreation resource for a large percentage of Alaska's population. Many of these trails host high-profile dog sledding, skiing, skijoring, snowmachining, and other types of races, and many others function as training grounds for race participants. The MSB Community Development and Economic Development Departments identified trails as centrally important to the economic vitality of the MSB (MSB, 2008a).

On state lands, the ADNR's generally allowed trail policy (11 AAC 96.020) applies, whereby any individual may construct a trail up to 5 feet wide on state land. Unofficial trails of this type can be found along all proposed rail line segments. Unofficial trails can also include means of accessing public or navigable waters on state land (11 AAC 38.05.127), riparian buffers along those waters (11 AAC 51.045), or trails along Section lines (11 AAC 51.025)

Table 13.2-1
Officially Recognized Trails Crossed by Rail Line Segment Right-of-Ways[a]

Rail Line Segment	Officially Recognized Trails
Big Lake	Aurora Dog Mushers Club Trail, Iditarod National Historic Trail, Herning Trail, 16 Mile Trail, Knik Connector Trail
Connector 1	Iditarod Link Trail, Flathorn Lake Trail, Pipeline Trail
Connector 2	
Connector 3	
Houston	Crooked Lake Trail, Iditarod National Historic Trail, Flat Lake Connector Trail, Houston Lake Loop
Houston North	Houston Lake Loop Trail
Houston South	Houston Lake Loop Trail
Mac East	
Mac West	Figure 8 Lake Loop
Willow	Iron Dog Trail, Crooked Lake Trail, West Gateway Trail, Iditarod Link Trail, Iditarod National Historic Trail, Mud Lake Trail, Lucky Shot Trail, Nancy Lake-Susitna Trail

[a] Source: ADNR, 2009, MSB, 2008b

Susitna Flats State Game Refuge

The Susitna Flats State Game Refuge encompasses approximately 300,800 acres of land supporting a large population of migratory birds, moose and bear habitat, and high-quality salmon rivers. It attracts many waterfowl, moose and bear hunters, sport fishermen, and trappers. It is estimated that approximately 10 percent of all waterfowl harvest in Alaska takes place within the Susitna Flats State Game Refuge. Approximately 45,000 angling days are spent each year on the Little Susitna River within the Susitna Flats State Game Refuge. The refuge also supports limited wildlife viewing activities. The primary access point to the refuge is via the Little Susitna Public Use Facility at the Little Susitna River (ADF&G, 1988). The Public Use Facility is within the Susitna Flats State Game Refuge, but is managed by the ADNR's Division of Parks and Outdoor Recreation. The facility includes an improved boat launch, three parking areas, angler trails and boardwalks, and more than 40 campsites with picnic tables and fireplaces (ADF&G, 2003). Upstream from the Public Use Facility, the ADF&G has developed seven boat-accessible and improved campsites, and the refuge is open to remote public camping

(ADF&G, 2008a). Public access to the refuge is also available where the western end of Holstein Avenue joins a north-south section line easement that is the eastern boundary of the refuge at this point. Holstein Avenue and the easement provide 4-wheel drive access to the refuge and an unimproved boat launch area, suitable for canoes and skiffs, located on Horseshoe Lake.

Dispersed Recreational Uses

Numerous recreation activities take place on state land outside of park and recreation boundaries, and might not be specifically associated with trails. Dispersed recreation can include such activities as hunting, fishing, hiking, berry gathering, wildlife viewing, and many other activities described as generally allowed uses under 11 AAC 96.020. The Willow Basin Sub-Area Plan includes recommended land uses for management units, some of which describe recreation as a recommended primary land use (ADNR, 1982).

13.2.4.3 Matanuska-Susitna Borough Recreation Areas and Facilities

The MSB owns and manages the Point MacKenzie Trailhead Parking Lot near the southern terminus of the proposed rail line. The site includes signage and an information kiosk. The parking lot provides access to Figure 8 Lake Loop Trail, a multi-use winter trail system that heads west toward the Susitna Flats State Game Refuge and the Susitna River (MSB, 2000). The Figure 8 Lake Loop Trail is not surveyed and does not have an established easement, although the MSB has recommended acquiring an easement (MSB, 2008b).

The MSB trails plan details officially recognized trails and describes their easement status. In general, trails frequently cross public and private lands. Easements have been set aside for trails where they cross public lands, and discontinuously where they cross private land. The MSB trails plan includes a goal of working with private landowners to obtain legal protection for trails recorded as regionally significant (MSB, 2000, as amended). Table 13.2-2 lists officially recognized trails with recorded MSB easements that intersect the rail line.

Several other unofficial trails do not have a recorded easement or survey. Trails of this type are known to receive a significant amount of recreational use. Table 13.2-3 lists these trails.

The MSB Recreational Trails Plan includes only a portion of all the trails that the public uses for recreation on MSB lands and private land. The MSB defers to local community councils, users, and other groups in the identification of locally significant trails, which are less likely to attract the public from outside a local community. Although these are not included in the MSB trails plan, the MSB provides technical assistance toward establishing public access (MSB, 2000, as amended). In addition, the trails data represented here are by nature incomplete, because the development of the MSB trail system is a dynamic process. Trails are regularly added and removed, with the eventual goal of achieving a comprehensive, interconnected, and legally dedicated system that serves the recreation needs of MSB residents and visitors (MSB, 2008a).

The MSB also owns a substantial amount of land in the study area outside of parks and recreation areas. These areas receive similar recreational use as the state lands outside parks and recreation areas described above. The Susitna Area Plan (ADNR, 1985) and Southeast Susitna

Table 13.2-2
Officially Recognized, with Recorded Easements Crossed by Rail Line Segment ROWs[a]

Name	Type of Use	Location
16 Mile Trail	Multiuse	South of Big Lake
Aurora Dog Mushers Club Trails	Winter, Nonmotorized	Southeast of Big Lake
Crooked Lake Trail	Winter, Multiuse	West from Crooked Lake to the Susitna River (west of Big Lake)
Flat Lake Connector Trail	Winter, Multiuse	West of Big Lake
Flathorn LakeTrail	Winter, Multiuse	North of the Susitna Flats State Game Refuge
Herning Trail	Year round, Multiuse	North-south parallel to Parks Highway on the eastern side
Houston Lake Loop Trail	Winter, Multiuse	Northeast of the Little Susitna Recreation River
Iditarod Link Trail	Winter, Multiuse	North of the Susitna Flats State Game Refuge
Iditarod National Historic Trail	Winter, Multiuse	North of the Susitna Flats State Game Refuge and Point MacKenzie Agricultural Project, south of Big Lake and the Nancy Lake State Recreation Area
Iron Dog Trail	Winter, Multiuse	North of the Little Susitna Recreation River
Mud Lake Trail	Winter, Multiuse	Northwest of the Nancy Lake State Recreation Area
Nancy Lake – Susitna Trail	Winter, Multiuse	West of the Nancy Lake State Recreation Area
Pipeline Trail	Winter, Multiuse	East-west through northern portion of the Susitna Flats State Game Refuge
West Gateway Trail	Winter, Multiuse	Southwest of Willow

[a] Source: MSB, 2008b.

Table 13.2-3
Officially Recognized Trails without Recorded Easements Crossed by Rail Line Segment ROWs[a]

Name	Type of Use	Location	Identifying Data
Figure 8 Lake Loop Trail	Winter, Multiuse	West of Point MacKenzie	Identified in Matanuska-Susitna Borough Trails Plan, no survey or easement, although easement is recommended by MSB.
Knik Connector Trail	Winter, Multiuse	Southeast-Northwest from Goose Creek to W. Susitna Parkway	Identified in Matanuska-Susitna Borough Trails Plan, no survey or easement.
Lucky Shot Trail	Winter, Multiuse	Mostly within the Willow Creek State Recreation Area	Identified in Matanuska-Susitna Borough Trails Plan, no survey or easement, although easement is recommended by MSB.

[a] Source: MSB, 2008b.

Area Plan (ADNR, 2008b) include recommendations that guide recreation opportunities in undeveloped MSB lands.

13.2.4.4 Rivers and Lakes

In addition to lakes and rivers in parks and recreation areas, the study area has numerous lakes and rivers used for a variety of recreation activities. Though none of the waterbodies the project would affect are designated as National Wild and Scenic Rivers, some are important sport fisheries, or are associated with rich wetland resources that provide habitat both for fisheries and game animals. Others have high value as navigable waterways and receive substantial amounts of boating.

The Little Susitna River is a prime coho salmon fishery, producing the second largest freshwater coho harvest in Alaska (ADF&G, 2004), and it supports a strong king salmon population. It is also a popular motorized and nonmotorized boating river. Access is available at the Cook Inlet river mouth, the Little Susitna Public Use Facility, the Millers Reach Boat Launch, and at Parks Highway near Houston. The Little Susitna Public Use Facility is the most popular boating location. The ADNR estimates that there are between 2,000 and 3,000 float trips on the river each year (ADNR, 2007), and the ADF&G estimates that the Little Susitna River receives approximately 45,000 angling days per year in the Susitna Flats State Game Refuge (ADF&G, 1988).

Willow Creek is one of the most important king salmon fisheries along Parks Highway. It is heavily fished, with boaters putting in near Parks Highway and floating west to the Susitna River (ADF&G, 2008b). The ADNR estimates that there are almost 9,000 floats per year on Willow Creek (ADNR, 2007).

Fish Creek, the main outlet for Big Lake, provides quality fishing near its mouth at the Knik Arm. At present, the creek is closed to fishing where the Big Lake Segment would cross, and the fishery is considered impaired (ADF&G, 2008b).

The study area includes numerous other small streams and creeks, some of which support populations of rainbow trout or other sport fish. The study area is dotted with many lakes that have wild or stocked sport fisheries, and are used extensively for fishing and boating. Lakes provide important fly-in access for float and ski planes and the study area is known to experience heavy aircraft use.

Section 13.2.1.2 describes state policy on access to and along waterbodies. The ADNR planning documents for the study area also include guidance regarding bridge clearance on navigable waterways for boats, wildlife, and riders on horseback, and along the banks of navigable rivers and lakes. Chapter 12 of this EIS fully describes navigable waterbodies in the study area.

13.2.5 Environmental Consequences

13.2.5.1 Proposed Action

Common Impacts

Construction Impacts

The following construction-related impacts would be common to all alternatives and would be temporary:

- Individuals attempting to access recreation areas and resources via trails and waterways would be temporarily impeded during rail line construction, including during construction of any designated crossings and bridges and installation of culverts for smaller waterways. Access across the rail corridor via roads would be temporarily impeded during construction. These impediments would affect all types of surface transportation, including by foot, boat, dog sled, and motorized vehicle (automobile, all-terrain vehicle, snow machine).
- Rail line construction activities would generate additional noise, which would be more noticeable in areas with generally low levels of noise and development, where trucking and rail activity is low or nonexistent. Users such as hikers, boaters, and campers could hear this additional noise. However, such increased noise due to construction would be temporary and would not constitute an adverse noise impact.
- Areas of active construction work in proximity to recreation resource areas could present a nuisance to users. They could experience increased dust and changes in access patterns, and discordant visual elements in the landscape from land clearing and the presence of construction equipment.
- Construction activities could result in temporary impacts to water quality, such as increased turbidity, which could affect recreational fishing.
- Construction activities could result in the temporary alteration of local distribution of wildlife, which could affect the experience of users engaging in recreational hunting and wildlife viewing. Impacts to hunters would primarily depend on the timing of construction in relation to the hunting season.
- Construction activities would require the use of staging areas, the exact location of which would be determined during final design. ARRC would establish staging areas primarily in the rail line ROW and would endeavor to utilize previously disturbed areas. Some staging areas, such as for construction of grade-separated crossings, might utilize space outside the ROW. These areas would be cleared for staging of construction materials and would likely be a locus of human activity that local wildlife would avoid. Recreationists in proximity to these staging areas could experience aesthetic impacts and noise levels temporarily higher than ambient levels. Once construction was complete, these staging areas could be returned to their prior uses.

Operations Impacts

The following impacts would occur after construction during rail operations:

- ARRC proposes to provide public access to officially recognized trails with a grade-separated crossing where practicable, or the trail could be relocated to avoid crossing the rail line. The design of the crossing would accommodate existing trail users at the time of construction or ROW conveyance (whichever occurs first). ARRC would coordinate with the trail owner and consult with user groups as appropriate where the crossing location may have to be relocated to accommodate a grade-separation, or multiple crossings within one mile might be consolidated.
- ARRC does not propose to provide crossings for unofficial trails. This includes all trails established on state land under the generally allowed uses policy, which are numerous and present along all proposed rail line segments. ARRC would not provide at-grade or grade-separated crossings for these trails. Further, ARRC trespassing and safety policies dictate that individuals could not cross or enter the rail line ROW without first obtaining approval from ARRC, and could not use the access road, walk along the tracks, or cross the tracks. Crossings of the rail line outside of public crossing locations would be considered trespass and subject to enforcement. Blockage of unofficial trails would be considered a permanent, adverse impact to recreational trails, trail use, and recreational access. However, hikers could utilize official trails in response to trail closings.
- The presence of between 3 and 5 new 180-foot communication towers could permanently alter the localized movement of recreational aircraft. The precise location of the communication towers is not yet known.
- The rail line could block access to and along public and navigable water bodies with access rights reserved through AS 38.05.127 (as described in Title 11 AAC 51.045). This would result in a change in recreational access patterns to certain waters. Because of the frequency of these access points, it is anticipated that users would identify an alternative location for recreational access to navigable and public waters that was not affected by the proposed rail line.
- In many parts of the ROW, routine maintenance would ensure vegetation was cleared and the ROW kept in an open condition for the life of the proposed rail line. The linear corridor of cleared vegetation for the rail line ROW, access road, and communications towers would constitute a visual intrusion on the landscape. If the rail line were visible from scenic viewpoints within the study area, these physical changes and new build features could affect the enjoyment of recreationists. However, there are already similar discordant visual elements, such as utility corridors and roadways, in the study area that would also be visible from scenic viewpoints.
- The loss of habitat due to clearing the ROW would not be expected to affect productivity of the habitat for purposes of fishing, hunting, trapping, and wildlife viewing because of the abundance of habitat in the study area. However, the rail line, grade embankment, and vegetation removal could affect wildlife movement. The embankment could affect the hydrological features of the landscape; however, ARRC would design and construct the proposed rail line in such a way as to maintain natural water flow and drainage patterns to the

extent practicable so that fish passage would not be inhibited. Therefore, user enjoyment of fisheries resources (sport fishing) would not be expected to decrease as a result of the project.

- The ADF&G indicated that all stream and river crossings have the potential to harm fish passage, and that the ADF&G is still addressing significant fish passage issues on the existing ARRC rail corridors (ADF&G, 2008b). ARRC would design and construct stream crossings that do not impede fish passage or impair the hydrologic functioning of the waterbody; however, any river crossing that adversely affects fish passage has the potential to cause a negative impact on sport fishing resources.
- Rail line operations would introduce the slight possibility of inadvertent spilling of petroleum products or other hazardous materials in natural areas in the unlikely event of a train derailment or collision. However, the likelihood of a release would be low because ARRC anticipates few shipments of hazardous materials, and railcars used for transportation of hazardous materials are designed to withstand various types of impacts. In the unlikely event of a spill, this would result in negative impacts to water quality and wildlife habitat, thereby adversely affecting the user experience of fishing, hunting, and wildlife viewing.
- Rail line operations would introduce a new source of noise to some relatively undeveloped areas. Existing noise sources that can be found essentially everywhere (although intermittently at times) and include all-terrain vehicles, snow machines, motor boats, floatplanes, and other personal, commercial, and military aircraft. Wayside noise from trains and noise from maintenance vehicle traffic would be infrequent and of short duration, but would be audible to people in the vicinity of the ROW during a train or vehicle passby. Train horns would constitute a new, intermittent source of high-intensity noise at at-grade crossings, where sounding the train horn would be required. ARRC anticipates two trains per day would use the new line. Decreased user enjoyment and avoidance behavior could result from train horn noise in passive recreation areas, primarily those areas within parks and at recreation sites, such as campgrounds, in proximity to an intersection of the proposed rail line with an at-grade road crossing.

Impacts by Alternative Segment and Segment Combination

Southern Segments and Segment Combinations

Mac West-Connector 1 Segment Combination

Construction of the Mac West-Connector 1 Segment Combination could result in the permanent conversion of 91 acres of Susitna Flats State Game Refuge to rail line use and rail line operations would result in severe noise impacts, as defined by the FRA[2], to approximately 1,489 acres of the

[2] Based on FRA criteria, noise levels that would cause a "severe" impact depend on the ambient noise level and the type of land use. For this analysis, the Section 4(f) properties were considered to be in land use Category 3 (for primarily daytime and evening use) except for camping areas, which were considered to be a Category 1 (where quiet is an essential element in their intended purpose). The increase in noise that would constitute a "severe" impact for each land use depends on the ambient noise level and is defined in Table 3-1 of the FRA impact assessment document (FRA, 2005).

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game refuge. Although the reduction in habitat resulting from conversion of the ROW to rail use would affect game refuge user experience and recreational enjoyment, the affected acreage would be a small fraction of the total 300,800-acre game refuge. The Mac West Segment would cross the Point MacKenzie Trailhead Parking Lot near the southern terminus of the proposed rail line. ARRC has proposed moving the trailhead and parking lot. The segment combination would cross the Figure 8 Lake Loop Trail at four points. ARRC would either provide grade-separated crossings, or, more likely, relocate the portions of the trail that cross the proposed rail line. There would be two crossings at a bend of the trail where it passes by the northeast branch of Horseshoe Lake. The remaining two crossings would occur at another bend in the trail – one just east of and one just west of an unidentified stream at Mile Post 4.6 along the rail alignment. In addition, a portion of the Mac West Segment would be located along a north-south section line that connects to the western end of Holstein Avenue and provides public 4-wheel drive access to the refuge. The Applicant has not proposed to provide a grade crossing at this location, so the proposed rail line would prevent access to the refuge, including an unimproved boat launch on Horseshoe Lake, from Holstein Avenue and along this section line.

After branching off of the Mac West Segment, Connector 1 Segment would flank the eastern boundary of the 720-acre Little Susitna Public Use Facility and would cross the access road leading to the facility, where the ADNR characterizes that it would affect users arriving at the site's "front door," and it would displace a north-south trail that recreationists use to access Susitna Flats State Game Refuge (ADNR, 2007). The impact Connector 1 Segment would have on the Susitna Flats State Game Refuge can be considered its most significant impact to recreation resources. The parking lot, boat launch, and campsites in the Little Susitna Public Use Facility would not be directly affected by the ROW; however, recreationists near this portion of the facility might experience increased noise levels due to train horn soundings at the at-grade crossing for the access road. The Connector 1 Segment alone would result in severe noise impacts, as defined by the FRA, to 497 acres of the game refuge. The Connector 1 Segment would also cross several officially recognized trails, which include Pipeline, Flathorn Lake (collocated with the Public Use Site access road), and Iditarod Link trails. ARRC has indicated that these trails would have continued connectivity through grade-separated crossings, the design of which would be determined during final design.

Mac West-Connector 2 Segment Combination

Construction of this segment combination would result in the permanent conversion of 56 acres of Susitna Flats State Game Refuge to rail line use and would result in severe noise impacts, as defined by the FRA, to 992 acres of the game refuge. The Mac West Segment would cross the Point MacKenzie Trailhead Parking Lot and Figure 8 Lake Loop Trail at the same four points as described above for the Mac West-Connector 1 Segment Combination, resulting in identical impacts to these resources. The Connector 2 Segment would not be anticipated to result in impacts to identified parks and recreation resources.

Mac East-Connector 3 Segment Combination

The Mac East Segment would not cross the Figure 8 Lake Loop Trail. At the southern terminus of the proposed rail line, the corner of the Mac East Terminal Reserve Area boundary would be approximately 160 feet from the trail. The proximity of the terminal reserve area to the trail could discourage the use of the trail and could lead to decreased use of all segments of Figure 8 Lake Loop Trail and divert recreationists to other trails in the area. Connector 3 Segment would not be expected to result in impacts to identified parks and recreation resources.

Northern Segments

Willow Segment

Construction of the Willow Segment would result in the permanent conversion of 7 acres of the northeast corner of Susitna Flats State Game Refuge, 17 acres in the southern part of Little Susitna State Recreation River, 12 acres of the northwest corner of Nancy Lake State Recreation Area, and 43 acres of Willow Creek State Recreation Area to rail line use. The Willow Segment would result in severe noise impacts, as defined by the FRA, to approximately 273 acres of the Susitna Flats State Game Refuge, 450 acres of the Little Susitna State Recreation River, 219 acres of the Nancy Lake State Recreation Area, and 334 acres of the Willow Creek State Recreation Area. These lands are dedicated to wildlife habitat preservation and public recreation. The Willow Segment would cross the Little Susitna River, which would have the potential to impact valuable sportfishing resources and recreational access (via boat and upland), in addition to decreasing user enjoyment of the natural setting. The Willow Segment would also cross a 12 acre portion of Nancy Lake State Recreation Area west of Red Shirt Lake. No known trails, campsites, or other active recreation sites are associated with the affected area, but the crossing would separate a portion (approximately 20 acres) of the recreation area west of the proposed rail line ROW from the remainder of the recreation area.

This segment would bisect Willow Creek State Recreation Area, affecting recreation activities within the park, including hiking along various trails, sport fishing, snowmachining, dog sledding, and general user enjoyment. The Willow Segment would cross Lucky Shot Trail, which is a part of the larger system of trails accessed from Willow West Gateway Trailhead or Willow Community Center and is heavily used in winter months when trails are groomed. Six of the last eight Iditarod Sled Dog Races have begun in Willow and have utilized the West Gateway trail system (Mat-Su Convention and Visitors Bureau, 2007). This area is also a popular training ground for dog sledding. Three trails within the West Gateway trail system, Lucky Shot Trail, Mud Lake Trail, and West Gateway Trail, would receive grade-separated crossings or relocations. The segment would cross Willow Creek, one of the most important salmon harvest rivers in the region, which could harm valuable sportfishing resources.

The Willow Segment would cross several officially recognized trails, including the Iditarod National Historic Trail, Crooked Lake, Iron Dog, and West Gateway, Mud Lake, Lucky Shot, Nancy Lake – Susitna, and Iditarod Link trails. ARRC has indicated that it would maintain trail connectivity through grade-separated crossings or relocations, the design of which would be determined during final design.

Big Lake Segment

The Big Lake Segment would cross several officially recognized trails, including the Aurora Dog Mushers Club Trail, Herning Trail, Knik Connector Trail, 16 Mile Trail, and Iditarod National Historic Trail. This segment would cross various parts of the Aurora Trail System a total of four times (including once where a segment of the Aurora Trail is collocated with Iditarod National Historic Trail). ARRC has indicated that it would maintain trail connectivity through grade-separated crossings or relocations, the design of which would be determined during final design.

Houston-Houston North Segment Combination

The Houston-Houston North Segment Combination would cross four officially recognized trails – Iditarod National Historic Trail, Crooked Lake Trail, Houston Lake Loop Trail, and Flat Lake Connector Trail. ARRC has indicated that it would maintain trail connectivity through grade-separated crossings or relocations, the design of which would be determined during final design. Construction of the segment combination would also result in the permanent conversion of 69 acres of Little Susitna State Recreation River to rail line use and would result in severe noise impacts, as defined by the FRA, to approximately 769 acres of the Recreation River. The Houston North Segment would cross the Little Susitna River, which would result in potential impacts to valuable sportfishing resources and recreational access (via boat and upland), in addition to decreasing user enjoyment of the natural setting. The river-crossing point would traverse the Nancy Lake Creek Junction Public Use Site within the Little Susitna River Recreation River, a popular camping and fishing location. Within the 200-foot ROW this site would require the conversion of any public-use facility land to rail line use.

Houston-Houston South Segment Combination

This segment combination would cross four officially recognized trails – Iditarod National Historic Trail, Crooked Lake Trail, Houston Lake Loop Trail, and Flat Lake Connector Trail. ARRC has indicated that it would maintain trail connectivity through grade-separated crossings or relocations, the design of which would be determined during final design. The Houston Lake Loop Trail would be crossed by the rail line three times, and a portion would run in proximity parallel to the rail line. This could affect users' experience through visual impacts. Construction of the segment combination would also result in the permanent conversion of 3 acres of Little Susitna State Recreation River to rail line use. The potentially impacted area is located immediately adjacent to the existing ARRC main line at Parks Highway, where ARRC would build a new bridge to accommodate the new siding. These improvements would occur within the existing main line ROW.

Summary of Impacts to Parks and Recreation Resources by Alternative

Table 13.2-4 summarizes recreation areas and trails each of the proposed Port MacKenzie Rail Extension alternatives would affect. All of the alternatives would intersect the Iditarod National Historic Trail and all alternatives that include the Mac West Segment (four of the eight alternatives) would cross the Point MacKenzie Trailhead and Parking Area and the Figure 8 Lake Loop Trail. The Mac East-Connector 3-Houston-Houston South Alternative would not impact any recreation areas or refuges and would have the least effect on trails – intersecting four officially recognized trails. The Mac East-Big Lake Alternative also would not impact any recreation areas or refuges and would intersect five officially recognized trails. The Mac-West-Connector 1-Willow Alternative would impact four recreation areas/facilities and 11 named trails. The other six alternatives would result in impacts greater than the Mac East-Connector 3-Houston-Houston South Alternative and less than the Mac West-Connector 1-Willow

Table 13.2-4
Impacts to Recreation Areas, Trails and Refuge by Alternative [a]

Alternative	Willow Creek State Recreation Area	Nancy Lake State Recreation Area	Little Susitna State Recreation River	Susitna Flats State Game Refuge	Point MacKenzie Trailhead and Parking Lot	West Gateway Trails	Iron Dog Trail	Crooked Lake Trail	Iditarod National Historic Trail	Houston Lake Loop Trail	Flat Lake Connector Trail	Aurora Dog Mushing Trails	Mud Lake Trail	Iditarod Link Trail	Flathorn Lake Trail	Pipeline Trail	Figure 8 Lake Loop Trail	Lucky Shot Trail	Nancy Lake – Susitna Trail	Herning Trail	16 Mile Trail	Knik Connector Trail
Mac West-Connector 1-Willow	X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X			
Mac West-Connector 1-Houston-Houston North			X	X	X			X	X	X	X			X	X	X	X					
Mac West-Connector 1-Houston-Houston South			X	X	X			X	X	X	X			X	X	X	X					
Mac West-Connector 2-Big Lake				X	X				X			X					X			X	X	X
Mac East-Connector 3-Willow	X	X	X	X		X	X	X	X				X	X				X	X			
Mac East-Connector 3-Houston-Houston North			X					X	X	X	X											
Mac East-Connector 3-Houston-Houston South								X	X	X	X											
Mac East-Big Lake									X			X								X	X	X

[a] Source: ADNR, 2009

Alternative, as indicated in Table 13.2-4. Chapter 19 describes measures to mitigate potential impacts of the proposed rail line on parks and recreation resources

13.2.5.2 No-Action Alternative

Under the No-Action Alternative, ARRC would not construct and operate the proposed Port MacKenzie Rail Extension, and there would be no impacts to recreation areas, refuges or trails from the project. Restricted-use covenants that various governing bodies have put in place to facilitate the development of a potential rail line could be lifted, thus allowing for other types of use and/or development.

13.2.6 Sections 4(f) and 6(f) Evaluation Summary

This section summarizes the findings of the evaluation of the potential impacts to recreation properties protected under Section 4(f) of the U.S. Department of Transportation Act of 1966 and Section 6(f) of the Land and Water Conservation Fund Act. Appendix M provides the full evaluation.

13.2.6.1 Section 4(f) Evaluation Summary

All potential alternatives of the Port MacKenzie Rail Extension could affect resources protected by Section 4(f) of the Department of Transportation Act. Section 4(f) resources affected by one or more alternatives include three recreation areas, one game refuge, and 13 officially recognized trails within the project area. A Programmatic Agreement (a draft is provided in Appendix J of this Draft EIS) would guide future efforts during final design and construction to identify and evaluate cultural resources including those that could be protected under Section 4(f) and would establish procedures for avoiding and mitigating impacts. All of the proposed rail line segments evaluated in the Draft EIS and discussed in the Draft Section 4(f) Evaluation are technically feasible to build. Likewise, any combination of the segments that would connect the existing main line to Port MacKenzie would satisfy the project's purpose and need. However, there are only two segment combinations that FRA and STB anticipate would result in *de minimis* impacts on Section 4(f) resources: the Mac East-Big Lake Alternative and the Mac East-Connector 3-Houston-Houston South Alternative. Of these two alternatives, the Mac East-Connector 3-Houston-Houston South Alternative would affect the fewest number (1) and length (204 feet) of Section 4(f) trails, while the Mac East-Big Lake Alternative would affect the greatest number (4) and length (2,408 feet) of Section 4(f) trails. Neither of these alternative's ROWs would affect the Susitna Flats State Game Refuge, the Little Susitna State Recreation River, the Nancy Lakes State Recreation Area, or the Willow Creek State Recreation Area. Additionally neither alternative would result in severe noise impacts, as defined by the FRA, to Section 4(f) properties.

Of the remaining alternatives that would require the use of Section 4(f) resources, the Mac West-Connector 1-Willow Alternative would potentially affect the greatest number of recreational trails (9), the longest length of recreational trails (3,395 feet), and the ROW from this alternative would affect the greatest acreage of parks and recreation areas and the wildlife refuge (217 acres). The operation of trains along this alternative would result in severe noise impacts, as defined by the FRA, to 2,765 acres of Section 4(f) properties. Of these remaining alternatives, the Mac East-Connector 3-Houston-Houston North would have the lowest impacts on number of trails (1), acreage of parks and recreational areas and the wildlife refuge affected by the ROW (69 acres), and length of trail crossed (204 feet). It would result in severe noise impacts, as defined by the FRA, to 769 acres of Section 4(f) properties. The Mac East-Connector 3-Houston-Houston South and Mac East-Big Lake alternatives would result in severe noise impacts to zero acres of Section 4(f) properties, the lowest of the proposed alternatives.

SEA's recommended preliminary mitigation measures and voluntary measures proposed by the Applicant for minimizing impacts to Section 4(f) resources include timing construction to minimize impacts on recreation, designing water crossings to accommodate recreational navigation and access to waterbodies, ensuring adequate trail crossings, minimizing impacts to recreation areas and refuges, relocation of the Port MacKenzie Trailhead and Parking Lot, and incorporating practices for management of fugitive dust during construction activities. Implementation of the measures to minimize harm and consultations with the managing agencies for eligible Section 4(f) resources described in Section M.1.f would reduce overall impacts to trails that are Section 4(f) resources to a *de minimis* level. The construction and operation of the proposed rail line could result in adverse impacts to Willow Creek State Recreation Area, Little

Susitna State Recreation River, Nancy Lakes State Recreation Area, and Susitna Flats State Game Refuge, depending on the selection of segments chosen.

Because the effects on all potentially historic properties cannot be fully determined prior to construction phase of the proposed rail line, SEA has developed a Programmatic Agreement (a draft is provided in Appendix J of the Draft EIS) for the Port MacKenzie Rail Extension that will govern the completion of the Section 106 process. Significant cultural resources eligible for protection under Section 4(f) that could be encountered during construction would be addressed by the Programmatic Agreement for the Port MacKenzie Rail Extension, which provides for the completion of the Level 2 (Evaluation Phase) survey if the Board authorizes an alignment and the locations of associated facilities have been established (i.e., gathering sufficient data for a determination of eligibility to the National Register). Additionally, the Programmatic Agreement establishes responsibilities for the treatment of historic properties, the implementation of mitigation measures, and ongoing consultation efforts, thereby ensuring that harm would be minimized to historic properties.

13.2.6.2 Section 6(f) Evaluation Summary

A portion of Nancy Lake State Recreation Area, which has received funding from the Land and Water Conservation Fund Act (LWCF) (16 U.S.C. 460l-4 *et seq*.), would be permanently converted from recreational to non-recreational uses in the event that either the Mac West–Connector 1–Willow Alternative or the Mac East– Connector 3– Willow Alternative is authorized by the Board. No properties protected by LWCF Section 6(f) would be affected by any other alternative.

13.3 Hazardous Materials and Waste Sites

This section identifies sites in the proposed Port MacKenzie Rail Extension project area known to be or that might have been contaminated by hazardous materials, identifies sites that are regulated hazardous waste facilities, and describes the potential impacts of constructing and operating the proposed rail line on or near known hazardous materials and waste sites. Section 13.3.1 describes the regulations governing hazardous materials and waste sites, Section 13.3.2 describes the study area, Section 13.3.3 describes the analysis methodology, Section 13.3.4 describes the affected environment (existing conditions), and Section 13.3.5 describes potential environmental consequences (impacts). Chapter 11 (Transportation) addresses issues related to hazardous materials during rail line operations (e.g., spills or leaks from railcars, incidents related to materials carried by the railcars).

A hazardous materials waste site is an area that has been affected by spills of oil or other releases of hazardous substances, by the migration of hazardous substances from a separate source, by disposal of hazardous substances in a manner once considered acceptable practice, or by use of a hazardous substance at a site in a manner once considered acceptable. Hazardous substances affecting a site might also have been disposed illegally or in an unauthorized manner. A regulated hazardous waste facility is a facility approved for handling (e.g., generating, transporting, treating, storing, and disposing of) hazardous wastes in accordance with Federal and state regulations.

Combined, these sites are where known hazardous materials, substances, or petroleum products are present under conditions that indicate an existing release, past release, or a potential release into soil, groundwater, or surface water; or that constitute other hazards to human health or the environment (such as unexploded ordnance).

There could be environmental consequences during project construction if contaminated groundwater was disturbed or contaminated soil was disturbed or removed and relocated or used elsewhere as fill. Removal by excavation or dewatering could expose contaminants and other hazardous substances, which could increase risks to human health or the environment.

13.3.1 Regulatory Setting

Table 13.3-1 lists and summarizes relevant Federal and state regulations and oversight programs concerning hazardous materials sites and facilities.

Table 13.3-1
Applicable Environmental Regulations, Agencies, and Oversight Programs[a] (page 1 of 3)

Regulation or Law	Agency	Oversight Program
Federal		
Comprehensive Environmental Response, Compensation and Liability Act of 1976 and Superfund Amendments and Reauthorization Act of 1986	USEPA	Superfund program compels responsible parties to clean up or reimburse the Federal Government for USEPA-led cleanups of abandoned hazardous waste sites.

Table 13.3-1
Applicable Environmental Regulations, Agencies, and Oversight Programs[a] (page 2 of 3)

Regulation or Law	Agency	Oversight Program
Federal (continued)		
The Resource Conservation and Recovery Act of 1976	USEPA	Resource Conservation and Recovery Act program focuses on active facilities containing or handling (i.e., generating, transporting, treating, storing, disposing of) hazardous waste and cleanup of releases.
Amendments to the Resource Conservation and Recovery Act in 1984	USEPA	Resource Conservation and Recovery Act amendments address prevention and cleanup of petroleum underground storage tank releases.
Safe Drinking Water Act and National Primary Drinking Water Regulations (40 Code of Federal Regulations 141)	USEPA	Under the Safe Drinking Water Act, the USEPA Region 10 Drinking Water Program sets standards for the quality of drinking water and oversees states, localities, and water suppliers.
Federal Water Pollution Control Act Amendments (Clean Water Act) of 1972, 1977, and 1984; and National Pollutant Discharge Elimination System	USEPA	National Pollutant Discharge Elimination System permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States.
Summary of the Emergency Planning and Community Right-to-Know Act of 1986	USEPA	Alaska State Emergency Response Commission helps local communities protect public health, safety, and the environment from chemical hazards.
Federal Insecticide, Fungicide, and Rodenticide Act of 1996	USEPA	This Act mandates Federal control of pesticide distribution, sale, and use.
The Toxic Substances Control Act of 1976	USEPA	This Act gives the USEPA the ability to track the 75,000 industrial chemicals currently produced in or imported to the United States.
State of Alaska		
Alaska Drinking Water Regulations, Section 18, Chapter 80 of the Alaska Administrative Code (18 AAC 80)	ADEC, Division of Water Quality	The ADEC, Division of Water Quality, establishes maximum contaminant concentrations for organic and inorganic contaminants in public water systems.
Alaska Water Quality Standards (18 AAC 70)	ADEC, Division of Water Quality	Water Quality Standards Assessment and Reporting Program establishes criteria for protected classes of water use for groundwater and surface water.
Oil and Hazardous Substances Pollution Control (18 AAC 75)	ADEC, Division of Spill Prevention and Response	Contaminated Sites Program protects human health and the environment by managing the cleanup of contaminated soil and groundwater in Alaska.
Underground Storage Tanks (18 AAC 78)	ADEC, Division of Spill Prevention and Response	Contaminated Sites Program, Underground Storage Tank staff of the Industry Preparedness Program provides technical and regulatory assistance on underground storage tank systems.
Alaska Solid Waste Management Regulations (18 AAC 60)	ADEC, Division of Environmental Health	Solid Waste Program manages solid waste (including hazardous waste) to prevent violation of the Alaska water quality standards (18 AAC 70).

Table 13.3-1
Applicable Environmental Regulations, Agencies, and Oversight Programs[a] (page 3 of 3)

Regulation or Law	Agency	Oversight Program
Joint Federal/State of Alaska Programs		
Alaska Hazardous Waste Management Regulations (18 AAC 62)	ADEC and USEPA	Regulations apply to hazardous waste generators, transporters, owners/operators of treatment, storage, and disposal facilities. Although hazardous waste regulations are promulgated for Alaska, the USEPA is the primary enforcement agency for hazardous waste management in Alaska under the Federal Resource Conservation and Recovery Act regulations.
Defense Environmental Restoration Act	ADEC, Division of Spill Prevention and Response, Contaminated Sites Program	Congress passed the Defense Environmental Restoration Act in 1986 to clean up U.S. Department of Defense hazardous materials sites. The ADEC is responsible for oversight of cleanup activities on Department of Defense hazardous materials sites.
Defense State Memorandum of Agreement	ADEC, Division of Spill Prevention and Response, Contaminated Sites Program; USEPA (Comprehensive Environmental Response, Compensation and Liability Act)	In 1991, Alaska and the U.S. Department of Defense agreed to cooperatively work on cleaning up Department of Defense hazardous materials sites (1,200 individual sites at approximately 200 facilities).
Statewide Management Action Plan on Cleanup of Formerly Used Defense Sites	ADEC, USEPA, and U.S. Army Corps of Engineers	In 2002, ADEC, U.S. Army Corps of Engineers, and USEPA signed a Statewide Management Action Plan on cleanup of Formerly Used Defense Sites in Alaska. The Plan describes the Formerly Used Defense Sites program and the State of Alaska and Federal oversight roles.
Military Munitions Response Program	ADEC, Division of Spill Prevention and Response, Contaminated Sites Program; USEPA	The Military Munitions Response Program addresses Department of Defense sites containing munitions constituents or munitions and explosives of concern. Under this program, the Army Corps of Engineers is performing environmental response activities at Formerly Used Defense Sites for the U.S. Army (Department of Defense executive agent for Formerly Used Defense Sites). ADEC and USEPA are responsible for oversight.

[a] AAC = Alaska Administrative Code; ADEC = Alaska Department of Environmental Conservation; USEPA = U.S. Environmental Protection Agency.

13.3.2 Study Area

The study area includes lands within 0.5 mile of the centerline of each rail line segment. Proposed rail line construction and operations would not be likely to affect or be affected by hazardous materials sites more than 0.5 mile from the rail line.

13.3.3 Analysis Methodology

Known hazardous materials sites and regulated sites within 0.5 mile of the centerline of each alternative segment were identified through searches of site records in Federal and state of Alaska databases and interviews with regulatory program staff. This Environmental Impact Statement (EIS) evaluates those sites for risks and potential impacts related to proposed rail line construction and operations.

Environmental Data Resources, Inc., supplied initial data and facilities information on the known hazardous materials sites. This included a list of three identified known sites and 416 "orphan sites" (sites for which there is not enough information about their exact locations) that could be within 1 mile of the alternative segments. Additional records were then reviewed and several regulatory program managers interviewed to assist in identifying orphan sites in the study area.

Results of the search and interviews further clarified that 2 of the 416 orphan sites are within 0.5 mile of the alternative segment centerlines. Appendix N of this EIS lists the Federal and state databases searched.

Based on available information regarding location, proximity to proposed rail line segment rights-of-way (ROWs), hazardous material or contaminant characteristics, and regulatory status, hazardous materials sites were evaluated to assess potential risks to human health and environmental impacts to lands, surface water, and groundwater that could result from proposed rail line construction and operations.

Regulatory status includes "open" and "closed" sites. Open sites are hazardous materials sites where remediation is ongoing. Closed sites are sites where contamination remains but institutional controls are in place, or sites where remediation activities are complete and have included removal of contaminated soil or groundwater or other hazardous materials. Rail line construction and operations on or near closed sites would not be likely to result in adverse environmental consequences or would pose almost negligible risk. Therefore, closed sites are considered low-risk sites. In contrast, open sites could result in adverse environmental consequences and pose a higher risk. Open sites of concern that would present greater risk during rail line construction and operations include:

- Sites within 0.5 mile of the rail line where land use or local zoning and institutional controls (deed or regulatory restrictions) do not prohibit borrow pit development.
- Sites within 500 feet of the rail line ROW that could be excavated or otherwise disturbed by intrusive actions associated with rail line construction.

13.3.4 Affected Environment

Five known sites within 0.5 mile of the rail line segments were identified for further evaluation of potential impacts that could result from proposed rail line construction and operations. Figures 13.3-1 through 13.3-3 show the locations of the five known sites, from north to south. Four of the sites have specific locations. Site 5, shown on Figure 13.3-3, is the former Susitna Flats Gunnery Range and covers a large area. Of the five sites, three (Sites 1, 3, and 5) are within 500 feet of rail line segment ROWs. Table 13.3-2 describes the five sites.

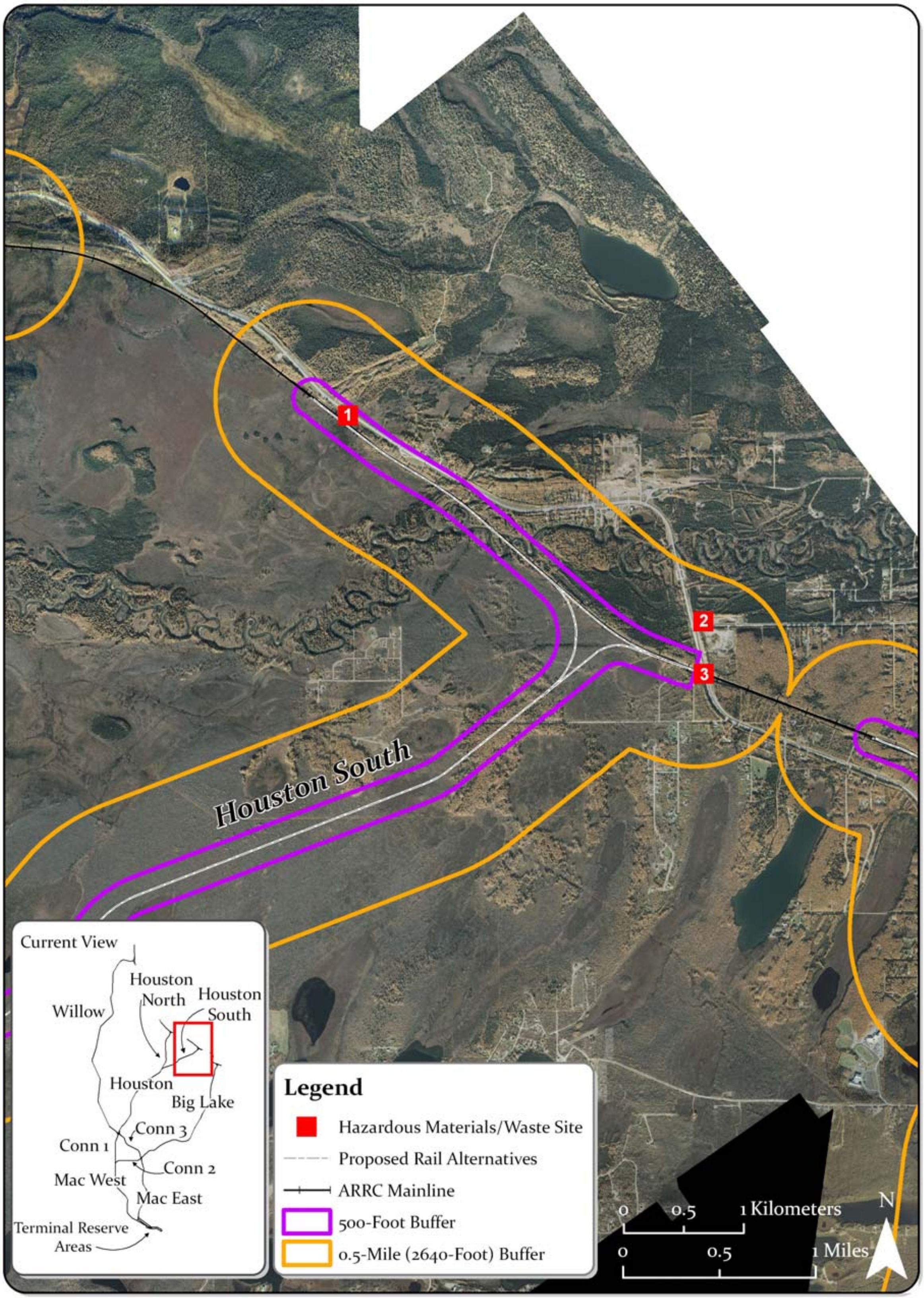

Figure 13.3-1. Hazardous Materials/Waste Sites along the Northern Section of the Houston-South Segment, Sites 1 through 3

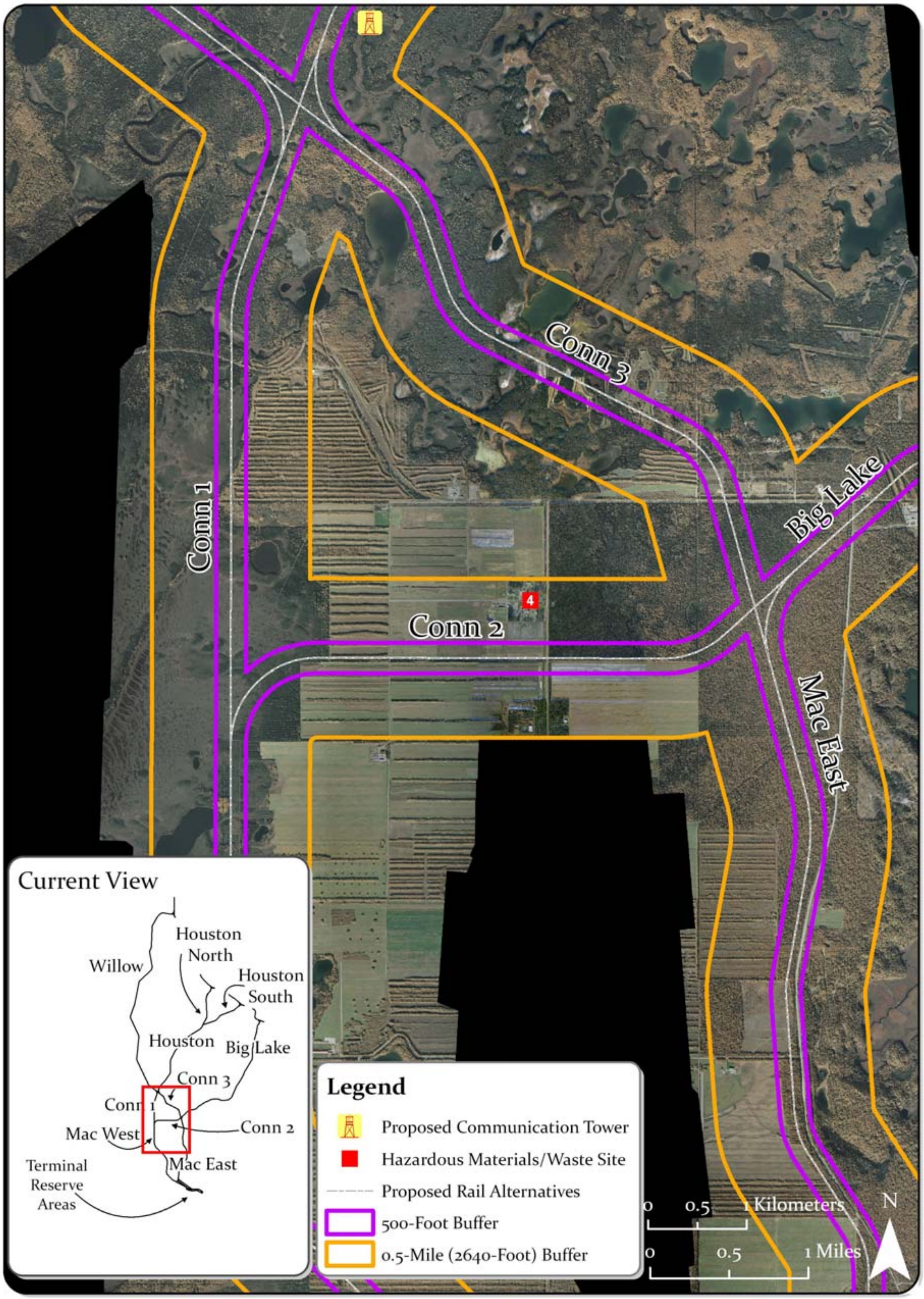

Figure 13.3-2. Hazardous Materials/Waste Sites along the Northern Section of Connector 2 Segment, Site 4

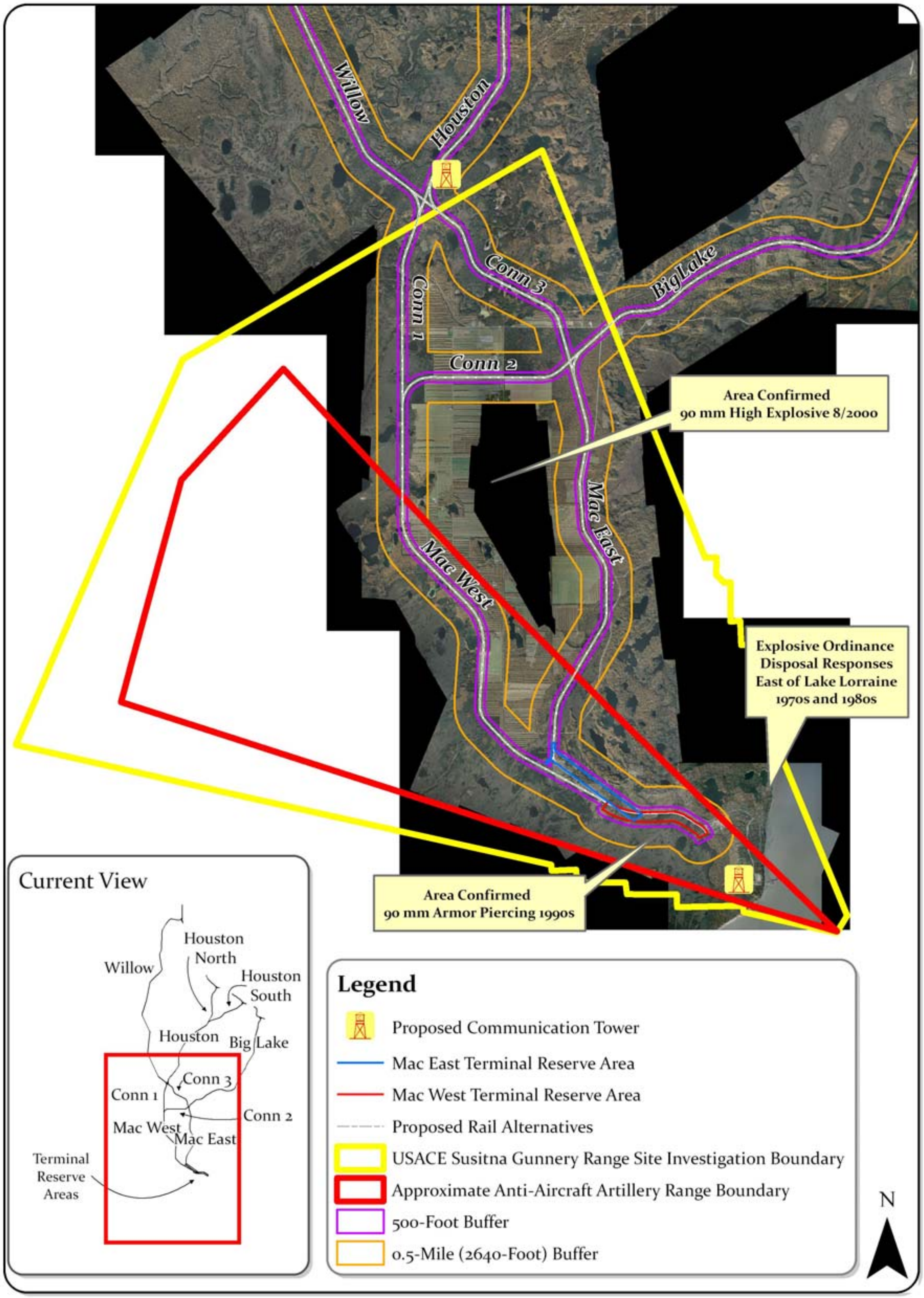

Figure 13.3-3. Area Encompassing Susitna Gunnery Range Hazardous Materials/Waste Sites along the Mac West, Mac East, Connector 1, Connector 2, Connector 3, and Big Lake Segments, Site 5

Table 13.3-2
Known Hazardous Material Sites and Regulated Facilities of Concern (page 1 of 2)

Site No.	Name (ROW Location)	Address	Longitude/ Latitude	Notes	Status
Figure 13.3-1 (Hazardous Materials/Waste Sites Along the Northern Section of the Houston South Segment)					
1	Houston Landfill (within right-of-way)	Mile Post 59, Parks Highway, Houston, Alaska, 99694	61.636954°/-149.852272°	Leachate containing several solvents was being generated at site and allowed to flow out of the facility. The site was subsequently capped and groundwater monitored for more than 5 years, starting in 1992. By 1997, no volatile organic compounds were detected in groundwater and metals were below regulated maximum allowable contaminant levels for groundwater.	Closed, Cleanup Complete (Low Risk)
2	QAP Houston Generator Spill (900 feet north of the proposed segment right-of-way)	Mile Post 57.3, Parks Highway, Houston, Alaska, 99694	61.622778°/-149.798611°	About 3 gallons of diesel fuel was spilled from a generator staged at construction headquarters in support of the construction of the separated grade crossing at Mile Post 56.3. Fuel was cleaned up and release was reported to the Alaska Department of Environmental Conservation.	Closed, Cleanup Complete (Low Risk)
3	ARRC MP 56 Parks Highway (within existing Alaska Railroad Corporation mainline right-of-way, and within proposed segment right-of-way)	Mile Post 56.4, Parks Highway, Near Railside Drive, Houston, Alaska 99694	61.622778°/-149.798611°	Petroleum (aviation jet fuel) contamination in soil related to 1972 train derailment encountered during excavation associated with Parks Highway road construction to widen road and build a railroad overpass (separated grade crossing). About 10,000 cubic yards of contaminated soil was excavated and stockpiled in four stockpiles within the Alaska Railroad Corporation right-of-way next to the site. Remaining contaminated soil was capped with 3 to 6 feet of clean fill. In 2000, the Alaska Department of Environmental Conservation approved alternative cleanup levels for this site based on site-specific conditions; institutional controls also were established (no removal of stockpiled soil without prior Department of Environmental Conservation approval). The Alaska Railroad Corporation also proposed spreading the soil within the right-of-way, and the Department of Environmental Conservation approved a "no further remedial action planned" conditional closure.	Closed, Cleanup Complete, Institutional Controls (Low Risk)
Figure 13.3-2 (Hazardous Materials/Waste Sites Along the Northern Section of Connector 2 Segment)					
4	Point MacKenzie Rehabilitation Center (960 feet north of the proposed segment right-of-way boundary)	Mile Post 0.6, 13690 S. Guernsey Road, Wasilla, Alaska 99687	61.417302°/-150.080278°	Sampling after underground storage tank removal found petroleum-contaminated soil above maximum contaminant levels remaining in place. Vertical and lateral extent of contamination has not yet been defined.	Open (Low Risk)

Table 13.3-2
Known Hazardous Material Sites and Regulated Facilities of Concern (page 2 of 2)

Site No.	Name (ROW Location)	Address	Longitude/ Latitude	Notes	Status
Figure 13.3-3 (Susitna Gunnery Range Hazardous Materials/Waste Sites Along the Mac West, Mac East, Connector 1, Connector 2, Connector 3, and Big Lake Segments)					
5	Susitna Gunnery Range (encompasses both rights-of-way and areas within 1 mile of the Mac West, Mac East, Connector 1, Connector 2, and Connector 3 segments, and a small portion of the Big Lake Segment)	Range 16N/Township 5W (T16N/R5W), Seward Meridian: Sections 1-5, 9-12, 13-18, 22-27, and 34-36; T16N/R4W: Sections 31-32; T15N/R5W: Sections 1-3, 10-12, 14-15, 22-23, 26-27, and 35-36; T15N/R4W: Sections 4-6, 7-8, 17, 20, 28-29, and 32-33; T14N/R5W: Sections 1, 12-13; T14N/R5W: Sections 5, 7-8, 17-18, 20-23, and 26-27.	Not applicable	The former Susitna Gunnery Range comprises 86,570 acres that extend approximately 17 miles from the firing point to beyond the Little Susitna River. The U.S. Army used the range in the 1950's and early 1960's as an impact area and safety zone for training anti-aircraft artillery troops in firing long-range weapons. A site investigation has been completed. No munitions were identified during the site investigation field effort. However, 90-millimeter projectiles (high explosive and armor piercing) were encountered during previous site activities. Due to the historical confirmation of munitions at the anti-aircraft range and the potential for munitions and munitions debris to be discovered in areas that have not been inspected by the Army, it was recommended that further investigations be performed. It was also recommended that areas of concern previously identified but then omitted from site investigation be reconsidered for further investigation. This includes areas where munitions and munitions debris were previously discovered.	Open (High Risk)

13.3.5 Environmental Consequences

13.3.5.1 Proposed Action

Common Impacts

Construction Impacts

There could be safety or environmental impacts during such construction activities as grubbing, filling, excavating, or related dewatering operations in areas of contaminated soils or groundwater within the rail line ROW and other work areas during rail line construction.

Operations Impacts

Routine rail line operations would not be expected to result in adverse impacts from hazardous materials sites. Chapter 11 (Transportation) addresses issues related to hazardous materials during rail line operations (e.g., spills or leaks from railcars, incidents related to materials carried by the railcars).

Southern Segments

Mac West, Mac East, Connector 1, Connector 2, and Connector 3 Segments

Site 5, the former Susitna Gunnery Range, is an open site composed of 86,570 acres. All areas within 0.5 mile of the Mac West, Mac East, Connector 1, Connector 2, and Connector 3 segment ROWs would be within the former Susitna Gunnery Range (see Figure 13.3-3). The Army used the range in the 1950's and early 1960's as an impact area and safety zone for training anti-aircraft artillery troops in firing long-range weapons (Parsons Brinckerhoff, 2008).

The Susitna Gunnery Range is no longer owned or leased for government/military purposes; it is now designated as a Formerly Used Defense Site. Rail line construction and operations activities in the area could result in environmental or safety impacts due to the potential presence of munitions constituents[1] or munitions and explosives of concern.[2]

There could be safety or environmental impacts if munitions and explosives of concern or munitions constituents were encountered during grubbing, filling, excavating, and related dewatering operations within the rail line ROW, adjacent areas, and borrow areas during rail line and road construction.

The U.S. Army Corps of Engineers and the Alaska Department of Environmental Conservation (ADEC) disagree regarding the need to further evaluate the former range for presence of

[1] Munitions constituents are any materials originating from unexploded ordnance, discarded military munitions, or other military munitions, including explosive and nonexplosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions.

[2] Munitions and explosives of concern are military munitions that might pose unique safety risks. These include unexploded ordnance, discarded military munitions, or munitions constituents present in high enough concentrations to pose an explosives or other health hazard.

munitions constituents and munitions and explosives of concern. The Corps of Engineers is responsible for cleaning up Formerly Used Defense Sites to ADEC standards and satisfaction. At present, the Corps of Engineers plans to conduct an investigation of five potential development sites in the Point MacKenzie area in the summer of 2010, which would include sites in the vicinity of the proposed rail line. The Corps of Engineers has indicated that further investigation, if any, would depend on the results of the summer 2010 investigation (Anchorage Daily News, 2010).

In addition to Site 5, there is one known low-risk site along Connector 2 Segment (see Figure 13.3-2). Site 4 (Point MacKenzie Rehabilitation Center) is an open site with petroleum-contaminated soil that remains after removal of an underground storage tank. Impacts from rail line construction would be unlikely because the site is not within 500 feet of the proposed rail line and is within a developed industrial area that would not likely be used as a source of gravel or ballast.

Northern Segments

Willow, Houston, and Houston North Segments

There are no known sites of concern that present a potential for environmental consequences resulting from rail line construction activities along these segments.

Big Lake Segment

The south end of the Big Lake Segment would be within the former Susitna Gunnery Range (Site 5). Potential impacts associated with rail line construction within the area of the former gunnery range are described above under southern segments.

Houston South Segment

There are three known low-risk sites along the Houston South Segment (see Figure 13.3-1). Site 1, Houston Landfill, was closed with solid waste capped in place. The solid waste cap would not be disturbed as a result of rail line construction. Subsequent to capping the site, groundwater monitoring for more than 5 years found no detectable volatile organic compounds or metals.

Site 2 (QAP Houston Generator Spill) and Site 3 (ARRC MP 56 Parks Highway) are known to have contained petroleum-contaminated soils prior to cleanup and closure. Site 2 is 900 feet north of the proposed ROW; therefore, construction would not likely affect any possible residual areas of *de minimis*-contaminated soils. Contaminated soil from the cleanup of Site 3 remains stockpiled north of the site within the existing Alaska Railroad Corporation main line ROW. *De minimis*-contaminated soil might remain in place at the site, but it is capped with 3 to 6 feet of clean fill and is within the Parks Highway ROW. Construction of the proposed rail line would not be likely to disturb the stockpiled contaminated soils north of the existing main line.

13.3.5.2 No-Action Alternative

Under the No-Action Alternative, ARRC would not construct and operate the proposed Port MacKenzie Rail Extension, and there would be no impacts to hazardous materials and waste sites from the project.

14. SOCIOECONOMICS

This chapter characterizes the socioeconomic resources in the proposed Port MacKenzie Rail Extension project area that could be affected by rail line construction and operations. The description of socioeconomic baseline conditions and impacts focuses on demographic characteristics, economic activities, and access to housing and public services.

14.1 Regulatory Setting

Council on Environmental Quality regulations for implementing the requirements of the National Environmental Policy Act of 1969 (NEPA) state that *Effects* to be taken into account "includes ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative" (40 Code of Federal Regulations [CFR] Part 1508.8) and that the *Human Environment* of interest to NEPA "shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment" (40 CFR Part 1508.14). The same regulations also state that, although "economic or social effects are not intended by themselves to require preparation of an environmental impact statement," when "economic or social and natural or physical environmental effects are interrelated, then the environmental impact statement will discuss all of these effects on the human environment."

14.2 Analysis Methodology

The Surface Transportation Board's Section on Environmental Analysis (SEA) analyzed potential direct and indirect, and temporary (short-term) and permanent (long-term) impacts to socioeconomics from proposed Port MacKenzie Rail Extension construction and operations.

Temporary direct impacts of construction are those potentially derived from a temporary increase in the demand for labor and construction materials. If workers were from the project area, the increase in labor demand would contribute to a reduction in unemployment. If workers were brought from other regions, migration to the project area might or might not generate pressure on available housing and public services. Any increase in local expenditures for labor and construction materials would stimulate the local economy.

Permanent direct impacts from rail line construction would be those potentially derived from the loss of economically productive land and any displacement caused by the establishment of a right-of–way (ROW) for the proposed rail line, and any socioeconomic impacts related to the physical barrier the rail line imposed on the flow of natural and human resources between the east and west sides of the rail line.

Potential direct impacts from rail line operations would depend largely on the extent to which rail access to the Port supports increased export and import of bulk material through the Port and on the extent to which this increased trade generated demand for labor and resources from neighboring areas. Potential indirect impacts analyzed include induced economic growth.

14.3 Study Area

The study area for socioeconomics is the Matanuska-Susitna Borough (MSB or the Borough). Traditionally, the largest agricultural producer in the State of Alaska and a recreation destination for residents of Anchorage and other visitors, the Borough grew in the past as a bedroom community around neighboring Anchorage, to which its economy is strongly linked. Most of the Borough's population lives within a 40- to 50-mile radius of Anchorage, and an estimated one-third of the workforce commutes to Anchorage for work (Wells and Hanson, 2006).

With relatively inexpensive housing and available land, in recent years the MSB has been the fastest growing area in the state. The Borough's recent economic growth has been heavily driven by a growing service sector, and the traditional unemployment gap between the Borough and Anchorage has narrowed.

14.4 Affected Environment

The rail line alternatives begin in the Port MacKenzie District, an industrial and commercial area comprising 8,940 acres at the south end of the project area and where there are no residents. The District has electrical and telephone service. A modular-home manufacturer is established in the District and a wood-chip exporting company that uses the Port has made improvements. The Port MacKenzie dock is longer than those of Valdez, Seward, or Whittier. The Port has deeper waters and has more available storage space than the Ports of Valdez, Seward, Whittier, or Anchorage (Northern Economics, 2007a).

The Port Mackenzie District is linked to the most populous areas of the MSB through 36 miles of gravel and paved roads that cross the community of Knik-Fairview before reaching Wasilla. The 2000 U.S. Census registered a population of 7,049 in Knik-Fairview, 5,469 in Wasilla, and 4,819 in Meadow Lakes, just west of Wasilla. There were 2,593 housing units in Kink-Fairview, 2,119 in Wasilla, and 2,003 in Meadow Lakes. In 2006, 90 percent of the population of the MSB lived between this area and Sutton along the road connecting east through Palmer (Wells and Hanson, 2006). Wasilla is also along a commuter bus route to Anchorage, and the MSB is part of the Anchorage Metropolitan Area as defined by the Office of Management and Budget, with about a third of the employed residents of the Borough commuting to Anchorage (Wells and Hanson, 2006).

As of July of 2007, the U.S. Census Bureau estimated the population of Wasilla to be 9,780. The Borough as a whole had an estimated population of 82,668 in 2007, up from 59,322 in the 2000 Census. There were 27,329 housing units in the Borough in 2000. The Department of Labor Bureau of Labor Statistics estimated the 2007 labor force for the Borough to be 39,308, with 7.1 percent (2,805) unemployed. Neighboring Anchorage had an estimated labor force of 152,630, with 5.0 percent (7,621) unemployed (BLS, 2007).

Most homes in areas where population is concentrated are fully plumbed and use individual water wells and septic systems, even in Wasilla, where the city operates a piped water and sewer system. A private or Borough-managed service for refuse collection is typically available for transfer to the Borough landfill in Palmer, and the Matanuska Electric Association provides electricity. Homes in Wasilla and Big Lake and many in the Knik-Fairview area have access to piped natural gas for heating (State of Alaska, undated).

Tourism and recreation are important economic sectors in the Borough and trails are often the main access available to recreational cabins and facilities (HDR Alaska and TNH-Hanson, 2008). In 2007, the accommodation and food services industry and the arts, entertainment and recreation industry generated an estimated 3,344 jobs, just over 10 percent of the total employment in the Borough, and about 6.3% of private non-farm earnings (BEA, 2007).

14.4.1 Southern Segments

The southern segments of the proposed rail line would cross a relatively sparsely populated area next to and within the Point MacKenzie Agricultural Project, which is the largest contiguous agricultural area in Alaska and is mostly used for dairy farming. The area immediately above the Agricultural Project has the most residents in the vicinity of the southern segments. According to the 2000 Census, there were 202 people living in two Census blocks in that area.

14.4.2 Northern Segments

The northern segments of the proposed rail line would also cross areas relatively sparsely populated and contains three important state recreation areas. The Willow Creek State Recreation Area is farthest to the north and receives 40,000 visits each year for fishing, camping, floating, boating, wildlife viewing, and hunting (HDR Alaska and TNH-Hanson, 2008). The Little Susitna State Recreation River receives between 2,000 and 3,000 float trips each year, in addition to fishing, camping, wildlife viewing, and hunting. The Nancy Lake State Recreation Area is used for a variety of activities year round, including canoeing, fishing, hiking, camping, skiing, snowmachining, and dog sledding.

The Iditarod Trail and other important local multi-use trails also cross the area.

The three largest communities in the area are Willow, Houston, and Big Lake. Willow is located around ARRC main line. The community of Willow had a population of 1,658 in the 2000 Census, and 60 percent of local homes are vacant or for seasonal use (State of Alaska, undated). Houston had a population of 1,202 and Big Lake a population of 2,635.

14.5 Environmental Consequences

14.5.1 Proposed Action

14.5.1.1 Common Impacts

Under the proposed action, impacts to the Port MacKenzie District and its commuter area and areas outside the MSB (such as cargo source areas) are expected to be same under all alternatives.

Construction Impacts

ARRC estimates it would employ 66 to 100 workers in the various phases of the 2-year construction period, and expects to utilize up to three crews working in 8-hour shifts around the clock. Table 14-1 lists the ARRC estimates for employment and equipment use during the construction period. Construction workers would likely be employed by existing grading and rail construction firms, several of which have offices in the area (HDR Alaska and TNH Hanson, 2008). The positive impact to employment would be temporary because it would be limited to the construction period.

Table 14-1
Estimated Port MacKenzie Rail Extension Construction Work Force and Equipment Needs[a]

Construction Activity	Crews	Crew Size	Equipment Needed, per Crew
Clearing and grubbing	3	6	1 loader/excavator, 2 articulated trucks, 2 bull dozers
Grading/embankment construction	3	22	6 scrappers, 6 articulated trucks, 2 compactors, 2 graders, 1 water truck, 3 bull dozers
Infrastructure	3	25	4 backhoes, 2 cranes, 2 forklifts, 4 concrete trucks
Track	1	25	2 excavators, 1 speed swing, 2 production tampers, 2 ballast regulators, 1 rail heater, 1 anchor applicator, 2 ballast trains
Site cleanup	4	4	1 pick-up truck, 1 high-rail truck

[a] Source: HDR Alaska and TNH-Hanson, 2008.

SEA expects most of the employees needed for rail line construction to be locally available. More than a third of the MSB's personal income comes from outside the Borough, mostly from commuters working in Anchorage, but also from long-distance commuters, including construction workers working around the state (Wells and Hanson, 2006). To the extent that workers prefer shorter commutes, recruiting is expected to be largely local. The local availability of workers for rail line construction suggests there should be no impacts to housing and public services.

ARRC provided rough cost estimates that suggest construction expenditures, including materials, labor and overhead costs, would be in the magnitude of $200 million to $280 million. A 2007 study conducted for the MSB suggests that 70 percent of these expenditures would be within the state (Northern Economics, 2007b).

Proposed rail line construction would result in an indirect temporary stimulus to the Borough's economy and labor market. The impact from direct expenditures and employment would be multiplied by follow-up rounds of local expenditures by direct employees and providers of services during the construction period. A 2007 study (Northern Economics, 2007b) suggests that the indirect impact would be the generation of a number of jobs at least equal to the direct employment generated during the construction period.

Operations Impacts

ARRC anticipates that the proposed rail line would begin to operate in 2012 and would entail two trains traveling daily, one in each direction, and employ four permanent employees. The proposed rail line is expected to provide Port MacKenzie with a transportation alternative to the existing truck access to the Port for exporting and importing bulk material – mineral and other natural resources – such as coal, gravel, and wood chips, and to support the use of the Port as a general cargo port (HDR Alaska and TNH Hanson, 2008).

The impact of the proposed rail line on the Port MacKenzie District would depend on the extent to which the rail line was used and generated demand for services at the Port, whether for outbound or inbound cargo. Additionally, access to resources such as coal could attract new industries or a thermal power plant to the District, although there are no definitive plans for such facilities.

14.5.1.2 Impacts by Segment

Impacts that would differ by segment include displacement of residences and impacts to economic activities derived from the intersection of the proposed rail line with unofficial trails, for which ARRC does not propose to provide grade-separated crossings. Unofficial trails would be blocked, and ARRC's trespassing regulations would prohibit the public from crossing of the ROW without first obtaining approval from ARRC.

Crossings of officially recognized trails would be grade-separated or relocated to minimize any disruptions in trail use. Recreation and tourism activities that use unofficial trails would be blocked by the rail line, but could possibly be diverted to nearby officially recognized trails. This could have a potentially adverse effect on economic activities directly or indirectly related to the use of such trails.

Construction Impacts

Southern Segments

The southern rail line segments could require taking some residential properties and displacements would be permanent. Given the small number of residential displacements, no difficulties in identifying and providing comparable nearby housing would be expected.

The southern rail line segments would cross some agricultural parcels with the most agricultural land affected by the Mac West-Connector 2 Segment Combination. Some farmland production would likely be lost.

The Mac West-Connector 1 Segment Combination borders the Susitna Flats Game Refuge, one of the most popular recreational hunting and fishing areas in the state (HDR Alaska and TNH-Hanson, 2008). Access to this recreation area through the Figure 8 Lake Loop Trail, Pipeline Trail and Flathorn Lake Trail would be protected with appropriate crossings.

See Chapter 13 for estimates of impacts to general land use and property along each rail line segment.

Northern Segments

Snowmobile trails present throughout the area and crossed by the rail line would not receive grade separation. Recreation activities currently making use of such crossings could either be diverted to other areas or discouraged.

Willow Segment

The Willow Segment would divide the Little Susitna State Recreation River and the Willow Creek State Recreation Area, and would border the Nancy Lake State Recreation Area. Official trails providing access to these areas would receive appropriate crossings, including Crooked Lake, Iditarod Link, Iron Dog, Historic Iditarod, Lucky Shot, West Gateway, and Mud Lake trails. The Nancy Lake – Susitna Trail that provides access to the Nancy Lake State Recreation Area would not receive grade separation and recreation and tourism currently making use of this trail may be either diverted to nearby official trails or discouraged.

Big Lake Segment

The Big Lake Segment would cross the most populous Census blocks among the northern segments and there would likely be some residential displacements along this segment. Given the small number of residential displacements, no difficulties in identifying and providing comparable nearby housing would be expected.

Houston North Segment

The Houston North Segment would divide the Little Susitna State Recreation River. The Houston Lake Loop Trail providing access to this area would receive a grade separated crossing with the rail.

See Chapter 13 for estimates of impacts to general land use and property for each alternative segment.

Operations Impacts

Residential displacements generated for construction of the rail line would be permanent.

ARRC does not propose to provide crossings for unofficial trails. Trails would be blocked by the rail line and current economic activities exploring such trails may be either diverted to nearby officially recognized trails or discouraged.

14.5.2 No-Action Alternative

Under the No-Action Alternative, ARRC would not construct and operate the proposed Port MacKenzie Rail Extension, and there would be no changes to existing socioeconomic conditions from the project. Freight traffic through Port MacKenzie could be limited by the absence of a convenient and proximate transportation alternative to trucks.

15. ENVIRONMENTAL JUSTICE

This chapter analyzes the potential impacts from the proposed action and alternatives on minority and low-income populations. Section 15.1 describes the regulatory setting, Section 15.2 describes the study area, Section 15.3 describes the analysis methodology, Section 15.4 describes the affected environment, and Section 15.5 describes the environmental consequences.

15.1 Regulatory Setting

Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*, directs Federal agencies to:

> [P]romote nondiscrimination in Federal programs substantially affecting human health and the environment, and provide minority and low-income communities access to public information on, and an opportunity for public participation in, matters relating to human health or the environment.

EO 12898 also directs agencies to identify and consider "disproportionately high and adverse" human health or environmental effects of their actions on minority and low-income communities, and provide opportunities for community input in the National Environmental Policy Act (NEPA) process, including input on potential effects.

After the issuance of EO 12898, the Council on Environmental Quality (CEQ) prepared *Environmental Justice Guidance Under the National Environmental Policy Act* to assist Federal agencies in meeting their environmental justice commitments under NEPA (CEQ, 1997). This guidance provides the following definitions of the terms "minority" and "low-income community" in the context of environmental justice analysis. Minority individuals are members of the following population groups: American Indian or Alaska Native, Asian or Pacific Islander, Black, and Hispanic. A low-income community is one found to be below the poverty thresholds from the Bureau of the Census. CEQ has oversight for the Federal Government's compliance with EO 12898 and NEPA process, with the U.S. Environmental Protection Agency (USEPA) serving as the lead agency responsible for implementation of the EO.

The Surface Transportation Board (STB or the Board) has not issued rules or guidance specifically addressing environmental justice. While EO 12898 applies to agencies such as the Federal Railroad Administration (FRA), it does not apply to independent agencies like the Board. Nonetheless, the Section on Environmental Analysis (SEA) has evaluated the potential for high and adverse impacts to determine if they would be borne disproportionately by minority or low-income communities.

15.2 Study Area

The region of influence for environmental justice encompasses the regions of influence for the other resource areas that could potentially affect minority and low-income populations. The administrative areas that contain these populations are Census blocks within the Matanuska-Susitna Borough (MSB), and more specifically the communities along the proposed rail alternatives (see Figure 15-1 for a visual representation of communities within the region of influence).

15.3 Analysis Methodology

To evaluate environmental justice impacts, SEA used the following five-step analytical methodology. Some of these steps were not triggered because the conditions for further analysis were not met.

- Step 1: SEA would characterize the potentially affected minority or low-income populations.
- Step 2: If high and adverse health and environmental impacts were identified, SEA would identify the environmental justice populations located in the affected environment. Following CEQ guidance, these locations containing environmental populations would be defined as those areas where: a) the percentage presence of a minority or low-income group in the population is more than 50 percent; or b) the percentage presence of the minority or low-income group in the population is considerably higher than the percentage of the population in the MSB and in the State of Alaska.
- Step 3: SEA would assess whether the high and adverse health and environmental impacts would affect environmental justice populations.
- Step 4: If high and adverse health and environmental impacts would occur on environmental justice populations, SEA would define the spatial distribution of these populations relative to the area of effect for the identified impact.
- Step 5: SEA would assess impacts on environmental justice populations relative to the impacts on the affected environment more generally to determine whether the high and adverse impacts identified would be disproportionately borne by environmental justice populations. SEA would analyze the geographic dispersion of the impacts as well as differentiated patterns of consumption of natural resources among minority and low-income populations.

15.4 Affected Environment

This section characterizes minority and low-income populations within the study area. Alaska is home to a specific minority group, the Alaska Native, that represented 15.6 percent of the state population in 2000 (U.S. Census), and subsistence consumption is an aspect of distinct importance in Alaska, as recognized by separate Federal and state regulations. Poverty levels in the MSB in 2000 were slightly above the state average.

To identify minority and low-income populations, SEA used data available from the 2000 U.S Census. Information on minority populations is available for Census blocks, and information on low-income populations is available for Census block groups. Census blocks are typically individual city blocks bounded by streets, but can be many square miles in rural areas. A block group is a collection of blocks. Both are subdivisions of Census tracts, areas that are relatively homogenous in population characteristics with an average of about 4,000 inhabitants.

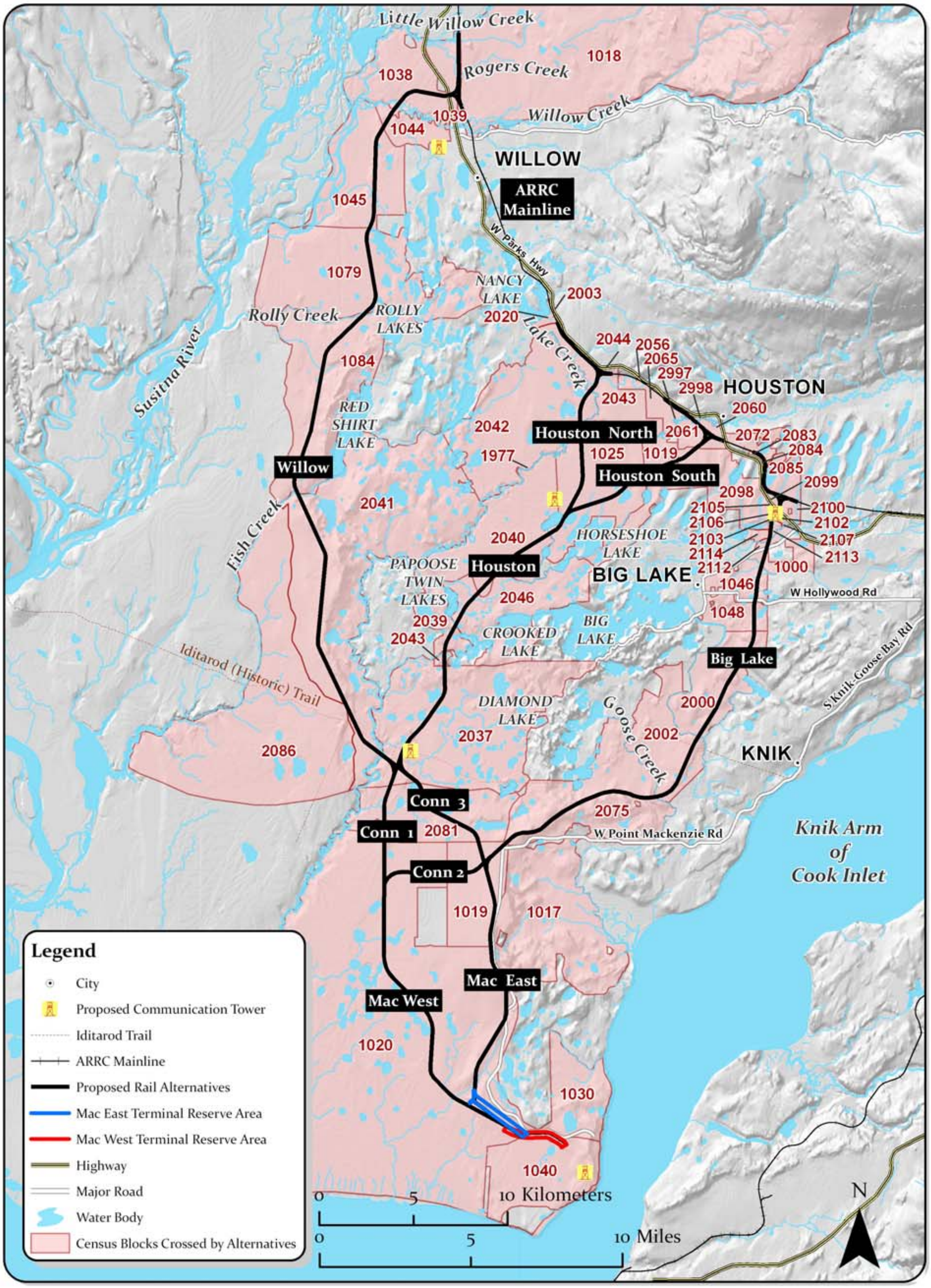

Figure 15-1. Census Blocks Crossed by the Alternatives

The presence of minority populations in the study area can be characterized using information available for Census blocks crossed by the 200-foot right-of-way for the various alternatives. Figure 15-1 shows the Census blocks potentially affected by the various rail line alternatives. Table 15-1 provides 2000 demographic data for the State of Alaska, MSB, and various rail line segments and segment combinations.

Two locations within the affected environment have minority populations that are higher than that of both the State of Alaska and the MSB. The Mac West-Connector 1 Segment Combination and the Mac East- 3 Connector Segment Combination both cross the same area just north of the Point MacKenzie Agricultural Project where the Alaska Native portion of the population is higher than that in the MSB and the State of Alaska. The other location is Big Lake Segment where the portion of the population that is classified by the 2000 Census as being of "Two or More Races" (e.g., Alaska Native and White) is higher than that of the Borough and Alaska which would indicate a population higher in minorities. These two locations are also the only areas within the affected environment where the total minority share of the population is larger than the minority share of the population in the MSB.

The presence of low-income populations in the study area can be characterized using U.S. Census Bureau Current Population Reports, Series P-60 on Income and Poverty, as suggested by CEQ guidance. These data are based on the American Community Survey conducted annually through a representative household sample. American Community Survey data are not available for relevant areas smaller than and within the MSB. Instead, the 2000 U.S. Census collected poverty information from a sample of the households and this information is available only at the Census block group level. Figure 15-2 shows Census block groups potentially affected by the alternatives.

Although Census block groups do not allow for distinguishing rigorously among alternatives, Table 15-2 provides information on the presence of low-income groups within the State of Alaska, MSB, and each Census block group. As indicated by the table, poverty levels in the project area in 1999 were generally higher than those for the Borough and for the State of Alaska, with the highest poverty levels being found around the Willow Segment.

15.5 Environmental Consequences

15.5.1 Proposed Action

For Step 1, SEA assessed whether any high and adverse health or environmental impacts to human populations would occur as a result of the proposed action. Chapters 3 through 14 describe the potential health and environmental impacts to resource areas, and Chapter 19 describes mitigation measures to adverse impacts. Based on the analysis presented in those chapters, SEA expects no high and adverse human health or environmental effects from construction or operation of the Port MacKenzie Rail Extension.

As a result of this absence of high and adverse human health or environmental effects, Steps 2 through 5 of SEA's impact assessment methodology were not conducted.

Table 15-1
Demographics in the Project Area by Segment[a]

	Total Population	Percent of Total Population								
		White	Black or African American	Alaska Native or American Indian	Asian	Native Hawaiian & Other Pacific Islander	Some Other Race	Two or More Races	Hispanic or Latino[b]	Minority Population[c]
Alaska	626,932	69.3	3.5	15.6	4.0	0.5	1.6	5.6	4.1	32.4
Matanuska Susitna Borough	59,322	87.6	0.7	5.5	0.7	0.1	0.9	4.6	2.5	13.7
Mac West - Connector 1	271	74.9	1.8	18.8	0.0	0.0	0.4	4.1	1.8	26.2
Mac West - Connector 2	73	97.3	0.0	0.0	2.7	0.0	0.0	0.0	0.0	2.7
Mac East - Connector 3	268	71.6	2.2	20.1	1.5	0.0	0.4	4.1	1.9	29.5
Willow	309	93.5	0.0	1.6	0.3	0.0	0.0	4.5	0.6	6.8
Big Lake	703	79.4	0.6	8.5	0.4	0.0	0.9	10.2	2.1	21.1
Houston - Houston North	250	94.4	0.0	2.8	0.0	0.0	0.0	2.8	3.6	8.8
Houston - Houston South	381	90.8	0.0	3.9	0.5	0.0	0.0	4.7	3.1	11.5

[a] Source: U.S. Census Bureau, 2000.
[b] Individuals who identify as Hispanic, Latino, or Spanish may be of any race; the sum of the other percentages under the “Percent of Total Population” columns plus the “Hispanic or Latino” column therefore do not equal 100 percent.
[c] Minority population, for the purposes of this analysis, is the total population for the U.S. Census designated place minus the non-Latino/Spanish/Hispanic White population.

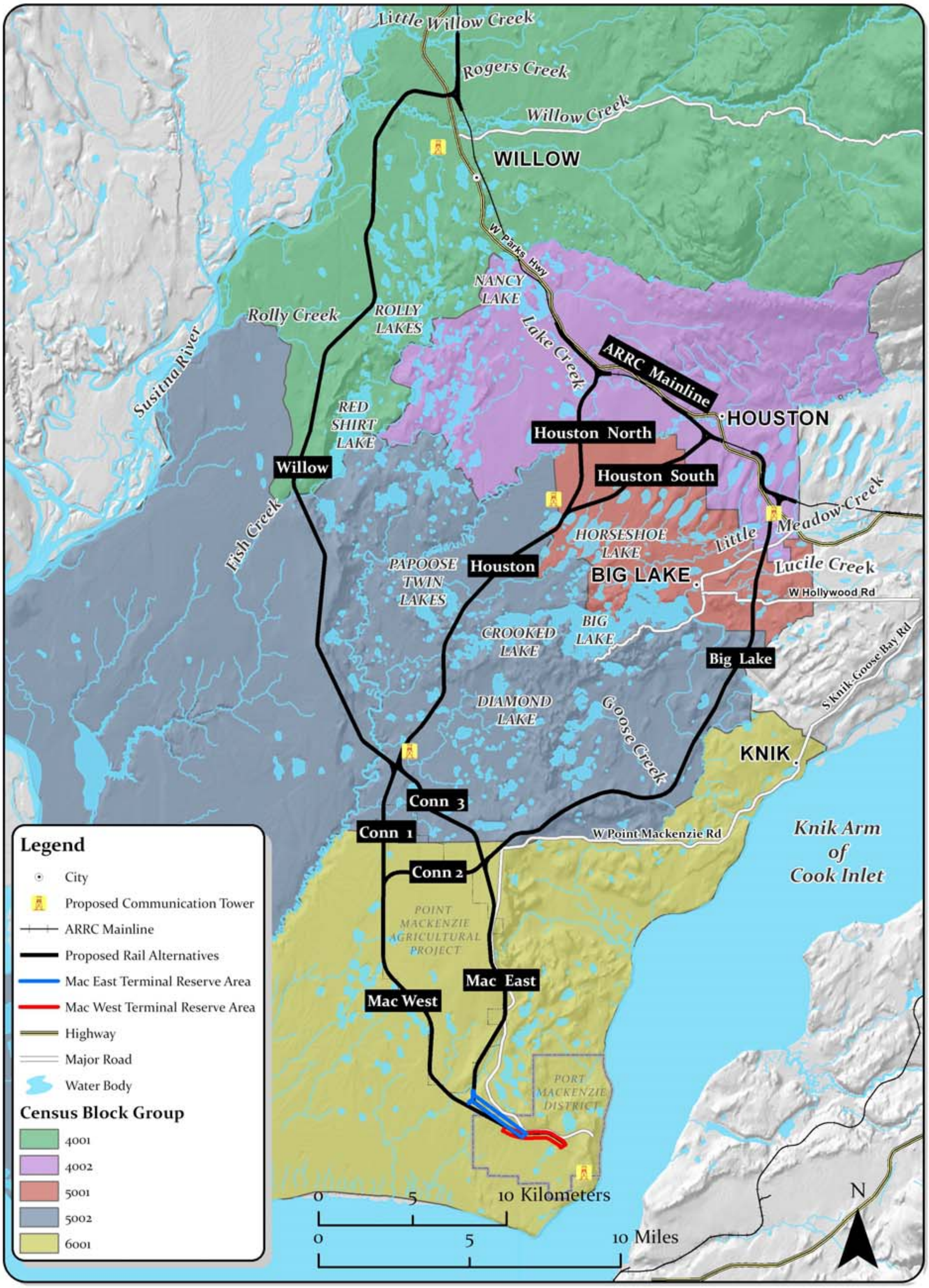

Figure 15-2. Census Block Groups Crossed by the Proposed Action and Alternatives

Table 15-2
Individuals and Families below the Poverty Level in the Project Area:
Number and Percentage of Population by Location, 1999[a]

		Families		Individuals	
		Number in Poverty	Percentage of Total Families	Number in Poverty	Percentage of Total Population
Alaska		10,270	6.7	57,602	9.4
Matanuska Susitna Borough		1,175	7.8	6,419	11.0
Block Grp					
4001	Willow	68	16.5	340	23.9
4002	Houston to South of Willow	43	12.0	223	16.0
5001	North of Big Lake to Parks Hwy	46	11.1	243	15.3
5002	South of Big Lake and W of the Little Susitna River	16	7.2	122	13.4
6001	Point MacKenzie	14	9.2	102	15.2

[a] Source: U.S. Census Bureau, 2000.

15.5.2 No-Action Alternative

Under the No-Action Alternative, ARRC would not construct and operate the proposed Port MacKenzie Rail Extension, and there would be no human health or environmental impacts from the project.

16. CUMULATIVE IMPACTS

This chapter describes potential cumulative impacts of the proposed Port MacKenzie Rail Extension; that is, the impacts of the proposed rail line when added to the impacts of other past, present, and reasonably foreseeable future projects and actions. The Surface Transportation Board's (STB or the Board) Section of Environmental Analysis (SEA) based this cumulative impacts analysis on the results of the environmental and community resources analyses reported in Chapters 3 through 15 of this Draft Environmental Impact Statement (EIS) and information SEA collected and reviewed about relevant past, present, and reasonably foreseeable future projects and actions that could result in impacts in the same area as the proposed rail line.

16.1 Applicable Regulations

Council on Environmental Quality (CEQ) regulations that implement the National Environmental Policy Act (NEPA) define a cumulative impact as "the impact on the environment which results from the incremental consequences of an action when added to the past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions" (40 Code of Federal Regulations (CFR) 1508.7). To help Federal agencies assess cumulative impacts under NEPA, CEQ developed a handbook entitled *Considering Cumulative Effects under the National Environmental Policy Act*. SEA followed these guidelines in its evaluation of whether past, present, and reasonably foreseeable future projects and actions in the area of the proposed rail line could, when combined with potential impacts of constructing and operating the proposed rail line, cumulatively result in environmental impacts.

16.2 Affected Environment

The project area is generally located north of Anchorage, Alaska, on the opposite side of the Knik Arm of the Cook Inlet. The proposed rail line would connect the Port MacKenzie District in the Matanuska-Susitna Borough (MSB or Borough) to a point on the existing Alaska Railroad (ARRC) mainline between Wasilla and north of Willow, Alaska. The area is relatively rural, with a few recreational areas managed by the State of Alaska and the MSB located nearby. The area is within the MSB and the Susitna River valley, bounded by the Susitna River on the west, Knik Arm of Cook Inlet on the south and east, and Parks Highway and the existing ARRC main line on the north. The project area would lie within the Susitna Lowland, which is the landward extension of the Cook Inlet Depression. The depression is a structural basin that contains the lowland basins of the Susitna River, its tributaries, and several other rivers that flow directly into the head of Cook Inlet.

The project area is located in the Cook Inlet Basin Ecoregion, a gently sloping lowland basin characterized by a variety of wetland and woodland habitats including evergreen, deciduous, and mixed forest stands. The area provides habitat for wildlife including bear, moose, wolf, furbearers, fish, and birds. Cultural and historic resources are found within the project area including cabins and trails. The study area includes several designated recreation areas, including the Willow Creek State Recreation Area, Nancy Lake State Recreation Area, the Little

Susitna State Recreation River, and two state recreation sites on the northern and southern shores of Big Lake. The study area also includes the Susitna Flats and Goose Bay state game refuges.

16.3 Methodology

An agency should evaluate cumulative impacts along with the analysis of the overall impacts of each alternative. The CEQ recommends that an agency's analysis accomplish the following:

- Focus on the effects and resources in the context of the proposed action.
- Present a concise list of issues relevant to the anticipated effects of the proposed action or eventual decision.
- Reach conclusions based on the best available data at the time of the analysis.
- Rely on information from other agencies and organizations about reasonably foreseeable projects and actions that are beyond the scope of the analyzing agency's purview.
- Relate to the geographic scope of the proposed project.
- Relate to the temporal period of the proposed project.

16.3.1 Establish Boundaries

Based on the geographic scope encompassing the various proposed rail line segments and the varied resource characteristics, SEA determined that appropriate geographic boundaries for this cumulative impacts analysis are Parks Highway to the north, Cook Inlet to the south, Knik Arm to the east, and the Susitna River to the west. SEA determined that appropriate timeframes for this cumulative impacts analysis are the two-year construction period and indefinite operations.

16.3.2 Collect and Screen Project and Action Data

SEA researched and collected information about other future projects and actions that could have impacts that would coincide in time and space with potential impacts of the proposed Port MacKenzie Rail Extension. SEA interviewed appropriate key personnel from project proponent and/or permitting offices and agencies to identify various past, present, and reasonably foreseeable future projects and actions, and reviewed analyses and information about those projects and actions to identify which to include in the cumulative impacts analysis and/or as part of each resource area analysis. SEA then applied a screening process to determine if projects and actions were reasonable, foreseeable, and could be associated with potential cumulative impacts. Section 16.4 describes the projects SEA selected for inclusion in the cumulative impacts analysis; Figures 16-1 through 16-3 show the locations of those projects.

16.3.3 Evaluate Potential Cumulative Impacts

SEA evaluated cumulative impacts for situations in which planned or reasonably foreseeable future projects and actions could overlap with the proposed Port MacKenzie Rail Extension in terms of geographic area and/or timeframe. Where available, SEA used existing relevant project data to analyze specific impacts resulting from other projects or actions; however, complete

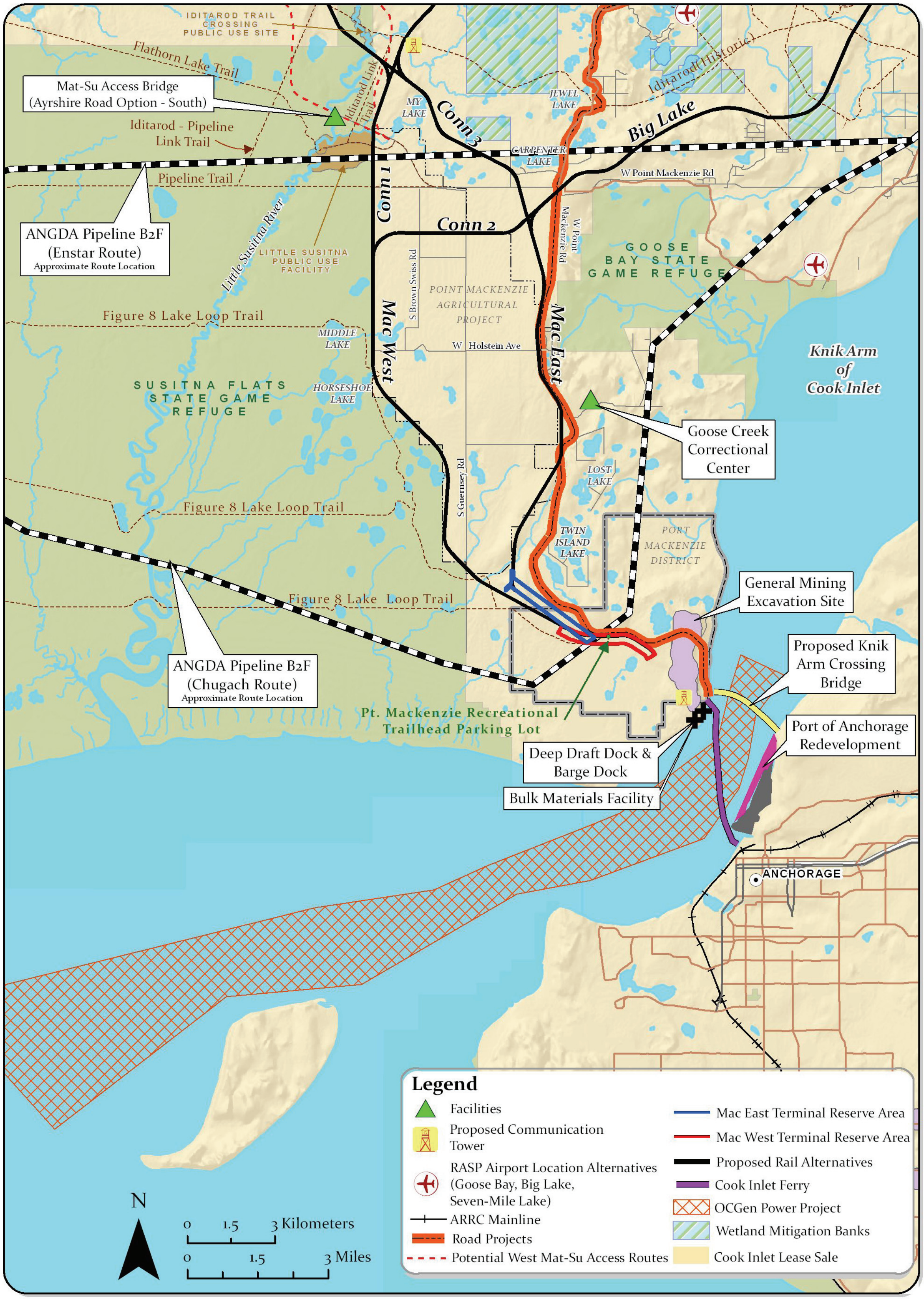

Figure 16-1. Other Projects Located Near the Mac East, Mac West, and Connector Segments

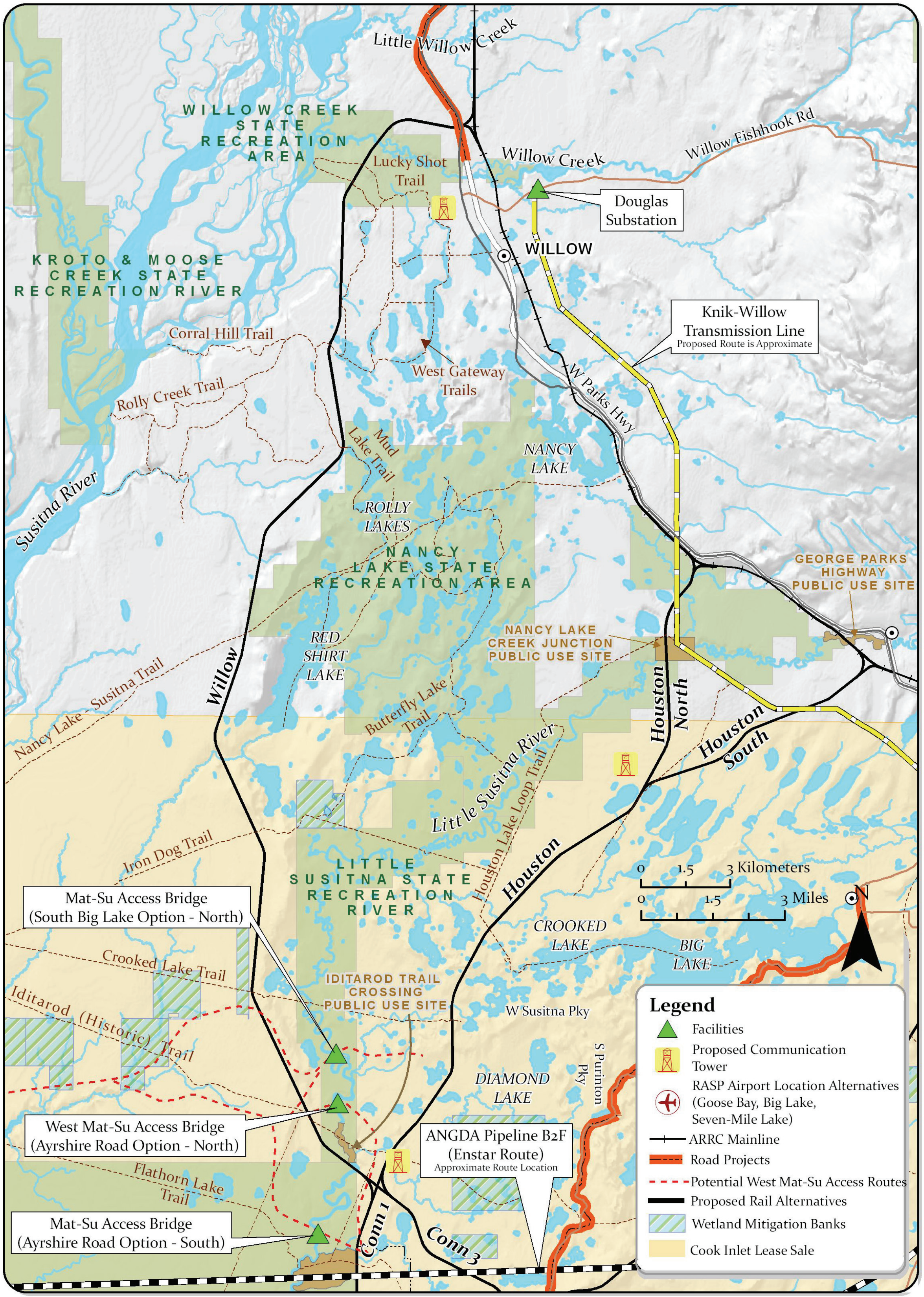

Figure 16-2 Other Projects Located Near the Willow and Houston Segments

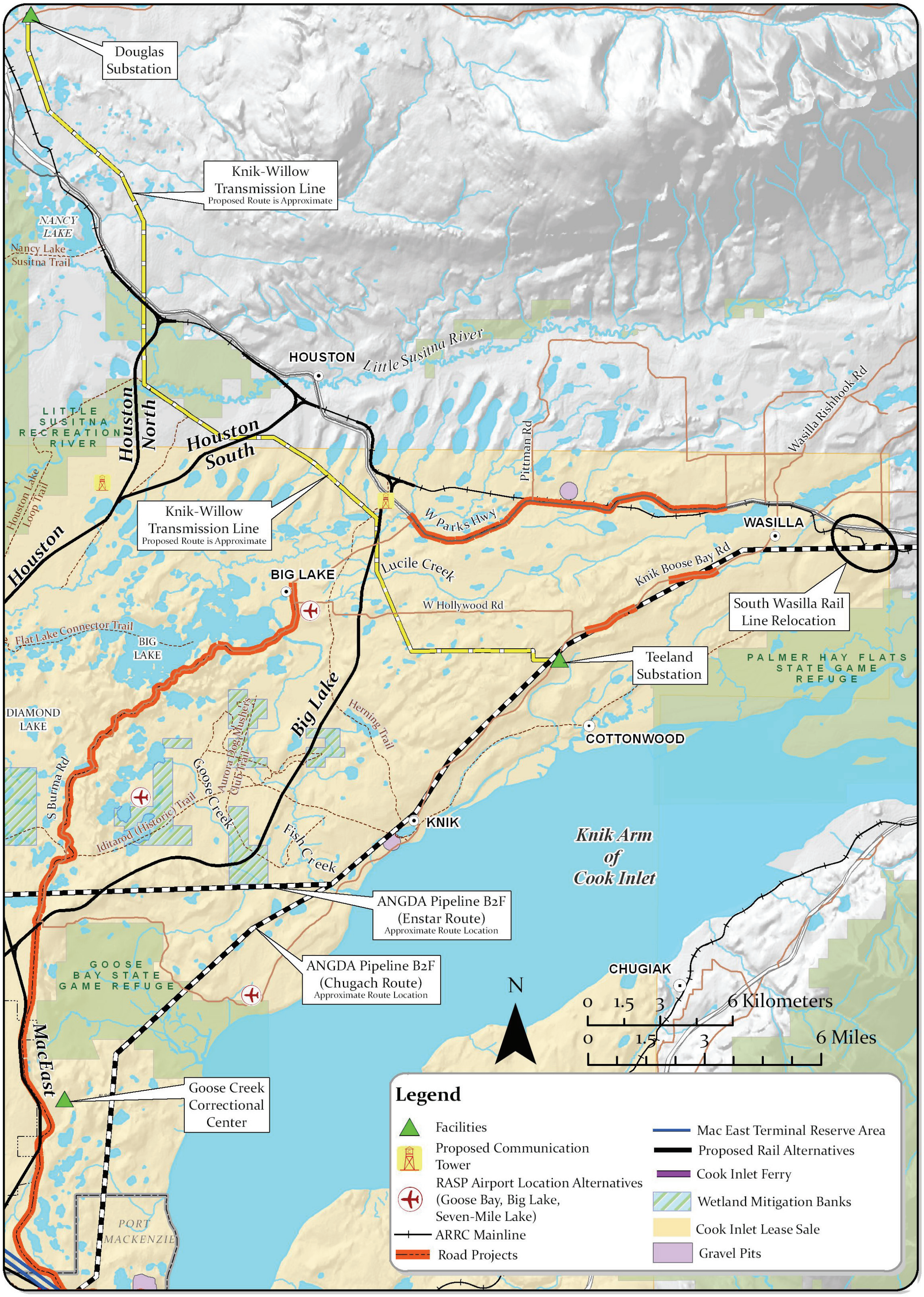

Figure 16-3 Other Projects Located Near the Big Lake Segment

impact analyses was not always available for the relevant projects and actions identified in this cumulative impacts analysis. Where quantitative project data was absent, SEA based the cumulative impacts analysis on the best available qualitative data and information. Section 16.4 summarizes potential cumulative impacts by resource area, and Appendix O provides a more detailed discussion. Chapter 20 includes references for both quantitative and qualitative data and additional information sources relied upon.

16.4 Other Relevant Projects and Actions

This section describes the projects SEA included in the cumulative impacts analysis. Appendix O identifies all projects and actions SEA considered for inclusion and provides a rationale for each project or action not included in the cumulative impacts analysis.

16.4.1 Brief History of the Project Area

When European contact began in the late 1700s, the Athabascan-speaking Dena'ina people were the inhabitants in the Upper Cook Inlet area, including the study area (Townsend, 1981). Early interaction between the Dena'ina, the Russians, and other European groups were limited but grew when Russians shifted their trading efforts from sea otter pelts to land furs which were traded within Alaska, with Russians serving as go-betweens for trade between Indians and Eskimos, and with China and Britain. The Dena'ina used their central geographic position and network of trails to serve as middlemen traders between the Russians and the groups farther in the interior, gathering relatively great wealth in a short time (DeLaguna, 1975; Osgood, 1965; Townsend, 1981; Stafeev, 1985).

From 1741 to 1838, Europeans inadvertently introduced the first of many epidemic diseases that devastated Native populations throughout the Arctic (Fortuine, 1992). In 1867, the United States purchased Alaska from Russia and performed a territory Census and summarized resources in 1879 (Bancroft, 1886; Petroff, 1881, 1884). Gold prospecting created the next great influx of Euro-Americans into Upper Cook Inlet, beginning with discoveries on the Kenai Peninsula and Turnagain areas in 1891 (Buzzell, 1986) and communities began to spring up and towns such as Knik and Susitna Station grew up along Cook Inlet. The community of Knik was the largest settlement in the Matanuska-Susitna Valley in the 1890s and it served as a transfer point for passengers and freight from ocean-going steamers to smaller vessels or for overland travel. However, the establishment of Anchorage in 1915 as the Alaska Railroad construction headquarters and ship anchorage spelled the end of Knik's prosperity.

After the 1918 Spanish influenza devastated the remaining Native population of Upper Cook Inlet, the survivors resettled at what is today Tyonek. Increasing populations of European Americans in the Upper Cook Inlet area made it correspondingly difficult for Dena'ina people to maintain their traditional land use patterns as promising lands of the Susitna and Matanuska Valleys became colonized. After realizing the strategic importance of the Alaska Territory during World War II, the Federal Government spent billions of dollars on civilian and military projects (Bush, 1984). Urbanization in Anchorage progressed slowly, with Dena'ina people being pushed away from their former home sites by development pressure, lack of property rights, and race-based discrimination. Among the last Dena'ina people to live a mixed traditional life on the land was Shem Pete, who lived in a cabin on Nancy Lake but eventually

Shem Pete and his son were forced off their land by land speculators who tricked them out of their rights to the land; they settled in Tyonek (Kari and Fall, 2003). The 1971 Alaska Native Claims Settlement Act was designed to transfer rights to lands taken by the Federal Government to Native peoples and to organize Alaska Natives into a suite of corporate entities.

Alaska officially became the 49th State on January 3, 1959 and voters created the Matanuska-Susitna Borough in 1964. With major improvements in transportation (the new Knik River Bridge completed in 1965, Houston was incorporated as a Third Class City in 1966 and the Anchorage to Fairbanks road (now named Parks Highway) was completed in 1971), and because of the large tracts of land available for subdivision, the Matanuska-Susitna Valley began to grow into a major population center, increasing from 6,509 people in 1970 to 59,322 in 2000 (ADOLWD, undated). The MSB continues to be the fastest growing area in the state with an average annual growth rate of 4.1 percent (ADOLWD, 2008).

Existing conditions reflect past and present projects and actions. The area around the proposed Port MacKenzie Rail Extension project has been developed increasingly over the past decades. Activities such as resource extraction, transportation improvements and growth, population growth, supporting infrastructure development, and major recreational development such as state recreation areas and wildlife refuges have all contributed to the current environmental conditions.

16.4.2 Projects and Actions Analyzed in this EIS

The projects described below and presented in Figures 16-1 through 16-3 could have potential impacts occurring within or near the Port MacKenzie Rail Extension project area. Many of the projects that have potential to contribute to cumulative impacts are concentrated towards the southern end of the project area near the Mac East, Mac West, and Connector segments.

Beluga to Fairbanks Natural Gas Pipeline. The Alaska Natural Gas Development Authority has proposed a 20-to 24-inch high-pressure bi-directional pipeline from Beluga to Fairbanks that would comprise four segments, one of which is the Beluga Fields to Palmer segment (ANGDA, 2008). This segment would follow one of two routes: both are located in the southern half of the Port MacKenzie Rail Extension project area. The Enstar Route would cross the Connector 1 Segment, Connector 3 Segment, and the Big Lake Segment, while the Chugach Route would cross the Mac East and Mac West segments.

Cook Inlet Areawide Oil and Gas Lease Sale. The Alaska Department of Natural Resources (ADNR) made a final best interest finding for the Cook Inlet areawide oil and gas lease sale (applicable to sales from 2009 through 2018) and sold four tracts (totaling 7,685 acres) at the May 20, 2009 sale. Three of the tracts and most of the total acreage leased are offshore with one onshore tract located near the Cook Inlet, west of the Susitna River (ADNR, 2009). Though impacts from the May 2009 sale would be focused in the Cook Inlet, most of the Port MacKenzie Rail Extension project area could be included in future lease sales.

Cook Inlet Ferry. The MSB anticipates construction of a dock at Port MacKenzie in summer 2010 (ADN, 2009) as part of the Borough's proposed year-round commuter ferry system that would provide transportation across the 2 miles of Knik Arm that separates MSB and

Anchorage. The project would also include parking and terminal structures (already constructed) and could lead to increased road development in the Point MacKenzie area.

Cook Inlet OCGenTM Power Project. Ocean Renewable Power Company Alaska plans to install its proprietary ocean current electrical generation technology, OCGen™, to generate renewable electricity from open-ocean and tidal currents in mid-2010 and operate it until at least mid-2011. The impacts of the project would be focused on the location where the project is sited in the Cook Inlet, and to-be-determined onshore locations where transmission lines would be constructed.

Knik Arm Crossing. Knik Arm Bridge and Toll Authority has proposed to construct the Knik Arm Crossing, a bridge that would cross the Knik Arm of Upper Cook Inlet. The bridge would be approximately 2.5 miles long and would connect the Municipality of Anchorage to MSB via Point MacKenzie Road. The crossing landfall would be approximately 1 mile from the Mac West Terminal Reserve and approximately 3 miles from the Mac East Terminal Reserve. Impacts resulting from the crossing would be focused at the southern end of the Port MacKenzie Rail Extension project area.

Knik-Willow Transmission Line Upgrade. The Alaska Energy Authority's (AEA) Knik-Willow (Teeland-Douglas) transmission line upgrade project would replace an older segment of the Anchorage-Fairbanks Intertie with a new 25-mile, 230 kilovolt transmission line between the Teeland (Knik) and Willow (Douglas) substations in Alaska. The transmission line route would be located in the northern part of the Port MacKenzie Rail Extension project area and would be likely to cross the Houston North, Houston South, and Big Lake segments. The AEA published a Draft Alaska Railbelt Regional Integrated Resource Plan (RIRP) Study in December 2009. That Draft RIRP includes a Lake Lorraine to Douglas route for a possible new transmission line. SEA did not include the possible Lake Lorraine to Douglas route area in this analysis as there are no specific routes or alternative routes defined. The Draft RIRP indicates that detailed engineering and permitting activity plans are not finalized or funded, and, if finalized and funded would begin in the 2011 through 2016 timeframe (Black & Veatch, 2009)

Goose Greek Correctional Center. The 450,000 square foot medium-security Goose Greek Correctional Center is an MSB and State of Alaska joint project under construction at the corner of Alsop Road and Point MacKenzie Road (DOWL Engineers, 2008). Impacts from the correctional center would be focused in the area of the Mac East Segment of the Port MacKenzie Rail Extension.

MSB Regional Aviation System Plan. The Regional Aviation System Plan (RASP) addresses aviation issues, needs, and growth with a geographic focus on the airports connected to the road system in the MSB. The RASP includes: a basic inventory of airports and improvements needed at public airports; a forecast of aviation growth; locations for new public airports and/or floatplane bases; preliminary plans for the layout of the highest priority new airports and floatplane bases; operations to improve aviation safety; and MSB roles in airport development and management. New or upgraded airport facilities identified in the RASP include locations at Big Lake, Goose Bay, and Seven-Mile Lake. The closest Port MacKenzie Rail Extension alternative would be the Big Lake Segment.

Port MacKenzie Development Projects: Bulk Materials Facility; Gravel Mining, Deep Draft Dock Expansion, Barge Dock Expansion. The following four projects at Port MacKenzie are planned or already operating. Impacts from the projects would be focused at the southern end of the Port MacKenzie Rail Extension project area and would be located closest to the Mac East and Mac West Terminal Reserves.

- The MSB plans to upgrade roads, storage and storage areas to develop a bi-modal bulk materials facility at Port MacKenzie to handle bulk materials cargo.
- The MSB and Quality Asphalt and Paving are moving gravel from an excavation site in Port MacKenzie to the Port of Anchorage to provide the foundation for the marine terminal development north expansion (White, 2008).
- The U.S. Army Corps of Engineers has permitted expansion plans for the 2004 Deep Draft Dock at Port MacKenzie and preliminary designs are complete; however, project funding is not yet in place (Zartman, 2008).
- In January 2007, Port MacKenzie received a permit to expand an existing barge dock by nearly 8 acres; funding was received in 2009 and construction is anticipated to begin in winter 2009-2010 (Zartman 2009).

Port of Anchorage Marine Terminal Redevelopment Project. The Port of Anchorage Marine Terminal Redevelopment Project began in 2005 and will expand, reorganize, and improve the Port of Anchorage by adding an additional 135 acres of land and providing approximately 8,880 linear feet of waterfront structures under a phased construction schedule through 2014. The project is located across the Cook Inlet from the southern end of the Port MacKenzie Rail Extension project area.

Road Projects. Road projects include Parks Highway: Lucas Road (Wasilla) to Big Lake Cutoff Improvements (State Transportation Improvement Program [STIP] #11961); Parks Highway: Willow Creek Bridge to Kashwitna River Bridge Rehabilitation, Mile Post 72-83; Point MacKenzie Road Upgrades and Paving (STIP #20254) from the intersection of South Burma Road to a point 0.5 mile before the intersection with Lu Young Lane (Koski, 2009); Point MacKenzie Road Improvements: Don Young Road Upgrades, South Big Lake/Burma Road Upgrades (previously STIP #21355), and Knik Goose Bay Road Improvements. These road projects would be located throughout the Port MacKenzie Rail Extension project area, including areas near the Big Lake, Willow, Mac East, and Mac West segments.

South Wasilla Rail Line Relocation. The Alaska Railroad Corporation (ARRC) plans to straighten curves along main line track in South Wasilla between ARRC Mile Posts 154 and 158. The relocation would take place in the far eastern end of the Port MacKenzie Rail Extension project area and would be closest to the Big Lake Segment.

Su-Knik Wetland Bank – Umbrella Mitigation Bank Instrument – Big Lake South Individual Bank Plan. The MSB and Sustainable Environments, LLC, propose to establish an umbrella preservation mitigation bank. The Big Lake South Bank in the MSB just south of the Houston, Wasilla, and Palmer growth corridor would be a part of this umbrella, and Fish Creek, Threemile Creek, and Goose Creek would flow through the project area and connect an extensive complex of existing wetlands. The mitigation banks would be located near the area of the Connector 1 Segment and the Houston Segment, and would be crossed by the Big Lake Segment of the Port MacKenzie Rail Extension.

West Mat-Su Access Project. MSB has proposed to build a bridge across the Little Susitna River into the southern part of the Fish Creek Management Area and is studying four access road options including three locations for the bridge – the extension of Susitna Parkway in the Big Lake area; a location approximately 0.8 miles north of where the Iditarod National Historic Trail crosses the river; and near the existing Little Susitna River access at the end of Ayrshire Road. Potential road options associated with the access project could intersect Connector 1 Segment and Big Lake Segment of the Point MacKenzie Rail Extension.

16.5 Environmental Consequences

This section summarizes the results of resource-specific cumulative impacts analyses detailed in Appendix O. It is a compilation of potential impacts; that is, the cumulative result of impacts of the proposed action and alternatives when added to the potential impacts of other actions. SEA analyzed cumulative impacts for situations in which planned or reasonably foreseeable projects and actions would overlap the proposed Port MacKenzie Rail Extension in relation to geographic area and project timeframe.

SEA identified the combined interaction of the proposed Port MacKenzie Rail Extension and other planned or reasonably foreseeable future projects and identified potential cumulative impacts for all of the environmental resource areas described in Chapters 3 through 15 of this EIS. Sections 16.5.1 through 16.5.13 summarize potential impacts of the proposed rail line and focus on how those impacts could contribute to cumulative impacts when combined with potential impacts of relevant other projects.

16.5.1 Geology and Soils

Potential impacts to geology and soils from the proposed Port MacKenzie Rail Extension include modifications of topography through excavation and fill associated with construction of the rail line and associated facilities; removal and replacement of soils classified as unsuitable for construction of railroad embankments and service roads; exposure of highly erodible soils to the erosive forces of wind and water; conversion of land in the Port MacKenzie Rail Extension right-of-way (ROW) that contain soils MSB considers to be of local importance for agricultural purposes; and potential damage to infrastructure from seismic events.

Construction and operations activities associated with the oil and gas lease sale, the bridge crossing of Cook Inlet, the transmission line and pipeline, and certain road projects would overlap with certain segments of the proposed rail line extension and minor cumulative impacts would result. Most notably, these activities could, to some extent, result in minor impacts in relation to topographic modification through removal and replacement of the existing soil profile. In some cases, these activities could also lead to the exposure of highly erodible soils or conversion of agricultural lands. Furthermore, infrastructure related to these projects would have some degree of vulnerability to damage resulting from seismic events. Potential impacts from the proposed Port MacKenzie Rail Extension, when added to potential impacts of the relevant projects, could result in minor cumulative impacts to geology and soils in the Matanuska-Susitna area.

16.5.2 Water Resources

There could be potential impacts to certain water resources from proposed rail line construction and operations, including impacts from clearing and grading; construction of unpaved access roads, bridges, staging areas, and culverts; water-supply withdrawals; and rail line operations. Impacts could include changes to natural drainage and altered flood hydraulics; increased potential for overbank flooding and debris jams; reduced floodplain area; increased scour and bank erosion; increased turbidity, sediment loads, and concentrations of pollutants; changes to recharge potential and aquifer dewatering, impacts to wetland mitigation areas, and impacts to the Goose Creek Fen. SEA analyzed impacts to surface waters and wetlands; cumulative impacts to groundwater and floodplains were not analyzed as there are not likely to be adverse impacts to groundwater or floodplains resulting from the proposed rail line extension.

The proposed rail line could add to existing impacts to surface water and wetlands resources in the project area from urban, recreation, transportation, agriculture, and resource-development activities.

Potential impacts to surface water and wetlands resources from the proposed rail line could overlap with impacts from several of the projects identified in Section 16.4, including the oil and gas lease sale, the transmission line, the correctional center, the aviation plan, the natural gas pipeline, development projects at Port MacKenzie, road projects, and the wetland mitigation bank. There would be no overlap of impacts to the Goose Creek Fen. Therefore, impacts to surface water and wetlands resources from the proposed Port MacKenzie Rail Extension, when added to the impacts of other relevant projects could result in cumulative impacts to surface water and wetlands resources in the Matanuska-Susitna area.

16.5.3 Biological Resources

The primary impacts of proposed rail line construction and operations would be habitat loss and altered suitability; fish, wildlife, and vegetation mortality; and reduced survival and reproductive success of native species. Linear projects that involve significant land clearing across long distances could interrupt natural fire ecology by leading to the creation of fire breaks along the project right-of-way. These fire breaks could lead to an increase in fuel accumulation along one side of the project right-of-way, thereby increasing the risk of more intense wildland fires. As a result of this disruption of the natural fire cycle, separated vegetation communities might experience different rates of ecological succession leading to a decrease in biodiversity in the project area.

All Port MacKenzie Rail Extension alternatives have the potential to impact biological resources already affected by urban, recreation, transportation, agriculture, and resource-development activities in the rail line project area.

Construction and operations activities associated with the oil and gas lease sale, the OCGen™ Power Project, the bridge and ferry crossing of Cook Inlet, the transmission line, the correctional center, the aviation plan, the natural gas pipeline, development projects at Port MacKenzie and the Port of Anchorage, road projects, and the wetland mitigation bank could affect wildlife habitat through habitat destruction and altered suitability (including increases in invasive plant populations and interruption of natural fire ecology), increased public access, noise, and potential direct and indirect wildlife mortality. The potential impacts of the proposed Port MacKenzie Rail Extension project, when added to the impacts of the noted projects, could result in cumulative impacts to the biological environment in the Matanuska-Susitna area.

16.5.4 Cultural and Historic Resources

Archaeological sites in the Port MacKenzie Rail Extension ROW that cannot be avoided could possibly be damaged during proposed rail line construction. The dog sledding cultural landscape could be adversely affected to varying degrees through loss of visual integrity, cultural privacy, potential loss of or changes to access, and changes to traditional or culturally notable use of and connection to the property. Officially recognized trails would be grade-separated or relocated, facilitating free passage; however, the integrity of any historic trails would still be adversely affected through the introduction of auditory and visual effects, and access across the study area by dog sledders who travel across unofficial trails would be impeded. In order for any potential effects to be considered adverse, the introduction of visual, atmospheric or audible elements would have to diminish the integrity of the property's major historic features (36 CFR 800.5(2)(v)). The NHPA Section 106 Programmatic Agreement being developed for this project would provide a mechanism to fully evaluate which properties are listed in or eligible for listing in the National Register of Historic Places, what their major historic features are, and whether those properties would be adversely affected by the proposed project.

Historic and potentially historic trails could be blocked, rerouted, or diverted. Depending on the timing of construction activities and/or locations of installed crossings, some trail routes, such as the Iditarod Dog Sled Race route, could be altered. Trail crossings would diminish the integrity of historic and potentially historic trails. Historic properties within the project area could be adversely affected and lose their context and integrity through visual, and audible effects. All alternatives would cross the Iditarod National Historic Trail thereby affecting the historic integrity of the trail and its ancillary network, and potentially affecting the eligibility of the ancillary network as NHPA trails or NHPA historic trail segments.

Noise and vibration impacts during construction and operations are not anticipated to be adverse as the estimated construction noise and general vibration levels would be below the FTA criteria for an adverse impact. Since there would be no buildings within the contour for the FTA fragile building damage criterion which was determined to be five feet on each side of the centerline and no receptors within the vibration annoyance contour which was determined to be 80 feet from the track centerline, there would be no damage to buildings or vibration impacts from proposed rail line operations.

There could be increases in residential development and recreation activity in the project area associated with the Knik Arm Crossing, Cook Inlet Ferry, the regional aviation plan, and the West Mat-Su Access Project. There would be construction activities associated with these projects and the correctional center, the transmission line, and the natural gas pipeline, which could result in adverse impacts to cultural and historic resources.

The Knik Arm Crossing in the study area could have a substantial impact on existing cultural resources particularly for those closest to Point MacKenzie and Knik areas, including the Iditarod National Historic Trail due to the increase in residential development from people taking advantage of the shortened commute between Point MacKenzie and Anchorage via the bridge. The construction of a segment of the Beluga to Fairbanks Natural Gas Pipeline project would cross a number of trails diminishing their integrity as several of them could have historical importance or be part of a dog sledding cultural landscape. Proposed rail line construction activities, when combined with these other projects, could result in cumulative impacts to cultural and historic resources.

16.5.5 Subsistence

All Port MacKenzie Rail Extension alternatives are in the state nonsubsistence area and are a considerable distance from areas where state-regulated subsistence activities occur. Therefore, impacts to subsistence uses outside the nonsubsistence area would be similar for all alternatives. Impacts to wildlife from the rail line alternatives could vary. Impacts to subsistence could include adverse impacts to resource availability as a result of train-resource collisions, especially for species that migrate through the project area; changes in resource availability if disruption from rail line operations affects species distribution and/or survival rates; and adverse impacts to user access due to ARRC regulations prohibiting access across the rail line except at designated crossing points.

The most substantial past impact on subsistence activities in the study area resulted from the creation of the Anchorage-Matsu-Kenai nonsubsistence area in 1992 under 5 Alaska Administrative Code 99.015. This action removed subsistence hunting and fishing regulations and the subsistence priority from a large continuous area of the Matanuska-Susitna, Anchorage, and Kenai Peninsula areas.

Cumulative impacts to subsistence uses would be minimal because planned or reasonably foreseeable future projects are within the Anchorage-Matsu-Kenai nonsubsistence area. Several of these projects would have a small footprint within the nonsubsistence area and, except for small habitat disturbances in the immediate area, would not be likely to contribute to larger cumulative impacts to subsistence. There are two foreseeable projects that could add to cumulative effects to subsistence uses outside the Anchorage-Matsu-Kenai nonsubsistence area – the Knik Arm Crossing and natural gas pipeline projects. The Knik Arm Crossing could draw more residents to the study area, thereby increasing the number of people who might travel to the closest subsistence managed lands. Depending on the proponents' policy regarding access along the natural gas pipeline ROW, the pipeline could restrict or improve subsistence-user access to subsistence managed lands. An overall increase in the number of development projects in the study area could lead to cumulative impacts to Knik and Eklutna tribal members' traditional use areas. While these traditional use areas are now within a nonsubsistence area, Eklutna and Knik tribal members could still have a traditional connection to the lands, and construction and operation of future projects could add to a sense of loss and intrusion by outsiders into their traditional harvest areas. To the extent that any project affects populations of beluga whales, there could be impacts to Cook Inlet Dena'ina villages (such as Tyonek, Eklutna, and Knik) subsistence use of beluga whales.

16.5.6 Climate and Air Quality

SEA has concluded that increases in emissions from construction and operation of the proposed Port MacKenzie Rail Extension project would be minimal in the context of existing conditions. Using a conservative approach SEA determined that construction emissions for the proposed project would be expected to be a small fraction of the Borough's total annual emissions during the assumed construction period of 2 years. Estimated nitrogen oxides (NO_x), PM_{10}[1], and $PM_{2.5}$[2] construction-related emissions would be well below the *de minimis* conformity thresholds of 100 tons per year for each pollutant. The estimated operations-related emissions would also be a small fraction of MSB annual off-highway vehicle emissions and the emission totals for each of the pollutants would be well below the *de minimis* conformity thresholds of 100 tons per year for each pollutant. SEA has also determined that emissions from the proposed terminal reserve at the end of the line in the Port MacKenzie District would be a fraction of the rail line operations-related emissions and well below the *de minimis* conformity thresholds of 100 tons per year for each pollutant.

Globally, sources of human-induced emissions of greenhouse gases include mainly burning of fossil fuels, with important contributions from clearing of forests, agricultural practices and other similar activities. Greenhouse gas emissions associated with the proposed project would be mostly carbon-dioxide (CO_2) emissions. Estimated annual average construction-related CO_2 emissions would be 3,073 metric tons per year and operations-related emissions would be 2,539 metric tons per year. Operations-related CO_2 emissions would represent a 2 percent increase in Alaska rail CO_2 emissions and would be less than 0.01 percent for Alaska as a whole (ADEC, 2008). Also, CO_2 emissions from existing highway activity would likely decrease as a result of the proposed rail line to the extent that transportation activity by truck would be shifted to rail. Similarly, CO_2 emissions would likely decrease if commodities from Interior Alaska were transported over the proposed rail line to Port MacKenzie rather than to the Port of Anchorage or Seward because of the shorter distance.

Although the emissions generated from the construction and operation of the Port MacKenzie Rail Extension project would be very small in comparison to annual global CO_2 emissions, they could contribute to global greenhouse gas emissions and when added to emissions from the reasonably foreseeable future projects and actions described in this Chapter (see also Appendix O) and similar projects and actions across the globe, they could lead to an adverse cumulative impact. The following paragraphs provide a discussion of the general impacts of climate change with a focus on Alaska and their effects on the proposed project.

The Intergovernmental Panel on Climate Change (IPCC) and the U.S. Global Change Research Program (USGCRP) have assessed the potential consequences of global climate change (IPCC, 2007 and USGCRP, 2009). The global average temperature since 1990 has risen by about 1.5

[1] All particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers.

[2] All particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.

degrees Fahrenheit (ºF) and it is projected to rise another 2 to 11.5ºF by 2100 with the greatest increases expected to occur in the Arctic and in the middle of continents. The U.S. average temperature has risen by a comparable amount and is very likely to rise more than the global average over this century, with some variation from place to place (USGCRP, 2009). Over the past 50 years, Alaska has warmed at more than twice the rate of the rest of the U.S. average leading to more pronounced climate change impacts in the state than in the rest of the U.S. Alaska's annual average temperature has increased 3.4ºF and the winters have warmed by 6.3ºF (Fitzpatrick *et. al.*, 2008 in USGCRP, 2009). Average annual temperatures in Alaska are predicted to rise about 3.5ºF to 7ºF by the middle of the century (USGCRP, 2009).

Precipitation patterns are also changing with increases and decreases observed across the globe and in some regions there have been increases in both droughts and floods (Trenberth *et. al.*, 2007 in USGCRP, 2009). Precipitation is projected to increase overall but substantial shifts are expected in where and how precipitation occurs and simultaneous increases in air temperature are expected to lead to drier conditions overall (Meehl *et. al.*, 2007 in USGCRP, 2009). Sea levels are rising at roughly double the rate observed over the past century as recorded by satellite data over the last 15 years (Bindoff *et. al.*, 2007 in USGCRP, 2009).

In Alaska, higher temperatures are already contributing to earlier spring snowmelt, reduced sea ice, widespread glacier retreat, and permafrost warming (ACIA, 2004; Fitzpatrick *et. al.*, 2008 in USGCRP, 2009). Reduced sea ice provides opportunities for increased shipping and resource extraction, however, at the same time increases coastal erosion (Jones *et al.*, 2009 in USGCRP, 2009) and flooding associated with coastal storms. Climate models project the Bering Sea to experience the largest decreases in atmospheric pressure in the Northern Hemisphere, suggesting an increase in storm activity in the region (Meehl *et. al.*, 2007 in USGCRP, 2009). Reduced sea ice also alters the timing and location of plankton blooms which is expected to drive major shifts of marine species such as Pollock and other commercial fish stocks (Grebmeier *et al.*, 2006 in USGCRP, 2009). The Bering Sea Pollock fishery off Alaska's west coast is the world's largest single fishery and has undergone major declines in recent years (USGCRP, 2009).

Insect outbreaks and wildfires are increasing with warming temperatures and Southcentral Alaska experienced the largest outbreak of spruce beetles in the world in the 1990s destroying over 5 million acres of Alaska spruce forest (Ryan *et al.*, 2008 in USGCRP, 2009; Juday *et al.*, 2005 in USGCRP, 2009). The average area burned per year in wildfires in Alaska is projected to double by the middle of this century (Balshi *et al.*, 2008 in USGCRP, 2009). Permafrost temperatures have increased throughout Alaska since the 1970s (Lettenmaier *et al.*, 2008, in USGCRP, 2009) with the largest increases measured in the northern part of the state (Osterkamp, 2007 in USGCRP, 2009). Greater evaporation and permafrost thawing due to warming temperatures is the likely cause for reduction in the area of closed basin lakes in Alaska over the last 50 years and threatens wetlands and the traditional lifestyle of Native peoples that depend on them. Degradation of permafrost could connect surface waters to groundwater, which has the potential to dry out shallow streams, ponds, and wetlands if re-supply by snowmelt and precipitation are less than losses from evaporation and percolation (ACIA, 2004). In areas with heavy concentrations of ground ice, permafrost thawing and associated ground surface collapsing could increase the formation of wetlands, ponds, and drainage networks (ACIA, 2004). Because water extraction would only occur during construction, long-term, climate-change induced changes in water availability would not be expected to affect the project.

Climate change-induced permafrost thaw could lead to embankment deformation through the process of thaw settlement which occurs when ice-rich permafrost thaws and causes the ground surface to subside (Lemke *et al.*, 2007). Ground subsidence could damage public infrastructure including roads, runways, water and sewer systems and rail embankments. It has been estimated that thawing permafrost could add $3.6 billion and $6.1 billion to future costs for publicly owned infrastructure in Alaska by 2030 (Larsen *et al.*, 2008 in USGCRP, 2009).

16.5.7 Noise and Vibration

Proposed Port MacKenzie construction activities, such as the use of heavy equipment and piledriving for bridges along certain segments, would generate noise. Rail line operations would generate wayside noise and noise from sounding locomotive warning horns at at-grade rail-highway crossings. There are no receptors near any of the alternatives that would experience adverse noise impacts during rail line operations. Because of the relatively low ambient noise level and proximity of receptors, the 3 dBA [A-weighted decibel] noise increase contour associated with the Big Lake Segment would include 16 receptors, the Houston South Segment contour would include 8 receptors, and the Mac West Segment contour would include 2 receptors. Because of relatively low ambient noise levels in these areas, train noise would be more noticeable than in other areas with higher ambient noise levels. However, because noise levels would be below the 65 decibel DNL [day-night average noise level] for all potential receptors, there would be no adverse noise impacts associated with any of the Port MacKenzie Rail Extension alternatives. Although some of the other projects and actions could increase noise levels, there is no overlap of the areas of noise impact from these projects and actions with the areas of potential noise impact from the proposed rail line. Because there are no adverse noise impacts from the proposed rail line extension, no cumulative impacts would result.

16.5.8 Energy

All segments of the Port MacKenzie Rail Extension would cross a 230 kilovolt transmission line that links the Beluga Power Plant near Tyonek to a bulk substation just south of the Port MacKenzie District. The Big Lake, Houston South, and Houston North segments would also cross a 138 kilovolt transmission line parallel to the ARRC main line between Knik-Fairview and Willow. Connector 1 Segment, Connector 3 Segment, and the Big Lake Segment would cross the Beluga-Wasilla natural gas pipeline that runs along Ayrshire Road and just north of Port MacKenzie Road. ARRC would have to ensure appropriate grade separations and employee-appropriate construction industry standards to minimize any potential to disrupt the provision of energy resources. Increases in energy consumption during proposed rail line construction would be negligible. Train operations would consume less than 0.5 percent of the annual statewide consumption of distillate fuel.

Cumulative impacts to energy resources would be limited to Port MacKenzie Rail Extension crossings of proposed transmission lines and pipelines. This would require coordination between ARRC and the proponents responsible for the other proposed projects to ensure appropriate planning for location of transmission pylons (for the Knik-Willow transmission line) and for grade separation between the Port MacKenzie Rail Extension and the Beluga-Fairbanks natural gas pipeline.

16.5.9 Transportation Safety and Delay

The proposed Port MacKenzie Rail Extension would have the potential to impact traffic safety and delay on the network of local, arterial, and collector roads that comprise much of the existing transportation system in the project area. Where new crossings along the proposed Port MacKenzie Rail Extension would be grade-separated, there would be no increase in the number of potential future train-vehicle accidents and no change in vehicle delay. Where crossings would not be grade-separated (at-grade crossings), there could be some accidents and an increase in vehicle delay.

There could be temporary vehicle delays during rail line construction at new at-grade crossings and where roads would be improved or relocated. Although rail line operations could affect delay at at-grade crossings, this impact would be minimal.

The proposed Port MacKenzie Rail Extension is expected to result in a small increase in future accident frequencies as a result of at-grade crossings. The proposed project should not result in a considerable increase in vehicle delay. There could be an increase in future accident frequency and vehicle delay from the proposed rail line when added to the Port MacKenzie development projects, the Knik Arm Crossing, the Cook Inlet Ferry, the West Mat-Su Access Project, and other road improvements.

16.5.10 Navigation

The proposed Port MacKenzie Rail Extension includes bridges and structures that would cross inland rivers and streams in the project area, which could have a negligible impact on navigation. Of the reasonably foreseeable future projects analyzed for cumulative impacts, only the West Mat-Su Access Project, which would include a new bridge across the Little Susitna River, could create the potential for cumulative impacts to navigation along this waterbody. Alternative access routes, including three potential bridge locations, are under consideration for the West Mat-Su Access project. The Willow, Houston North, and Houston South segments also include a bridge crossing of the Little Susitna River. Construction of any of these segments, combined with the West Mat-Su Access project, could result in cumulative impacts to navigation along the Little Susitna River due to the construction of bridges over this waterbody. However, the cumulative impacts to navigation would be negligible if the bridges are constructed with vertical and horizontal clearances equal or greater than those found in existing bridges on the waterway.

16.5.11 Land Use

The MSB, the State of Alaska, and private entities own most of the land the proposed rail line would directly affect. Impacts to land use from the proposed Port MacKenzie Rail Extension construction and operations would vary depending on alternative. Existing land uses within the ROW would be permanently changed, and any activities within the ROW not associated with the rail line would require an ARRC entry permit. In the area of the Big Lake Segment, the proposed rail line extension would require taking 17 residences and three structures. Two structures in the Connector 3 Segment ROW would be taken, and one structure in the Mac East Segment ROW would be taken.

Public lands in the project area are used primarily for recreation, hunting, and fishing. Figures 16-1 through16-3 show the recreational resources associated with the Port MacKenzie Rail Extension segments. Construction activities could temporarily impede access to trails and waterways, including the Iditarod National Historic Trail. Operations activities could impact the experience of users engaged in activities such as recreation, hunting, fishing and wildlife viewing. Officially recognized trails would be grade-separated or relocated, but ARRC does not propose to provide crossings for unofficial trails. Unofficial trails would be blocked, and ARRC's trespassing regulations would prohibit the public from crossing of the ROW without first obtaining approval from ARRC.

Mining and timber harvesting are also allowed by permit. Private lands in the project area are primarily in agricultural and residential use. Lands outside the ROW would maintain their existing ownership and uses, but landowners could change the way they use the land as allowed by MSB building or zoning rules. The proposed rail line includes two freight-only trains per day, with no passenger service or whistle stops. Except for the rail line and associated facilities within the ROW, the presence and operation of the rail line would not be likely to result in substantial changes in land use patterns in the project area.

Impacts of the proposed rail line could combine with the impacts of the Cook Inlet areawide oil and gas lease sale and the Knik Arm Crossing to produce potentially significant land-use changes; the rail line contribution to those cumulative impacts would be minimal. The Beluga to Fairbanks natural gas pipeline project could combine with the Port MacKenzie Rail Extension project resulting in cumulative impacts in the area of the Connector 1 Segment, Connector 3 Segment, and Mac West Segment, depending on pipeline and rail line route alternatives.

16.5.12 Socioeconomics

Potential socioeconomic impacts from the proposed Port MacKenzie Rail Extension could include a temporary increase in direct employment during construction. This temporary increase in direct employment could be complemented by additional indirect employment generated through suppliers and service providers and induced employment through multiple rounds of expenditures and consumption along production and consumption chains. The local labor force would partly meet the increased labor demand, and any increased pressures on housing and public services from the migration of laborers to the project area would be minor.

Cumulative impacts to socioeconomic resources would include increased demand for labor, which would likely lead to increased demand for local housing and public services to the extent that labor migrates to the MSB from outside the area. Labor for some of the construction projects might come from the Municipality of Anchorage and reside in that area, which would reduce pressure on the MSB housing market and public services from migration to the area. To the extent that some of the foreseeable projects would shorten the commute time between the MSB and Anchorage, there could be incentives for workers to permanently relocate to the MSB. However, because this permanent stimulus for relocation would occur only after construction works were completed, the MSB housing market and its public services would have time to adjust to expected increases in demand.

There could be long-term negative impacts to recreational activities because the proposed rail line would cross land used for recreational purposes. Crossings of officially recognized trails would be grade-separated or relocated. Recreation and tourism activities that use unofficial trails would be blocked by the rail line, but could possibly be diverted to nearby officially recognized trails. This could have a potentially adverse effect on economic activities directly or indirectly related to the use of such trails. Cumulative impacts to recreation activities are expected to be minor.

16.5.13 Environmental Justice

Because proposed Port MacKenzie Rail Extension construction and operations would not result in high and adverse impacts to human health or the environment, minority and low-income populations would not experience disproportionately high and adverse impacts.

Based on the analysis of cumulative impacts reported in Sections 16.4.1 through 16.4.12, impacts of the proposed Port MacKenzie Rail Extension, when added to the impacts of other past, present, or reasonably foreseeable future projects and actions, would not result in high and adverse cumulative impacts to human health or the environment. In the absence of high and adverse human health and environmental effects, even considering the impacts of other relevant projects, there would be no disproportionately high and adverse cumulative impacts to minority and low-income populations.

17. SHORT-TERM USE VERSUS LONG-TERM PRODUCTIVITY OF THE ENVIRONMENT

Proposed rail line construction and operations would require short-term uses of land and other resources. This chapter examines and compares the project's potential short-term uses of the environment to the maintenance and enhancement of long-term environmental productivity.

17.1 Applicable Regulations

The National Environmental Policy Act (NEPA) states in Section 102 (42 United States Code [U.S.C.] 4332) that all agencies of the Federal Government —

> *(C) include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on* --
>
> > *(iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity,…*

This portion of NEPA recognizes that short-term uses and long-term productivity of the environment are linked, and that opportunities acted upon have corollary opportunity costs in relation to foregone options and productivity that could have continuing effects well into the future. This chapter examines short-term uses and long-term productivity together, according to resource area. Chapters 3 through 16 describe specific impacts to resource areas.

17.2 Short-Term Uses and Long-Term Productivity

The relationship between short-term uses and long-term productivity would not be appreciably different from one alternative to another.

17.2.1 Land Use

Construction of the proposed rail line would convert undeveloped land and land used or planned for public recreation, wildlife habitat, low-density residential development, light industrial uses, agriculture, timber harvesting, and mining to freight rail operations. Productivity loss for soils would be limited to the areas disturbed by land clearing, grading, and construction. It is unlikely that the proposed rail line railbed would ever be returned to its current use and condition, so effects on soils and some land uses would be permanent. The Surface Transportation Board's Section of Environmental Analysis (SEA) estimates that about 2 acres of agricultural land could be directly affected. This minimal loss of agricultural land would not adversely affect long-term agricultural productivity.

Proposed rail line construction would likely alter recreational access due to closure of unofficial trails crossed by the proposed ROW; however, trail users could utilize other official trails in response to trail closings. ARRC does not propose to provide crossings for unofficial trails. Unofficial trails would be blocked and ARRC's trespassing regulations would prohibit the public from crossing of the ROW without first obtaining approval from ARRC. The rail line could alter access to and along public and navigable water bodies with access rights reserved through Alaska Statute 38.05.127 (as described in Title 11 Alaska Administration Code 51.045), which would result in a change to recreational access patterns to certain waters. Because access points are numerous, SEA anticipates that users would identify an alternative location for recreational access to navigable and public waters that is not affected by the proposed rail line. The rail line, grade embankment, and vegetation removal could affect wildlife movement. The embankment could affect the hydrological features of the landscape; however, the Alaska Railroad Corporation (ARRC) would design and construct the proposed rail line to maintain natural water flow and drainage patterns to the extent practicable to minimize long-term maintenance and provide for fish passage. Therefore, SEA would not expect use of sport fishing to decrease as a result of the project. New, 180-foot communication towers for rail line operation could alter the localized movement of recreational aircraft.

17.2.2 Water Resources

Construction of the proposed rail line would result in short-term disturbances to surface water and groundwater resources, and to floodplains. There would be minimal consumption of surface water and groundwater resources during the construction process. Wetlands and waters that would be filled would not recover in the short term, and long-term productivity related to those resources would be lost. The loss of functions and values (such as erosion and flood control, water-supply replenishment, water-quality protection, aquatic-habitat maintenance; and aesthetic appreciation and recreational opportunities) in filled wetlands would affect long-term productivity. Rail line construction and operations impacts to wetlands would vary by project alternative and could range from 188 acres to 478 acres. The intensity of potential impacts to wetlands would be a function of not only the portion of wetland filled but of the sensitivity and importance of the affected wetland and the value of the adjacent habitat the proposed rail line would fragment. Wetlands excavated for fill material would likely be converted to surface waters, but could eventually return to wetlands. Wetlands filled during construction would likely not return to wetlands without restoration efforts.

Potential long-term effects to productivity from the proposed rail line could result where the railbed or access roads would be near or adjacent to waterbodies. Spring ice break-up, snowmelt, and rainstorms could affect water quality through increased transport of fine-grained sediments; increased concentrations of pollutants that could alter waterbody chemistry and pH; and fugitive dust from rail operations and vehicle use of access roads. Bridges and culverts could change channel hydraulics and impact water quality due to increased sediment transport loads and increased sedimentation. Features of the proposed rail line would result in other minor impacts to surface waters and groundwater, as described in Chapter 4, Water Resources.

Proposed rail line construction and operations activities could result in long-term effects to groundwater movement through changes in infiltration and recharge rates due to compaction of the overlying soil. These effects would be limited to the footprints of the rail line, facilities, access roads, and staging areas.

The proposed project would include the construction of bridge abutments and, embankments within floodplains. These features would reduce the cross-sectional area available for flood storage and conveyance of flood flows, but the size of this area would be extremely small in relation to the overall floodplain area and would not affect long-term productivity of the area.

17.2.3 Biological Resources

Proposed rail line construction would result in some short- and long-term impacts to plant communities and fish and wildlife resources. Other than the Cook Inlet beluga whale, there are no Federal- or state-protected threatened, endangered, or candidate plant or animal species in the project area. There are no rare plants or vegetation communities of conservation concern in the project area.

During construction, vegetation would be removed within the 200-foot (ROW) and potential for some staging areas, and plant communities in those areas would be considerably altered. Vegetation loss would be short term in some areas and long term in others, depending on the type of vegetative cover. Natural recovery and assisted restoration of vegetation would take place in some areas in the project area after construction activities ceased. However, some vegetation, such as forests, would require from 70 to 200 years to regenerate, which would be considered a long-term habitat loss, even with restoration. Potential impacts along the longest potential route would include clearing of up to approximately 1,272 acres of vegetation within the ROW, of which approximately 941 acres is forest vegetation. The shortest possible route would involve approximately 930 acres of vegetation, of which approximately 678 acres is forest.

Rail line and facilities construction would result in short-term disturbance in Alaska Department of Fish and Game Game Management Subunits 14A and 14B. In general, construction-related impacts to wildlife would include habitat loss, alteration, and fragmentation; decrease in breeding success from exposure to construction noise and from increased human activity; and direct mortality from project construction. Specifically, habitat loss from project alternatives would result in reduced habitat for approximately five to seven moose, which would likely be of no consequence to the existing moose population, and therefore would not result in any long-term impacts to the moose population. Moose-train collisions from operations on the proposed rail line would kill an estimated average of three to four moose per year. When operation of increased train traffic on the ARRC main line as a result of the proposed project is also considered, the estimated total increase in moose-train collision mortality would be six to seven moose per year, on average (see Section 5.3).

There would be additional short-term disturbance and intentional harassment of wildlife like bears and moose by hazing for the protection of workers and equipment during construction. Impacts to habitat, including loss, alteration, and fragmentation, initiated with project construction would continue through project operations. Specific impacts to wildlife would include direct mortality from collisions with construction vehicles, trains, power lines, and communications towers. Proposed rail line construction would result in localized impacts to fish populations during the construction period.

Potential indirect rail line construction- and operations-related impacts to the endangered beluga whale would include impacts to fish forage resources due to rail line stream crossings and potential impacts to beluga whale presence in the waters off Port MacKenzie due to induced noise and disturbance from increased ship traffic. SEA has determined that with implementation of avoidance and minimization measures, rail line construction and operations *may affect, but is not likely to adversely affect* the Cook Inlet beluga whale (see Appendix H).

Primary direct effects to fisheries from rail line construction and operations would include increased erosion and sedimentation from removal of riparian vegetation, and loss or alteration of stream and riparian habitats due to placement of structures, alteration of stream and wetland hydrology, and blockage of movements. The extent of impacts would depend on the alternative and type of crossing.

17.2.4 Air Quality

Chapter 8, Climate and Air Quality, describes estimated emissions that would result from construction and operation of the proposed rail line. Estimated emission totals for volatile organic compounds, carbon monoxide, and particulate matter with an aerodynamic diameter equal to or less than 10 or 2.5 microns are well below the *de minimis* conformity thresholds of 100 tons per year for each pollutant. The estimated increases in emissions from rail line construction and operations would be minimal in the context of existing conditions and any potential impacts to climate and air quality would be low under any of the alternatives evaluated (see Chapter 8, Table 8-4). Over the long term, the project could have a beneficial effect on air quality to the extent that commodities from Interior Alaska that would be transported to Port MacKenzie over the proposed rail line would otherwise be transported to the Ports of Anchorage or Seward, emissions associated with rail line transport of those commodities would be reduced because of the shorter rail haul distance.

18. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

To facilitate comparison of project alternatives, the National Environmental Policy Act (NEPA) requires a consolidated discussion of environmental consequences to focus on any irreversible and irretrievable commitments of resources. This chapter describes the effects of the proposed rail line in relation to irreversible and irretrievable commitments of resources. Irreversible commitments of resources represents a loss of future options, and applies primarily to the use of nonrenewable resources, such as cultural resources or fossil fuels, and to resources renewable only over a long period. Irretrievable commitments of resources represents opportunities foregone for the period of the proposed action and relates to the use of renewable resources, such as timber or human effort, and to other utilization opportunities foregone in favor of the proposed action.

18.1 Applicable Regulations

NEPA Section 102 (42 United States Code 4332) and Council on Environmental Quality regulations (40 Code of Federal Regulations Part 1502.16) require that all agencies of the Federal Government—

> *(C) include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on --*
>
> > *(v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.*

18.2 Resource Commitments

Implementation of the proposed action would result in the commitment of natural and man-made resources for proposed rail line construction and operations. The primary commitment of resources would be from rail line construction, but there would be some commitment of resources during rail line operations. Sections 18.2.1 through 18.2.8 describe potential commitments of physical and human resources and commitments of resources for specific resource areas. The commitment of resources would be generally similar for all alternatives. This chapter does not address the No-Action Alternative because there would be no project-related irreversible and irretrievable commitment of resources under that alternative.

18.2.1 Construction Materials and Labor

If ARRC implemented the proposed action, large amounts of construction materials would be committed to the project. ARRC would need construction materials to build the track structure (using ballast, subballast fill material, rail ties, and steel rail), track sidings, power lines, buried communications cables, embankments, access roads, grade-separated crossings, rail bridges and culverts, a terminal reserve area (consisting of yard sidings, storage areas, and a terminal building to support train maintenance), and communications towers.

Human effort would be irretrievably committed during the project planning, construction, and operations phases. The commitment of time and available labor to construct the proposed rail line would represent an irretrievable commitment of resources.

18.2.2 Physical Setting

Construction of the proposed rail line would lead to permanent alterations in topography of the relatively flat terrain in the Susitna Lowland, but grading and filling could be reversed in the unlikely event that the rail line was abandoned. Because outcroppings of bedrock are rare or absent throughout the study area and ARRC does not anticipate encountering bedrock in cuts required for the construction of railroad embankment or access road, there should be no irreversible changes to bedrock. All rock used as ballast and subballast during rail line construction would be obtained from the quarry in Curry, Alaska, or existing commercial quarries. Construction activities would irretrievably affect soils classified as unsuitable for construction and that need to be removed and replaced with imported, well-draining soils not susceptible to frost. Large cut slopes for construction would have a high potential for erosion, but a long-term impact would be preventable so long as the erodible soils were revegetated and stabilized following construction.

18.2.3 Groundwater

Rail line construction and operations activities could affect groundwater movement through irreversible changes in infiltration and recharge rates due to compaction of the overlying soil; permanent rail line maintenance structures would negligibly affect groundwater infiltration. These effects would be limited to the footprints of the proposed rail line, facilities, access roads, and staging areas. Proposed rail line operations could also affect groundwater quality if project components and operations activities provided additional pollutant sources or pollutant pathways to groundwater. During construction and operations of borrow areas, there could be dewatering of aquifers or reservoirs of local, shallow, thawed, water-bearing zones, resulting in an irreversible change in aquifer and reservoir water levels. Excavation of borrow areas could also affect the local hydrogeologic regime (and water balance) through the removal of saturated materials, but excavated borrow areas would likely fill with groundwater over time.

18.2.4 Biological Resources

The land the proposed rail line, permanent rail line associated facilities, and access roads would occupy would be irreversibly removed from natural habitat for the life of the proposed project. In addition, disturbance of areas for temporary construction activities could result in changes that would be irreversible over the long term. The permanent conversion of vegetation resources and wildlife habitat along the rail line and at associated facilities could represent an irreversible commitment of biological resources for the life of the proposed project and beyond if areas were not restored if rail line abandonment occurred, or if former vegetation cover and composition did not recover. Losses of wildlife during rail line construction and operations would represent an irretrievable commitment of biological resources. Potential impacts to wetlands and riparian habitats from rail line construction would represent an irreversible rather than irretrievable commitment of resources if these resources were not restored following abandonment.

Potential indirect impacts to the endangered Cook Inlet beluga whale from increased noise and disturbance from an increase in ship traffic could represent an irretrievable impact because ship traffic to Port MacKenzie would decline if the rail line abandonment occurred. Potential impacts to beluga whale fish forage resources due to rail line stream crossings would be minimized and mitigated through consultation with the National Marine Fisheries Service. Therefore, the Section of Environmental Analysis (SEA) anticipates that the project would not result in material changes to anadromous fish runs that support beluga whales. With implementation of impact avoidance and minimization measures, SEA has determined that the proposed rail line *may affect, but is not likely to adversely affect* the Cook Inlet beluga whales (see Appendix H).

18.2.5 Cultural Resources

Cultural resources (archaeological sites, historic trails, structures and sites, cultural landscapes, and traditional cultural properties) are nonrenewable resources, and any loss of such resources would be irreversible.

If the Board authorized construction and operation of the proposed rail line, and cultural resources in the Area of Potential Effects were found to meet National Register of Historic Places inclusion criteria, compliance with Section 106 regulations would also include an application of the criteria of adverse effect (36 CFR 800.5). Consultations with 10 federally recognized Native American tribes, tribal groups, and Alaska Native Regional Corporations in the vicinity of the proposed rail line are underway to evaluate potential cultural resources to determine their eligibility for inclusion on the National Register of Historic Places, to assess potential effects to eligible cultural resources from the proposed rail line, and to minimize impacts to cultural resources in the Area of Potential Effects. The rail line alternatives could intersect and affect historic trails, known cultural resources within the ROW, and additional known cultural resources within 1 mile of the ROW centerline. Depending on alternative, the proposed rail line would impact a maximum of 51 and a minimum of 20 known cultural resources.

18.2.6 Land Use and Ownership

Proposed rail line construction and operations would require commitment of land for the rail line, associated facilities, and access roads. Depending on alternative, the proposed project would impact an estimated minimum of about 990 acres and an estimated maximum of about 1,322 acres of public and private land within the 200-foot ROW. These lands would be utilized for the 200-foot rail ROW, associated facilities, and staging areas. Land owners in the study area include the State of Alaska, the Federal Government, Matanuska-Susitna Borough, the Alaska Mental Health Trust, the University of Alaska, private citizens, and Native Alaskans/Native Alaskan Corporations. Table 18-1 identifies, by land owner, the maximum amount of acreage within the 200-foot ROW the proposed rail line could affect.

If, at a future date, ARRC were to abandon the rail line, much of the construction material could be removed; however, it is not likely that all of the natural landscape would be restored, and some of the changes would remain irreversible. If abandonment occurred, any land for which ARRC obtained a lease would presumably revert back to management by the lessor listed in Table 18-1. If purchased, land would likely remain in ARRC's possession. If ARRC operated

Table 18-1
Maximum Acreage of Affected Land within the 200-Foot Right-of-Way by Ownership

Land Owner	Acreage
Matanuska-Susitna Borough	563
Private	405
State of Alaska	277
Other Public[a]	49
Mental Health Trust Authority	238
Native Corporation	158
Public University	44

[a] Includes public roads, city land, and land for which there are no data but assumed to be public.

on any land by easement, SEA assumes that these easements would be extinguished upon rail line abandonment.

Loss of recreational land uses would be irretrievable, including an irretrievable loss of connectivity of unofficial trails, for which ARRC does not propose to provide grade-separated crossings. Mining land use within the ROW would be lost to use as a rail corridor; however, the potential impact to resource extraction would depend on the resource extraction technique and the vertical location of the resource. The Mac East Segment, Connector 3 Segment, and the Big Lake Segment would cross residential or nonresidential areas with structures and would result in impacts to those areas and structures.

18.2.7 Energy Resources

All rail line construction activities would consume fuel, mostly in the form of diesel. This would be an irreversible use of nonrenewable fossil fuels. Train operations on the proposed rail line would also require an irreversible commitment of fuel resources. To the extent that any bio-fuels would be used, that would be an irretrievable use of resources. SEA estimated fuel usage for train operations for the longest alternative assuming one round-trip (two, one-way trips) freight rail train per day with three locomotives and 80 rail cars, with a loaded weight of 125 tons per car and unloaded weight of 30 tons per car. Using these conservative assumptions, the projected annual fuel consumption for round-trip operation of a train on the proposed rail line would be less than 215,000 gallons (see Chapter 10).

18.2.8 Financial Resources

The commitment of financial resources would differ slightly depending on the alternative selected if the STB authorizes construction and operation. The estimated cost to construct the approximately 45-mile-long proposed rail line ranges from $199.1 million to $286.6 million.

19. MITIGATION

This chapter describes mitigation measures that, if imposed in any Surface Transportation Board's (STB or the Board) decision granting the Alaska Railroad Corporation (ARRC or the Applicant) the authority to construct and operate the proposed rail line, would avoid, minimize, or compensate for potential adverse environmental impacts. For each resource area, ARRC has proposed voluntary mitigation measures, which include regulatory-related requirements and associated best management practices. In addition, the STB's Section of Environmental Analysis (SEA) has recommended additional preliminary mitigation measures.

19.1 Overview of SEA's Approach to Recommended Mitigation

In conducting the environmental review process, SEA has taken the "hard look" at the environmental consequences of the proposed Port MacKenzie Rail Extension, as required by the National Environmental Policy Act (NEPA). SEA's review included both construction of the proposed rail line and associated facilities, and rail line operations over the proposed rail extension. In its environmental review, SEA conducted a thorough and comprehensive analysis of the potential environmental effects associated with the proposed action alternatives. Chapter 1 and Appendices A and B provide information on SEA's agency consultation activities.

19.1.1 Limits of the Board's Conditioning Power

The Board has authority to impose conditions to mitigate potential environmental impacts. Any conditions the Board imposes must relate directly to the transaction before it, must be reasonable, and must be supported by the record before the Board. Thus, the Board's practice consistently has been to mitigate only those impacts that result directly from the proposed action. The Board typically does not require mitigation for pre-existing environmental conditions, such as the effects of existing rail operations.

SEA notes, however, that the Council on Environmental Quality (CEQ), which oversees the implementation of NEPA, has stated in *Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations* (46 *Federal Register* [*FR*] 18026, March 23, 1981) that:

> All relevant, reasonable mitigation measures that could improve the project are to be identified, even if they are outside the jurisdiction of the lead agency or the cooperating agencies, and thus would not be committed as part of the RODs [Records of Decision] of these agencies. Sections 1502.16(h), 1505.2(c). This will serve to…alert agencies or officials who can implement these extra measures, and will encourage them to do so. Because this EIS [Environmental Impact Statement] is the most comprehensive environmental document, it is an ideal vehicle in which to lay out not only the full range of environmental impacts but also the full spectrum of appropriate mitigation.

Agencies participating as cooperating agencies may issue individual decisions concerning the proposed Port MacKenzie rail extension and intend to use information in this EIS for decisionmaking purposes. They could require additional mitigation measures in their RODs and permits.

19.1.2 Voluntary Mitigation and Negotiated Agreements

SEA encourages applicants to propose voluntary mitigation. In some situations, voluntary mitigation might replace mitigation measures the STB might otherwise impose, or it could supplement mitigation the STB might impose. Because applicants gain a substantial amount of knowledge about the issues associated with a proposed right-of-way during project planning, and because they consult with regulatory agencies during the permitting process, they are often in a position to offer relevant voluntary mitigation.

Since the announcement of the proposed Port MacKenzie Rail Extension, the Applicant has been working with local communities and interested agencies to learn about concerns they have about the project. Based on those consultations, the Applicant has worked with a team of technical specialists from various disciplines to develop voluntary mitigation measures in an effort to address many of the concerns that have been raised. The Applicant included many of its proposed voluntary mitigation measures in the Preliminary Environmental and Alternatives Report (ARRC, 2007).

As an alternative to mitigation measures that the Board could unilaterally impose on applicants (notwithstanding mitigation required by other regulatory agencies that may have jurisdiction over potentially affected resources), SEA encourages applicants to negotiate mutually acceptable agreements with affected communities and other government entities to address potential environmental impacts, if appropriate. Negotiated agreements could be with neighborhoods, communities, counties, cities, regional coalitions, states, and other entities. If applicants submit to the Board any negotiated agreements with communities or other entities, the Board would require compliance with the terms of any such agreements as environmental conditions in any final decision authorizing the proposed action or alternatives. These negotiated agreements would supersede any environmental conditions for that particular community or other entity that the Board might otherwise impose.

19.1.3 Preliminary Nature of Mitigation

SEA's preliminary mitigation measures are based on the information available to date, consultations with appropriate agencies, and the environmental analysis presented in this document. These preliminary mitigation measures could be imposed by the Board in addition to ARRC's voluntary mitigation measures.

SEA emphasizes that the identified mitigation measures are preliminary and invites public and agency comments on these proposed mitigation measures. For SEA to assess the comments effectively, it is critical that the public be specific regarding any desired mitigation and the reasons why the suggested mitigation would be appropriate.

SEA will make its final recommendations on mitigation to the Board in the Final EIS after considering all public comments on the Draft EIS. SEA intends to include all of the voluntary mitigation measures submitted by the Applicant in its recommendations to the Board. The Board will then make its final decision regarding this project and any conditions it might impose. In making its decision, the Board will consider the Draft EIS, the Final EIS, public comments, and SEA's final mitigation recommendations.

19.2 Mitigation Measures

For the environmental resource areas discussed in the Draft EIS, if SEA concluded that the impacts would be negligible, no mitigation would be warranted. For this reason, this section does not discuss energy, subsistence, socioeconomics, and environmental justice. The following discussion does not address the No-Action Alternative, because that alternative would result in no change in impacts from those already occurring.

Much of the mitigation that follows is technical in nature. To assist readers, SEA has defined some terms used in the mitigation measures in the Glossary that follows Chapter 22.

19.2.1 Topography, Geology, and Soils

19.2.1.1 Applicant's Voluntary Mitigation Measures

The Applicant voluntarily proposed the following measures for mitigating potential project-related impacts to topography, geology, and soils:

VM-1 The Applicant shall design project-related rail line and associated facilities in accordance with engineering criteria related to permafrost, seismic events, and other geologic hazards to comply with applicable design codes. For example, the Applicant shall design the project in accordance with the latest applicable seismic codes taking into account the region's potential for earthquake activity, to mitigate potential damage to bridges and tracks.

19.2.1.2 SEA's Preliminary Mitigation Measures

SEA did not identify preliminary mitigation measures for potential project-related impacts to topography, geology, and soils.

19.2.2 Water Resources

19.2.2.1 Applicant's Voluntary Mitigation Measures

The Applicant voluntarily proposed the following measures for mitigating potential project-related impacts to water resources:

VM-2 The Applicant shall be subject to U.S. Environmental Protection Agency and Alaska Department of Environmental Conservation jurisdiction under the National Pollutant Discharge Elimination System (NPDES) for storm water discharges resulting from project-related construction activities. Requirements that are commonly part of a Stormwater Pollution Prevention Plan associated with a NPDES Stormwater Construction Permit include the following:

- Ground disturbance shall be limited to only the areas necessary for project-related construction activities.

- During earthmoving activities, topsoil shall be reused wherever practicable and stockpiled for later application during reclamation of disturbed areas.
- Appropriate erosion control measures shall be employed to minimize the potential for erosion of soil stockpiles until they are removed and the area is restored.
- Disturbed areas shall be restored as soon as practicable after construction ends along a particular stretch of rail line, and the goal of restoration shall be the rapid and permanent reestablishment of native ground cover on disturbed areas to prevent soil erosion.
- The bottom and sides of drainage ditches shall be revegetated using natural recruitment from the native seed sources in the stockpiled topsoil or a seed mix free of invasive plant species.
- If weather or season precludes the prompt reestablishment of vegetation, temporary erosion control measures shall be implemented.

VM-3 The Applicant shall obtain Federal permits required by Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act, from the U.S. Army Corps of Engineers prior to initiation of project-related construction activities in wetlands and waterbodies. The Applicant also agrees to obtain necessary state permits and authorizations (e.g., Alaska Department of Fish and Game Fish Habitat Permit, Alaska Department of Natural Resources Land Use Permit, and an Alaska Department of Environmental Conservation Section 401 water quality certification). The Applicant shall incorporate stipulations into construction contract specifications.

VM-4 The Applicant shall avoid and minimize impacts to waters of the U.S., including wetlands, to the extent practicable. The Applicant shall provide compensatory mitigation for unavoidable impacts to wetlands as part of the U.S. Army Corps of Engineers Section 404 permit, to the extent practicable in accordance with the reasonable requirements of the Clean Water Act.

VM-5 The Applicant shall design and construct the proposed rail line in such a way as to maintain natural water flow and drainage patterns to the extent practicable. This shall include installing bridges or placing equalization culverts through the embankment as necessary, preventing impoundment of water or excessive drainage, and maintaining the connectivity of floodplains and wetlands.

VM-6 The Applicant shall disturb the smallest area practicable around any streams and, as soon as practicable following project-related construction activities, revegetate disturbed areas using native vegetation.

VM-7 The Applicant shall minimize the number of temporary stream crossings constructed to provide access for contractors, work crews, and heavy equipment to the extent practicable. Where needed, temporary structures shall be placed to avoid overly constricting active channels and shall be removed as soon as practicable after the crossing is no longer needed.

VM-8 The Applicant shall coordinate with the Matanuska Susitna Borough (MSB) Floodplain Administrator to ensure that new project-related stream and floodplain crossings are appropriately designed. For crossings within the mapped 100-year floodplain, drainage crossing structures shall be designed to pass a 100-year flood.

VM-9 The Applicant shall evaluate project-related construction water needs in relation to stream flow rates and groundwater recharge rates, as appropriate, and shall and minimize effects on surface water and groundwater. Water withdrawals shall be subject to prior written approval by the Alaska Department of Natural Resources Division of Mining, Land and Water, and also from the Alaska Department of Fish and Game Division of Habitat for withdrawals from fish-bearing waters.

VM-10 For all project-related crossings of fish-bearing waters that incorporate bridges or culverts, the Applicant shall design, construct, and maintain the conveyance structures in accordance with the National Marine Fisheries Service 2008 publication, "Anadromous Salmonid Passage Facility Design" [National Marine Fisheries Service. 2008. Anadromous Salmonid Passage Facility Design. NMFS, Northwest Region, Portland, Oregon] or equivalent and reasonable requirements.

VM-11 The Applicant shall time project-related construction in anadromous streams to minimize adverse effects to salmon during critical life stages when practicable. The Applicant shall incorporate timing windows [i.e., those time periods when salmon are least vulnerable to disturbances], as specified by the Alaska Department of Fish and Game Division of Habitat, into construction contract specifications for instream work. The Applicant shall design and construct stream crossings so as not to impede fish passage or impair the hydrologic functioning of the waterbody.

VM-12 When project-related activities, such as culvert and bridge construction, require work in streambeds, the Applicant shall conduct activities, to the extent practicable, during either summer or winter low-flow conditions.

19.2.2.2 SEA's Preliminary Mitigation Measures

SEA recommends the following additional preliminary measures as mitigation for potential project-related impacts to water resources:

1) The Applicant shall design, construct, and operate the rail line and associated facilities, including bridge abutments, to maintain existing water patterns and flow conditions and provide long-term hydrologic stability by conforming to natural stream gradients and stream channel alignment and avoiding altered subsurface flow, to the extent practicable. Project-related supporting structures (e.g., bridge piers) shall be designed to minimize scour and increased flow velocity, to the extent practicable.

2) Prior to project-related construction, the Applicant shall complete jurisdictional delineations of wetlands and other surface waters that are subject to Section 404 of the Clean Water Act for all associated facilities proposed outside of the right-of-way.

3) The Applicant shall implement all reasonable best management practices imposed by the U.S. Army Corps of Engineers' (USACE) under Section 404 of the Clean Water Act to minimize project-related impacts to waters of the U.S., including wetlands. Standard best management practices are specified in the USACE Alaska District's Nationwide Permits

General Best Management Practice Guide (U.S. Army Corps of Engineers, 2007. “Nationwide Permits: General Best Management Practice.” Alaska District, Regulatory Program. Online at: http://www.poa.usace.army.mil/reg/NWPs.htm) and could include the following:

- Containing sediment and turbidity at the work site by installing diversion or containment structures.
- Disposing of dredge spoils or unusable excavated material not used as backfill at upland disposal sites in a manner that minimizes impacts to wetlands.
- Revegetating wetlands as soon as possible, preferably in the same growing season, by systematically removing vegetation, storing it in a manner to retain viability, and replacing it after construction to restore the site.
- Using fill materials that are free from fine material.
- Stockpiling topsoil and organic surface material, such as root mats, separately from overburden and shall return it to the surface of the restored site.
- Dispersing the load of heavy equipment such that the bearing strength of the soil (the maximum load the soil can sustain) would not be exceeded. Suitable methods could include, but are not limited to, working in frozen or dry ground conditions, employing mats when working in wetlands or mudflats, and using tracked rather than wheeled vehicles.
- Using techniques such as brush layering, brush mattressing, live siltation (a revegetation technique used to trap sediment), jute matting and coir logs to stabilize soil and reestablish native vegetation.

4) Prior to initiating project-related construction activities, the Applicant shall mark stream channels and existing culvert locations in the project construction area before snowfall obscures their location to avoid damage to these areas.

5) During project-related design, the Applicant shall align road and track crossings of water bodies perpendicular or near perpendicular to waterbodies, where practicable, to minimize crossing length and potential bank disturbance.

6) During project-related construction, the Applicant shall remove all project-related construction debris (including construction materials, soil, or woody debris) from water bodies, including wetlands, as soon as practicable during the open-water period, or prior to break-up for debris on top of or within ice or snow crossings.

7) The Applicant shall construct project-related water crossings in a manner that minimizes disturbances to streambeds, streambanks, and flow. Measures to meet these goals could include installing bridge piers during the winter, and initially constructing permanent project-related crossing structures, when practicable, to avoid the need to construct both temporary and permanent crossing structures.

8) During project-related construction, the Applicant shall perform all off-road travel and clearing in a manner that maintains existing surface and subsurface hydrology and water quality, to the extent practicable. Except for off-road travel approved by the land owner, project-related construction activities beyond the 200-foot right-of-way (ROW) shall be supported only by ice roads, winter trails, existing or temporary roads, or air or boat service. Project-related wintertime off-road travel beyond the ROW shall be limited to areas where snow and ice depth are sufficient to protect the ground surface and vegetation. Summertime off-road travel beyond the ROW shall occur only if it can be accomplished without damaging vegetation or the ground surface, including streambanks that may be crossed.

9) The Applicant shall design, construct, and use project-related winter roads to avoid degradation of water quality and to protect the roadbed from significant rutting, ground disturbance, or thermal erosion of permafrost areas. Where feasible and prudent, if the surface organic mat is removed or excessively reduced over thaw-unstable permafrost terrain, that area shall be stabilized by re-covering it with insulating material, revegetating, or installing water-bars as soon as practicable. Soil cuts or fills located in thaw-unstable permafrost terrain shall be avoided to the extent practicable. All cuts shall promptly be stabilized.

10) The Applicant shall not mine gravel required for project-related construction within the limits of ordinary high water of waterbodies unless otherwise authorized by the Alaska Department of Natural Resources (ADNR), Division of Mining, Land, and Water. The Applicant also shall consult with the Alaska Department of Fish and Game (ADF&G) and the U.S. Army Corps of Engineers (USACE) prior to conducting these activities. Mine-site development and restoration within the limits of ordinary high water of waterbodies shall be performed in accordance with the reasonable requirements of ADNR, ADF&G, and USACE.

11) The Applicant shall abandon project-related geotechnical boreholes in compliance with the reasonable requirements of Alaska Department of Environmental Conservation 18 Alaska Administrative Code 80.015(e), Well protection, source water protection, and well decommissioning.

12) The Applicant shall follow all applicable Federal regulations and standard protocols for transporting hazardous substances and other deleterious compounds to minimize the potential for a spill occurrence.

13) Prior to construction, the Applicant shall consult with the Alaska Department of Environmental Conservation or other regulatory agencies to determine appropriate regulations and associated requirements for project-related tank storage facilities. At a minimum, the Applicant shall place tank storage facilities as far as practicable from streams or rivers, and implement secondary containment measures (e.g., use of lined and bermed pits).

14) The Applicant shall direct the operators of project-related vehicles to not drive in or cross streams other than at crossing points determined by the Alaska Department of Environmental Conservation and U.S. Army Corps of Engineers.

15) During project-related construction, the Applicant shall minimize to the extent practicable, the duration and extent of activity at temporary construction facilities, such as staging areas, and provide surface treatments to minimize soil compaction (e.g., scarify compacted soils during reclamation to promote infiltration) and promote vegetation regrowth after the facilities are no longer needed to support construction.

16) The Applicant shall ensure that all project-related culverts and bridges are sufficiently clear of debris to avoid stream-flow alteration and increased flooding. The Applicant shall inspect all drainages, bridges, and culverts semi-annually (or more frequently, as seasonal flows dictate) for debris accumulation and remove and properly dispose of debris promptly.

17) During final design of the project, the Applicant shall conduct all siting, design, and development of the rail line and associated facilities according to the reasonable requirements within the jurisdiction of the Alaska Department of Natural Resources and the Alaska Department of Fish and Game.

18) If the Surface Transportation Board authorizes the Big Lake Segment, the Applicant shall mitigate impacts to the Su-Knik Mitigation Bank in accordance with the reasonable requirements of the U.S. Army Corps of Engineers and other appropriate authorizing agencies.

19) The Applicant shall use contaminant-free embankment and surface materials in project-related construction.

20) The Applicant shall return all project-related stream crossing points to their preconstruction contours to the extent practicable.

21) During construction, the Applicant shall prohibit project-related construction vehicles from driving in or crossing streams at other than established crossing points.

22) During construction, the Applicant shall use temporary barricades, fencing, and/or flagging in sensitive habitats to contain project-related impacts to the construction area. The Applicant shall locate staging areas in previously disturbed sites to the extent practicable and not in sensitive habitat areas.

19.2.3 Biological Resources

19.2.3.1 Applicant's Voluntary Mitigation Measures

The Applicant proposed the following measures for mitigating potential project-related impacts to biological resources:

VM-13 The Applicant shall restrict its project-related workers from (1) hunting or fishing while stationed at work camps; (2) harassing wildlife, including winter or calving concentrations of moose (cows with yearling calves can be particularly defensive); (3) approaching known occupied bear dens; and (4) feeding wildlife.

VM-14 The Applicant shall obtain project-related state permits and authorizations, including the Alaska Department of Fish and Game Fish Habitat Permit.

VM-15 The Applicant shall implement Essential Fish Habitat (EFH) conservation measures as agreed upon with the National Marine Fisheries Service during the EFH consultation process for this project.

VM-16 The Applicant shall clear vegetation in preparation for project-related construction before or after the typical migratory bird nesting season as identified by the U.S. Fish and Wildlife Service (USFWS)(typically May 1 to July 15), to the extent possible to ensure compliance with the Migratory Bird Treaty Act. If clearing is required during the nesting season, the Applicant shall conduct a nest survey and consult with the USFWS, prior to clearing the vegetation, to identify additional appropriate compliance measures.

VM-17 During the bald eagle nesting season (typically March through August), the Applicant and its contractor(s) shall use their best efforts to avoid bald eagle disturbance during project-related construction. Nests shall be protected in accordance with U.S. Fish and Wildlife Service guidelines.

VM-18 Subject to consultation with the Alaska Department of Fish and Game and Alaska Department of Natural Resources, the Applicant shall work with adjacent land managers to develop alternative preferred habitat away from the proposed rail line and construct a widened embankment to allow moose a place to retreat on one side when a train passes in an effort to reduce the potential for moose strikes.

VM-19 The Applicant shall use appropriate methods to handle, store, and dispose of waste generated during project-related construction activities. Food and garbage shall be secured and disposed in a manner to prevent bears from gaining access to such materials and in accordance with applicable and reasonable Federal, state, and local regulations.

19.2.3.2 SEA's Preliminary Mitigation Measures

SEA recommends the following additional preliminary measures as mitigation for potential project-related impacts to biological resources:

23) In consultation with appropriate agencies, including the U.S. Fish and Wildlife Service (USFWS) and the Alaska Department of Fish and Game (ADF&G), the Applicant shall locate project-related associated facilities to minimize the size and degree of impacts to highly sensitive habitat areas (as defined by the USFWS and the ADF&G). Off-ROW areas shall be restored in accordance with a reclamation plan developed in cooperation with USFWS, ADF&G, or other appropriate agency staff.

24) During project-related construction, the Applicant shall not clear riparian vegetation within 100 feet of fish-bearing water bodies and 50 feet of non-fish-bearing water bodies and emergent wetlands, unless approved by the Alaska Department of Natural Resources.

25) Prior to the project's final design, the Applicant shall consult with the U.S. Fish and Wildlife Service (USFWS), the U.S. Army Corps of Engineers (USACE), and the Alaska Department of Fish and Game (ADF&G) on the precise locations of any highly sensitive habitat areas (as defined by the USFWS and the ADF&G) within the project area. Consistent with the standards of those agencies, highly sensitive habitat areas could include high-functioning wetland communities, fens, late-succession forests, and areas that have moderate to high densities of fine-grained permafrost soils, especially if the permafrost area is adjacent to or near a waterbody. Where practicable, the Applicant shall avoid the destruction or fragmentation of highly sensitive habitat areas, if they are encountered during surveying and preconstruction activities, through refinements in the project's final design.

26) To reduce potential collision and electrocution impacts to birds resulting from project-related power lines and communication towers, the Applicant shall:

- Consult with the U.S. Fish and Wildlife Service for current guidelines on tower siting, marking, and guy lines.
- Incorporate standard, raptor-proof designs, as outlined in "Suggested Practice for Avian Protection on Power Lines: The State of the Art in 2006" (Avian Power Line Interaction Committee. 2006. Edison Electric Institute, APLIC, and the California Energy Commission. Washington, DC, and Sacramento, CA. Online at http://www.aplic.org/), into the design of electrical distribution lines in areas of identified bird concerns to avoid electrocution of eagles, owls, and other smaller raptors, including:
  - Use of marking techniques such as balls or flappers to increase transmission line visibility, especially in areas where sandhill cranes and bald eagles are likely to roost, forage, or nest.
  - Maintain a minimum 60-inch separation between conductors and/or grounded hardware and potentially use insulation materials and other applicable measures, depending on line configuration.
  - Incorporate standard raptor-proof designs (as outlined in "Avian Protection Plan Guidelines." Avian Power Line Interaction Committee and U.S. Fish and Wildlife Service. 2005. Online at http://www.aplic.org) into the design of the electrical distribution lines to reduce bird collisions.

27) To the extent practicable, the Applicant shall minimize the project-related ground disturbance, clearing of established vegetation, removal of wildlife habitats and riparian vegetation. The Applicant shall also minimize the re-establishment of vegetation near the railbed that would be attractive to moose.

28) The Applicant shall implement standard best management practices to minimize impacts to vegetation during project-related forest clearing, including:

- Minimizing construction vehicle traffic in areas where excessive soil compaction and rutting would cause erosion
- Using low ground pressure construction vehicles to minimize disruption to soil

29) Prior to project-related construction, the Applicant shall consult with the Alaska Department of Natural Resources to develop mitigation to address the spread and control of nonnative invasive plants (NIPs). The mitigation shall include developing and implementing a monitoring and control plan for NIPs during project-related rail line construction and operations. In addition to specifying that only seed mixes containing native or non-sustaining seed (such as annual rye) that are free of invasive plant species be used, this plan could include:

- Developing and implementing aggressive management programs to limit colonization by invasive plant species and eradicate any invasive species within the rail line right-of-way and support facilities
- Requiring pressure washing of the wheels, tracks, undercarriages, buckets, etc., of all equipment at staging areas before they are allowed into the construction area
- Implementing procedures to prevent, control, and monitor any NIPs that might germinate as a result of a spill of grain or animal feeds (e.g., hay, pellets) during rail line operations
- Minimizing contact with roadside sources of weed seed that could be transported to other areas
- Using only certified weed-free straw and mulch for erosion
- Ensuring that adequate topsoil depth (minimum 4 inches) and textures are in place and promptly reseeding or revegetating using only plant species native to Southcentral Alaska
- Using only seed meeting certified standards pursuant to 11 Alaska Administrative Code 34.075, Prohibited Acts

30) Unless otherwise approved by the Alaska Department of Fish and Game, project-related detonation of explosives within, beneath, or in proximity to fish-bearing waters shall not result in overpressures exceeding 2.7 pounds per square inch unless the water body, including its substrate, is frozen solid. Peak particle velocity stemming from explosive detonation shall not exceed 0.5 inch per second during the early stages of egg incubation.

31) The Applicant shall comply with the reasonable requirements of Alaska Statute (AS) 16.05.841, Fishway Required, and AS 16.05.871, Protection of Fish and Game, regarding project-related winter ice bridge crossings and summer ford crossings of all anadromous and resident fish streams. If necessary, natural ice thickness could be augmented (through removing snow, adding ice or water, or other technique) if site-specific conditions, including water depth, are sufficient to protect fish habitat and maintain fish passage.

32) The Applicant shall not narrow an anadromous water body between its mean high water lines for the project, unless authorized in writing by the Alaska Department of Fish and Game (ADF&G) prior to project-related construction, thereby enabling ADF&G to apply reasonable design criteria or requirements.

33) The Applicant, in consultation with the Alaska Department of Fish and Game (ADF&G) and the Alaska Department of Natural Resources, shall evaluate, implement, and monitor various aspects of project-related rail design, maintenance, and operations to document moose mortality from collisions with trains, and to develop a strategy to reduce the moose-train collision mortality rate. The strategy could include:

- Maintaining vegetation along the right-of-way (ROW) in primary (e.g., grasses/sedges) or late (e.g., old-growth spruce) successional stages. If vegetation is allowed to progress to the secondary successional stage (i.e., shrubs), maintaining it at the shortest possible height, not to exceed 0.5 meter, encouraging shrubs of non-preferred moose browse species (e.g., alder, dwarf birch), and minimizing re-growth of willow, paper birch, and aspen.
- Mowing vegetation in late summer before energy stores are transferred to the roots.
- In winter, plowing snow back from the track to the outer edge of the trackside clearing to allow moose easy access away from the tracks when a train approaches.
- Not seeding grasses after approximately July 15, because fresh green growth has been noted to attract moose to ROWs during early fall, resulting in high rates of moose/train collisions.
- Developing a plan in conjunction with the ADF&G to catalog all strikes (not just confirmed or suspected deaths) in a timely manner that shall include, but is not necessarily limited to: precise location (latitude and longitude), date and time; weather and other environmental conditions at the time and location of strike; and attributes associated with the train, such as horn use, speed, and track characteristics.
- Designing, constructing, and operating all aspects of the rail line to minimize significant alteration of moose and other wildlife movement and migration patterns.

34) The Applicant shall prepare and implement a bear interaction plan to minimize conflicts between bears and humans. In consultation with the Alaska Department of Fish and Game, the Applicant shall develop appropriate educational programs and management plans when project-related construction and operations plans are being prepared.

35) The Applicant shall not conduct project-related construction and land clearing activities within 0.5 mile of known occupied bear dens, unless alternative mitigation measures are approved by the Alaska Department of Fish and Game (ADF&G). The Applicant shall obtain a list of known den sites from the ADF&G Division of Wildlife Conservation prior to commencement of any project-related activities and shall report occupied dens encountered.

36) Prior to initiating project-related construction activities, the Applicant shall consult with the local offices of the Natural Resource Conservation Service and the Palmer Plant Center

to develop an appropriate plan for restoration and revegetation of disturbed areas (including appropriate seed mix specifications). This would apply to areas that cannot be revegetated using natural recruitment from the native seed sources in the stockpiled topsoil.

19.2.4 Cultural Resources

19.2.4.1 Applicant's Voluntary Mitigation Measures

The Applicant voluntarily proposed the following measures for mitigating potential project-related impacts to cultural resources:

VM-20 The Applicant shall develop protocols to inform and prepare project-related construction supervisors of the importance of protecting archaeological resources, graves, and other cultural resources and how to recognize and treat the resources.

VM-21 The Applicant shall comply with the Programmatic Agreement developed through the Section 106 process under the National Historic Preservation Act.

19.2.4.2 SEA's Preliminary Mitigation Measures

SEA did not identify additional preliminary measure as potential mitigation for project-related impacts to cultural resources.

19.2.5 Climate and Air Quality

19.2.5.1 Applicant's Voluntary Mitigation Measures

The Applicant voluntarily proposed the following measures for mitigating potential project-related impacts to climate and air quality:

VM-22 To minimize fugitive dust emissions created during project-related construction activities, the Applicant shall implement appropriate fugitive dust suppression controls, such as spraying water or other established measures. The Applicant shall also operate water trucks on haul roads as necessary to reduce dust.

VM-23 To limit project-related construction emissions, the Applicant shall work with its contractor(s) to ensure that construction equipment is properly maintained and that required pollution-control devices are in working condition.

19.2.5.2 SEA's Preliminary Mitigation Measures

SEA did not identify additional preliminary mitigation measures for potential project-related impacts to climate and air quality.

19.2.6 Noise and Vibration

19.2.6.1 Applicant's Voluntary Mitigation Measures

The Applicant voluntarily proposed the following measures for mitigating potential project-related impacts from noise and vibration:

VM-24 The Applicant shall work with its construction contractor(s) to minimize, to the extent practicable, construction-related noise disturbances near residential areas. Construction and maintenance vehicles shall be in good working order with properly functioning mufflers to control noise.

VM-25 The Applicant shall consult with affected communities regarding its planned construction schedule to minimize, to the extent practicable, project-related construction noise and vibration disturbances in residential areas during evenings and weekends.

VM-26 Prior to initiating construction activities related to the proposed rail line, the Applicant shall establish a Community Liaison to consult with affected communities, landowners, and agencies. Among other responsibilities, the Community Liaison shall assist communities or other entities with the process of establishing quiet zones, if requested.

19.2.6.2 SEA's Preliminary Mitigation Measures

SEA recommends the following additional preliminary measure as mitigation for potential project-related impacts from noise and vibration:

37) If the Surface Transportation Board authorizes the Big Lake Segment, the Applicant shall not conduct pile driving associated with bridge construction on the segment during nighttime hours.

19.2.7 Transportation

19.2.7.1 Applicant's Voluntary Mitigation Measures

The Applicant voluntarily proposed the following measures for mitigating potential project-related impacts to transportation:

VM-27 The Applicant shall establish a Diagnostic Team comprising Applicant staff, community members, representatives of the Alaska Department of Transportation and Public Facilities and other entities regarding project-related roadway/rail line crossings in consultation with Federal Railroad Administration safety officials. This process shall result in appropriate safety measures for every roadway/rail line crossing.

VM-28 The Applicant shall coordinate with Federal, state, and local emergency management officials in the project area. The Applicant shall provide, upon request, applicable hazardous-materials training and/or project-related information to enhance readiness.

The Applicant shall incorporate the proposed rail line into its existing emergency response process and shall update its Oil Spill Contingency Plan to include the proposed rail line.

VM-29 During construction of project-related tracks across existing roads, the Applicant shall notify road users of temporary road closings and other construction-related activities. The Applicant shall provide for detours and associated signage, as appropriate, or maintain at least one open lane of traffic at all times to allow for the quick passage of emergency and other vehicles. The Applicant shall display signs providing the name, address, and telephone number of a contact person onsite to assist the public in obtaining immediate responses to questions and concerns about project activities.

VM-30 To the extent practicable, the Applicant shall confine all project-related construction traffic to project-specific roads within the right-of-way (ROW) or established public roads. Where traffic cannot be confined to these roads, the Applicant shall make necessary arrangements with landowners to gain access. The Applicant shall remove and restore upon completion of project-related construction any temporary access roads constructed outside the rail line ROW unless otherwise agreed to with the landowners.

VM-31 The Applicant shall consult with appropriate state and local transportation agencies to determine the final design and other details of project-related grade crossings and warning devices.

VM-32 Before the start of project-related operations, the Applicant shall contact appropriate local, state and Federal emergency response organizations and shall provide them with information concerning the proposed operations, schedules, and any site hazards or restrictions that could impact responders.

19.2.7.2 SEA's Preliminary Mitigation Measures

SEA did not identify additional preliminary mitigation measures for potential project-related impacts to transportation.

19.2.8 Navigation

19.2.8.1 Applicant's Voluntary Mitigation Measures

The Applicant voluntarily proposed the following measures for mitigating potential project-related impacts to navigation:

VM-33 The Applicant shall obtain a Section 9 Bridge Permit from the U.S. Coast Guard for construction of project-related bridges over navigable rivers.

VM-34 In coordination with the U.S. Coast Guard, the Applicant shall provide adequate clearances for navigation of recreational boats on navigable rivers.

19.2.8.2 SEA's Preliminary Mitigation Measures

SEA recommends the following additional preliminary measures as mitigation for potential project-related impacts to navigation:

38) In coordination with the Alaska Department of Natural Resources (ADNR), the Applicant shall ensure that project-related bridges and culverts placed on navigable or public waters, as determined by the ADNR, are designed and installed to accommodate:

- Navigation by recreational boat users in a manner that shall not impede existing uses, to the extent practicable, and
- Public access and use of the statutory easements as established by the reasonable requirements of Alaska Statute 38.05.127, Access to Navigable or Public Water.

19.2.9 Land Use

19.2.9.1 Applicant's Voluntary Mitigation Measures

The Applicant voluntarily proposed the following measures for mitigating potential project-related impacts to land use:

VM-35 The Applicant shall develop a spill prevention, control, and countermeasure plan for petroleum products and/or response plan for hazardous materials, as required by applicable Federal and state regulations, prior to initiating any project-related construction activities. These plans shall address methods for preventing discharges and spill control, and containment and cleanup should a release occur. Plans shall include a requirement to conduct weekly inspections of equipment for any fuel, lube oil, hydraulic, or antifreeze leaks. The plan shall provide that, if leaks are found, the Applicant shall require the contractor(s) to immediately remove the equipment from service and repair or replace it.

VM-36 As part of the National Pollutant Discharge Elimination System Stormwater Construction Permit and Stormwater Pollution Prevention Plan, the Applicant shall:

- Restore land used for temporary staging areas during project-related construction to natural conditions if occurring on undeveloped Alaska Department of Natural Resources land or to its former uses if occurring on private land.
- Restore public land areas that were directly disturbed by project-related construction equipment and not owned by the Applicant (such as temporary access roads, haul roads, and crane pads) to their original condition, as reasonable and practicable, upon completion of construction.
- In business and industrial areas, store project-related equipment and materials in established storage areas or on the Applicant's property. The Applicant shall prohibit parking of equipment or vehicles, or storage of materials along driveways or in parking lots, unless agreed to by the property owner.

- Prohibit project-related construction vehicles, equipment, and workers from accessing work areas by crossing business or agricultural areas, including parking areas or driveways, without advance notice to/permission from the owner.

VM-37 For each of the public grade crossings on the proposed rail line, the Applicant shall provide permanent signs prominently displaying both a toll-free telephone number and a unique grade crossing identification number in compliance with Federal Highway Administration regulations (23 Code of Federal Regulations Part 655). Applicant's personnel shall answer the toll-free number 24 hours a day.

VM-38 The Applicant shall continue its ongoing community outreach efforts by maintaining a Web site about the project throughout the construction period of the rail line.

VM-39 In the event of any damage caused by project-related construction activities, the Applicant shall work with affected landowners to appropriately redress any damage to each landowner's property.

VM-40 The Applicant shall work with affected businesses or farms to appropriately address project-related construction activity issues affecting any business or farm.

VM-41 To the extent practicable, the Applicant shall ensure that entrances and exits for businesses are not obstructed by project-related construction activities, except as required to move equipment.

VM-42 Depending on the alternative approved, during construction of the crossings over navigable rivers, some short-term temporary restrictions of watercraft traffic could occur for safety purposes. In that event, the Applicant shall install warning devices to notify boaters of project-related bridge construction activities. The Applicant also shall display signs providing the name, address, and telephone number of a contact person onsite to help waterway users obtain immediate responses to questions and concerns about project activities.

VM-43 The Applicant shall make reasonable efforts to minimize disruptions to utilities by scheduling project-related construction work and outages to low-use periods. The Applicant shall notify residents and other utility customers in advance of project-related construction activities requiring temporary service interruptions.

VM-44 The Applicant shall make reasonable efforts to identify all utilities that are reasonably expected to be materially affected by the project-related construction within the right-of-way (ROW) or that cross the ROW. The Applicant shall consult with utility owners during design and construction so that utilities are protected during project-related construction activities. The Applicant shall notify the owner of each such utility identified prior to project-related construction activities and shall coordinate with the owner to minimize damage to utilities.

VM-45 In accordance with the Applicant's Oil Spill Contingency Plan and Emergency Response Plan, the Applicant shall make the required notifications to the appropriate Federal and state environmental agencies in the event of a reportable hazardous materials release. The Applicant shall work with the appropriate agencies, such as the Alaska Department of Environmental Conservation, the U.S. Environmental

Protection Agency, and the U.S. Fish and Wildlife Service, to respond to and remediate releases.

VM-46 At least one month before initiating construction activities in the area, the Applicant shall provide the information described below regarding project-related construction of the proposed rail line, and other information, as appropriate, to fire departments within the project area, the Federal Emergency Management Agency, and the Matanuska Susitna Borough Emergency Operations Department:

- The schedule for construction throughout the project area, including the sequence of construction of public grade crossings and approximate schedule for these activities at each crossing;
- A 24-hour emergency telephone number to reach the Applicant in the event of an emergency
- The name and number of the Applicant's project contact, who shall be available to answer questions or attend meetings for the purpose of informing emergency-service providers about the project-related construction and operations; and
- Revisions to this information, including changes in construction schedule, as appropriate.

19.2.9.2 SEA's Preliminary Mitigation Measures

SEA recommends the following additional preliminary measures as mitigation for potential project-related impacts to land use:

39) Prior to project-related construction, the Applicant shall consult with Alaska Department of Natural Resources (ADNR) and other appropriate agencies and user groups to develop a plan to ensure construction activities occur during the most appropriate timeframe to limit potential impacts on recreation activities. The Applicant also shall comply with the following measures:
    - The plan shall be developed prior to completion of final engineering plans and following consultation with the ADNR, the Alaska Department of Fish and Game, other appropriate government agencies, and user groups to determine the location of all officially recognized trails that would be crossed by the rail line.
    - The plan shall designate temporary access points if main access routes must be obstructed during project-related construction and include an agreed-upon number and location of access points as determined during consultation with applicable agencies.

40) The Applicant shall consult with the appropriate management agencies, including the Alaska Department of Natural Resources and the Alaska Department of Fish and Game to ensure that project-related bridges and culverts are designed, constructed, and maintained to accommodate travel by winter modes of transportation (snow machine, dog sled, etc.) on streams and rivers used for recreational access, as determined under mitigation measure 38.

41) The Applicant shall consult with resource management agencies including the Alaska Department of Natural Resources, the Alaska Department of Fish and Game, and appropriate trail user groups regarding provision, access, and design of crossings for trail easements that intersect with the rail line. Consultation shall include concerns related to general dispersed-use access, informal public trails on state land, blazed section lines, and long stretches of rail line without designated public crossings.

42) When project-related construction takes place on state and private land, the Applicant shall consult with the Alaska Department of Natural Resources Division of Forestry to salvage or dispose of commercial and personal use timber within the right-of-way in accordance with the Forest Practices Act and the Susitna Forestry Guidelines. Timber salvage and disposal shall comply with Alaska Statute 41.17.082, Control of Infestations and Disease.

43) If unanticipated sources of hazardous or regulated materials or potentially contaminated areas are encountered during project-related construction activities, the Applicant shall immediately notify the Alaska Department of Environmental Conservation and stop all work in the area until a corrective action plan has been approved. Handling, treatment, and disposal of any hazardous materials shall occur in full compliance with all Federal, state, and local requirements.

44) The Applicant shall conduct project-related right-of-way acquisition in conformance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (42 U.S.C. 4601 *et seq.*), regulations promulgated pursuant to that statute (49 Code of Federal Regulations Part 24), and all reasonable terms and conditions of Alaska Statute 34.60.010 through 34.60.150, Relocation Assistance and Real Property Acquisition Practices.

45) The Applicant shall consult with local airports in the vicinity and the Alaska Department of Transportation & Public Facilities and the Federal Aviation Administration to ensure that notice has been given to pilots of the construction and location of new project-related communication towers.

46) If the Surface Transportation Board authorizes the Mac West Segment, the Applicant shall consult with the Alaska Department of Fish and Game to develop and implement measures, including consideration of replacing refuge acreage used for rail right-of-way, to minimize impacts to the Susitna Flats Game Reserve to the extent practicable.

47) If the Surface Transportation Board authorizes the Mac West Segment, the Applicant shall consult with Alaska Department of Natural Resources and Matanuska-Susitna Borough to determine an appropriate location of and relocate the Point MacKenzie Trailhead, Parking Lot, and the eastern end of the Figure 8 Loop Trail to another site.

48) If the Surface Transportation Board authorizes the Willow Segment, the Applicant shall consult with the Alaska Department of Fish and Game and the Alaska Department of Natural Resources to develop and implement measures, including consideration of replacing acreage used for rail right-of-way, to minimize impacts to the Nancy Lake State

Recreation Area, Little Susitna State Recreation River, and Willow Creek State Recreation Area to the extent practicable.

49) If the Surface Transportation Board authorizes the Houston North Segment, the Applicant shall consult with the Alaska Department of Natural Resources (ADNR) to develop and implement measures to minimize impacts to the Little Susitna State Recreation River and the Nancy Lake Creek Junction public use site. The Applicant shall replace any camping or other facilities within the right-of-way, as determined through consultation with ADNR.

50) If the U.S. Army Corps of Engineers completes a full-scale remedial investigation and feasibility study of the nature and extent of contamination or explosive hazards within the right-of-way within the boundaries of the former Susitna Gunnery Range, the Applicant shall observe the findings and recommendations of the study as approved by Alaska Department of Environmental Conservation.

51) In the event that construction or other intrusive activities associated with the rail line proceed within the boundaries of the former Susitna Gunnery Range prior to completion of a remedial investigation and feasibility study (RI/FS) by the U.S. Army Corps of Engineers (USACE), or in the event that the USACE does not conduct a RI/FS, the Applicant shall work with field-work contractors to arrange for an unexploded ordnance (UXO) sweep when conducting project-related field work in the area. Further, the Applicant shall ensure that field-work contractors are provided with training for the identification of UXO's and shall notify USACE in the event they discover munitions before or during construction. If UXO are encountered during construction or other intrusive activities associated with the rail line, the Applicant shall immediately stop all work in the area and notify the Alaska Department of Environmental Conservation (ADEC) and the USACE. The Applicant shall delay work until a response plan has been approved by ADEC and USACE and implemented.

52) Prior to initiation of project-related construction activities, and for a period of one year following start-up of operations on the rail line, the Applicant shall establish a Community Liaison to consult with affected communities, businesses, and appropriate agencies; develop cooperative solutions to local concerns; be available for public meetings; and conduct periodic public outreach. The Applicant shall provide the name and phone number of the Community Liaison to mayors and other appropriate local officials in each community through which the proposed rail line passes.

53) Project-related construction vehicles, equipment, and workers shall not access work areas by crossing residential properties without the permission of the property owners.

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Chapter 17: Short-Term Use Versus Long-Term Productivity of the Environment

No references.

Chapter 18: Irreversible and Irretrievable Commitment of Resources

No references.

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21. LIST OF PREPARERS

Surface Transportation Board
Section of Environmental Analysis

Victoria J. Rutson	Chief, Section of Environmental Analysis
David Navecky	Environmental Protection Specialist/Project Manager

Federal Railroad Administration

John Winkle	Office of Railroad Development

U.S. Army Corps of Engineers

Benjamin Soiseth	Regulatory Specialist, Mat-Su Regulatory Field Office

U.S. Coast Guard

Jim Helfinstine	Commander Seventeenth Coast Guard District

Contractors

ICF International and its subcontractors, ENTRIX, USKH, and Stephen R. Braund & Associates, were responsible for supporting the Surface Transportation Board's Section of Environmental Analysis in the performance of its environmental analyses and preparation of this Environmental Impact Statement.

Name, Firm, Project Function	Qualifications
Project Management	
Alan Summerville, ICF International Project Manager	M.A. City Planning, B.A. Economics and Political Science. 19 years of experience participating in and managing the preparation of NEPA documents, including 16 years on rail projects.
David Bauer, ICF International Deputy Project Manager; Column Leader of Climate and Air Quality, Noise and Vibration, and Transportation Safety and Delay	M.S. Environmental Engineering Sciences, B.A. Chemistry. 31 years of environmental assessment and management experience, including 8 years on rail projects.
Technical and Other Expertise (in alphabetical order)	
Cindy Anderson, USKH Fisheries Resources, Essential Fish Habitat Report	B.S. Biology. 7 years of experience in regulatory compliance for impacts to fish habitat, project reviewer for impacts to fisheries resources during coastal development, 18 years of fisheries research and management of commercial Pacific salmon and Bering Sea Herring fisheries.
Shawna Barry, ICF International Document Production, Quality Control	M.A. Environmental and Resource Policy, B.S. Biology. 3 years of experience in environmental analysis
Stephen Braund, Stephen R. Braund & Associates Cultural Resources, Subsistence, Tribal and Government-to-Government Consultation	M.A. Anthropology, B.A. Northern Studies/English. 32 years of experience researching and assessing impacts associated with subsistence in Alaska.
Jeanette Brena, ENTRIX Water Quality	M.S. Environmental Engineering, B.S. Civil/Environmental Engineering. 11 years of experience in regulatory compliance, permitting, and impact assessment.
Ed Carr, ICF International Climate and Air Quality	M.S. Atmospheric Science, B.S. Meteorology. 15 years of experience in assessing mobile source air toxic emissions.
David Coate, ICF International Noise and Vibration	M.S. Energy Technology, B.A. Mathematics, Physics and Chemistry. 31 years of experience in acoustics, rail noise and vibration measurement, prediction, and assessment.
Jack Colonell, ENTRIX Water Resources Lead	Ph.D. Civil Engineering and Applied Mathematics, M.S. Civil Engineering and Applied Mathematics, B.S. Civil Engineering. More than 40 years of professional experience, including 25 years of experience in environmental impact assessment.
Rob Crotty, ENTRIX Hazardous Materials and Waste Sites	B.S. Geology. 24 years of environmental, geosciences, and remediation experience in Alaska.
Cristiano Facanha, ICF International Transportation Safety and Delay	Ph.D. Civil and Environmental Engineering, M.S. Transportation Engineering, M.S. Management of Transportation, B.S. Industrial Engineering. 6 years of experience in transportation analysis.
Kelly Hammerle, ICF International Document Production, Quality Control	M.P.A. Environmental Policy Emphasis, B.S. Fisheries and Wildlife Sciences. 5 years of experience in environmental analysis.
John Hansel, ICF International NEPA and Regulatory Compliance Review	J.D., cum laude, B.A., Economics. 30 years of experience managing the preparation of NEPA documents.

Name, Firm, Project Function	Qualifications
Erik Hilsinger, Stephen R. Braund & Associates Cultural Resources	M.A. Archaeology, B.A. Anthropology. 9 years of experience conducting archeological fieldwork and researching and assessing impacts associated with cultural resources and subsistence in Alaska.
Sarah Jenniges, ENTRIX GIS Lead	M.S. Geography, Specializing on Environmental GIS and Remote Sensing, B.A. Geography, Certified GISP (Geographic Information Systems Professional). 11 years of GIS experience working in public and private sector, 3 years in environmental GIS analysis application.
David Johnson, ICF International Proposed Action and Alternatives, Quality Control	B.S. Biology, Minors in Geology and Chemistry. 10 years of experience assessing aquatic resources, resource inventory and classification, impact assessment, permitting assistance, and regulatory compliance.
Whitney Kihlstrom, ICF International Quality Control	B.S. Environmental Science. 2 years of experience in environmental analysis
Tanvi Lal, ICF International Irreversible and Irretrievable Commitment of Resources, Short-term Use Versus Long-term Productivity of the Environment, Quality Control, References	M.S., Environmental Science and M.P.A., Environmental Policy, B.S. Biotechnology. 3.5 years experience in environmental analysis
Paul Lawrence, Stephen R. Braund & Associates Cultural Resources and Subsistence	B.A. Anthropology. 6 years of experience conducting archaeological and subsistence fieldwork and researching and assessing impacts associated with cultural resources and subsistence in Alaska.
Sarah Lindberg, USKH Wetlands and Vegetation	M.A. Alpine Plant Studies, B.S. Environmental Studies. 8 years of experience in environmental impact assessment.
Steve Lombard, ENTRIX Navigation	B.A. Geology. More than 35 years of professional experience in Alaska, coordinating numerous permitting and compliance programs with Federal, state, and local regulatory agencies.
Amalia Marenberg, ICF International Quality Control	B.S. Environmental Science. 2 years of experience in CEQA and NEPA document preparation, impact assessment, and environmental analysis.
JoAnn Mitchell, USKH Public Involvement	M.S. Engineering Management, B.S. Civil Engineering. 20 years of experience in civil engineering and public involvement.
Christopher Moelter, ICF International Cumulative Impacts, Section 4(f) and Section 6 (f) Evaluation, References	M.E.M. Environmental Tourism, B.S. Zoology. 5 years of experience in environmental analysis.
Mike Nagy, ENTRIX Agency Consultation; Column Leader of Natural and Physical Environment Sections, Land Use, and Navigation; Tribal and Government-to-Government Consultation	Graduate Studies Natural Resources, B.S. Natural Resources. 32 years of experience in environmental impact assessment and documentation.
Lynn Noel, ENTRIX Biological Resources Lead	M.S. Natural Resources-Fisheries, B.S. Biology. 22 years of experience conducting fish and wildlife research, monitoring, and affects-assessment projects. 15 years of experience completing impact assessments, wildlife and wetland habitat mapping, and conducting spatial analyses for impact assessments in Alaska.

Name, Firm, Project Function	Qualifications
Melissa Pauley, ICF International Mitigation	M.S. Environmental Science and Management, B.S. Environmental Studies. 6 years of experience in regulatory compliance, permitting, and impact assessment.
David Peterson, ENTRIX Parks and Recreational Resources	M.A. Urban & Regional Planning, B.A. Sociology/Anthropology and Religion. 3 years of experience participating in and managing the preparation of CEQA and NEPA documents. 6 years of urban planning experience in the regional planning, economic development, environmental impact analysis, redevelopment, and transportation sub-fields.
Iris Prophet, Stephen R. Braund & Associates GIS	B.S. Environmental Science, Certificate in GIS. 6 years of experience using GIS, including mapping and analyzing cultural resources and subsistence data for Alaska.
Debra Rogers, ICF International Cumulative Impacts Lead	M.B.A., B.S. Business Administration. 15 years of experience in NEPA analysis and project management.
Stephanie Schively, Stephen R. Braund & Associates Cultural Resources	B.S. Anthropology. 5 years of experience conducting archaeological and subsistence fieldwork and researching and assessing impacts associated with cultural resources and subsistence in Alaska.
Zane Shanklin, USKH Geology and Soils	M.S. Arctic Engineering, B.S. Civil Engineering. 28 years experience in civil engineering design and support.
Judith Shipman Technical Editor, Quality Assurance, Quality Control	A.A. General Studies. 32 years of experience in NEPA document production and editing.
Michael Smith, ICF International Column Leader of Built Environment Sections and Cumulative Impacts	Ph.D. Sociology, M.A. Geography, B.A. Environmental Studies. 16 years of experience in environmental impact assessment.
Rick Starzak, ICF International Section 106 Compliance Coordination, Programmatic Agreement	M.A. Architecture, B.S. Biology. 29 years of experience in architectural history.
Allison Stork, ICF International Cartographic Coordinator, Document Production, Quality Control	M.S. Geography, B.A. Geography, B.A. English. 3 years of experience in environmental analysis.
Shilpa Trisal, ICF International Section 4(f) and Section 6(f) Evaluation	M.S. Community Planning, B.A. Urban Planning. 6 years of experience preparing and reviewing Section 4(f) and Section 6(f) evaluations for transportation projects.
Alex Uriarte, ICF International Energy Resources; Socioeconomics; Environmental Justice	Ph.D. Development Studies, M.S. Economics, B.A. Economics. 11 years of experience in socioeconomic studies, management and monitoring of economic development projects.
Hova Woods, ICF International Document Manager	M.P.A. Environmental Policy and Management, B.S. Finance. 9 years of experience in environmental policy and impact assessment.

22. DRAFT EIS CIRCULATION

Surface Transportation Board (STB) regulations identify the types of agencies and officials to receive environmental documentation (49 Code of Federal Regulations [CFR] Part 1105.7). In addition, National Environmental Policy Act (NEPA) regulations identify appropriate distribution (40 CFR Part 1500 to 1508). This chapter lists the agencies, officials, and other interested persons receiving the Draft Environmental Impact Statement (EIS) for the proposed Port MacKenzie Rail Extension. The STB's Section of Environmental Analysis (SEA) also provided specific information about how to comment on this Draft EIS to those on the notification list.

The U.S. Environmental Protection Agency (USEPA) is expected to publish a Notice Availability of the Draft EIS in the *Federal Register* on March 26, 2010. SEA distributed the Draft EIS through hard copy and CD-ROM mailing to maximize public awareness of the availability of the document and to provide instructions on how to comment on the Draft EIS.

SEA maintains an environmental distribution list composed of individuals potentially affected by the project, individuals with a specific role in the environmental process, and individuals who have expressed an interest in the proposed action. SEA continues to update the distribution list as individuals request inclusion. The list included approximately 6,800 contacts at the time SEA distributed the Draft EIS.

Sections 22.1 through 22.5 list the Federal, state, and local agencies; tribes; Federal, state, and local elected officials; and other organizations who have been invited to participate in the environmental review process and have received the Draft EIS. This chapter does not list the approximately 5,900 individuals on the distribution list who do not fall into any of these categories but did receive the Draft EIS.

22.1 Federal Agencies

- Bureau of Land Management
- Federal Aviation Administration
- National Park Service
- NOAA National Marine Fisheries Service
- Office of Energy Projects, Federal Energy Regulatory Commission
- U.S. Army
- U.S. Army Corps of Engineers
- U.S. Coast Guard Seventeenth District
- U.S. Department of Defense
- U.S. Environmental Protection Agency
- U.S. Fish & Wildlife Service
- U.S. Forest Service
- U.S. Postal Service

22.2 State and Local Agencies

- Alaska Bureau of Vital Statistics
- Alaska Department of Commerce, Community & Economic Development
- Alaska Department of Corrections
- Alaska Department of Education and Early Development
- Alaska Department of Environmental Conservation
- Alaska Department of Fish & Game
- Alaska Department of Health & Social Services
- Alaska Department of Labor & Workforce Development
- Alaska Department of Law
- Alaska Department of Military & Veterans Affairs
- Alaska Department of Natural Resources
- Alaska Department of Public Safety
- Alaska Department of Revenue
- Alaska Department of Transportation & Public Facilities
- Alaska Division of Homeland Security and Emergency Management
- Alaska State Community Service Commission
- Alaska State Library

- Alaska State Medical Examiner's Office
- Alaska State Troopers
- Buffalo/Soap Stone Community Council
- City of Houston
- City of Palmer
- City of Wasilla
- Matanuska-Susitna Borough
- Mat-Su Borough Planning Commission
- Mat-Su Borough School Board
- Mat-Su Borough School District
- Meadow Lakes Community Council
- Municipality of Anchorage
- North Lakes Community Council
- North Slope Borough
- Palmer Planning & Zoning Commission
- Petersville Community Council
- Port Mackenzie Community Council
- South Knik River Community Council
- South Lakes Community Council
- Talkeetna Community Council
- Trapper Creek Community Council
- Waldrons Pond Community
- Wasilla Planning Commission
- Willow Area Community Council

22.3 Alaska Native Villages and Corporations

Copies of correspondence between SEA and the tribal contacts can be found in Appendix B.

- Alaska Federation of Natives
- Alaska Inter-Tribal Council
- Chickaloon Village Traditional Council
- Chickaloon-Moose Creek Native Association
- Cook Inlet Region, Inc.
- Cook Inlet Tribal Council
- Eklutna Inc.
- Golden Creek - Susitna Native Association
- Knik Tribal Council
- Knikatnu, Inc.
- Native Village of Cantwell
- Native Village of Eklutna
- Native Village of Tyonek
- Tyonek Native Corporation

22.4 Federal, State, and Local Elected Officials

- Ronald G. Arvin, Mat-Su Assembly
- Alan Austerman, Alaska State Legislature
- Richard Best, Palmer City Council
- Mark Begich, Senator
- Cindy Bettine, Mat-Su Assembly
- Chris Birch, Anchorage Assembly Member
- Ruth G Blanchard, Houston City Council
- Kevin Brown, Palmer City Council
- Robert Buch, Alaska State Legislature
- Armeda Bulard, Denali Borough Assembly
- Con Bunde, Alaska State Legislature
- Rosemary Burnett, Houston City Council
- Mike Chenault, Alaska State Legislature
Michael Chmielewski, Palmer City Council
- Sharon Cissna, Alaska State Legislature
- Matt Claman, Anchorage Assembly Member
- Dan Coffey, Anchorage Assembly Member
- John Coghill, Alaska State Legislature
- Jim Colver, Mat-Su Assembly
- John C. Combs, City of Palmer Mayor
- Cyrus Cooper, Denali Borough Assembly
- Harry Crawford, Alaska State Legislature
- Nancy Dahlstrom, Alaska State Legislature
- Bettye Davis, Alaska State Legislature
- Mike Doogan, Alaska State Legislature
- Harriet Drummond, Anchorage Assembly Member
- Fred Dyson, Alaska State Legislature
- Bryce Edgmon, Alaska State Legislature
- Dennis Egan, Alaska State Legislature
- Johnny Ellis, Alaska State Legislature
- Ken Erbey, Palmer City Council
- Rich Erickson, Meadow Lakes Community Council
- Mark Ewing, Mat-Su Assembly
- Anna Fairclough, Alaska State Legislature
- Patrick Flynn, Anchorage Assembly Member
- Neal Foster, Alaska State Legislature
- Hollis French, Alaska State Legislature
- Les Gara, Alaska State Legislature
- Berta Gardner, Alaska State Legislature
- Carl Gatto, Alaska State Legislature
- Elvi Gray-Jackson, Anchorage Assembly Member
- Voncille Gregoire, Chase Community Council
- Max Gruenberg, Alaska State Legislature
- Mike Gutierrez, Anchorage Assembly Member
- David Guttenberg, Alaska State Legislature
- Vern Halter, Mat-Su Assembly
- Brad Hanson, Palmer City Council
- John Harris, Alaska State Legislature
- Mike Hawker, Alaska State Legislature
- Bob Herron, Alaska State Legislature
- Lee Himes, Houston City Council
- Lyman Hoffman, Alaska State Legislature

- Lindsey Holmes, Alaska State Legislature
- Eileen Holmes, Denali Borough Assembly
- Pete Houston, Mat-Su Assembly
- Charlie Huggins, Alaska State Legislature
- Richard Hundrup, Denali Borough School District, Vice-President
- Kyle Johansen, Alaska State Legislature
- Craig Johnson, Alaska State Legislature
- Jennifer Johnston, Anchorage Assembly Member
- Reggie Joule, Alaska State Legislature
- Scott Kawasaki, Alaska State Legislature
- Wes Keller, Alaska State Legislature
- Michael Kelly, Alaska State Legislature
- Beth Kerttula, Alaska State Legislature
- Robert Kohlsdorf, Denali Borough Assembly
- Albert Kookesh, Alaska State Legislature
- Vickie Lausen, Denali Borough Assembly
- Bob Lynn, Alaska State Legislature
- Lesil Mcguire, Alaska State Legislature
- Linda Menard, Alaska State Legislature
- Kevin Meyer, Alaska State Legislature
- Charisse Millett, Alaska State Legislature
- Bob Mueller, Denali Borough Assembly
- Cathy Munoz, Alaska State Legislature
- Lisa Murkowski, Senator
- Mark Neuman, Alaska State Legislature
- Bill O'Hara, Big Lake Community Council, President
- Donny Olson, Alaska State Legislature
- Kurt Olson, Alaska State Legislature
- Debbie Ossiander, Anchorage Assembly Chair
- Sean Parnell, Governor
- Joe Paskvan, Alaska State Legislature
- Will Peabody, Lazy Mountain Community Council
- Mary Pearson, Denali Borough School District, President
- Pete Petersen, Alaska State Legislature
- Roger Purcell, City of Houston Mayor
- Jay Ramras, Alaska State Legislature
- Woodie Salmon, Alaska State Legislature
- Darcie Salmon, Knik-Fairview Community Council
- Paul Seaton, Alaska State Legislature
- Sheila Selkregg, Anchorage Assembly Member
- Bill Starr, Anchorage Assembly Member
- Bert Stedman, Alaska State Legislature
- Jim Sterling, Big Lake Community Council
- Gary Stevens, Alaska State Legislature
- Bill Stoltze, Alaska State Legislature
- David Talerico, Denali Borough Mayor
- Bill Thomas, Alaska State Legislature
- Joe Thomas, Alaska State Legislature
- Virgie Thompson, Houston City Council
- Berkley Tilton, Knik-Fairview Community Council
- Chris Tuck, Alaska State Legislature
- Teresa Chepoda Usibelli, Denali Borough Assembly
- Kathrine Vanover, Palmer City Council
- Thomas Wagoner, Alaska State Legislature
- Clay Walker, Denali Borough Assembly
- Bill Wielechowski, Alaska State Legislature
- Peggy Wilson, Alaska State Legislature
- Tammie Wilson, Alaska State Legislature
- Lance Wilson, City of Houston Deputy Mayor
- John Winklmann, Denali Borough Assembly
- Mike Wolfe, Meadow Lakes Community Council
- Lynne Woods, Mat-Su Assembly
- Don Young, House of Representatives

22.5 Other Organizations

- 3D & Co
- 4 D'S Trust
- 9-J Corp
- A Growing Dream LLC
- A-1 Mobile Homes
- Acs Wireless Inc.
- AK Regional Council of Carpenters
- Alascon, Inc.
- Alaska Airlines
- Alaska Association For Historic Preservation
- Alaska Cabaret, Hotel, Restaurant & Retailers Association
- Alaska Center for the Environment
- Alaska Chiropractic and Therapy
- Alaska Clean Air Coalition
- Alaska Club Partners LLC
- Alaska Community Action on Toxics
- Alaska Conservation Alliance
- Alaska Dev Services, Inc.
- Alaska Digitel LLC
- Alaska Forum On The Environment
- Alaska Garden Gate B&B
- Alaska Heritage Homes Inc
- Alaska Historical Society
- Alaska Housing Finance Corp
- Alaska Housing Finance Corporation
- Alaska Industrial Development and Export Authority
- Alaska Industrial Resources Inc
- Alaska Job Corps

- Alaska Job Corps Center
- Alaska Miners Association
- Alaska Mountain Bike
- Alaska Moutain And Wilderness Huts Associations
- Alaska Mtg Group
- Alaska Native Heritage Center
- Alaska Native Science Commission
- Alaska Native Tribal Health Consortium
- Alaska Natural History Association
- Alaska Nurses Associoation
- Alaska Oil & Gas Association
- Alaska Oil & Gas Conservation Commission
- Alaska Pacific Capital Company
- Alaska Pacific Dev Co.
- Alaska Parent Teacher Association
- Alaska Pipeline Service Co.
- Alaska Power Association
- Alaska Public Interest Research Group
- Alaska Railroad Board of Directors
- Alaska Railroad Corporation
- Alaska Rim Engineering
- Alaska Rural Rehab Corporation
- Alaska Sales & Svc, Inc.
- Alaska Sales and Service
- Alaska Scottish Ritecare
- Alaska Society for the Prevention of Cruelty to Animals Inc.
- Alaska State AFL-CIO / Laborers Local 341
- Alaska State Fair
- Alaska State Homebuilders Association
- Alaska State Medical Association
- Alaska State Snowmobile Association
- Alaska Support Industry Alliance
- Alaska Survival
- Alaska Travel Industry Association
- Alaska Troutfitters
- Alaska Trucking Association
- Alaska Trust Deeds
- Alaska USA Federal Credit Union
- Alaska Wilderness Recreation and Tourism Association
- Alaska Wilderness Tours
- Alaska Wildlife Alliance
- A-Lazy Acres B & B
- Albryce LLC
- All Nations Church
- All Seasons Travel
- Allstate Insurance Co.
- Alma Corp
- Alyeska Pipeline Service Company
- Alyeskaflats LLC
- Amats
- American Federation of Government Employees
- American Lung Association of Alaska
- American Red Cross of Alaska
- Anadarko Petroleum Corporation
- Analytica Group - Environmental Laboratories
- Anch Roofing & Control, Inc.
- Anchor Point Public Library
- Anchorage Chrysler Dodge
- Anchorage Economic Development Corporation
- Anchorage Education Association
- Anchorage Neighborhood Housing Services
- Anchorage Roofing and Construction
- Anchorage Snowmobile Club
- Anderson Village Library
- Aniak Public Library
- Archdiocese of Anchorage
- Arctic Power
- Arctic Slope Regional Corporation
- Arcticorp
- Argus Fire Protection
- Arjer Properties LLC
- Assoc of Vlg Council Pres
- Associated General Contractors of Alaska
- Association of Village Council Presidents
- AT&T Alascom
- Audubon Alaska
- Aurora Real Estate LLC
- Aurora, Inc.
- B & J Investments LLC
- B&B Farms
- Baker Oil Tools
- Ball Family Ltd Prtnrshp
- Baptist Mid-Missions
- Barrick Gold and Donlin Creek Joint Venture
- Bays Bed & Breakfast
- BCE LLC
- Bear Alaska LLC
- Best Western Lake Lucille Inn
- Bethel Chapel, Inc.
- Bible Baptist Church
- Big Lake Chamber of Commerce
- Big Lake Lions, Inc.
- Big Lake Ventures LLC
- Big Lake Library Advocates
- Big Lake Public Library
- Birchcreek Builders
- BJ Custom Aircraft Cylinders
- Bob King Design
- Borealis Business Services
- BP Exploration (Alaska), Inc.
- Bradley Reid + Associates
- Brady & Co
- Brandywine Ltd

- Brazeau Bonzai Enterprises
- Breeden Farm LLC
- Bristol Environmental Engineering
- British Petroleum
- Brodahl Family Ltd Prtnrshp
- Brown Jug, Inc.
- Bryant L & S Alaska Community Property
- Budget Feed & Farm
- Burns Holdings LLC
- Butt Sisters Properties
- Butte Community Council
- C-4 Properties LLC
- Calista Corporation
- Cameron Properties Group LLC
- Canadian Consulate
- Cantwell Community Library
- Carey Homes, Inc.
- Caribou Lodge
- Carleson Custom Homes
- Carlile Transportation Systems
- Carr-Gottstein Properties
- Casa Del Duenda Invs LLC
- Cash Alaska
- CBMC Ltd
- Ch2M Hill
- Chadux
- Chugach Alaska Corporation
- Chugach Electric Assn Inc
- Chugach Heritage Foundation
- Chugiak-Eagle River Chamber of Commerce
- Chugiak Childrens Services
- Chugiak/Eagle River Branch Library
- Church of Christ
- City of Houston
- Clark-Wiltz Mining
- Cnr Holdings LLC
- Colaska, Inc.
- Colony Inn
- Combs Insurance Agency
- Commonwealth North
- Conoco Phillips Alaska Inc.
- Conocophillips
- Copper Valley Community Library
- Consolidated Enterprises
- Corzan Prop Ltd Prtnrshp
- Coulter Family Trust 2001
- Craig Taylor Equipment Company Inc
- Crl Services LLC
- Crosby Construction
- Crown Affair LLC
- Cruz Construction, Inc.
- D F Inv
- D H Plumbing and Heating Inc
- D&M Concrete
- Davidson's Inv
- Denali Drilling
- Denali Foods, Inc.
- Denali View Raft Adventures
- Deshka Lndg Outdoor Assn
- Discovery Const, Inc.
- Disotell Group, Inc.
- District Council of Alaska
- Dittrich Fam Ltd Prtnrshp
- Dolin Charleene M May Est
- Domabe Ltd Prtnrshp
- Doodad Inn LLC
- Doug Geeting Aviation
- Drven Corporation
- Eagle River Community Center
- Eagle River Printing
- Easley Associates
- Edward Jones Investments
- Ellenburg Third Fam Ltd
- Embley Fam Ltd Partnership
- Emerald Alaska Inc.
- Enchanted Forest #1, Inc.
- Endres Investments LLC
- Energy and Resource Economics
- Environmental And Natural Resources Office, Directorate of Public Works
- Equity Trust Company Custodian FBO
- Exxon Mobil
- Fairview Park Inv Ltd
- Fairview Parks Invalid
- Falconer & Lentfer Prtnr
- Falcon's Ridge LLC
- Felton Ivan W LLC
- Fikes Neil E Est
- Financial Services Inc
- Fineline Builders Inc
- Fire Art By Griz
- First American Title of Alaska
- First Assembly of God Church
- First Baptist Chr Willow
- First National Bank
- First National Bank Alaska
- Fisher Family Ltd Prtnrsp
- Fisherman's Choice Charters
- Floral Creations
- Foster Michael L Prop LLC
- Fosters Fine Finishes
- Frank Edw G Jr Cust For
- Fred's Towing and Recovery
- Fremont Investment & Loan
- Friends of Mat-Su
- Fuller Quality Inv I LLC

- Future Interests
- Gate Creek Cabins
- Gator Brothers LLC
- Genesis Homes & Dev LLC
- Geraghty Family Ltd Partnership
- Gold Creek-Susitna
- Golder Associates, Inc.
- Goose Bay Ltd
- Gorilla Fireworks
- Governor's Council on Disabilities and Special Education
- Grace Community Church Inc.
- Grace Investments LLC
- Gramdma's Cabin LLC
- Grasshopper Adventures
- Great Northern Engineering
- Greater Farm Loop Community Council
- Greater Palmer Chamber of Commerce
- Greater Wasilla Chamber of Commerce
- Green Star
- GSC LLC
- H & R Investments, Inc.
- H&H Investments LLC
- H.C. Price Co.
- Hagen Investments LLC
- Hall Quality Homes
- Harbor Enterprises Dba Petro Marine
- HDR Alaska, Inc.
- Heart Land Homes
- Heartland Homes Inc
- Hellrung Custom Homes, Inc.
- Henderson & Kolivosky Inc
- Hidden Assets LLC
- Highlander Inv LLC
- Hmd Prop
- Holland America Line/Westours, Inc.
- Holy Transfiguration Church
- Homestead Rv Park
- Hope Community Resources Inc
- Horizon Lines of Alaska
- Houston Chamber of Commerce
- Houston Lodge, Inc.
- Hudson Air Service, Inc.
- Huston Cliff & Allie 2003
- Hyder Public Library
- Ibew
- Ibew Union Local 1547
- Idiatrod Trail Committee, Inc.
- Independent Baptist Church
- Ingrim Investments, Inc.
- Inv Brokers Lazy Lake Ltd
- J & B Investments LLC
- J A Spain & Sons Inc
- Jade North LLC
- Janssen Contracting Inc.
- JD Steel Co., Inc
- JMD Group
- Johmor Co
- Johnson Tire Svc, Inc.
- Jolt Construction Company
- Judy Patrick Photography
- Julien Katie C Dds Ms Psp
- Juneau Downtown Branch Library
- Juneau Valley Branch Library
- K & T Enterprises
- K2 Aviation
- K2 Builders, Inc.
- KABATA
- Kayann Willow Co.
- Kayann Willow Company
- Kenai Community Library
- Kettleson Memorial Library
- Key Bank of Alaska
- Keybank Na
- Keystone Ltd Partnership
- Klebs Mechanical, Inc.
- Klh/
- Klondike Ltd
- KLS Fine Homes LLC
- Kmbq Radio
- Knd Investments Ltd
- Knecht Revocable
- Knik Development Group LLC
- Koniag, Inc.
- Ktna-Fm
- Kuskokwim Consortium Library
- Kuster Lndg Owners Association
- Laborers International Union of North America, 341
- Laborers Local 341
- Laidlaw Transit, Inc.
- Lake Lucille Condominiums
- Land Trust
- Land Trust 26A7
- Law Offices of Kenneth D
- Let LLC
- Liberty Builders, Inc.
- Lifetime Adventures
- Lily Pond LLC
- Lincoln Vlg Airpark
- LLP Partnership
- Local 183-A.F.G.E.
- Local 367
- Local 995/996
- Local Spiritual Assembly
- Lochner Fam Ltd Prtnrshp

- Long Rifle Lodge
- Loon Lake LLC
- Lorato Joint Venture
- Lord Investments LLC
- Lots LLC
- LRA Properties LLC
- LSO LLC
- Lynden
- Machinists & Aerospace Workers Local 601-Air Transportation
- Mahay's Riverboat Service, Inc.
- Map Consulting
- Mapmakers Alaska
- Marathon Oil Company
- Matansuka Valley Federal Credit Union
- Matanuska Electric Association
- Matanuska Telephone Association
- Mat-Su Convention & Visitors Bureau
- Mat-Su Dog Sled Council
- Mat-Su Miners Baseball
- Mat-Valley Federal Creidt Union
- MCB's Delights & Delectables
- Mcghan Const Co, Inc.
- Mcintyre Ent, Inc.
- Mckay Family Ltd Prtnrshp
- Mel-Annie-K LLC
- Merit Homes LLC
- Metro Mtg & Sec Co Inc.
- Mikunda Cottrell & Co., CPA'S
- Miller Inv LLC
- Millers Reach Homeowners
- Miner Designs
- Moldoon Library
- Monaghan Const Inc
- Mountain View Branch Library
- Morris Community Corporation/Tower
- Mosesian Family LLC
- MPI Services
- MPM LLC
- Museum of Northern Adventure
- M-W Drilling, Inc.
- N Star Term and Stevedore Co
- Nana Development Corporation, Inc.
- National Parks Conservation Association
- National Wildlife Federation - Alaska
- Neeser Const, Inc.
- Network Business Systems
- New Harvest/Apostolic
- Norcon, Inc.
- Nord Ad Specialties
- North County Fine
- North Star Behavioral Health
- North Star Terminal and Stevedore Company LLC
- Northern Dynasty Mines, Inc.
- Northern Stars
- Northland Baptist Ministries
- Northland Minerals Inc
- Northpoint Dev LLC
- Nunat Development LLC
- Our Lady of Comprehensive Care Center
- Our Lady of Fatima San
- Ourtrust LLC
- P & P Properties LLC
- Palmer Chamber of Commerce
- Palmer Chevron
- Palmer Correctional Center
- Palmer Machinery Company
- Palmer Pioneer Lions
- Palmer Public Library
- Palmer Senior Center
- Palmer Veterinary Clinic Inc
- Par 4 Development Co. LLC
- Paramount Investment LLC
- Parks Glenn Corporation
- Patton Boggs LLP
- Peking Garden
- Pending Sale From State
- Peregrine Properties, Inc.
- Petro Marine Services
- Pg Properties LLC
- Photon Investment Co
- Picture This Art Gallery
- Pink Elephant Stores, Inc.
- Pioneer Equipment, Inc.
- Pioneer Motel & Apts
- Pioneer Natural Resources Alaska, Inc.
- PMB 756
- PMB 811
- Point Bluff LLC
- Point Mackenzie CC
- Port of Anchorage
- Potter Place LLC
- Power Sports LLC
- Preston Hills LLC
- Providence Health Sys-Wa
- Prudential Vista Real Estate
- Prudential Jack White/Vista Real Estate
- PTF Investments
- Q-1 Corp
- Quaintance Bob
- Quality Auto Supply of Alaska
- Quality Sand & Gravel LLC
- Qwiz, Inc.
- R & D Development LLC

- Rafter T Ranch Trail Rides
- Rapp Richard H Jr Irrevtr
- Rebco Inv
- Red Sand Ltd
- Reisner Fam Ltd Prtnrshp
- Rensch Thos J Co-Tre
- Resource Development Council For Alaska
- Ridge Development Company the LLC
- Ring David B Trust Agreement
- Rita LLC
- Rocky Lake Asset Protect Trail
- Roger Hickel Contracting
- Rose Ridge Bed & Breakfast
- Rose Urban Rural Exchange
- S Double L K Partnership
- SS & T Robertson LLC
- Safe-T-Way Electric, Inc.
- Sage Alaska Prop LLC
- Salvation Army
- Samatt LLC
- Samson-Dimond Branch Library
- Schneider Michael Irrevocable Trust
- Schwantes Inc.
- Scsl, Inc.
- SCW LLC
- Sealaska Corp
- Sequential Reserve Tr
- Service Oil & Gas
- Seventh Day Adventists
- Shamburek Law Office LLC
- Shaub & Associates
- Shell Exploration & Production
- Shilanski 2001 LLC
- Siegel Const LLC
- Sierra Club
- Slg Inv LLC
- Slm, Inc.
- Smith Barbara A Tr Agrmt
- Snowball Express
- Southcentral Foundation
- Southwest Alaska Municipal Conference
- Sparrows Song Cemetery
- Specialized Woodworks
- Spenard Builders Supply
- Spernak Anita L Trust Agreement
- Spinell Homes, Inc.
- Sr Wasilla LLC
- St Michaels Catholic Church
- Stan Foo & Associates
- Starboard Cove Homeowners
- State Farm Insurance Co.
- Statewide Clearing, Inc.
- Sternwheelers Investment Partnership
- Stonebridge Homes, Inc.
- Stonebridge Inv, Inc.
- Stony Creek LLC
- Suburban Land Sales Corp
- Suiter Construction Inc.
- Sunnyvale Estates
- Sunshine Ventures
- Susitna Associates Inc
- Susitna Girl Scout Concil
- Susitna Investments LLC
- Susitna River Lodging
- Susitna Slough LLC
- Sutton Public Library
- Sutton/Alpine Civic Club
- Tait Properties LLC
- Talkeetna Aero Services
- Talkeetna Air Taxi
- Talkeetna Alaskan Lodge
- Talkeetna Chamber of Commerce
- Talkeetna Gifts & Collectibles
- Talkeetna Historical Society
- Talkeetna Public Library
- Talkeetna River Adventures LLC
- Talkeetna River Guides
- Talkeetna Roadhouse
- Talkeetna/Denali Visitors Center
- Tesoro Alaska Petroleum Company
- Tew's Ent LLC
- TGI Funding Co LLC
- The Alaska Skijor Club
- The Birchwood Corportation
- The Boeing Company
- The Carter Company
- The Cohen Group
- The Conservation Fund
- The Ellis Group Inc.
- The Frontiersman
- The Great Land Trust, Inc.
- The Palmer Group
- The Thomas Company Inc
- The Wilderness Society
- Three Rivers Accommodations
- Ticon Restaurant Equipment
- Tilby Ltd Partnership
- Timber Basin Const LLC
- TNH-Hanson
- Totem Ocean Trailer Express
- Travel Services
- Trident Services
- Trump LLC
- Trustees For Alaska
- Tull & Associates
- Tunista Prop, Inc.

- Tuzzy Consortium Library
- UAA/Chugiak-ER Campus
- UA-Land Management
- UBS Financial Services, Inc.
- Udelhoven Oilfield System Services
- UFCW AFL-CIO Local Union 1496
- Ultima Thule Wilderness Lodge
- Ultimate Alaska Experiences
- Unit Company
- United Transportation Union
- University of Alaska
- Upper Susitna Shooters
- USKH Inc.
- Valley Hospital
- Valley Locksmith
- Valley Open Bible Fellowship
- Valley Trades Center LLC
- Valley Visions LLC
- Veco Alaska, Inc.
- Venture Development Group
- Vreeland Richard Sr. Gdn
- Wasilla Four Prop LLC
- Wasilla Public Library
- Wasilla-Knik Historical Society
- WD Corporation
- Webb Ron Paving & Snow
- Wells Fargo Bank of Alaska
- Whistle Stop Bed & Breakfast
- White Raven Dev, Inc.
- Whitter Ports And Harbor
- Why Not Travel
- Willow Area Community Organization
- Willow Area Seniors, Inc.
- Willow Dog Mushers Association
- Willow Public Library
- Willow Trading Post, Inc.
- Willow Trail Committee
- Win LLC
- Windhover Construction
- Wood Family Investors LLC
- Wrightway Auto Carriers
- Y Community Council
- Z. J. Loussac Public Library - AK Collection
- Zoetie LLC
- Zweifel Properties, Inc.

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