

**APPENDIX O**  
**CUMULATIVE IMPACTS**



## **O. CUMULATIVE IMPACTS**

The Surface Transportation Board's (STB or the Board) Office of Environmental Analysis (OEA) researched and collected information about other future projects and actions that could result in impacts that would coincide in time and space with potential impacts of the proposed Port MacKenzie Rail Extension. OEA interviewed 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. OEA then applied a screening process to determine if projects were reasonable, foreseeable, and could be associated with potential cumulative impacts. This appendix describes projects and actions OEA considered for inclusion in the cumulative impacts analysis. Section O.1 describes projects and actions OEA included in the analysis; Section O.2 lists projects OEA did not include in the analysis and provides an explanation for their exclusion; and, lastly, Section O.3 describes potential cumulative impacts of the proposed rail line when added to the impacts of projects and actions described in Section O.1.

### **O.1 Projects and Actions Included in the Analysis**

#### **O.1.1 Alaska Stand Alone Gas Pipeline Project**

The State of Alaska has proposed to construct a 24-inch diameter, high pressure pipeline to transport natural gas and possibly additional natural gas liquids (NGL) from Alaska's North Slope to markets in the Anchorage Bowl and other customers along the pipeline route. The Alaska District U.S. Army Corps of Engineers (USACE) has been designated the lead Federal agency under the National Environmental Protection Act (NEPA) for the Alaska Stand Alone Gas Pipeline (ASAP) Project. The USACE has conducted scoping, analyzed preliminary alternatives, and is in the process of developing a Draft EIS, which is anticipated for release in the spring of 2011 (Sweet, 2010). Project construction is anticipated to begin in 2012 and finish by the end of 2015 (State of Alaska, 2009). Under the Parks Highway Stand Alone Alternative, the pipeline would route from the North Slope to Livengood, AK along existing highway and pipeline corridors to Willow, where it would then deviate from Parks Highway and follow the Susitna River and Little Susitna River valleys. In addition to the pipeline, the ASAP project would include a 35-acre NGL facility at the corner of Guernsey Road and Ayrshire Road and fractionation and storage facilities located approximately one mile northwest of the Port MacKenzie pier.

#### **O.1.2 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 released a notice of sale on February 22, 2010. The ADNR sold 35 tracts (totaling 138,880 acres) at the May 26, 2010 sale. Additional authorizations are required for subsequent exploration, development, and production phases. None of the tracts that were sold are in the rail line project area; however, most of the rail line project area could be included in future lease sales.

### **O.1.3 Cook Inlet Ferry**

Matanuska-Susitna Borough (MSB) is proposing a year-round commuter ferry system that would provide transportation across the 2 miles of Knik Arm that separate the MSB and Anchorage, Alaska. This project would involve the construction of a ferry landing located more than 1 mile from the Mac West Terminal Reserve of the proposed rail line. The terminal building and parking area for the ferry have already been constructed. The MSB plans to submit an application for dock construction after it finds a design agreeable to the U.S. Coast Guard, Cook Inlet Tug and Barge, and the Municipality of Anchorage. Pending funding, the MSB anticipates constructing a dock at Port MacKenzie in 2011 or 2012 (Weller, 2010). The vessel itself was designed, constructed, and christened in April 2010. The U.S. Navy will test the vessel before turning it over to the MSB (ADN 2010).

### **O.1.4 Cook Inlet OCGen™ Power Project**

Ocean Renewable Power Company (ORPC) Alaska has developed a proprietary ocean current electrical generation technology (OCGen™) to generate renewable electricity from open-ocean and tidal currents with minimal impact to the environment (ORPC, 2006). The OCGen™ Tidal Turbine-Generator Unit (TGU) utilizes advanced design cross flow turbines on either side of a single underwater permanent magnet generator and has no gears. TGUs can be stacked to create larger OCGen™ modules. ORPC plans to install the first phase of the project, consisting of 1 module, by July 2011 for a 1-year environmental testing and monitoring period. Project impacts would be focused on the specified installation location within the Cook Inlet and to-be-determined onshore locations where transmission lines would be constructed. As of September 2009, the technology had been developed to the point of field testing; feasibility tests and other studies were in progress. On October 13, 2010, the Federal Energy Regulatory Commission (FERC) issued a preliminary permit to study the feasibility of constructing the project (FERC, 2010). ORPC previously held a preliminary permit for the project.

### **O.1.5 Knik Arm Crossing**

The Knik Arm Crossing project would involve constructing a 2.5-mile bridge crossing the Knik Arm of Upper Cook Inlet to connect the Municipality of Anchorage with the MSB. The project would include a toll plaza, a rural principle artery, and phased construction to meet anticipated future travel demand (KABATA and ADOT&PF, 2007). The roadway connection on the MSB side of the Knik Arm would be Point MacKenzie Road near the Port MacKenzie District. The crossing landfall would be located 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 rail line project area. On September 18, 2007, the Federal Highway Administration (FHWA) issued the *Final Environmental Impact Statement and Final Section 4(f) Evaluation Summary for the Knik Arm Crossing*. The FHWA issued their Record of Decision on December 8, 2010 in which they identified the Northern Access – Erickson Alternative as their selected alternative (FHWA, 2010a). This alternative includes a road approaching the bridge on the Mat-Su side that begins at the intersection of Point MacKenzie Road and Burma Road, continues south to the Port MacKenzie District boundary, traverses the uplands north of Lake Lorraine, and then heads south towards the Knik Arm bluff

near Anderson Dock. The Knik Arm Bridge and Toll Authority anticipates that construction could begin in 2012, with completion of the bridge in 2016 (KABATA, 2010).

### **O.1.6 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 25 miles of new 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 rail line project area and likely would cross the Houston North, Houston South, and Big Lake segments. As of February 2009, AEA anticipated that an additional route from the Lake Lorraine area near Point MacKenzie to Willow would be studied and possibly could include a new switchyard about 3 miles northwest of Port MacKenzie. The AEA published a Draft Alaska Railbelt Regional Integrated Resource Plan (RIRP) Study in December 2009. The Draft RIRP includes a Lake Lorraine to Douglas route for a possible new transmission line. OEA did not include the possible Lake Lorraine to Douglas route area in this analysis because 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).

### **O.1.7 Goose Creek Correctional Center**

The Goose Creek Correctional Center, a joint project between the MSB and the state, is an approximately 450,000-square-foot, 1,536 bed, medium-security prison at the corner of Alsop Road and Point MacKenzie Road. The facility will be on a 300-acre lot, 150 acres of which already have been cleared as of June 2009 (ADOC and MSB, 2009a). As part of this and other projects, Point MacKenzie Road and Alsop Road would be upgraded to meet applicable standards. A groundbreaking ceremony took place on June 17, 2010 and the operational phase-in is expected by June of 2012 (MSB, 2010a). Impacts from the correctional center would be focused in the area of the Mac East Segment of the proposed rail line.

### **O.1.8 MSB Regional Aviation System Plan**

The MSB Regional Aviation System Plan (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, and preliminary plans for layout of the highest priority new airports and floatplane bases. New or upgraded airport facilities identified in the RASP include locations at Big Lake, Goose Bay, and Seven-Mile Lake. The closest rail line segment would be the Big Lake Segment. Additionally, as a corollary to the RASP, the MSB Assembly approved a Float Plane Facility Location study, but a future reconnaissance and environmental study will be needed to identify the preferred location of this facility (Sworts, 2008).

### **O.1.9 Port MacKenzie Development Projects**

The MSB owns Port MacKenzie and continues to explore commercial ventures for the port, as highlighted by the projects listed below. Impacts from the projects below would be focused at the southern end of the project area and would be located closest to the Mac East and Mac West

terminal reserves. In addition to the projects listed here, the MSB is considering other projects not included in this cumulative impacts analysis because OEA considers them speculative (see Section O.2) (Zartman, 2008).

#### **O.1.9.1 Bulk Materials Facility**

In a verified statement submitted to the STB on December 16, 2008, the MSB indicated that they are pursuing development of a bi-modal bulk materials facility at Port MacKenzie. The facility plan would include upgrades to roads, storage, and storage areas at the Port (ARRC, 2009). Construction started on the access road and the stock-pile pad in September 2009 (Sworts, 2009).

#### **O.1.9.2 Gravel Mining**

As part of an ongoing port expansion project, the MSB and Quality Asphalt and Paving are moving gravel by dump scow 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). Approximately 451,000 tons were excavated in the summer of 2008 (Zartman, 2008), no gravel was excavated in the summer of 2009 for the Port of Anchorage project, and approximately 450,000 tons are planned for excavation in the summer of 2010 (Zartman, 2009).

Another mining project at the Alsop pit located approximately 10 miles north of the port involved the mining of less than 100,000 tons of Class A gravel to be used for the Point MacKenzie Road Upgrades and Paving project (Sworts, 2009).

#### **O.1.9.3 Deep-Draft Dock Expansion**

In July 2008, the USACE permitted expansion plans for a deep-draft dock at Port MacKenzie. Although the preliminary designs have been completed for this expansion, as of October 2009, Port MacKenzie had not secured funding for the project (Zartman, 2009). In December 2004, the berth depth of the dock proposed for expansion was increased to 60 feet to accommodate vessels such as panamax and cape-sized vessels, state ferries, and cruise ships to dock. After the dock was completed, a private company constructed a conveyor system, road, and 18-acre pad to allow for the import and export of commodities.

#### **O.1.9.4 Port MacKenzie-Barge Dock Expansion**

A Port MacKenzie barge dock constructed in 2000 and expanded in 2003 (Port MacKenzie, 2008) is expected to be further expanded by almost 8 acres. The Port received a permit for the expansion in January 2007 and funding was received in 2009 (Zartman, 2009). As of August 2010, the project was nearing completion of the initial phase, which includes construction of the new borrow dike, filter rock, and armor rock. Interior fill is being embanked with an estimated quantity of 250,000 tons of material to be placed. Drainage improvements are being constructed adjacent to Don Young Road (MSB 2010b).

#### **O.1.10 Port of Anchorage Marine Terminal Redevelopment Project**

The Port of Anchorage Marine Terminal Redevelopment Project will expand, reorganize, and improve the Port of Anchorage over a 7-year period by adding 135 acres of land (doubling the

size of the marine terminal) and by providing approximately 8,880 linear feet of additional waterfront structures near the existing Port of Anchorage marine terminal. The project is located across the Cook Inlet from the southern end of the rail line project area. Construction began in 2005 and is expected to continue through 2014, primarily in summer field seasons. The U.S. Department of Transportation Maritime Administration, in cooperation with the Port of Anchorage, published an Environmental Assessment and a Finding of No Significant Impact in March 2005 (Port of Anchorage Intermodal Project, 2008).

### **O.1.11 Road Projects**

A number of road projects are planned throughout the rail line project area, including areas near the Big Lake, Willow, Mac East, and Mac West segments. OEA included those road projects listed below in the cumulative impacts analysis as reasonably foreseeable because they are funded, their designs are almost complete and would be ready for implementation upon receiving or being assigned funding, or they have been designated as a recipient of American Reinvestment and Recovery Act funding.

#### **O.1.11.1 Parks Highway: Lucas Road (Wasilla) to Big Lake Cutoff Improvements (State Transportation Improvement Program [STIP] #11961)**

This project would widen Parks Highway to 4 lanes, as well as perform traffic and safety improvements between Wasilla and the Big Lake Cutoff (ADOT&PF, 2006). The improvements would include work at Bridge No. 1922 Wasilla Railroad Crossing (ADOT&PF, 2008a). On September 12, 2010, the FHWA issued their Finding of No Significant Impact for the project (FHWA, 2010b). Design occurred in 2010, clearing the right-of-way (ROW) is scheduled for 2011, and construction of the roadway is scheduled for 2012 (ADOT&PF, 2011).

#### **O.1.11.2 Parks Highway: Willow Creek Bridge to Kashwitna River Bridge Rehabilitation, Mile Posts 72 to 83**

This Alaska Department of Transportation and Public Facilities (ADOT&PF) project involves Federal funding for rehabilitation and necessary safety improvements to Parks Highway. In April 2009, a categorical exclusion was completed for the project, indicating that the project does not generally result in adverse environmental impacts (ADOT&PF, 2003). Construction has begun and was anticipated to be completed in October 2010 (ADOT&PF, 2009b).

#### **O.1.11.3 Point MacKenzie Road Upgrades and Paving (STIP #20254)**

This realignment and paving project upgrades 12.2 miles of Point MacKenzie Road from the intersection of South Burma Road to a point 0.5 mile before the intersection with Lu Young Lane (Koski, 2009), as noted in the 2006-2009 STIP. In addition to widening, this project includes straightening 13 curves in the lower 9 miles of Point MacKenzie Road and installing culverts to cross drainages along the alignment (MSB, 2009a). A geotechnical report was used to develop 3 alternatives to complete the final 0.5 mile of upgrades (Koski, 2009). Construction on this segment began in June 2009 (MSB, 2009a).

#### **O.1.11.4 Point MacKenzie Road Improvements: Don Young Road Upgrades (STIP #18755)**

The MSB, in cooperation with the ADOT&PF and the Alaska Division of Federal Highway Administration, is proposing repairs to Point MacKenzie Road between Mile Posts 21.8 and 23.0 – a segment also known as Don Young Road (Jackson, 2009) – to improve vehicle safety and increase access to the Port MacKenzie dock. This project would reduce the grade of Don Young Road from 10 percent to 5 percent and improve water drainage. Seven culverts would be placed under the roadway, and drainage ditches would be constructed. A Categorical Exclusion for this project was completed on May 19, 2008 (ADOT&PF, 2008b). As of September 2009, construction to upgrade Don Young Road had not begun.

#### **O.1.11.5 South Big Lake/Burma Road Upgrades (previously STIP #21355)**

These adjacent projects would upgrade South Big Lake and Burma roads. In 2008, the ADOT&PF performed environmental and preliminary design work for the Burma Road improvements (ADOT&PF, 2008d). Final design and ROW acquisition funds are earmarked for 2009 (ADOT&PF, 2008c). The designs of both road projects are expected to be completed by mid-2010; however, the ADOT&PF will need additional state appropriations to begin construction.

#### **O.1.11.6 Knik Goose Bay Road Improvements**

Improvements to Knik Goose Bay Road would include installing traffic signals at Fairview Loop Signal and Vine Road. At present, the project is in the design phase, with construction and installation anticipated for the summer of 2009 (Kemplen, 2008); however, the ADOT&PF needs an additional \$600,000 in funding for the Fairview Loop Signal options. The ADOT&PF completed Environmental Checklists for both intersection projects in 2008 (ADOT&PF, 2008e).

#### **O.1.11.7 Knik Goose Bay Road Widening: Centaur Avenue to Vine Road (STIP #24596)**

This project consists of widening a 6.44-mile segment of Knik-Goose Bay Road to a divided 4 lane facility between Centaur Avenue (near Parks Highway) and Vine Road. It would include separated bicycle and pedestrian facilities, appropriate safety engineering strategies such as rumble strips, and access points that are determined to be the most effective at reducing crashes along the road. Design work began in 2010 (AKDOT&PF, 2009c).

#### **O.1.11.8 Museum Drive Extension (MSB Project 30090)**

The Museum Drive Extension will act as a collector and access road for the highway to alleviate traffic related issues along Parks Highway, Sylvan Drive, Vine Road, Marigold Drive, and Museum Drive. The 1.9-mile extension, south of Parks Highway, would connect Marigold Drive to the existing Museum Drive and intersect Sylvan Road and Vine Road. Controlled access at the intersections will provide safe, efficient, and viable access alternatives to private driveways along the highway. The proposed extension is currently in the design phase and construction could begin as soon as 2011 (MSB, 2010c).

#### **O.1.11.9 Machen Drive Extension (MSB Project 30090)**

The 1.2-mile Machen Drive Extension would connect Machen Road to Nicola Avenue, intersecting Church Road along its path. The extension would generally travel in the east-west direction. This new road would collect local traffic and bring it to an access point along the highway, allow local traffic to travel east-west, and possibly allow traffic to avoid the highway. This extension is currently in the design phase and construction could begin as soon as 2011 (MSB, 2010d).

#### **O.1.11.10 South Mack Drive Extension (City of Wasilla Project No. 54987)**

The South Mack Drive Extension would be approximately 1.5 miles in length and would connect South Mack Drive (Parks Highway side) to South Mack Drive (Knik Goose Bay Road side), connecting Knik Goose Bay Road to the highway. The City of Wasilla has developed this project to provide an alternate route to access Knik Goose Bay Road from Parks Highway. The South Mack Drive/Parks Highway intersection is currently signalized, while the Knik Goose Bay Road/South Mack Drive intersection is not. If this extension is constructed, more traffic is expected at the Parks Highway/South Mack Drive intersection. This extension is currently in preliminary design, with possible construction beginning in the fall of 2010 or the spring of 2011 (City of Wasilla, 2010).

#### **O.1.11.11 Lucille Street Rehabilitation Study**

The MSB has received a grant from the Department of Commerce, Community, and Economic Development to study the feasibility of improving North Lucille Street between E. Spruce Avenue and E. Schrock Road. The project will consider adding lanes to N. Lucille Street, with safety upgrades to the intersection at N. Lucille and E. Seldon Road. Funding includes pre-design, ROW and environmental studies, and a final reconnaissance-level report. Final design and construction funding has not been identified at this time (MSB, 2010e).

#### **O.1.11.12 Seward Meridian Parkway (STIP # 2481)**

The Seward Meridian Parkway Phase I will reconstruct Seward Meridian Parkway from Parks Highway to Seldon Road into a 4-lane facility with a center left-turn lane and a separated pedestrian/bicycle path on the west side. Construction would likely begin in 2011 (AKDOT&PF, 2009c).

#### **O.1.11.13 Vine Road Upgrade**

This project would widen and pave 3.4 miles of existing road connecting Parks Highway with Knik-Goose Bay Road. The project would repair failed sections of the sub-grade, reconstitute drainage, add base course material, add a 4-foot shoulder, and repave with hot mix. This project is within a fast-growing area of the Borough and is listed in the Long Range Transportation Plan as needed before 2025 (MSB, 2007a).

#### **O.1.11.14 Seldon Road Extension**

This project would construct 1.5 miles of new road between Beverly Lake Road and Church Road. This is also part of the Seldon-Bogard Corridor, which will connect Parks Highway with Glenn Highway. The new road will include an adjacent pathway. This project is listed in the LRTP as a base project that should be in progress now and completed well before 2015 (MSB, 2007a).

#### **O.1.11.15 Fish Creek Park Wayside (STIP #6216)**

This project would consist of the construction of a pedestrian bridge and a 10-vehicle parking area adjacent to South Big Lake Road at Fish Creek and a separated path for pedestrians from Fish Creek to South Big Lake wayside. The project would also bring the trail system to the wayside and would result in the paving of 0.25 mile of South Big Lake Wayside Access Road. Environmental clearance was achieved in 2001 and the ROW was authorized in 2002. The project is scheduled to begin the design phase in 2013 (AKDOT&PF, 2009c).

#### **O.1.12 South Wasilla Rail Line Relocation**

ARRC plans to straighten curves along the 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 line project area and would be closest to the Big Lake Segment. The Federal Transit Administration issued an Environmental Assessment in September 2005 and a Finding of No Significant Impact in January 2006 (FTA, 2006). ARRC will construct the project in 2 phases. Phase 1 is approximately from ARRC Mile Posts 154 to 156; Phase 2 is from ARRC Mile Posts 156 to 158. As of March 2010, ARRC was working to acquire the ROW for Phase 1 (ARRC, 2010).

#### **O.1.13 Su-Knik Mitigation Bank – Umbrella Mitigation Bank Instrument – Big Lake South Individual Bank Plan**

The MSB and Sustainable Environments, LLC partnership, together referred to as Su-Knik, propose to establish an umbrella preservation mitigation bank. The Big Lake South Bank, a 2,279-acre wetland preservation mitigation bank, is located in the MSB just southeast of Big Lake and just south of the Houston, Wasilla, and Palmer growth corridor, and would be a part of this umbrella. Fish Creek, Threemile Creek, and Goose Creek flow through the project area and connect an extensive complex of existing wetlands. The Supplement to the Umbrella Bank Instrument<sup>1</sup> for the Big Lake South Bank was completed in September 2007 (Interagency Review Team, 2007a and 2007b). The mitigation banks would be located near the area of the Connector 1 Segment and the Houston Segment and would cross the Big Lake Segment of the proposed rail line.

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<sup>1</sup> A Mitigation Bank Instrument is a planning document used to establish a wetland mitigation bank.

### **O.1.14 West Mat-Su Access Project**

The MSB has proposed to build a bridge across the Little Susitna River into the southern part of the Fish Creek Management Area, thereby providing road access to the western side of the Little Susitna River. The MSB is studying 4 road access route options, including 3 locations for the bridge: the extension of Susitna Parkway in the Big Lake area, a location approximately 0.8 mile 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. The access project might also include a short spur road continuing 3 to 4 miles west past the Little Susitna River (MSB, 2007b). The Federal Highway Administration would fund the project. Potential road options associated with the access project could intersect the Connector 1 and Big Lake segments of the proposed rail line.

## **O.2 Projects Considered but not Included in the Analysis**

Certain projects proposed in the vicinity of the proposed rail line have been excluded from this cumulative impacts analysis for the reasons provided below.

- A proposed Matanuska Electric Association coal-fired power plant is not being considered until at least 2012 (Carter, 2008) and is therefore not considered reasonably foreseeable.
- A proposed MSB agricultural processing and product development facility to be collocated with a nutrition center is not funded and is therefore not considered reasonably foreseeable.
- Certain Port MacKenzie development projects have been proposed but have no associated design specifics and/or funding and are therefore not considered reasonably foreseeable.
- USACE permitting actions were considered; however, no current or foreseeable USACE permit applications would be in the area of the proposed rail line. OEA searched the USACE Alaska District Web site for USACE-sponsored operations and permit applications and contacted officials from the USACE's Regulatory Division to identify future applications that are known, but have not yet been officially filed. Because no projects requiring permits are planned in the vicinity of the proposed rail line, USACE actions are not included in this cumulative impacts analysis.
- The MSB completed a draft Joint Land Use Study to provide recommendations regarding land development policies and a compatible implementation strategy that supports the military's mission in the study area (MSB, 2009b). The draft Joint Land Use Study addresses noise concerns and appears to indicate that no noise contour is generated for helicopter operations because of the low number of helicopter operations. Because there are no residences in the very small area of overlap between the project area and the Elmendorf AFB contour, OEA concluded that it did not require further analysis.

## **O.3 Environmental Consequences**

This section discusses the potential cumulative impacts resulting from the proposed rail line in conjunction with the other reasonably foreseeable actions described in Section O.1. For this analysis, OEA identified potential cumulative impacts to all of the environmental resource areas

described in Chapters 3 through 15 of the Environmental Impact Statement (EIS). Cumulative impacts are discussed according to these resource areas in Sections O.3.1 through O.3.13 below.

## **O.3.1 Geology and Soils**

### **O.3.1.1 Analysis**

The primary impacts to geology and soils from the proposed rail line construction and operation would include:

- Modification of topography through excavation and fill.
- 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 lands within the ROW that contain soils considered to be of local importance for agriculture.
- Potential damage to infrastructure from seismic events.

Past impacts to soils and geology in the project area are primarily a result of excavation and fill activities associated with construction of the existing roadway network, residential and agricultural development, and borrow-site development. All of these activities result, to some extent, in minor impacts involving topographic modification and removal and replacement of the existing soil profile. Some of these activities also lead to the exposure of highly erodible soils or conversion of agricultural lands.

Present and reasonably foreseeable cumulative impacts to geology and soils resulting from the proposed rail line, in conjunction with the specific projects described in Section O.1, are listed below.

#### **Alaska Stand Alone Gas Pipeline Project**

Alaska's proposed Alaska Stand Alone Gas Pipeline Project could contribute minor cumulative impacts to geology and soils in the project area through excavation and fill activities associated with burial of the pipeline. Potential impacts could overlap primarily with those for the Willow, Mac East, Big Lake, Connector 1, Connector 3, and Connector 3 Variant segments.

#### **Cook Inlet Areawide Oil and Gas Lease Sale**

The lease of state-owned land under the Cook Inlet areawide oil and gas lease sale would result in minor impacts to geology and soils resources in the rail line project area. Impacts to geology and soils would result primarily from development activities, such as the excavation and fill associated with construction of facilities and access roads and land clearing to create linear corridors for seismic surveys (ADNR, 2008). Such development activities could expose highly erodible soils, which could result in potential cumulative impacts to geology and soils in conjunction with those impacts associated with the proposed rail line alternatives.

### **Cook Inlet Ferry**

The Cook Inlet Ferry project would impact geology and soils in the proposed rail line project area through excavation and fill activities associated with construction of the dock and landing. Minor cumulative impacts to geology and soils could result from these construction activities. Terminal buildings and parking areas for the ferry are already constructed and would therefore not contribute to cumulative impacts to geology and soils in conjunction with the proposed rail line alternatives.

### **Knik Arm Crossing**

The Knik Arm crossing would impact geology and soils in the proposed rail line project area through excavation and fill activities associated with road upgrades and construction of new roadways connecting to the bridge. Development in the Point MacKenzie Agricultural Project would be expected as a result of the Knik Arm Crossing Project, and would contribute to the conversion of land that contains soils the MSB considers to be of local importance for agricultural purposes (FHWA and KABATA, 2007). Construction activities and development in previously undisturbed areas could also increase soil erosion (FHWA and KABATA, 2007). Minor cumulative impacts to geology and soils could result from these construction and development activities.

### **Knik-Willow Transmission Line Upgrade**

The 4 alternative routes for the 230-kilovolt Teeland-Douglas transmission line upgrade project would require 236 to 242 acres of land clearing (Dryden and LaRue *et al.*, 2004). The land clearing could expose highly erodible soils and could cumulatively contribute to potential impacts from the proposed rail line alternatives that include the Big Lake, Houston North, and Houston South segments. The transmission line facilities would be vulnerable to damage from seismic events.

### **Goose Creek Correctional Center**

The Goose Creek Correctional Center is a new construction project that could contribute minor cumulative impacts to geology and soils in the proposed rail line project area through excavation and fill activities associated with construction of the facility and associated access roads and parking lots. Furthermore, the location of the facility in the Point MacKenzie Agricultural Project would result in the conversion of agricultural lands that the MSB considers to be of local importance, thereby cumulatively contributing to potential impacts on soils from the proposed rail line.

### **MSB Regional Aviation System Plan**

Implementation of the RASP could contribute minor cumulative impacts to geology and soils in the proposed rail line project area through excavation and fill activities associated with upgrades to existing airstrips and construction of new airports and float-plane facilities and of support infrastructure such as access roads and parking lots.

## **Port MacKenzie Development Projects**

Excavation and fill associated with Port MacKenzie development projects including the expansion of existing deep-draft and barge docking facilities, construction of a bi-modal bulk materials facility, and development of an open-pit gravel mine could be expected to contribute minor cumulative impacts to geology and soils in the proposed rail line project area.

Construction for the bulk materials facility and gravel mining project is already underway.

## **Road Improvement Projects**

Development of new road corridors could contribute to minor cumulative impacts to geology and soils in the proposed rail line project area through excavation and fill associated with road bed construction. In addition, land clearing for the projects could expose highly erodible soils, which could contribute to potential impacts from the proposed rail line alternatives. The severity of impacts to geology and soils would depend on the length and route of the proposed roadways and the types of soils they would cross. The road projects included in this cumulative impacts analysis would not be expected to result in conversion of any agricultural lands that the MSB considers to be of local importance.

## **West Mat-Su Access Project**

The construction of a bridge across the Little Susitna River and an associated access road could contribute minor cumulative impacts to geology and soils in the rail line project area through excavation and fill activities associated with the construction of the proposed road bed and stream crossings.

### **O.3.1.2 Conclusion**

Construction and operation activities associated with some of the projects described above would result in minor adverse impacts to geology and soils resources and could cumulatively contribute to minor potential impacts associated with the proposed rail line. Most notably, to some extent these construction and operation activities would result in minor impacts related to topographic modification and removal and replacement of the existing soil profile. In some cases, the activities could 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. Impacts from the proposed rail line, when added to other relevant present and reasonably foreseeable future projects and actions, could result in minor cumulative impacts to soils and geology in the Matanuska-Susitna area.

## **O.3.2 Water Resources**

### **O.3.2.1 Analysis**

Table O-1 summarizes the direct and indirect potential impacts to water resources that could result from proposed rail line construction and operation activities.

**Table O-1  
Potential Impacts to Water Resources from the Proposed Port MacKenzie Rail Extension**

<b>Effects of Construction and Operation</b>	<b>Direct Impacts</b>	<b>Indirect Impacts</b>
Blockage, convergence, or changes to the natural drainage	x	
Altered flood hydraulics		x
Increased potential for overbank flooding and/or ice/debris jams		x
Reduced floodplain area	x	
Increased scour, bank erosion, and/or channel aggradation		x
Stresses on natural water balances		x
Increased turbidity and sediment loads		x
Increased concentrations of pollutants		x
Removal of surface soils and changes in recharge potential	x	
Dewatering of aquifers		x
Impacts to Su-Knik Mitigation Bank	x	
Impacts to Goose Creek Fen	x	

Potential rail line impacts could contribute to existing direct and indirect impacts to water resources in the project area, which have resulted from past and ongoing urban, recreation, transportation, agriculture, and natural resource development activities. The Big Lake Segment would affect the Goose Creek Fen and Su-Knik Mitigation Bank lands, both of which are considered to be sensitive and important wetlands resources. Alternatives for the proposed rail line that include the Big Lake Segment could negate some of the beneficial impacts of the Su-Knik Mitigation Bank by reducing the wetland acreage available to compensate for the impacts of development projects elsewhere. The following paragraphs describe cumulative impacts to water resources from the proposed rail line when added to the impacts of several ongoing and reasonably foreseeable future projects and actions. OEA analyzed impacts to surface waters and wetlands; 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.

**Alaska Stand Alone Pipeline Project**

Physical disturbances from burial of the pipeline such as land clearing, excavation, and placement of fill near waterbodies could result in direct impacts to surface waters and wetlands. Potential impacts to water resources from the proposed rail line, when added to potential impacts from the ASAP Project, could result in cumulative impacts in areas where the projects overlap,

primarily in the areas of the Willow, Big Lake, Mac East, Connector 1, Connector 3, and Connector 3 Variant segments.

### **Cook Inlet Areawide Oil and Gas Lease Sale**

Potential impacts to surface waters and wetlands from the proposed rail line, when added to surface water and wetland impacts from Cook Inlet Areawide oil and gas lease sale activities could result in cumulative impacts to water resources in areas where the projects overlap. Development activities would include clearing corridors for seismic surveys, drilling wells, production activities, and direct excavation and fill activities for the construction of associated facilities and access roads. Physical disturbances such as land clearing, excavation, and placement of fill near waterbodies could result in direct impacts to surface waters and wetlands.

### **Knik Arm Crossing**

The Knik Arm Crossing project would be expected to impact water resources in the proposed rail line project area. Bridge construction, road upgrades, new roadways to connect to the bridge, and increased traffic near waterbodies could directly impact surface waters. However, since there is no overlap of potential surface water impacts from the Knik Arm Crossing with those from the rail line, no cumulative impacts would result.

### **Knik-Willow Transmission Line Upgrade**

The preferred alternative for the Teeland-Douglas transmission line project could contribute to cumulative impacts to surface waters and wetlands in the proposed rail line project area through construction and land clearing activities near waterbodies. The preferred alternative for the transmission line would require construction that would run parallel to the existing transmission lines and cross the proposed Houston North, Houston South, and Big Lake segments. The transmission line construction and clearing activities near waterbodies could directly impact the same surface water and wetland resources as those in the impact areas of the proposed rail line segments.

### **Goose Creek Correctional Center**

The Goose Creek Correctional Center could impact surface water resources in the area of the Mac East Segment. Potential impacts to surface water resources from the proposed rail line along the Mac East Segment, when added to surface water impacts from the Goose Creek Correctional Center, could result in locally substantial cumulative impacts to surface water resources.

### **MSB Regional Aviation System Plan**

Physical disturbances such as land clearing, excavation, and placement of fill near waterbodies under the RASP could directly impact surface water resources. In addition, oil and fuel leaks from float planes and runoff from new airports and associated parking lots could reduce water quality. The potential impacts to water resources from the Big Lake Segment of the proposed rail line, when added to regional and localized impacts to surface water quality from

implementing the Regional Aviation System Plan, could cumulatively impact water resources in the area of the Big Lake Segment due to the proximity of the Big Lake Airport facility.

### **Port MacKenzie Development Projects**

Cumulative impacts to surface water could occur in the area of the Mac West, Mac East Variant, and Mac East segments as a result of the combination of surface water impacts from Port MacKenzie development projects, including the expansion of existing deep-draft and barge docking facilities, construction of a bi-modal bulk materials facility, and development of an open-pit gravel mine, and the proposed rail line.

### **Port of Anchorage Marine Terminal Redevelopment Project**

The U.S. Department of Transportation, Maritime Administration, in cooperation with the Port of Anchorage, concluded that the Port of Anchorage Marine Terminal Redevelopment Project would not result in significant adverse impacts to water resources. Therefore, there would be no significant cumulative impacts to water resources from the proposed rail line and the Port of Anchorage Marine Terminal Redevelopment Project.

### **Road Improvement Projects**

Development of new road corridors would directly impact surface water, groundwater, and floodplain resources. The scale of impacts would depend on the length and routes of the proposed roads and the waterbodies they would cross. Physical disturbances such as land clearing, excavation, and placement of fill near waterbodies could directly impact surface water resources. Water resource impacts from road projects in the areas of the Mac East, Willow, and Big Lake segments would overlap with potential impacts of the rail line, resulting in cumulative impacts to surface water resources.

### **Su-Knik Mitigation Bank – Umbrella Mitigation Bank – Big Lake South Individual Bank Plan**

The wetland bank concept would compensate for wetland impacts from developments that occur elsewhere. The Big Lake Segment would cross 2 wetland mitigation bank areas, thus reducing the wetland acreage available to compensate for the impacts of other projects. Therefore, potential impacts from the proposed rail line, when added to the impacts of other development projects in the area of the Big Lake Segment, could result in cumulative impacts to water resources in the wetland bank areas.

### **West Mat-Su Access Project**

Construction of the bridge and access roads under the West Mat-Su Access Project could cause increased traffic near waterbodies and could directly impact surface water. Potential road options associated with the project could be constructed near the Connector 1 Segment and the Willow Segment. Therefore, potential impacts to surface water resources from the proposed rail line, especially in areas close to the West Mat-Su Access Project, could result in cumulative impacts to surface water resources.

### **O.3.2.2 Conclusion**

Construction and operation activities associated with the projects described above could impact surface water and wetland resources in some of the same areas as certain rail line segments. There would be no overlap of impacts to the Goose Creek Fen from other present or reasonably foreseeable future proposed projects and actions. Therefore, potential impacts to water resources from the proposed rail line, when added to other relevant projects and actions, could result in cumulative impacts to water resources in the Matanuska-Susitna area.

### **O.3.3 Biological Resources**

#### **O.3.3.1 Analysis**

The primary potential impacts to biological resources from construction and operation of the proposed rail line 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 fire cycles by leading to the creation of fire breaks along the project ROWs. These fire breaks could lead to an increase in fuel accumulation along 1 side of the project footprint, thereby increasing the risk of more intense wildland fires. As a result of this disruption of the fire cycle, separated vegetation communities might experience different rates of ecological succession, leading to a decrease in biodiversity in the project area.

All proposed rail line alternatives could contribute to cumulative impacts to biological resources in the project area. The potential impacts could add to impacts from existing urban, recreation, transportation, agriculture, and resource development activities. The following paragraphs describe the impacts of other relevant projects and how potential impacts from the proposed rail line, when added to the impacts of other relevant projects, could result in cumulative impacts to biological resources.

#### **Alaska Stand Alone Pipeline Project**

Implementation of the Parks Highway alternative for the ASAP Project could result in impacts similar to those of the proposed rail line, as both projects are linear and the Parks Highway alternative runs parallel to or intersects with certain rail line segments. Cumulative impacts could result primarily for the Willow, Mac East, Big Lake, Connector 1, Connector 3, and Connector 3 Variant segments.

#### **Cook Inlet Areawide Oil and Gas Lease Sale**

The ADNR's Minerals Management Service found that lease sales and potential subsequent exploration and development would have no measurable negative effects on the Cook Inlet area (MMS, 2003), and the ADNR issued a Final Best Interest Finding on January 20, 2009 (ADNR, 2009).

Oil and gas lease activities in the Susitna Flats and Goose Bay state game refuges could impact the same areas as the proposed rail line's Connector 1 Segment and Mac West Segment; these rail segments would encroach on the Susitna Flats State Game Refuge. Seismic survey lines and

temporary and permanent access roads and facilities in these refuges could increase access to hunting and fishing areas in the refuges. Seismic survey lines could contribute to additional fragmentation of forested and wetland habitats throughout the proposed rail line project area. Cleared seismic-line and temporary-access corridors would likely receive heavy off-road vehicle use, especially corridors through densely forested areas. Increases in off-road vehicle traffic would impact stream banks by increasing erosion at crossings and would impact wetlands as off-road vehicles make new trails through wetland areas. Any increases in off-road vehicle access would also contribute to the spread of invasive plant species by aiding in the distribution of seed material and creating environmental conditions, such as soil compaction and exposed mineral soils, which favor the growth of non-native plants. Therefore, potential impacts to biological resources from the proposed rail line, when added to impacts from oil and gas lease activities, could result in cumulative impacts to biological resources in the Susitna Flats State Game Refuge.

### **Cook Inlet Ferry**

Cook Inlet Ferry construction and operation would impact Essential Fish Habitat, anadromous fish, marine mammals, and marine birds through reduced water quality resulting from increased suspended sediments from runoff; non-point source pollution from the ferry parking lot runoff, associated buildings, and roads; and noise from terminal and ferry operations (HDR, 2006a). Potential indirect impacts of the proposed rail line related to increased vessel traffic at Port MacKenzie, when added to marine pollution and disturbance from the Cook Inlet Ferry, could result in cumulative impacts to biological resources.

The indirect impacts of increased vehicle traffic on Port MacKenzie and Knik-Goose Bay roads resulting from the Cook Inlet Ferry would result in collision mortality for moose and other animals. Potential wildlife-train collision impacts from the proposed rail line, particularly from the Mac East and Big Lake segments, when added to wildlife-vehicle collision impacts associated with the ferry, could result in cumulative impacts to wildlife. Increased vehicle traffic would also have the potential to contribute to the spread of invasive plant populations.

### **Cook Inlet OCGen™ Power Project**

Development of a pilot marine tidal power project employing mid-water OCGen™ turbine generator units, mooring lines, anchors, and power cables could impact marine benthic habitat, Essential Fish Habitat, beluga whales, and marine and anadromous fish. The project could disturb migratory patterns that, along with the potential impacts to Essential Fish Habitat from the proposed rail line, could reduce the reproductive success of salmonids. Additionally, temporary construction noise (boat traffic, pile driving, etc.) and potential turbidity would likely disturb beluga whales. Operation of the turbine generator units could potentially affect beluga whales through collision or obstruction. The Cook Inlet demonstration project area extends from north of Cairn Point in the Knik Arm to Fire Island Shoals. Potential impacts from the proposed rail line, when added to the impacts from installation of the pilot project, could result in minor cumulative impacts to vessel traffic, noise, beluga whales, and marine and anadromous fish.

## **Knik Arm Crossing**

The Knik Arm Crossing could result in minor impacts to marine fish and invertebrates, beluga whales, marine birds, Essential Fish Habitat, and anadromous fish. The Knik Arm Crossing project could cause reduced freshwater habitat quantity and quality, reduced terrestrial habitat quality, changes in local abundance and distribution of bird and mammal species, increased mortality from vehicle collisions, barriers to movement between habitats, increased hunting pressure leading to population declines, and changes in game management plans for moose and brown bears (HDR and URS, 2006).

Vehicle collision mortality for moose and other wildlife from increased traffic along Point MacKenzie Road, Big Lake Road, Knik-Goose Bay Road, and other secondary roadways on the west side of Knik Arm would result due to increased traffic from the Knik Arm Crossing. Collision mortality from the proposed rail line, when added to collision mortality from the Knik Arm Crossing, could result in cumulative impacts to wildlife.

Road upgrades and new roadways that would be constructed to connect to the Knik Arm Crossing would impact fisheries by decreasing water quality due to runoff of pollutants from road surfaces and increased turbidity caused by increased erosion from construction areas. In addition, underwater noise during bridge construction could adversely affect beluga whales as they are sensitive to types of pile driving that are within the range of their hearing. Increased vehicle traffic would also have the potential to contribute to the spread of invasive plant populations, and could cause indirect impacts to beluga whales causing them to avoid the area. Potential impacts from the proposed rail line, when added to impacts from the Knik Arm Crossing, could result in cumulative impacts to fisheries, beluga whales, wildlife, and the spread of invasive plant populations.

## **Knik-Willow Transmission Line Upgrade**

The preferred alternative for the 230-kilovolt Teeland-Douglas transmission line project would parallel the existing 230-kilovolt and 138-kilovolt lines. Upgrades to the existing lines would not require additional land clearing under the preferred alternative. Other alternatives would require land clearing of between 236 and 242 acres (Dryden and LaRue *et al.*, 2004), resulting in incremental impacts through habitat loss and alteration. The proposed power lines associated with the proposed rail line and the proposed Knik-Willow transmission line would result in collision mortality for migratory and resident bird species and, when combined, could lead to cumulative impacts to these birds.

New transmission line corridors would also lead to impacts of increased habitat fragmentation and subsequent use by recreational off-road vehicles, especially along the transmission line alternatives, through heavily forested areas. Potential impacts from the proposed rail line, when added to impacts of the proposed new transmission line, could result in cumulative impacts to biological resources, especially along the Houston North, Houston South, and Big Lake segments. The increase in off-road vehicle use would also result in habitat change along streams where crossings would be made and through adjacent wetlands as off-road vehicles create more trails.

## **Goose Creek Correctional Center**

The Goose Creek Correctional Center requires clearing 150 acres of forested habitat, which would result in wildlife habitat loss and fragmentation. Correctional center operations would result in increased traffic along Point MacKenzie Road, Knik-Goose Bay Road, and other local secondary roads from correctional workers, visitors, and suppliers traveling to and from the center; the increased traffic would increase moose and other wildlife-vehicle collision mortality.

Potential impacts from the proposed rail line, when added to impacts from the correctional center, could result in cumulative habitat loss, forested habitat fragmentation, and wildlife-vehicle collision mortality, which could cause locally substantial impacts along rail line alternatives that include the Mac East Segment.

## **MSB Regional Aviation System Plan**

Upgraded and new facilities under the RASP would result in habitat loss and alteration, increased air traffic, and increased associated recreational activities, which would consequently increase disturbance to wildlife, especially waterbirds and waterfowl. New float-plane facilities would result in reduced water quality due to oil and fuel leaks and to runoff from new airports and associated parking facilities, and the location of the proposed Seven-Mile Lake facility near a wetland mitigation bank area would conflict with the purpose of the mitigation bank to provide wildlife habitat. Proposed upgrades to the Goose Bay Airport would contribute to disturbance of shorebird migration staging habitat and waterfowl migration and nesting habitat in the Goose Bay State Game Refuge. The expansion of the Goose Bay Airport would also contribute to additional noise disturbance near habitats used by beluga whales in the Knik Arm. Increased aviation traffic and related activities would also have the potential to increase the spread of invasive plant species. Potential impacts along the proposed rail line alternatives that include the Mac East and Big Lake segments, when added to the impacts of aviation system activities, could result in cumulative impacts to various biological resources.

## **Port MacKenzie Development Projects**

Environmental reviews indicate that the Port MacKenzie development projects, including the expansion of existing deep-draft and barge docking facilities, construction of a bi-modal bulk materials facility, and development of an open-pit gravel mine, would affect marine resources and Essential Fish Habitat and could result in cumulative impacts to beluga whales and beluga whale habitats (National Marine Fisheries Service, 2008). The proposed rail line could indirectly contribute to cumulative effects on the beluga whale marine environment through possible increases in vessel traffic and noise. ARRC anticipates that if the proposed rail line were completed, approximately 5 vessels per year would arrive and load coal at Port MacKenzie (ARRC, 2009). Development of the Port MacKenzie bi-modal facility would increase truck traffic to and from Port MacKenzie, resulting in increased moose and other wildlife-vehicle collision mortality along Point MacKenzie and Knik Goose Bay roads. Potential wildlife-train collision mortality impacts from the proposed rail line, when added to collision impacts of the Port MacKenzie development projects, could result in cumulative impacts to wildlife, particularly in the areas of the proposed rail line Mac East, Mac East Variant, and Big Lake segments.

## **Port of Anchorage Marine Terminal Redevelopment Project**

An assessment of the environmental effects of the Port of Anchorage Marine Terminal Redevelopment Project concluded that there would be no substantial cumulative impacts to vegetation and wildlife because of the disturbed nature of the site and minimal native habitat to support wildlife (DOT, 2005). The Port of Anchorage expansion project affects intertidal and sub-tidal habitats and could result in adverse, but not significant, cumulative impacts to Essential Fish Habitat (DOT, 2005). The National Marine Fisheries Service determined that valuable habitat for fish and beluga whales in upper Cook Inlet would be affected by the Port of Anchorage expansion and that habitats would be degraded due to increased noise (National Marine Fisheries Service, 2006). The Biological Assessment included in this Final EIS as Appendix H addressed potential indirect impacts from the proposed rail line to the endangered Cook Inlet beluga whale and concluded that the proposed rail line may affect, but is not likely to adversely affect, the beluga whales or access of beluga whales to Type 1 habitats in the Knik Arm. The proposed rail line could cause potential indirect effects on the beluga whale from increases in vessel traffic and associated noise and disturbance effects. When noise impacts from the Port of Anchorage expansion project are added to the potential indirect impacts of the proposed rail extension, cumulative impacts to the beluga whales could result.

## **Road Improvement Projects**

Development and improvement of road corridors would contribute to habitat loss and alteration. The scale of impacts would depend on the length and route of the proposed road and the type and nature of the habitats that would be crossed. Most road improvement projects would require vegetation clearing next to the roadway or across new corridors, resulting in incremental habitat loss. Roadway improvements could benefit fish and wildlife by providing for enhanced fish passage with upgrades to existing bridges or culverts; reducing collision mortality for big game species with increasing driver visibility on widened roadways with improved lighting; providing for wildlife protection and movement by providing underpasses. However, these beneficial effects could be offset by detrimental effects such as incremental habitat loss and alteration, increased exposure to contaminated runoff from pavement, increased sedimentation to streams, fragmentation of connected wetlands from fill, and increased traffic volumes and traffic velocity, leading to increased moose- and other wildlife-vehicle collisions. In general, the 6 road projects included in the cumulative impacts analysis would involve approximately 50 miles of existing or new roadways throughout the project area. Therefore, there could be cumulative impacts to biological resources in the form of habitat loss and alterations and wildlife-vehicle mortality.

## **Su-Knik Mitigation Bank – Umbrella Mitigation Bank – Big Lake South Individual Bank Plan**

Wetlands in wetland banks would generally be considered protected. The bank concept would facilitate development in wetland habitats outside the bank, for which the protected wetlands would be used to comply with compensatory mitigation requirements. Provided the protected wetlands are of superior capacity to support fish and wildlife populations, this would result in a net benefit for most wildlife species. The Big Lake Segment would cross 2 areas in the wetland mitigation bank and would remove wetlands in the bank, which would be contrary to the

intended conservation purpose of the mitigation bank and result in a negative impact to the wetland mitigation bank.

### **West Mat-Su Access Project**

Construction of a bridge and access road under the West Mat-Su Access Project would result in incremental terrestrial and aquatic habitat loss and alteration. The new access road would cross proposed rail line segments and could enable both off-road and roadway vehicles to access the rail line maintenance road along the Willow Segment and Connector 1 Segment. This increased access could put additional harvest pressure on the Little Susitna River and the Susitna River tributary fisheries and local wildlife resources. Increased access and off-road vehicle use could result in cumulative stream habitat loss from instream crossings and the habitat loss of adjacent wetlands.

#### **O.3.3.2 Conclusion**

Construction and operation activities associated with the projects described above could contribute to adverse cumulative effects to the biological environment in the area of the proposed rail line. Most notably, these projects include actions that would affect wildlife habitat through habitat destruction and altered suitability, including increases in invasive plant populations and changes in fire cycles, increased public access, noise, and potential direct and indirect wildlife mortality. The potential impacts of the proposed rail line, when added to the impacts of the noted projects, could result in cumulative impacts to the biological environment in the Matanuska-Susitna area.

### **O.3.4 Cultural and Historic Resources**

#### **O.3.4.1 Analysis**

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 East Variant-Connector 3 Variant-Houston-Houston South Alternative would affect the fewest known cultural resources and pass through areas with a low probability (such as wetlands) of having large numbers of undocumented cultural resources.

Archaeological sites in the proposed rail line ROW that cannot be avoided could possibly be damaged during proposed rail line construction and could lose their eligibility for listing on the National Register. Numerous salmon streams in the area are host to archaeological sites in and adjacent to the stream beds and the proposed rail crossings of these streams, and changes in stream flow, could affect those archaeological sites.

Historic properties in the project area could be adversely affected and lose their context and integrity through visual and audible effects. However, many of the historic structures that could experience visual or audible effects are either associated with the railroad (such as the Houston railroad station) and thus would not be affected by the introduction of railroad-associated visual or audible elements or are located near the existing rail line along Parks Highway and already experience visual and audible effects associated with rail line operation. The remaining historic

structures are generally within 0.5 mile of the rail line alternatives and could experience visual and audible effects. For any of these potential effects to be considered adverse, however, the introduction of visual, atmospheric, or audible elements would have to diminish the integrity of the property's significant historic features (36 C.F.R. § 800.5(2)(v)).

The Iditarod Dog Sledding Historic District could be adversely affected to varying degrees through loss of visual integrity, cultural privacy, potential loss of or changes to access within the ROW, and changes to traditional or culturally substantial use of and connection to the property. Trails that are contributing features of the Iditarod Dog Sledding Historic District would be grade-separated, 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 could be impeded. 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 National Historic Preservation Act (NHPA) trails or NHPA historic trail segments.

### **Alaska Stand Alone Pipeline Project**

Impacts to cultural and historic resources from construction of the buried natural gas pipeline Parks Highway alternative route could result in impacts similar to those of the proposed rail line, as both projects are linear and the Parks Highway alternative runs parallel to or intersects with certain rail line segments. Impacts from pipeline construction could overlap with potential impacts from the proposed rail line primarily for the Mac East and Willow segments, resulting in cumulative impacts. Potential trail crossings could experience disturbance during excavation and construction of the pipeline, but should remain functional once the pipeline is buried.

### **Knik Arm Crossing**

Although there would be no immediate impacts to cultural resources in the proposed rail line study area from the proposed Knik Arm Crossing, any increase in residential development from people taking advantage of the short commute between Point MacKenzie and Anchorage via the bridge across the Knik Arm could have an impact on existing cultural resources in the study area, particularly for those closest to the Point MacKenzie and Knik areas, and including the Iditarod National Historic Trail and the Iditarod dog sledding cultural landscape.

### **Knik-Willow Transmission Line Upgrade**

Impacts to cultural resources from the 25-mile, 230-kilovolt transmission line could include direct destruction or disturbance of cultural resources in the transmission line ROW. However, since the preferred transmission line alternative parallels the existing transmission line, additional impacts to cultural resources would be expected to be minor.

### **Goose Creek Correctional Center**

Impacts to cultural resources from the Goose Creek Correctional Center would be localized to the 330 acres developed for the correctional facility. The contribution to cumulative impacts to

cultural resources in the study area from the Goose Creek Correctional Center would likely be low given the small footprint of the correctional center compared to the study area.

### **MSB Regional Aviation System Plan**

Direct impacts to cultural resources from the MSB RASP would be localized to any new airport sites selected under this plan. Increase in access to the study area created by new airports could attract more residential development or recreational users, thereby increasing cumulative impacts to cultural resources in the study area.

### **West Mat-Su Access Project**

Direct impacts to cultural resources from a proposed bridge across the Little Susitna River would be localized to the site of bridge construction if there are any cultural resources in the area. Indirect impacts to cultural resources near the bridge could be greater because the new access created by the bridge would open the western side of the Little Susitna River to an increased number of recreational users and could contribute to cumulative cultural resources impacts.

#### **O.3.4.2 Conclusion**

Activities related to some of the projects described above could result in impacts to cultural and historic resources. Direct impacts would be localized and could result where project activities are focused in one area, such as the ROW for the ASAP Project; indirect impacts could result from projects that promote or attract increased development and/or population growth such as the MSB RASP. Potential impacts from the proposed rail line, when added to other relevant projects, could result in cumulative impacts to cultural and historic resources.

### **O.3.5 Subsistence**

#### **O.3.5.1 Analysis**

All proposed rail line alternatives are in the state nonsubsistence area and are at a considerable distance from areas where state-regulated subsistence activities occur; therefore, impacts to subsistence uses outside the nonsubsistence area would be similar regardless of which alternative the STB authorized, if any. Impacts to wildlife associated with the rail line could vary depending on the alternatives. Impacts to subsistence resulting from the proposed rail line 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 operation affects species distribution and/or survival rates.
- Adverse impacts to user access because of ARRC regulations prohibiting access across the rail line except at designated crossing points. The farther west the rail line alternative, the more subsistence users could be affected.

The most substantial past impact to subsistence activities in the study area resulted from the creation of the Anchorage-Matsu-Kenai nonsubsistence area in 1992 under Alaska Administrative Code (Alaska Admin. Code 5 § 99.015), which removed subsistence hunting and fishing regulations and the subsistence priority from a large continuous area of the Matanuska-Susitna, Anchorage, and Kenai Peninsula areas. Subsequent appeals to the constitutionality of this regulation by local indigenous groups with a history of subsistence activities in the area, including the Kenaitze Indian Tribe, Ninilchik Traditional Council, Knik Tribal Council, and Native Village of Eklutna, were eventually overruled.

### **Alaska Stand Alone Pipeline Project**

Impacts to subsistence in the study area from the proposed natural gas pipeline could include short-term effects on subsistence resources and user access during construction activities and potentially long-term adverse impacts to user access if the project proponents restrict user access along the pipeline ROW. However, access to subsistence use areas in GMU 16B could also be improved by allowing general public access along the ROW.

### **Cook Inlet Areawide Oil and Gas Lease Sale**

While offshore oil and gas development could affect fish and marine subsistence uses through potential oil spills, habitat degradation, contamination, and other effects, the study area lies in the Anchorage-Matsu-Kenai nonsubsistence area; therefore, impacts to subsistence uses from offshore oil and gas development would not be expected in the study area. Subsistence users residing in the study area who travel to other nearby subsistence areas to harvest fish or marine mammals (such as at Tyonek) could, however, experience impacts. Any onshore oil and gas developments in the study area could affect subsistence users through the introduction of new roads, which could increase access to nearby subsistence areas (such as Game Management Unit [GMU] 16B), thereby potentially increasing competition and decreasing resource availability.

### **Cook Inlet Ferry**

To the extent that marine activities affect beluga populations, the Cook Inlet Ferry could affect subsistence uses of beluga whales by Cook Inlet Dena'ina villages such as Tyonek, Eklutna, and Knik.

### **Cook Inlet OCGen™ Power Project**

No impacts to subsistence uses would be expected in the study area with the development of the Cook Inlet OCGen™ Power Project. The project lies in Cook Inlet within the Anchorage-Matsu-Kenai nonsubsistence area and would not be expected to impede subsistence users' access to areas managed under subsistence regulations. Studies on the impacts of the OCGen™ TGU on migrating subsistence resources, such as marine mammals and fish, are limited. Preliminary information related to other similar tidal devices indicates that these devices do not affect fish (ORPC, 2008). To the extent that these devices could affect beluga whale migration patterns and their populations due to device and mammal interactions through strikes and collision/entanglements, underwater noise and vibration, electromagnetic radiation fields, and alteration of habitats, it could affect subsistence uses of beluga whales by Cook Inlet Dena'ina villages such as Tyonek, Eklutna, and Knik.

## **Knik Arm Crossing**

The proposed Knik Arm Crossing could have the greatest indirect effect on subsistence of all foreseeable development projects. A bridge connecting the Municipality of Anchorage residents with Port MacKenzie and other lands in the Susitna Valley could increase the number of residents in these areas, which could in turn increase the number of people who might travel to GMU 16B for subsistence purposes, thereby increasing competition among existing users and reducing resource availability. To the extent that marine activities resulting from the bridge affect beluga whale populations, it could affect subsistence uses of beluga whales by Cook Inlet Dena'ina villages such as Tyonek, Eklutna, and Knik.

### **O.3.5.2 Conclusion**

Cumulative impacts to subsistence uses would be minimal given that any planned or reasonably foreseeable projects in the area would be in the Anchorage-Matsu-Kenai nonsubsistence area. Several of these projects would have a small footprint in the nonsubsistence area and, except for small habitat disturbances in the immediate area, could likely contribute to larger cumulative impacts to subsistence. Two foreseeable projects that could add to cumulative impacts to subsistence uses outside the Anchorage-Matsu-Kenai nonsubsistence area are the proposed Knik Arm Crossing and the ASAP projects. The Knik Arm Crossing could draw more residents to the study area, thereby increasing the number of people traveling to the closest subsistence-managed lands in GMU 16B. Depending on the proponent's policy regarding access along the pipeline ROW, the natural gas pipeline could restrict or improve subsistence user access to GMU 16B.

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 in a nonsubsistence area, Eklutna and Knik tribal members might 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.

## **O.3.6 Climate and Air Quality**

### **O.3.6.1 Analysis**

OEA has concluded that increases in emissions from construction and operation of the proposed rail line would be minimal in the context of existing conditions. Using a conservative approach, OEA determined that construction emissions for the proposed alternative requiring the most rail construction (Mac West -Connector 1-Willow, the longest potential route at 46 miles) 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, PM<sub>10</sub><sup>2</sup>, and PM<sub>2.5</sub><sup>3</sup> construction-related emissions would be well below the *de minimis* conformity thresholds of 100 tons per year for each pollutant.

OEA used a similar conservative approach to estimate rail line operation emissions assuming an average of 1 round trip (2 one-way trips) freight rail train per day with 3 locomotives, 80 rail

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<sup>2</sup> All particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers.

<sup>3</sup> All particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.

cars, with a loaded weight of 125 tons per car and unloaded weight of 30 tons per car (ARRC, 2008b and ARRC, 2008a). OEA also assumed that freight trains would begin operating along the proposed rail line in 2012 (ARRC, 2008a, 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). The estimated operation-related emissions would be a small fraction of MSB annual off-roadway 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. OEA has also determined that emissions from the proposed terminal reserve at the end of the rail line in the Port MacKenzie District would be a fraction of the rail line operation-related emissions and well below the *de minimis* conformity thresholds of 100 tons per year for each pollutant.

In February 2010, CEQ issued *Draft NEPA Guidance on the Effects of Climate Change and Greenhouse Gas Emissions*, which was intended to help explain how Federal agencies should analyze the environmental effects of greenhouse gas emissions and climate change when they describe the environmental effects of a proposed action. To date, this guidance has not been finalized. Regardless, the methodology included in this cumulative impacts analysis generally follows the concepts included in CEQ's 2010 draft guidance issued in February 2010.

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<sub>2</sub>) emissions. Construction-related emissions would be limited to the 2-year construction period and operation-related emissions would continue in subsequent years. Estimated annual average construction-related CO<sub>2</sub> emissions would be 3,141 metric tons per year and operation-related emissions would be 2,606 metric tons per year. Operation-related CO<sub>2</sub> emissions would represent a 2-percent increase in ARRC CO<sub>2</sub> emissions and would be less than 0.01 percent for Alaska as a whole (ADEC, 2008). Also, CO<sub>2</sub> emissions from existing roadway 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<sub>2</sub> 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 the commodities would move by rail.

Although the emissions generated from the construction and operation of the proposed rail line would be very small in comparison to annual global CO<sub>2</sub> emissions, they would contribute to global greenhouse gas emissions and, when added to emissions from the reasonably foreseeable future projects and actions described in this Appendix (see Section O.2) and similar projects and actions across the globe, they could lead to a cumulatively adverse 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 rail line.

The Intergovernmental Panel on Climate Change (IPCC) and the U.S. Global Change Research Program (USGCRP) has assessed the potential consequences of global climate change (IPCC, 2007 and USGCRP, 2009). The global average temperature has risen by about 1.5 degrees Fahrenheit (°F) since 1900 and is projected to rise another 2 degrees to 11.5°F 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 this state than in the rest of the United States. During that time, Alaska's annual average temperature has increased 3.4°F and the winters have warmed by 6.3°F (Fitzpatrick *et al.*, 2008 in USGCRP, 2009). Average annual temperatures in Alaska are predicted to continue to rise about 3.5°F to 7°F above 2009 levels by the middle of the century (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). Precipitation patterns also are 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, so increases in air temperature are expected to lead to drier conditions overall (Meehl *et al.*, 2007 in USGCRP, 2009).

In Alaska, higher temperatures are already contributing to earlier spring snowmelt, reduced sea ice, and widespread glacier retreat (IASC, 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 that the Bering Sea will 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 from 2009 levels by the middle of this century (Balshi *et al.*, 2008 in USGCRP, 2009).

### **O.3.6.2 Conclusion**

The relatively low concentrations of ambient air pollutants in the project area should remain well below National Ambient Air Quality Standards, even with the addition of emissions associated with the proposed rail line operation. Although the greenhouse gas emissions generated from the proposed rail line would be very small in comparison to global emissions levels, they could contribute to a cumulatively adverse impact on global climate change. Consequences of global climate change include increased global temperatures, change in precipitation patterns, and rise in sea levels. The long-term climate change induced changes in water availability would not be expected to impact the proposed project, as water extraction would occur only during the estimated 2-year construction period.

## **O.3.7 Noise and Vibration**

### **O.3.7.1 Analysis**

Primary noise sources during construction of the proposed rail line would include heavy equipment that would be used during rail line construction and pile driving during bridge construction. Noise impacts could result for receptors near planned bridge construction as part of the Big Lake, Willow, Houston South, and Mac East segments.

For other waterbodies in the project area, drainage structures (which could include bridges) would be constructed, the specific type of which would be determined during final design and permitting. If bridges were the type of drainage structure constructed, impacts to receptors would result along crossings as part of the Willow, Big Lake, Connector 1, Mac West, and Houston South segments.

No receptors were identified near the other ARRC-proposed bridges or drainage structures, so no noise impacts from construction would be expected at these other locations. The primary sources of noise from proposed rail line operation would be wayside noise and locomotive warning horn sounding for at-grade rail-roadway crossings. Because of the relatively low ambient noise level and proximity of receptors, the 3 A-weighted decibel (dBA) increase contour associated with the Big Lake Segment would include 18 receptors, the Connector 3 Segment would include 15 receptors, the Willow Segment would include 13 receptors, the Houston South Segment would include 9 receptors, the Mac West Segment would include 2 receptors, the Mac East Variant Segment would include 2 receptors, and the Connector 3 Variant Segment would include 2 receptors. Also, 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. Of these, 1 receptor associated with the Mac East Variant Segment and 1 receptor associated with the Connector 3 Segment would experience noise levels above the 65 decibel day-night average noise level (DNL); rail line alternatives that include either of those segments would result in adverse noise impacts for those receptors.

### **Cook Inlet Areawide Oil and Gas Lease Sale**

One of the primary concerns related to oil and gas development in marine waters is the potential effect that noise from seismic surveys, construction activities, and ongoing boat, drilling, and aircraft activities could have on marine mammals and other marine animals (Hofman, 2003). In 2005, the Minerals Management Service found that a proposed geophysical (seismic) survey would have no significant effect on the lower Cook Inlet area (MMS, 2005).

### **Cook Inlet Ferry**

A minor adverse impact during construction of the Cook Inlet Ferry would include increased noise. Upgrades to Knik Arm Access Road could temporarily increase noise levels near the mouth of Ship Creek. Additionally, it is unlikely that noise levels would have a lasting adverse impact on fish in Knik Arm or near the mouth of Ship Creek, because these areas currently experience considerable noise due to Port MacKenzie, U.S. Air Force, and ARRC operations.

Construction activities would be temporary and would not be expected to last more than 6 months.

### **Knik Arm Crossing**

The proposed Knik Arm Crossing project could facilitate development in the MSB, which would lead to increased noise levels in the study area.

Future noise levels under the proposed Knik Arm Crossing build alternatives for each of the 3 receptors in the MSB portion of the study area are projected to range from 60 to 64 dBA, depending on the alternative, and are not expected to approach the noise abatement criteria for residential areas.

Traffic-noise modeling results indicate that there would be impacts from traffic noise within 200 feet of the centerline of the proposed Knik Arm Crossing ROW. Therefore, any future residential land uses immediately adjacent to the ROW could experience traffic noise impacts. More noise-compatible uses, such as commercial or retail activities, would not be affected at this distance. For areas where the ROW might be wider than 400 feet, there should be no impacts from traffic noise.

### **MSB Regional Aviation System Plan**

Implementation of the RASP would include upgrades to existing airstrips and development of new airports and float-plane facilities. The plan identifies noise-sensitive land uses, but does not include a noise impacts analysis. OEA assumes noise impact due to increased air traffic would be moderate or less.

### **Port of Anchorage Marine Terminal Redevelopment Project**

Because construction activities such as dredging, filling, and pile driving would be the same for all construction years, noise levels during any construction day would remain around 81 dBA (equivalent sound level [ $L_{eq}$ ]) at 100 feet (within the Port of Anchorage) and 61 to 65.5 dBA at 1,000 to 2,000 feet in any given year. What varies by construction year is the duration of pile driving, which is the loudest contributor to noise. Pile driving associated with dock construction is anticipated to range from a high of 130 days to a low of 106 days. Although some hourly noise levels would exceed 85 dBA, daily noise levels from construction at the Port of Anchorage would not exceed the 85 dBA 8-hour time-weighted level in which a hearing conservation program for on-site workers is required under the Occupational Safety and Health Administration (29 C.F.R. § 1910.95).

Maximum noise levels in nearby residential areas from construction at the Port of Anchorage would not exceed the Anchorage noise ordinance requirements of 80 (hourly  $L_{eq}$ ) dBA during any construction year. Therefore, construction noise would not affect residential areas. Noise levels in DNL at areas closest to construction at Cherry Hill housing, parks, and residential areas on Government Hill are projected to be between 61.0 and 65.5 dBA during a construction day, increasing 0.5 to 1.0 dBA over baseline levels. This amount of change falls below the threshold for cumulative noise levels. Therefore, construction noise would not have a significant adverse impact on adjacent residential areas.

## **South Wasilla Rail Line Relocation**

A noise and vibration analysis indicated that no significant noise and vibration impacts are expected. Existing noise sources in the project vicinity include roadway traffic, aircraft overflights, railroad operations, and local neighborhood activities. The project would reduce horn noise because trains would no longer have to sound their horns at the 5 eliminated at-grade main line crossings. Trucks using the gravel pits and freight and passenger trains operating through the area are the primary sources of existing vibration. The vibration analysis indicated that 1 property would be affected; however, this property is already affected by the existing track. The noise and vibration analysis indicated that the project's impact to this property would be small enough that the vibration change would not be perceptible to the residents.

### **O.3.7.2 Conclusion**

Construction and operation activities associated with the projects described above could contribute minor noise-related impacts to the environment in the study area. Although some of these projects include actions that would increase noise levels considerably, 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 no adverse noise impacts would result from the proposed rail line, no cumulative noise impacts would result.

## **O.3.8 Energy**

### **O.3.8.1 Analysis**

All segments of the proposed rail line would cross a 230-kilovolt transmission line linking 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 also would cross a 138-kilovolt transmission line parallel to the ARRC main line between Knik-Fairview and Willow. The Connector 1, Connector 3, Connector 3 Variant, and Big Lake segments would cross an existing natural gas pipeline that runs along Ayrshire Avenue and just north of Point MacKenzie Road. ARRC would have to employ appropriate construction industry standards to minimize any potential to disrupt the provision of energy resources. Increases in energy consumption for proposed rail line construction would be negligible. Train operation would consume less than 0.5 percent of the annual statewide consumption of distillate fuel.

## **Cook Inlet OCGen™ Power Project**

Increased production of energy from the utilization of the Cook Inlet tidal flows would establish landfalls for transmission line routes along Cook Inlet's eastern coast near Kenai and East Foreland. In areas of potential overlap with proposed rail line segments, Ocean Renewable Power Company would need to carefully site their transmission line pylons to avoid the risk of power interruptions.

## **Knik-Willow Transmission Line Upgrade**

This project is in the preliminary stage of design, and there could be changes to the current alignment. ARRC would need to coordinate with the Alaska Energy Authority regarding possible relocation of pylons.

## **Alaska Stand Alone Gas Pipeline Project**

Alaska has started the process for preparing a Draft EIS for a natural gas pipeline between the North Slope and the Cook Inlet region that would cross the project area. This alternative would primarily cross the Willow, Mac East, Connector 1, Connector 3, Connector 3 Variant, and Big Lake segments. ARRC would need to coordinate with the State of Alaska to ensure that grade separation and appropriate construction industry standards are followed.

### **O.3.8.2 Conclusion**

Cumulative impacts on energy resources in the affected area would be limited to crossings of the proposed rail line alternatives with proposed transmission lines and pipelines. Coordination between ARRC and agencies responsible for the proposed project would be required to ensure appropriate planning for location of transmission pylons and for grade separation between the proposed rail line and proposed pipelines.

## **O.3.9 Transportation Safety and Delay**

### **O.3.9.1 Analysis**

The proposed project has the potential to result in impacts to 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 on the proposed rail line would be grade-separated, there would be no increase in the number of potential train-vehicle accidents and no change in vehicle delay. Where crossings would not be grade-separated (at-grade crossings), OEA's analysis indicates that there could be an increase in accidents and vehicle delay.

At present, there are 4 at-grade crossings along the ARRC main line in the project area. OEA's analysis indicates that accident frequencies at the existing at-grade crossings would increase slightly due to increased train traffic from the proposed rail line. For these at-grade crossings, the greatest accident frequency increase would be 6.2 percent. This corresponds to a decrease in the time between predicted accident events from 1 accident every 66 years under existing conditions to 1 accident every 62 years under the proposed project. For new at-grade crossings constructed as part of the proposed project, the predicted accident frequency for the most heavily traveled roads, South Burma Road and Willow Creek Parkway, would be 1 accident every 131 and 114 years, respectively.

OEA anticipates temporary vehicle delays during proposed rail line construction at new at-grade crossings and where roads would be improved or relocated. At the existing at-grade crossing with the highest total daily delay, Willow Fishhook Road on the ARRC main line, the number of vehicles delayed is projected to increase from 11 to 13 delayed vehicles per day under the proposed rail line. This represents an increase from 0.5 to 0.7 percent of all vehicles traveling

through that crossing. At the new at-grade crossings constructed as part of the proposed rail line, the highest total delay would be 0.3 percent of all daily traffic at the South Burma Road crossing. Although proposed rail line operation would impact the delay at at-grade crossings, OEA concludes that this impact would be minimal.

Impacts to transportation safety resulting from at-grade crossings are largely a function of the number of trains and the volume of vehicle traffic traversing the at-grade crossing, along with other factors. Impacts to transportation delay are influenced primarily by the amount of time trains obstruct an at-grade crossing and the volume of vehicle traffic along roads with at-grade crossings. Therefore, the other projects and actions with the greatest potential to cumulatively contribute to impacts on transportation safety and delay are those that increase train traffic along the proposed rail line or ARRC main line in the project area, those that increase vehicle volume on roads that have at-grade crossings of the proposed rail line or the ARRC main line in the proposed project area, or those that result in the construction of additional at-grade crossings in the proposed project area.

### **Projects with the Potential to Affect Rail Traffic**

Of the potential projects identified in Section O.1, the Port MacKenzie development projects, including gravel mining, the bulk materials facility, and the deep-draft and barge dock expansions, could increase rail traffic along the proposed rail line. However, the need for increased shipments of bulk materials, intermodal containers, and other freight to and from Port MacKenzie is part of the purpose and need of the ARRC proposed action and was factored into the analysis of direct and indirect impacts. If the Port MacKenzie development projects increased rail traffic beyond the levels already evaluated in the impacts analysis, there would be increased rail traffic along the proposed rail line (regardless of alternative), which would lead to more traffic delays and increased accident frequencies at at-grade crossings in the area. The other projects identified in this cumulative impacts analysis are not anticipated to increase rail traffic in the proposed project area.

### **Projects with the Potential to Affect Vehicular Traffic**

Projects that would increase the amount of vehicular traffic in the project area could be expected to increase the frequency of future accidents and add to the number of vehicles delayed by train traffic. These impacts would depend on the combination of segments constructed as part of the proposed rail line and the roads where traffic volumes would increase. In most cases, increased delay and accident frequencies would occur only if traffic volumes increased along roads that cross the proposed rail line at grade. However, if traffic increased along nearby roads or other primary roads in the project area, there could be increased traffic spill-over onto the roads with at-grade crossings.

### **Knik Arm Crossing and Cook Inlet Ferry**

Of the projects listed in Section O.1, both the proposed Knik Arm Crossing and the Cook Inlet Ferry were identified as projects that could increase vehicular traffic from Anchorage to Port MacKenzie, leading to higher traffic volumes in the area of the proposed rail line. The Knik Arm Crossing would connect the Municipality of Anchorage to the MSB via Point MacKenzie

Road, which the proposed rail line's Big Lake Segment would cross at grade. If this segment and the Knik Arm Crossing were constructed, there could be increased vehicular traffic along a road with an at-grade crossing, thereby increasing the frequency of future accidents and the number of vehicles delayed by train traffic. Cook Inlet Ferry operations could also lead to increased traffic on Point MacKenzie Road, and could also lead to increased transportation safety and delay impacts at the at-grade crossing.

### **West Mat-Su Access Project**

The West Mat-Su Access Project would include road access to the Fish Creek Management Area that could cross the Connector 1 Segment and/or the Willow Segment. One access road option associated with this project would cross both the Connector 1 and Willow segments, while the other access road options would only cross either the Willow Segment or the Connector 1 Segment. If at-grade crossings were constructed at intersections of the roads in the West Mat-Su Access Project and the rail line, they would increase the frequency of future accident events and the number of vehicles that could experience delay at at-grade crossings.

### **Other Road Projects**

Section O.1 identifies several other road projects. These actions can be generally characterized as upgrades to road surfaces, increases in the number of lanes to road segments, addition of safety devices, and flattening and straightening roadways. Evaluated individually, these projects would not be expected to notably affect the overall volume of traffic in the area of the proposed rail line. They would not include new at-grade crossings and they would not increase traffic on the roads the proposed rail line would cross using at-grade crossings. Therefore, none of the road projects would contribute to a cumulative impact on transportation safety and delay. However, the combination of all road projects would lead to an overall upgrade in transportation infrastructure in the project area. As road infrastructure improves and capacity is added, this could encourage more vehicular traffic in the project area for a variety of reasons, including access to recreational resources, driving through the area en route to other destinations, and/or increased commercial, industrial, and residential development allowed by improved roadways. As the general volume of traffic in the project area increases, the likelihood of a portion of that traffic spilling over onto roads with at-grade crossings would increase. Therefore, road projects that improve the transportation infrastructure in the rail line project area could lead to cumulative impacts on transportation safety and delay.

### **O.3.9.2 Conclusion**

The proposed rail line is expected to result in a small increase in future accident frequencies as a result of at-grade crossings. The proposed rail line is not anticipated to result in a considerable increase in vehicle delay. There could be an increase in future accident frequency and vehicle delay as a cumulative result of the proposed rail line combined with Port MacKenzie development projects, the Knik Arm Crossing, Cook Inlet Ferry, the West Mat-Su Access Project, and road improvement projects.

## **O.3.10 Navigation**

### **O.3.10.1 Analysis**

The proposed rail line includes bridges and structures that would cross inland rivers and streams in the project area, resulting in negligible potential impacts to navigation. The Willow, Houston North, and Houston South segments include a bridge crossing over the Little Susitna River. Of the reasonably foreseeable future projects analyzed for cumulative impacts, only the proposed West Mat-Su Access Project would include a new bridge across the Little Susitna River, creating the potential for cumulative impacts to navigation along this waterbody.

For the West Mat-Su Access Project, the MSB proposes to build a bridge across the Little Susitna River into the southern part of the Fish Creek Management Area, thereby providing road access to the western side of the Little Susitna River. The Fish Creek Management Area is approximately 45,000 acres of state and MSB land northwest of Point MacKenzie between the Little Susitna and Big Susitna rivers. The Draft Fish Creek Management Plan (MSB, 2008a) includes a figure depicting three potential locations for the bridge – the extension of Susitna Parkway in the Big Lake area; a location approximately 0.8 mile north of where the INHT crosses the river; and a location near the existing Little Susitna River access at the end of Ayrshire Road. The Access Project might also include a short spur road continuing 3 to 4 miles west, past the Little Susitna River. The MSB has not yet developed a detailed bridge design.

Although the proposed rail line may include bridges and structures that would cross other inland rivers and streams in the project area, none of the reasonably foreseeable future projects analyzed for cumulative impacts would also cross these waterbodies. Therefore there would be no potential cumulative impact on navigation on waterbodies other than the Little Susitna River as identified above.

### **O.3.10.2 Conclusion**

Assuming that the bridge across the Little Susitna River would be designed with vertical and horizontal clearances similar to other existing and proposed bridges on the river, significant impacts to navigation would not be likely, and there would not be substantial cumulative impacts.

## **O.3.11 Land Use**

### **O.3.11.1 Analysis**

Land owners in the study area include the Federal and state governments, the MSB, Alaska Mental Health Trust, University of Alaska, private citizens, Alaska Native Regional Corporation (Cook Inlet Regional Incorporated) and Alaska Native Village Corporation (Knikatu Inc.) established under the Alaska Native Claims Settlement Act of 1971, 43 U.S.C. § 1601, and land given to an authorized individual Indian, Aleut, or Eskimo in Alaska under the Native Allotment Act of 1906, 43 U.S.C. § 270. Potential impacts to land use from proposed rail line construction and operation 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 would require the taking of 10 structures, 5 residences, and 1 business. Structures also would be taken along the Connector 3 Segment ROW (2 structures) and in the Mac East Variant Segment ROW (1 structure). There would be no adverse land use impacts outside the ROW.

Public lands in the project area are used primarily for recreation, hunting, and fishing. Construction activities could temporarily impede access to trails and waterways, including the INHT. Operation 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. There would be a loss of connectivity of trails for which grade-separated crossings would not be provided. These trails would be blocked, and ARRC's trespassing regulations would prohibit the public from crossing the ROW without first obtaining approval from ARRC.

Mining and timber harvesting also are allowed by permit. Private lands in the project area are primarily forested or 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 is expected to handle 2 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 proposed rail line would not likely result in substantial changes in land use in the project area.

### **Alaska Stand Alone Gas Pipeline Project**

The State of Alaska's proposed gas pipeline could result in temporary impacts to land use during construction of the pipeline and easement, and in long-term impacts from use of the permanent easement. This, when combined with the direct and indirect effects on land use potentially resulting from the proposed rail line, could cause cumulative impacts on land use and recreational resources in the rail line project area.

### **Cook Inlet Areawide Oil and Gas Lease Sale**

The proposed lease sale area consists of all state-owned uplands in the Matanuska and Susitna River valleys generally south and west of Houston and Wasilla, the Anchorage Bowl, the western and southern Kenai Peninsula from Point Possession to Anchor Point, and the western shore of Cook Inlet from the Beluga River to Harriet Point. The lease sale area also includes all state-owned tidal and submerged lands in upper Cook Inlet from Knik Arm and Turnagain Arm south to Anchor Point and Tuxedni Bay (ADNR, 2008).

The lands offered in this lease sale include lands in which the state owns both the land and mineral estate and lands where the state owns just the mineral estate, with the land estate either privately owned or held by a borough or municipality. Only state-owned lands and oil and gas mineral estates within the tracts that are free and unencumbered would be included in any lease issued. The use of some lands leased could change from undeveloped to developed for oil and gas production if exploration finds developable reserves. This change in land use for leased areas, combined with land use impacts from the proposed rail line, could result in cumulative

impacts to existing land use patterns in the project area. Depending on where future land-based lease sales occur, cumulative impacts to recreational resources could result.

### **Knik Arm Crossing**

Of all foreseeable development projects, the proposed Knik Arm Crossing could have the greatest impact on land use. The area from Point MacKenzie/Port MacKenzie to approximately Parks Highway, which includes the Big Lake and the Knik-Fairview areas, would likely experience increased growth and development with the proposed bridge in place (HDR, 2006b). The proposed Point MacKenzie Road and Northern Access alternatives associated with the Knik Arm Crossing project would be consistent with the MSB Long Range Transportation Plan, the MSB Core Area Comprehensive Plan, and the MSB Special Use Districts because a Knik Arm crossing is identified and described in those plans as part of the future transportation system. At present, there is no zoning, no building-permit requirement, and few MSB land use controls in the southwest MSB area (HDR, 2006b). Increased access, provided by the Knik Arm Crossing, could contribute to significant cumulative impacts to land use patterns within the project area. However, since the proposed rail line has minimal land use impacts, its contribution to cumulative land use impacts would be minimal.

The indirect impacts of increased traffic, growth, and development could affect some of the same recreational resources as those potentially affected by the proposed rail line, thereby resulting in cumulative impacts.

### **Knik Willow Transmission Line**

The proposed transmission line could potentially conflict with land use in the area of the Little Susitna State Recreation River, which would combine with potential impacts to recreational resources in the areas of the Houston North, Houston South, and Big Lake segments and could result in cumulative land use impacts.

### **Goose Creek Correctional Center**

The Goose Creek Correctional Center requires clearing 150 acres of forested land at the junction of Alsop Road and Point MacKenzie Road. The MSB owns this undeveloped land. Impacts to land use from this project would be near to, but not overlapping with, potential impacts from the proposed rail line Mac East Segment. Therefore, cumulative impacts to land use patterns and recreational resources in the project area would be minimal.

### **MSB Regional Aviation System Plan**

Upgrades to existing airstrips and development of new airports and float-plane facilities would take place by implementation of the Regional Aviation System Plan. Upgraded and new facilities could increase access and demand for land in the project area. The plan requires that an airport, commercial float-plane base, helipad, and heliport be shown on a plat if subdivision of land is required. This requirement would help ensure that adequate land is provided for approach and departure clearances and for development setbacks from runways, and that the aviation facility's compatibility with surrounding land uses is considered before a plan is approved.

Therefore, cumulative impacts to land use and recreational resources would be expected to be minimal.

### **Port MacKenzie Development Projects**

Port MacKenzie development projects include the expansion of existing deep-draft and barge docking facilities, construction of a bi-modal bulk materials facility, and development of an open-pit gravel mine. Some of these projects have already been constructed. The gravel mine is operating in the vicinity of the southern terminus of the Mac East, Mac East Variant, and Mac West segments. The land in the vicinity of the port is either undeveloped public or privately owned land. There is some past and present agricultural use. Development of industrial-related facilities to support the Port of MacKenzie would constitute a permanent change from undeveloped or agricultural land to developed industrial land. Where these areas coincide with the proposed rail line, there could be cumulative impacts to land use. There are no impacts to recreational resources from the proposed rail line that overlap with impacts of the port development projects; therefore, no cumulative impacts would be expected to occur.

### **South Wasilla Rail Line Relocation**

The proposed track realignment and other action alternatives could have a minor cumulative impact on land use by removing some parcels that are currently residential and other parcels that could be used for future expansion of the existing residential community (Creekside Preserve residential area). There are no foreseeable large-scale economic activities that would stimulate a substantial amount of expansion of the community; therefore, adequate vacant replacement land is available, and potential adverse cumulative impacts to land use would be minimal. There are no impacts from the proposed rail line to recreational resources in the area of the South Wasilla Rail Line Relocation; therefore, no cumulative impacts to recreational resources would be expected to occur.

### **West Mat-Su Access Project**

The proposed West Mat-Su Access Project includes development of access across the Little Susitna River into the southern Fish Creek Management Area. Construction of a bridge and access road would result in incremental changes to land use in the vicinity of the proposed rail line. At present, this land is undeveloped privately and publicly owned land. The West Mat-Su Access Project's new access road would cross either the Connector 1 Segment and/or the Willow Segment. The bridge access road could also facilitate access to these areas for hunting, fishing, and recreation. Potential impacts to recreational resources from the proposed rail alternative, when combined with impacts from the West Mat-Su access project, could result in cumulative impacts to recreational resources.

### **O.3.11.2 Conclusion**

The proposed rail line would not likely result in substantial changes in land use patterns in the project area, with the exception of the rail line associated facilities within the ROW. 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 substantial changes in land use patterns; the rail line contribution to those cumulative impacts would be expected to be minimal.

The ASAP Project could combine with the proposed rail line to produce cumulative impacts to land use in the areas of the Connector 1, Connector 3, Connector 3 Variant, Mac East, Willow, and Big Lake segments, depending on pipeline and rail line route alternatives.

As noted on Figures 13.2-1 through 13.2-6 and Table O-2, all segments of the proposed rail line could result in impacts to recreational resources. Potential impacts to recreational resources could overlap with impacts from certain other projects resulting in cumulative impacts.

### **O.3.12 Visual Resources**

#### **O.3.12.1 Analysis**

The primary potential impacts to visual resources from construction and operation of the proposed rail line would be vegetation removal along the ROW, construction of a linear rail line, construction of at-grade and grade-separated road and trail crossings, potential blocking of trails without crossings, and construction of bridges over waterways. These changes would alter the existing visual character for most segments, affecting sensitive viewer groups.

All proposed rail line alternatives could contribute to cumulative impacts to visual resources in the project area. The potential impacts could add to impacts from development projects occurring in the reasonable foreseeable future. The following paragraphs describe the impacts of other relevant projects and how potential impacts from the proposed rail line, when added to the impacts of other relevant projects, could result in cumulative impacts to visual resources.

#### **Alaska Stand Alone Gas Pipeline Project**

The ASAP Project would be a 24-inch diameter pipeline that is between 753 and 845 miles long, depending on alternative, and would enter the project area near Willow along Parks Highway and then follow the Susitna River and Little Susitna River valleys. The project also includes a 35-acre NGL facility at the corner of Guernsey Road and Ayrshire Road and a fractionation and storage facilities located approximately 1 mile northwest of the Port MacKenzie pier. This facility would add to visible built features within the project area. Most of the pipeline would be buried along existing roadway facilities and revegetated following construction. Although it is anticipated that horizontal directional drilling would be used, bridges could be used to cross major water bodies. Bridges crossing recreational rivers would add visible, linear, elevated human-made visual elements in areas where none presently exist and the proposed rail line would add to the cumulative visual impacts of bridges crossing waterways in the project area.

#### **Cook Inlet Areawide Oil and Gas Lease Sale**

The Cook Inlet areawide oil and gas lease sale consists of 35 tracts sold by the ADNR that total 138,880 acres. While these tracts are not in the project area, future lease sales could occur in the project area. If future lease sales occur in and around the project area, cumulative visual impacts could result from the addition of facilities for the proposed rail line and for the exploration, development, and production of oil and gas into viewsheds where no such features and no such similar features exist. In addition, in the unlikely event of an oil spill or gas explosion,

**Table 13.2-4  
Affected Recreation Areas, Trails, and Refuges by Alternative**

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 Trail	Iron Dog Trail	Crooked Lake Trail	Iditarod National Historic Trail	Houston Lake Loop Trail	Flat Lake Connector Trail	Aurora Dog Musers Club Trail	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	Big Lake Trail #1	Big Lake Trail #2	Big Lake Trail #5	Big Lake Trail #14	
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	X
Mac West-Connector 1-Houston-Houston South			X	X	X			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									
Mac East-Connector 3-Houston-Houston North			X					X	X	X	X															X	X
Mac East-Connector 3-Houston-Houston South								X	X	X	X												X	X	X	X	
Mac East-Big Lake									X			X							X	X	X						
Mac East Variant-Connector 2a-Big Lake									X			X							X	X	X						
Mac East Variant-Connector 3 Variant-Willow	X	X	X			X	X	X	X			X	X				X	X									
Mac East Variant-Connector 3 Variant-Houston-Houston North			X					X	X	X	X															X	X
Mac East Variant-Connector 3 Variant-Houston-Houston South								X	X	X	X												X	X	X	X	

catastrophic changes to marine, shoreline, and terrestrial environments that would affect access to and cause permanent alterations in highly regarded aesthetic resources and impact wildlife viewing and game hunting. These possible impacts could be combined with access restrictions from the blockage of some unofficial recreation trails or impacts to views from waterways resulting from the proposed rail line.

### **Cook Inlet Ferry**

The Cook Inlet Ferry would provide a year-round commuter ferry system across the Knik Arm between the MSB and Anchorage. The terminal building and parking area for the ferry are constructed and are part of the existing visual environment. The ferry landing location would be constructed over one mile away from the Mac West Terminal Reserve of the proposed rail line. Docks are a common visual feature in the Cook Inlet area, and the ferry landing would not cumulatively add to visual impacts. Ferry traffic associated with the project also would not cumulatively add to visual impacts, as larger and smaller boats associated with the shipping industry, fishing, and recreation are a common visual element on the Cook Inlet waterway.

### **Cook Inlet OCGen™ Power Project**

The OCGen™ Tidal TGU would primarily occur underwater and not affect visual resources. However, cumulative visual impacts could result from to-be-determined onshore locations of transmission lines. The proposed transmission lines would require vegetation clearing and introduce a linear utility line with tall, vertical towers. Potential impacts to visual resources from the proposed rail line, when combined with impacts from the Cook Inlet OCGen™ Power Project, could result in cumulative impacts associated with vegetation clearing, linear features, transmission lines, and facilities.

### **Knik Arm Crossing**

The Knik Arm Crossing project would construct a large bridge over the Knik Arm of Upper Cook Inlet between Anchorage and the MSB, connecting at Point MacKenzie Road near the Port MacKenzie District. The proposed rail line and Knik Arm Crossing would have cumulative visual impacts resulting from the addition of linear, elevated, human-made structures that cross waterways in areas where none presently exist in the proposed rail line project area.

### **Knik-Willow Transmission Line Upgrade**

The proposed transmission line could require vegetation clearing and introduce a linear utility line with tall, vertical towers in the area of the Little Susitna State Recreation River. It could also introduce a new visual features associated with the switchyard. Potential impacts to visual resources from the proposed rail line, when combined with impacts from the Knik-Willow Transmission Line Upgrade, could result in cumulative impacts associated with vegetation clearing, linear features, transmission lines, and facilities.

### **Goose Creek Correctional Center**

The 450,000-square-foot Goose Creek Correctional Center will be built on a 300-acre lot, half of which is already cleared. This project also includes an upgrade to Point MacKenzie Road and Alsop Road. Roadway upgrades would not result in cumulative visual impacts, as the roadways are pre-existing and upgrades would not alter the existing visual character. The Center would require additional vegetation clearing and construction of a large-scale facility that would introduce a new source of nighttime lighting in proximity to the proposed rail line terminal reserve areas where there would also be new facilities, resulting in cumulative visual impacts associated with introducing new built features on previously undeveloped, unlit land.

### **MSB Regional Aviation System Plan**

Upgrades to existing airstrips would not result in cumulative visual impacts as the airstrips are a pre-existing part of the visual environment. New airports and float-plane facilities would require the clearing of land to accommodate takeoff and landing and could include construction of buildings and installation of lights that would introduce a new source of nighttime lighting. These activities could be in proximity to the proposed rail line project area where there also would be land clearing and new facilities, resulting in cumulative visual impacts associated with introducing new built features on previously undeveloped, unlit land.

### **Port MacKenzie Development Projects**

Port MacKenzie Development Projects include a bulk materials facility, gravel mining, and 2 dock expansions at the southern end of the proposed rail line project area. The bulk materials facility will upgrade roads, storage, and storage areas at the Port. Gravel mining includes mining at existing locations that are presently in operation. The bulk facility and dock expansion projects occur where similar, pre-existing visual elements exist, and thus would not alter the existing visual character or result in cumulative visual impacts. The continuation of gravel mining would result in mine expansion, the clearing of adjacent lands, and the conversion of those lands to highly disturbed sites. Potential impacts to visual resources from the proposed rail line, when combined with impacts from the Port Mackenzie Development Projects, could result in cumulative impacts associated with vegetation clearing and land disturbance.

### **Port of Anchorage Marine Terminal Redevelopment Project**

The Port of Anchorage Marine Terminal Redevelopment Project would double the size of the marine terminal and provide additional waterfront structures near the existing Port of Anchorage marine terminal. The project is under construction. Cumulative visual impacts would not result from the proposed rail line as the terminal expansion keeps with the existing visual character in the terminal redevelopment area and thus would not degrade the existing visual character.

### **Road Projects**

Many of the road projects within the proposed rail line project area are designed or are in the process of being constructed. These projects include roadway widening, realignment and paving of unpaved roadways, and installation of traffic signals and culverts. Roadway widening and realignment would require vegetation clearing within the ROW, resulting in the primary visual

impact. Because these impacts occur along existing roadway corridors, the existing visual character would not be greatly altered or result in cumulative visual impacts.

### **South Wasilla Rail Line Relocation**

The South Wasilla Rail Line Relocation would straighten curves along the main line track in South Wasilla. Because these impacts would occur near the existing rail corridor, the existing visual character would not be greatly altered or result in cumulative visual impacts.

### **Su-Knik Mitigation Bank – Umbrella Mitigation Bank Instrument – Big Lake South Individual Bank Plan**

The Su-Knik Mitigation Bank would conserve and protect existing wetlands within a mitigation bank, resulting in beneficial impacts to visual resources by maintaining these sensitive environments. There would be no cumulative impacts to visual resources.

### **West Mat-Su Access Project**

The West Mat-Su Access Project would build a bridge across the Little Susitna River into the southern part of the Fish Creek Management Area. An access road also would need to be constructed that likely would require at-grade or grade-separated crossings of official trails. The proposed rail line and the West Mat-Su Access Project would have cumulative visual impacts resulting from the addition of the bridge, which would introduce an additional linear, elevated, human-made structure across the Little Susitna River where none presently exist, increase the amount of trail crossings, require vegetation clearing, and introduce more linear features through construction of the access road.

### **O.3.12.2 Conclusion**

The proposed rail line would result in impacts to visual resources in the project area. Impacts from the proposed rail line would combine with the impacts from the projects described above. Therefore, potential impacts to visual resources from the proposed rail line, when added to other relevant projects and actions, could result in cumulative impacts to visual resources in the project area.

## **O.3.13 Socioeconomics**

### **O.3.13.1 Analysis**

The potential socioeconomic impacts of the proposed rail line would include a temporary increase in direct employment during project-related construction. This temporary increase in direct employment would be complemented by additional indirect employment generated through suppliers and service providers. Induced employment through multiple rounds of expenditures and consumption along production and consumption chains also could occur. The increased labor demand would likely be met in part by the local labor force, and any increased pressures on housing and public services derived from the migration of laborers to the affected area would be minor, as discussed below.

Potential long-term negative impacts that the proposed rail line could have on recreational activities, by crossing land used for recreational purposes, would be mitigated through appropriate crossings for people and wildlife at trail crossings and within state recreational areas. ARRC would provide grade-separated crossings or relocations for officially recognized trails. There would be a loss of connectivity of trails for which grade-separated crossings would not be provided. These trails would be blocked, and ARRC's trespassing regulations would prohibit crossing of the ROW.

The cumulative impacts analysis required expanding the analysis of housing availability to include the Municipality of Anchorage, because some of the projects expected in the near future would be either in Anchorage or link the MSB to Anchorage. The Municipality of Anchorage would be a potential option for residence for workers on these projects.

Table O-3 lists reasonably foreseeable projects that could generate cumulative socioeconomic impacts to those generated by the proposed rail line, and it identifies what those cumulative impacts could be. The table does not include the Su-Knik Mitigation Bank. The bank would be used to offset authorized impacts to wetlands with no reasonably foreseeable impacts on employment, migration, demand for housing and public services, or economic activity. The table includes the Cook Inlet areawide oil and gas lease sale because it would have socioeconomic impacts through its subsequent activities (exploration and production of oil and gas). Potential socioeconomic impacts would include job creation; potential in-migration of workers to production areas, generating increased demand for housing and public services; and potential use of land currently used for recreational activities. However, the extent of these potential impacts on the MSB would depend on the specific areas for which bids are received and the extent to which exploration leads to production. Because this is currently unknown, no further cumulative impacts analysis is included here. The table includes the MSB Regional Aviation System Plan to the extent that implementation includes upgrades of public airports in the area or the construction of a new public airport. Because discussions of potential locations for a new airport are still preliminary, permanent increases in local demand for labor, housing, and public services, or displacements and loss of economically productive land generated by the construction of a new airport, cannot be determined at this time.

All projects listed in Table O-3 would temporarily generate increased demand for construction labor in the project area, and as if they came to fruition. Although estimates of the number of jobs generated by each of these projects are not readily available, there are estimates for some of the potentially larger projects. Construction of the proposed Knik Arm Crossing would generate an annual average of between 2,200 and 3,100 jobs in its 2-year construction period, with a share of these jobs being filled by non-local hires. A construction start date for the bridge is not yet known. The Goose Creek Correctional Center is located at a site 9 miles from the Port MacKenzie dock; construction began in spring 2009 and is expected to be complete by late 2011 to early 2012 (MSB, 2008b). This construction project is expected to generate 600 to 700 jobs. To the extent that these large construction projects absorb the existing local labor force, ARRC would be obliged to recruit from beyond the MSB for construction workers. In that case, increased pressures on housing and public services from labor migrating to the MSB to work on the proposed rail line would add to the pressure generated by other construction projects.

**Table O-3  
Potential Impacts of Expected Projects in the Affected Area**

	<b>Temporary Increase in Demand for Labor (construction)</b>	<b>Permanent Increase in Local Demand for Labor, Housing, and Public Services</b>	<b>Displacements, Loss of Economically Productive Land, or Barriers to Mobility</b>
Cook Inlet OCGen™ Power Project	✓		
Knik-Willow transmission line upgrade	✓		
Alaska Stand Alone Gas Pipeline Project	✓		✓
Cook Inlet Ferry	✓	✓	
Knik Arm Crossing	✓	✓	
Goose Creek Correctional Center	✓	✓	✓
Port MacKenzie development projects	✓	✓	
South Wasilla rail line relocation	✓		✓
Redevelopment of the Port of Anchorage Marine Terminal	✓		
West Mat-Su access road to the Fish Creek area	✓		✓
Various road improvement projects	✓	✓	
Cook Inlet areawide oil and gas lease sale	✓	✓	✓
MSB Regional Aviation System Plan	✓		

Some of the construction projects would employ workers who reside in the Anchorage urban area and would not necessarily stimulate relocation to the MSB. This would be the case for the redevelopment of the Port of Anchorage Marine Terminal, and likely the Knik Arm Crossing and the Cook Inlet Ferry. To the extent that the labor employed is able to reside in Anchorage, not only the Anchorage labor force but also its housing market would be available to address the rising demands (for labor and housing for in-migrating labor) from the projects. The Municipality of Anchorage is estimated to have 110,164 housing units, 7,688 (7 percent) of which were estimated to be vacant between 2005 and 2007 (U.S. Census Bureau, 2005-2007).

Some projects could permanently increase the demand for housing and public services in the MSB. The Goose Creek Correctional Center operations area is expected to create 350 prison jobs (MSB, 2008c). The proposed Knik Arm Crossing, the Cook Inlet Ferry, and the improvement of roads around Port MacKenzie would reduce the travel time between Anchorage and areas in the MSB, such as Knik-Fairview and Big Lake. This could stimulate the use of these MSB areas for residential or business purposes linked to Anchorage. To the extent that increased migration to the MSB derives from this shorter commute to Anchorage, this could contribute to a cumulative increased demand on local housing and associated public services, such as water, sanitation, and electricity. Because this permanent stimulus for relocation would occur only after construction is completed, the MSB housing market and its public services would have time to adjust to expected increases in demand.

Some projects would occupy or cross lands potentially used for various economic activities. The proposed ASAP Project Parks Highway alternative would cross the project area parallel to the existing Parks Highway and run south to Port MacKenzie; the Goose Creek Correctional Center would be developed at the corner of Alsop Road and Point MacKenzie Road; and the South Wasilla rail line relocation would straighten about 4 miles of the rail line in the Wasilla urban area. The cumulative impacts of the proposed rail line and these projects on the economic activities derived from the use of lands in the affected area are expected to be minor. Burial of the ASAP Project's gas pipeline would minimize impacts to the productive use of lands crossed; the Goose Creek Correctional Center would be developed off recreational parks or trails in a mostly undeveloped area; and the South Wasilla rail line relocation would cross mostly vacant, residential, and some commercial (gravel pit) land. A fourth project, the proposed West Mat-Su Access road to the Fish Creek area would cross the Little Susitna State Recreation River and possibly the Susitna Flats State Game Refuge, providing access from the eastern side of the Little Susitna River. To the extent there were any impacts to recreational activities, these could be cumulative to those from the proposed rail line, particularly along the Willow Segment, which would also cross the Little Susitna State Recreation River in the same general area.

### **O.3.13.2 Conclusion**

Cumulative impacts to socioeconomic resources would include increased demand for labor that 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 could 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 projects would shorten the commute time between the MSB and Anchorage, there could be incentives for permanent relocation of workers to the MSB. However, because this permanent stimulus for relocation would occur only after construction was completed, the MSB housing market and its public services would have time to adjust to increases in demand. Cumulative impacts to recreation activities from use of land by the various expected projects in the affected area would be expected to be minor.

### **O.3.14 Environmental Justice**

Because proposed rail line construction and operation would not result in high and adverse impacts to human health or the environment, there would be no disproportionately high and adverse impacts to minority and low-income groups.

Based on the cumulative impacts analysis in this appendix and summarized in Chapter 16 of this Draft EIS, there would be no high and adverse impacts to human health or the environment from the cumulative impacts of proposed rail line construction and operation activities when added to the impacts of other past, present, and reasonably foreseeable future projects and actions.

## O.4 REFERENCES

- ADEC (Alaska Department of Environmental Conservation). 2008. Draft Summary Report of Improvements to the Alaska Greenhouse Gas Emission Inventory. January.
- ADN (Anchorage Daily News). 2010. "Sen. Murkowski christens new Mat-Su ferry." *Anchorage Daily News* (Anchorage, AK). July 11, 2010. Online at: <http://www.adn.com/2010/06/11/1319416/sen-murkowski-christens-new-mat.html> (accessed November 11, 2010).
- ADNR (Alaska Department of Natural Resources). 2008. Proposed Cook Inlet Areawide Oil and Gas Lease Sale, Preliminary Finding of the Director. ADNR Division of Oil and Gas, September 29.
- ADNR. 2009. Cook Inlet Areawide Oil and Gas Lease Sale: Final Finding of the Director. January 20.
- ADOC (Alaska Department of Corrections) and MSB (Matanuska Susitna Borough). 2009. Goose Creek Correctional Center June 2009 Project Status Report. Online at: [http://ww1.matsugov.us/index.php?option=com\\_docman&task=doc\\_download&gid=1732&Itemid=238](http://ww1.matsugov.us/index.php?option=com_docman&task=doc_download&gid=1732&Itemid=238) (accessed September 2, 2009).
- ADOT&PF (Alaska Department of Transportation & Public Facilities). 2003. Categorical Exclusion Checklist. Project Name: Parks Highway MP 72-83 Rehabilitation Willow Creek to Kashwitna River. Project Number: IM-OA4-1(22) / 54985.
- ADOT&PF. 2006. Parks Highway Visioning Document. AKSAS Project Number 74833. Prepared by CHM2HILL. Online at: <http://www.parkshighway44-52.info/documents/ParksHwyVisioning.pdf> (accessed December 5, 2008).
- ADOT&PF. 2008a. 2006-2009 Alaska Statewide Transportation Improvement Program Amendment 17. Approved by FHWA and FTA, July 2, 2008, Updated with Administrative Modifications through November 15, 2008. Part of 2006-2008 Final STIP, Approved by FHWA and FTA, February 2006.
- ADOT&PF. 2008b. Categorical Exclusion Documentation Form. Project Name: Point MacKenzie Road Improvement (Don Young Road Upgrades). Project Number (state/Federal): 58168/SDP-0001-(370). May 19.
- ADOT&PF. 2008c. Burma Road Improvements. (Project No. 53199.) November 10.
- ADOT&PF. 2008d. South Big Lake Road Realignment. (Project No. 57187.) November 10.
- ADOT&PF. 2008e. State Projects Environmental Checklist. Palmer – Wasilla Highway Phase II – Knick Goose Bay Road and Vine Road Intersection Improvements. (Project Number: 50951.) March, 18. Online at: <http://alaskarailroad.com/pdf/2009%20South%20Wasilla%20Rail%20Relocation.pdf>

ADOT&PF. 2009a. DOT&PF Economic Stimulus Packages Putting Alaskans to Work. Submitted Reports. ADOTPF-ARRA-Init-Rep\_FHWA-1586\_3-31-2009.pdf. Online at: [http://www.dot.state.ak.us/econstim/documents/ADOTPF-ARRA-Init-Rep\\_FHWA-1586\\_3-31-2009.pdf](http://www.dot.state.ak.us/econstim/documents/ADOTPF-ARRA-Init-Rep_FHWA-1586_3-31-2009.pdf) (accessed September 9, 2009).

ADOT&PF. 2009b. Statewide Transportation Improvement Program (STIP) 2010 – 2013 STIP Draft. September 1. Online at: [http://www.dot.state.ak.us/stwdplng/cip\\_stip/assets/10\\_13stip/stip\\_2010\\_2013\\_review\\_draft\\_corrected\\_9\\_1\\_09.pdf](http://www.dot.state.ak.us/stwdplng/cip_stip/assets/10_13stip/stip_2010_2013_review_draft_corrected_9_1_09.pdf) (accessed September 3, 2009).

ADOT&PF. 2011. Statewide Transportation Improvement Program (STIP) 2010 – 2013 STIP Revision 15 Incorporated. Online at: [http://www.dot.state.ak.us/stwdplng/cip\\_stip/Rev\\_15/Assets/Revision\\_15\\_approved\\_STIP.pdf](http://www.dot.state.ak.us/stwdplng/cip_stip/Rev_15/Assets/Revision_15_approved_STIP.pdf) (accessed February 21, 2011).

AMATAS (Anchorage Metropolitan Area Transportation Solutions). 2009. Anchorage Bowl 2009 Major Amendment to the 2027 LRTP – Chapter 13. Public Review Draft. September 24. Online at: <http://www.muni.org/Departments/traffic/AMATS/Documents/PRDLRTPC13092409.pdf> (accessed October 13, 2009).

ARRC (Alaska Railroad Corporation) 2008a. Preliminary Environmental and Alternatives Report for the Port MacKenzie Rail Extension Project.

ARRC. 2008b. Petition for Exemption to Construct And Operate A Rail Line Extension to Port MacKenzie, Alaska. December 5.

ARRC. 2009. ARRC’s Response to SEA’s January 30, 2009, Document Request. Enclosure in letter from Kathryn Floyd (Mayer Brown LLP) to Victoria Rutson (Surface Transportation Board Section of Environmental Analysis). June 25, 2009.

ARRC. 2010. South Wasilla Rail Line Relocation: Project Facts. September. Online at: [http://www.alaskarailroad.com/Portals/6/pdf/projects/2010\\_09\\_14\\_South\\_Wasilla\\_Realignment\\_PROJ.pdf](http://www.alaskarailroad.com/Portals/6/pdf/projects/2010_09_14_South_Wasilla_Realignment_PROJ.pdf). (accessed November 11, 2010).

Balshi, M. S., A. D. McGuire, P. Duffy, M. Flannigan, J. Walsh, and J. M. Melillo. 2008. “Assessing the Response of Area Burned to Changing Climate in Western Boreal North America using a Multivariate Adaptive Regression Splines (MARS) Approach.” *Global Change Biology* 15(3):578-600.

Bindoff, N. L., J. Willebrand, V. Artale, A. Cazenave, J. Gregory, S. Gulev, K. Hanawa, C. Le Quéré, S. Levitus, Y. Nojiri, C. K. Shum, L. D. Talley, and A. Unnikrishnan. 2007. Observations: Oceanic Climate Change and Sea Level. Pages 385-432 in S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor, and H. L. Miller (eds.), Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to

the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.  
Cambridge, UK, and New York: Cambridge University Press.

Black and Veatch. 2009. Alaska Railbelt Regional Integrated Resource Plan Study. December 2009.

Carter, L. 2008. Telephone conversation between Lorali Carter (Matanuska Electrical Association) and Debi Rogers (ICF International). December 17, 2008.

City of Wasilla. 2010. South Mack Drive (Clapp Road) Extension City of Wasilla Project No. 54987. Fact Sheet. Available online: <http://www.parkshighway44-52.info/southmack/documents/20100916%20SMackFactSht%20ver2.pdf> (accessed November 11, 2010).

DOT (Department of Transportation). 2005. Port Intermodal Expansion Project: Final Marine Terminal Redevelopment Environmental Assessment. Prepared by Anchorage Port Expansion Team, Port of Anchorage, Anchorage, AK, and U.S. Department of Transportation, Seattle, WA.

Dryden and LaRue, Inc., Land Field Services, Inc., Travis/Peterson Environmental Consultants, Inc. 2004. Alaska Intertie Upgrade Study: 230 kV Transmission Line Teeland Substation to Douglas Substation. January 30. Prepared for Alaska Energy Authority, Inc., Anchorage, AK by Dryden & LaRue, Inc., Land Field Services, Inc., and Travis/Peterson Environmental Consultants, Inc., Anchorage, AK.

FERC (Federal Energy Regulatory Commission). 2009. Written Request Letter for Additional Information on Draft License Application for a Pilot Project from Jennifer Hill (FERC) to Christopher Sauer (Ocean Renewable Power Company Alaska, LLC). Project No. 12679-002.) June 29, 2009.

FERC. 2010. Order Issuing Preliminary Permit and Granting Priority to File License Application. Project No. 12679-003. October 13, 2010.

FHWA (Federal Highway Administration). 2010a. Record of Decision Knik Arm Crossing Project. Federal Project No: ACSTP-0001(277). AKSAS Project No: 56047. Online at: <http://www.knikarmbridge.com/documents/121010FinalKnikArmCrossingROD.pdf> (accessed December 17, 2010).

FHWA (Federal Highway Administration). 2010b. Parks Highway MP 44-52, Lucas Road to Big Lake Road FHWA Finding of No Significant Impact. Available online: [http://www.parkshighway44-52.info/documents/Parks%20EA%20FONSI/57178\\_Parks%20Hwy%20MP%2044-52\\_FONSI\\_Signed.pdf](http://www.parkshighway44-52.info/documents/Parks%20EA%20FONSI/57178_Parks%20Hwy%20MP%2044-52_FONSI_Signed.pdf). (accessed November 11, 2010).

FHWA (Federal Highway Administration) and Knik Arm Bridge Toll Authority (KABATA). 2007. Knik Arm Crossing Final Environmental Impact Statement. December 18.

- Fitzpatrick, J., R. B. Alley, J. Brigham-Grette, G. H. Miller, L. Polyak, and M. Serreze. 2008. Preface: Why and How to Use This Synthesis and Assessment Report. Pages 8-21 in Past Climate Variability and Change in the Arctic and at High Latitude. Synthesis and Assessment Product 1.2. Reston, VA: U.S. Geological Survey.
- FTA (Federal Transit Administration). 2006. Finding of No Significant Impact for the Alaska Railroad Corporation South Wasilla Track Realignment. FTA Region 10. February 1.
- Grebmeier, J. M., J. E. Overland, S. E. Moore, E. V. Farley, E. C. Carmack, L. W. Cooper, K. E. Frey, J. H. Helle, F. A. McLaughlin, and S. L. McNutt. 2006. "A Major Ecosystem Shift in the Northern Bering Sea." *Science* 311(5766):1461-1464.
- HDR (HDR Alaska, Inc.). 2006a. Final Cook Inlet Ferry NEPA Supplemental Environmental Assessment. Submitted pursuant to 42 U.S.C. 4332(2)(c), 23 CFR Part 771. Prepared for Federal Transit Administration, Seattle, WA, and MSB, Palmer, AK, by HDR Alaska, Inc., Anchorage, AK.
- HDR. 2006b. Land Use and Transportation Forecasting Draft Report. Prepared for: Knik Arm Bridge and Toll Authority, Alaska Department of Transportation & Public Facilities, and Federal Highway Administration. February.
- HDR and URS (HDR Alaska, Inc and URS Corporation). 2006. Knik Arm Crossing Final Cumulative Effects Technical Report. (Agreement No: P 42070. Federal Project No: ACSTP-0001(277). AKSAS Project No: 56047.) March. Prepared for Knik Arm Bridge and Toll Authority, Alaska Department of Transportation & Public Facilities, Anchorage, AK, and Federal Highway Administration, Juneau, AK, by HDR Alaska, Inc. and URS Corporation, Anchorage, AK.
- Hofman, R. J. 2003. "Marine Sound Pollution: Does it Merit Concern?" *Marine Technology Society Journal* 37(4):66-77.
- IASC (Arctic Council and the International Arctic Science Committee). 2004. Impacts of a Warming Arctic: Arctic Climate Impact Assessment. Cambridge, UK, and New York: Cambridge University Press. Online at: <http://www.acia.uaf.edu>
- Interagency Review Team. 2007a. Su-Knik Environmental Bank. Southcentral Alaska. Umbrella Mitigation Bank Instrument.
- Interagency Review Team. 2007b. Su-Knik Environmental Bank. Southcentral Alaska. Appendix G: Big Lake South Individual Bank Plan. Supplement to the Umbrella Bank Instrument. Su-Knik Environmental Bank. Southcentral Alaska.
- IPCC (Intergovernmental Panel on Climate Change). 2007. Climate Change 2007: Synthesis Report. A. Allali, R. Bojariu, S. Diaz, I. Elgizouli, D. Griggs, D. Hawkins, O. Hohmeyer, B. P. Jallow, L. Kajfež-Bogataj, N. Leary, H. Lee, D. Wratt (eds.). Online at: [http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4\\_syr.pdf](http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf) (accessed July 2008).

- Jackson, K. 2009. Email communication between Kevin Jackson (Alaska Department of Transportation & Public Facilities) and Christopher Moelter (ICF International) regarding the Don Young Road Upgrade Project. January 9, 2008.
- Jones, B. M., C. D. Arp, M. T. Jorgenson, K. M. Hinkel, J. A. Schmutz, and P. L. Flint. 2009. "Increase in the Rate and Uniformity of Coastline Erosion in Arctic Alaska." *Geophysical Research Letters* 36, L03503, doi:10.1029/2008GL036205.
- Juday, G. P., V. Barber, P. Duffy, H. Linderholm, T. S. Rupp, S. Sparrow, E. Vaganov, and J. Yarie. 2005. Forests, Land Management, and Agriculture. Pages 781-862 in Arctic Climate Impact Assessment. Cambridge, UK, and New York: Cambridge University Press. Online at: <http://www.acia.uaf.edu/pages/scientific.html>.
- KABATA (Knik Arm Bridge and Toll Authority) and ADOT&PF (Alaska Department of Transportation & Public Facilities). 2007. Knik Arm Crossing Final Environmental Impact Statement and Final Section (4)f Evaluation. Prepared for Federal Highway Administration. December 18, 2007.
- KABATA. 2009. NEPA and the Knik Arm Crossing. Online at <http://www.knikarmbridge.com/nepa.html> (accessed February 19, 2010).
- KABATA. 2010. Knik Arm Crossing Project Milestone and Schedule. Online at: <http://www.knikarmbridge.com/schedule.html> (accessed November 11 2010).
- Kemplen, A. 2008. Telephone conversation between Allen Kemplen (Alaska Department of Transportation & Public Facilities) and Debi Rogers (ICF International) regarding schedule for Knik Goose Bay Road Improvements. December 1, 2008.
- Koski, R. 2009. Email communication between Robert Koski (Matanuska-Susitna Borough Project Manager) and Christopher Moelter (ICF International) regarding status and location of the Point MacKenzie Road Improvement and Paving Project. January 9, 2009.
- Larsen, P. H., S. Goldsmith, O. Smith, M. L. Wilson, K. Strzepek, P. Chinowsky, and B. Saylor. 2008. "Estimating Future Costs for Alaska Public Infrastructure at Risk from Climate Change." *Global Environmental Change* 18(3):442-457.
- Lemke, P., J. Ren, R. B. Alley, I. Allison, J. Carrasco, G. Flato, Y. Fujii, G. Kaser, P. Mote, R. H. Thomas and T. Zhang. 2007. Observations: Changes in Snow, Ice and Frozen Ground. In S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor and H. L. Miller (eds.), Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK New York: Cambridge University Press.
- Lettenmaier, D., D. Major, L. Poff, and S. Running. 2008. Water Resources. Pages 121-150 in P. Backlund, A. Janetos, D. Schimel, J. Hatfield, K. Boote, P. Fay, L. Hahn, C. Izaurralde, B. A. Kimball, T. Mader, J. Morgan, D. Ort, W. Polley, A. Thomson, D.

- Wolfe, M. G. Ryan, S. R. Archer, R. Birdsey, C. Dahm, L. Heath, J. Hicke, D. Hollinger, T. Huxman, G. Okin, R. Oren, J. Randerson, W. Schlesinger, D. Lettenmaier, D. Major, L. Poff, S. Running, L. Hansen, D. Inouye, B. P. Kelly, L. Meyerson, B. Peterson, and R. Shaw (eds.), The Effects of Climate Change on Agriculture, Land Resources, Water Resources, and Biodiversity in the United States. (Synthesis and Assessment Product 4.3.) Washington, D.C.: U.S. Department of Agriculture.
- Meehl, G. A., T. F. Stocker, W. D. Collins, P. Friedlingstein, A. T. Gaye, J. M. Gregory, A. Kitoh, R. Knutti, J. M. Murphy, A. Noda, S. C. B. Raper, I. G. Watterson, A. J. Weaver, and Z. C. Zhao. 2007. Global Climate Projections. Pages 747-845 in S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, and H.L. Miller (eds.), Climate Change 2007: The Physical Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK and New York: Cambridge University Press.
- MMS (Minerals Management Service). 2003. Cook Inlet Planning Area Oil and Gas Lease Sales 191 and 199, Final Environmental Impact Statement. OCS EIS/EA MMS 2003-055, Alaska Outer Continental Shelf.
- MMS. 2005. Proposed Geophysical Survey Cosmopolitan Unit, Cook Inlet, Environmental Assessment. OCS EIS/EA MMS 2005-045, Alaska Outer Continental Shelf. Online at: [http://www.mms.gov/alaska/ref/EIS%20EA/Cosmo\\_EA/ea\\_Cosmo.pdf](http://www.mms.gov/alaska/ref/EIS%20EA/Cosmo_EA/ea_Cosmo.pdf) (accessed October 5, 2009).
- MSB (Matanuska-Susitna Borough). 2007a. Mat-Su Borough Long-Range Transportation Plan, Final Report. Adopted June 2007. Prepared by HDR Alaska Inc. Available online: [http://www.matsugov.us/index.php?option=com\\_docman&task=doc\\_download&gid=1831&Itemid=238](http://www.matsugov.us/index.php?option=com_docman&task=doc_download&gid=1831&Itemid=238) (accessed November 11, 2010).
- MSB (Matanuska-Susitna Borough). 2007b. Fish Creek Management Plan: Draft Alternatives. May 7. Online at: [http://www.agnewbeck.com/pdf/matsu/Fish\\_Creek/Fish\\_Creek\\_Alternatives\\_draft.pdf](http://www.agnewbeck.com/pdf/matsu/Fish_Creek/Fish_Creek_Alternatives_draft.pdf) (accessed December 5, 2008).
- MSB. 2008a. Draft Fish Creek Management Plan. Final Draft Released July 21, 2008. Prepared by Agnew: Beck Consulting, LLC, JadeNorth, LLC. Online at: <http://www.agnewbeck.com/pages-portfolio/matsu/fishcreek-mngt-plan.htm> (accessed June 25, 2008).
- MSB. 2008b. Mat-Su Borough Goose Creek Correctional Center October 2008 Status Report. Online at: <http://ww1.matsugov.us/prison/images/stories/site/October08.pdf> (accessed December 4, 2008).
- MSB. 2008c. Goose Creek Correctional Center: Home Page. Online at: <http://ww1.matsugov.us/prison> (accessed December 4, 2008).
- MSB. 2009a. Point MacKenzie Road Improvements. MSB Public Works Webpage. Online at: [http://ww1.matsugov.us/publicworks/index.php?option=com\\_content&view=article&id=](http://ww1.matsugov.us/publicworks/index.php?option=com_content&view=article&id=)

[53:pt-mac-road-improvements&catid=7:pme-projects&Itemid=5](#) (accessed January 8, 2009).

MSB. 2009b. Joint Land Use Study. Public Review Draft. Produced by WHPacific with assistance by EDAW and AECOM. July.

MSB (Matanuska-Susitna Borough) 2010a. Goose Creek Correctional Center: Matanuska-Susitna Borough Project Facts. August. Online at: [http://www.matsugov.us/index.php/projects/project-fact-sheets/doc\\_download/1436-goose-creek-correctional-center](http://www.matsugov.us/index.php/projects/project-fact-sheets/doc_download/1436-goose-creek-correctional-center). (accessed November 11, 2010).

MSB (Matanuska-Susitna Borough) 2010b. Port Mackenzie Barge Dock Expansion Project: Matanuska-Susitna Borough Project Facts. August. Online at: [http://www.matsugov.us/index.php/projects/project-fact-sheets/doc\\_download/2384-barge-dock-expansion](http://www.matsugov.us/index.php/projects/project-fact-sheets/doc_download/2384-barge-dock-expansion). (accessed November 11, 2010).

MSB (Matanuska-Susitna Borough) 2010c. Parks Highway Connectors Museum Drive Extension MSB Project No. 30090. Fact Sheet. Available online: <http://www.parkshighway44-52.info/museum/Museum%20Fact%20Sheet%20SM%20FINAL.pdf> (accessed November 11, 2010).

MSB (Matanuska-Susitna Borough) 2010d. Parks Highway Connectors Machen Road Extension MSB Project No. 30090. Fact Sheet. Available online: <http://www.parkshighway44-52.info/machen/Machen%20Fact%20Sheet%20FINAL.pdf> (accessed November 11, 2010).

MSB (Matanuska-Susitna Borough) 2010e. Lucille Street. MSB Planning Department Web Page. Available online: [http://www.matsugov.us/planning/index.php?option=com\\_content&view=category&id=54:lucille-street&layout=blog&Itemid=20206](http://www.matsugov.us/planning/index.php?option=com_content&view=category&id=54:lucille-street&layout=blog&Itemid=20206) (accessed November 11, 2010).

National Marine Fisheries Service. 2006. POA-2003-502-N Ship Creek. March 22, 2006 correspondence from Robert D. Mecum, Acting Administrator, Alaska Region, National Marine Fisheries Service, Juneau, AK, to Colonel Timothy J. Gallagher, U.S. Army Corps of Engineers, Anchorage, AK.

National Marine Fisheries Service. 2008. POA-1979-412 Knik Arm. May 15 correspondence from Robert D. Mecum, Acting Administrator, Alaska Region, National Marine Fisheries Service, Juneau, Alaska, to Colonel Kevin J. Wilson, District Engineer, U.S. Army Corps of Engineers AK District, Anchorage, AK.

ORPC (Ocean Renewable Power Company Alaska, LLC). 2006. Application for Preliminary Permit. Before the United States Federal Energy Regulatory Commission (FERC). Docket No. P-12679-000. May 2006.

ORPC. 2008. Alaska Cook Inlet OCGen Tidal Energy Project. FERC No. 12679. Initial Consultation and Informational Meeting. Meeting Notes. July 3, 2008.

- ORPC. 2009. OCGEN™ Projects. Alaska. Online at:  
[http://www.oceanrenewablepower.com/ocgenproject\\_alaska.htm](http://www.oceanrenewablepower.com/ocgenproject_alaska.htm) (accessed September 4, 2009).
- Osterkamp, T. 2007. “Characteristics of the Recent Warming of Permafrost in Alaska.”  
*Journal of Geophysical Research* 112, F02S02, doi:10.1029/2006JF000578.
- Port MacKenzie. 2008. Long-Term Vision for Future of Commercial Transportation Users. Presentation at Alaska Regional Ports Conference. January 10-11, 2008. Online at:  
[http://www.poa.usace.army.mil/en/cw/AK%20Regional%20Ports%20Study/Panel1\\_MarcVanDongen.pdf](http://www.poa.usace.army.mil/en/cw/AK%20Regional%20Ports%20Study/Panel1_MarcVanDongen.pdf) (accessed December 5, 2008).
- Port of Anchorage Intermodal Expansion Project. Online at:  
[http://www.portofanchorage.org/ov\\_project.html](http://www.portofanchorage.org/ov_project.html) (accessed December 5, 2008).
- Ryan, M. G., S. R. Archer, R. Birdsey, C. Dahm, L. Heath, J. Hicke, D. Hollinger, T. Huxman, G. Okin, R. Oren, J. Randerson, and W. Schlesinger. 2008. Land Resources. Pages 75-120 in P. Backlund, A. Janetos, D. Schimel, J. Hatfield, K. Boote, P. Fay, L. Hahn, C. Izaurralde, B. A. Kimball, T. Mader, J. Morgan, D. Ort, W. Polley, A. Thomson, D. Wolfe, M. G. Ryan, S. R. Archer, R. Birdsey, C. Dahm, L. Heath, J. Hicke, D. Hollinger, T. Huxman, G. Okin, R. Oren, J. Randerson, W. Schlesinger, D. Lettenmaier, D. Major, L. Poff, S. Running, L. Hansen, D. Inouye, B. P. Kelly, L. Meyerson, B. Peterson, and R. Shaw (eds.), The Effects of Climate Change on Agriculture, Land Resources, Water Resources, and Biodiversity in the United States. (Synthesis and Assessment Product 4.3.) Washington, D.C.: U.S. Department of Agriculture.
- State of Alaska. 2009. Stand Alone Pipeline Project Description/Plan of Development. Draft 11-16-2009. Available online: <http://asapeis.com/Documents/Project%20Description.pdf> (accessed November 11, 2010).
- Sweet, S. 2010. Telephone Communication between Serena Sweet (U.S. Army Corps of Engineers, Alaska District) and Christopher Moelter (ICF International) regarding the status of the Alaska Stand Along Pipeline Project. November 9, 2010.
- Sworts, B. 2008. Email communication between Brad Sworts (Matanuska-Susitna Borough Planning, Transportation, and Environmental Division) and Debi Rogers (ICF International) regarding the status of the Matanuska-Susitna Borough Regional Aviation Systems Plan. November 25, 2008.
- Sworts, B. 2009. Telephone communication between Brad Sworts (Matanuska-Susitna Borough Planning, Transportation, and Environmental Division) and Debi Rogers (ICF International) regarding the status of various proposed Port MacKenzie projects. October 13, 2009.
- Travis, M. 2009. Email communication between Michael Travis (Travis/Peterson Environmental Consulting, Inc.) and Debi Rogers (ICF International) regarding updated to the Knik-Willow Transmission Line project. October 12, 2009.

- Trenberth, K. E., P. D. Jones, P. Ambenje, R. Bojariu, D. Easterling, A. Klein Tank, D. Parker, F. Rahimzadeh, J. A. Renwick, M. Rusticucci, B. Soden, and P. Zhai. 2007. Observations: Surface and Atmospheric Climate Change. Pages 235-335 in S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor, and H. L. Miller (eds.), Climate Change 2007: The Physical Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK and New York: Cambridge University Press.
- U.S. Census Bureau. 2005-2007. American Community Survey 3-Year Estimates. Online at: <http://factfinder.census.gov> (accessed February 25, 2009).
- USGCRP (U.S. Global Change Research Program). 2009. Global Climate Change Impacts in the United States. A State of Knowledge Report from the U.S. Global Climate Change Research Program. June. Online at: <http://www.globalchange.gov/usimpacts>
- Weller, M. 2010. Personal Communication between Mike Weller (Matanuska-Susitna Borough) and Christopher Moelter (ICF International). Phone call regarding the status of the Port MacKenzie ferry landing facilities. December 10, 2010.
- White, R. 2008. "Gravel Operation Revives Port MacKenzie." *Anchorage Daily News* (Anchorage, AK). July 18, 2008. Online at: <http://www.adn.com/matsu/story/468242.html> (accessed December 4, 2008).
- Zartman, S. 2008. Telephone communication between Sandy Zartman (Port MacKenzie Port Director's Office) and Debi Rogers (ICF International) regarding the status of various Port MacKenzie projects, including the deep draft dock expansion. November 20, 2008.