

# Initial Study Report Meeting

## *Study 7.6 Ice Processes in the Susitna River*

*October 17, 2014*

Prepared by HDR



## Study 7.6 Objectives

- Document the timing, progression, and physical processes of freeze-up and break-up during 2012–2014 between tidewater and the Oshetna River confluence (PRM 235.2 [RM 233.4]), using historical data, aerial reconnaissance, stationary time-lapse cameras, and physical evidence
- Determine the potential effect of various Project operational scenarios on ice processes downstream of Watana Dam using modeling and analytical methods
  - Develop a modeling approach for quantitatively assessing ice processes in the Susitna River
  - Calibrate the model based on existing conditions. Use the model to determine the extent of the open water reach downstream of Watana Dam during Project operations
  - Use the model to determine the changes in timing and ice-cover progression and ice thickness and extent during Project operations

## Study 7.6 Objectives

- Develop detailed models and characterizations of ice processes at instream flow Focus Areas in order to provide physical data on winter habitat for the Fish and Aquatics Instream Flow Study (Study 8.5)
- Provide observational data of existing ice processes and modeling results of post-Project ice processes to the Fluvial Geomorphology Modeling below Watana Dam Study (Study 6.6), Groundwater Study (7.5), Instream Flow Studies (Studies 8.5-8.6), Fish and Aquatics Study (Studies 9.12), Riparian Vegetation Study Downstream of the Proposed Susitna-Watana Dam (Study 11.6), Recreation and Aesthetics Studies (12.5-12.7), and Socioeconomic and Transportation Study (Study 15.7)
- Research and summarize large river ice processes relevant to the Susitna River, analytical methods that have been used to assess impacts of projects on ice-covered rivers, and the known effects of existing hydropower operations in cold climates

## *Study 7.6 Components*

- Aerial Reconnaissance (ISR Part A, Section 4.1; 4)
- Time-Lapse Camera Monitoring (ISR Part A, Section 4.2; 4)
- Ice Measurement Data (ISR Part A, Section 4.3; 7)
- Other Field Data (ISR Part A, Section 4.4; 8)
- River1D Ice Process Model Development for Existing Conditions (ISR Part A, Section 4.5; 8)
- Lower River Assessment (ISR Part A, Section 4.6; 9)
- Review and Compilation of Existing Cold Regions Hydropower Project Operations and Effects (ISR Part A, Section 4.7; 10)

## *Study 7.6 Variances*

No significant variances have been made. Minor variances pertaining to the originally proposed time-lapse camera locations in Section 4.2 of the RSP have been made to provide for improved coverage and views of freeze-up and break-up processes.

## *Study 7.6 Summary of Results in ISR (ISR Study 7.6, Part A – Section 5)*

- Breakup observations from the mouth to the Oshetna River (PRM 0-235.2) by aerial reconnaissance and time-lapse cameras made during 2012 and 2013 (Study 7.6, Appendix A)
- Freeze-up observations from the mouth to the Oshetna River (PRM 0-235.2) by aerial reconnaissance and time-lapse cameras made during 2012 (Study 7.6, Appendix A)
- Mapping of thermal and velocity open leads from the mouth to the Oshetna River (PRM 0-235.2) by aerial reconnaissance made during 2012 and 2013 (Study 7.6, Appendix A)
- Ice thickness, elevation, and winter discharge measurements made at nine Instream Flow water level recording stations in coordination with Study 8.5 during 2013 and 2014 (Study 7.6, Appendix B)
- River1D model developed for PRM 80-187.2 and calibrated for original 88 measured cross sections
- Proof-of-Concept Meeting held in April 2014 (Study 7.6, Appendix D); FA-128 (Slough 8A) River2D model example

## *Study 7.6 Summary of Results in ISR (ISR Study 7.6, Part A – Section 5)*

- Assessment of Lower River water elevations under proposed conditions of increased discharge during winter completed at Sunshine and Susitna Station (Study 7.6, Appendix A)
- Review and compilation of existing cold regions hydropower project operations and effects including degree of success of using various modeling techniques (Study 7.6, Appendix C)

## *Study 7.6 Summary of Results since ISR (September 2014 Tech Memo)*

- Breakup observations from the mouth to the Oshetna River (PRM 0-235.2) by aerial reconnaissance and time-lapse cameras made during 2014 (Study 7.6, TM-2014)
- Freeze-up observations from the mouth to the Oshetna River (PRM 0-235.2) by aerial reconnaissance and time-lapse cameras made during 2013 (Study 7.6, TM-2014)
- Mapping of thermal and velocity open leads from the mouth to the Oshetna River (PRM 0-235.2) by aerial reconnaissance made during 2014 (Study 7.6, TM-2014)
- River1D ice processes model modified with new measured cross sections and calibrated for open water conditions
- River2D models developed for FA-128 (Slough 8-A) and FA-104 (Whiskers Slough) and calibrated for open water conditions

# *AEA Proposed Modifications to Study 7.6 in ISR (ISR Study 7.6, Part C – Section 7.1.2)*

## **Time Lapse Cameras**

- The Study Plan indicated time lapse cameras would be located at FA-151 (Portage Creek) and FA-184 (Watana Dam). Lack of Cook Inlet Regional Working Group (CIRWG) land access in 2013 prevented the placement of these proposed cameras.
- A remote telemetered camera at ESS55 near the mouth of Portage Creek installed by the Fish and Aquatics Instream Flow Study (Study 8.5) provided suitable images, fully meeting the study objectives.
- The ice conditions at the Watana Dam site were obtained through the aerial video flights during freeze-up, the open lead surveys, and breakup, which provided adequate coverage of FA-184 (Watana Dam) to meet the study objectives.

# Current Status and Steps to Complete Study 7.6

- **River1D Ice Processes Model**
  - Complete the ice-covered calibration for existing conditions, including updates to geometric data from 2014 field studies
  - Simulate existing and proposed Project operational scenarios for the 50-year hydrologic record during ice-covered periods
  - Coordinate with other studies to provide information on jam locations, water elevations, and flooded areas (Studies 6.6, 7.5, 8.5, and 8.6)
- **River2D models of the Focus Areas (FA)**
  - Develop and calibrate models for the other 8 FA's as geometric data becomes available
  - Utilize models to simulate depth and velocity during ice-covered periods using cold, warm, and average representative years of the hydrologic record
- **Model Analysis**
  - Conduct model accuracy and error analyses for the River1D and River2D modeling efforts

## *Licensing Participants Proposed Modifications to Study 7.6?*

- Agencies
- CIRWG members and Ahtna
- Public