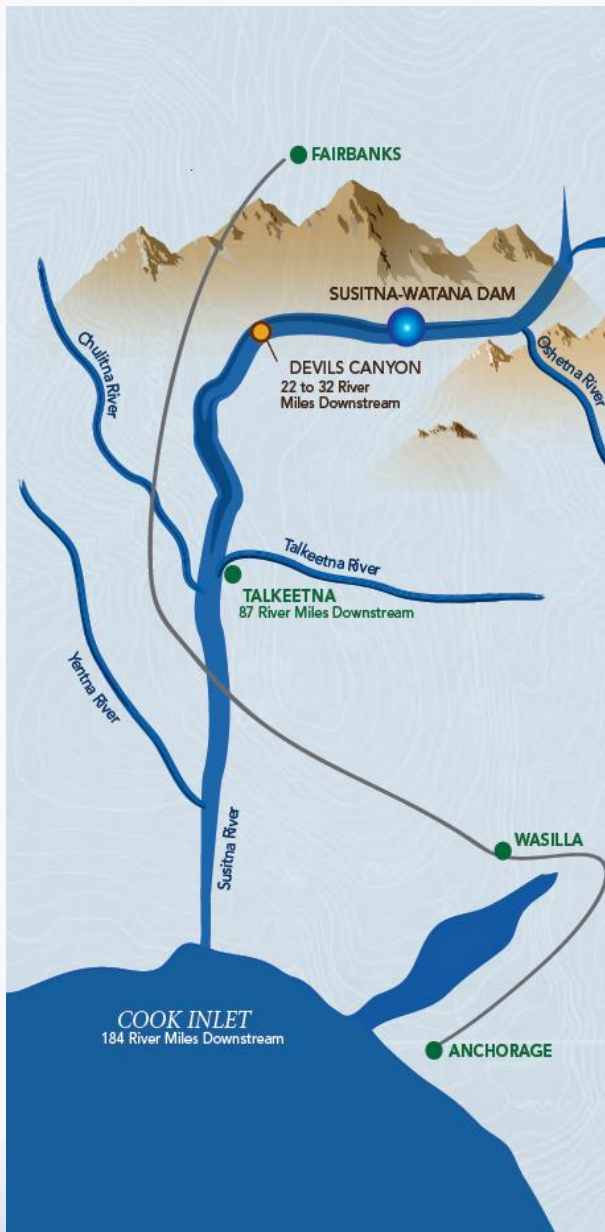


Initial Study Report Meeting

Study 6.6 Fluvial Geomorphology Modeling below Watana Dam

March 23, 2016

Prepared by
Tetra Tech, Inc



Study 6.6 Status

- **ISR Documents (ISR Part D, Section 4)**
 - Initial Study Report (June 3, 2014)
 - Winter Sampling of Main Channel Bed TM (Sept 26, 2014)
 - Decision Point on Fluvial Geomorphology Modeling of the Susitna River below PRM 29.9 TM (Sept 26, 2014)
 - 2014-2015 Study Implementation Report (Nov 4, 2015)
 - Fluvial Geomorphology Modeling Development TM (Attachment 1)
 - ISR Part D (Nov 6, 2015)
- **Data Collection was conducted in 2013 and completed in 2014**
- **The three study components were advanced**

Study 6.6 Objectives

- Develop calibrated models to predict the magnitude and trend of geomorphic response to the Project
- Apply the developed models to estimate the potential for channel change for with-Project operations compared to existing conditions
- Coordinate with the Geomorphology Study to integrate model results with the understanding of geomorphic processes and controls to identify potential Project effects that require interpretation of model results
- Support the evaluation of Project effects by other studies in their resource areas providing channel output data and assessment of potential changes in the geomorphic features that help comprise the aquatic and riparian habitats of the Susitna River

Study 6.6 Components

- Bed Evolution Model Development, Coordination, and Calibration
(ISR Part A, Section 4.1; pg 7)
- Model Existing and with-Project Conditions
(ISR Part A, Section 4.2; pg 48)
- Coordination and Interpretation of Model Results
(ISR Part A, Section 4.3; pg 51)

Study 6.6 Variances

(ISR Part D Section 6.2 and SIR Section 4)

- Use of Ackers White transport function instead of Wilcock Crowe as originally planned.
- Including groundwater sources in Focus Area 2-D hydraulic models.
- Not considering PDO for selection of hydrology for representative wet, average and dry years.

Summary of Results

(ISR Part A Section 5.1 and SIR Section 5.1)

Bed Evolution Model Development

- 2013 and 2014 Field Data
 - Cross sections (Study 8.5)
 - Bathymetry (Study 8.5)
 - LiDAR (Study 6.6)
 - Bed and Bank material sampling (Study 6.6)
 - Substrate mapping (Study 8.5)
 - Water surface elevations (Studies 8.5 and 6.6)
 - ADCP (velocity and discharge) (Study 8.5)
 - Stage hydrographs (Study 7.5)
 - Sediment transport (USGS) (analysis in Study 6.5)
 - Tributary surveys and bed materials (Study 6.6)
 - Geomorphic mapping (Study 6.5)
 - Winter bed sampling (Study 6.6 pilot 2013 and collection in 2014)
 - Discharge measurements to characterize groundwater sources (Studies 8.5 and 6.6 in 2014)

Summary of Results

(ISR Part A Section 5.2 and SIR Section 5.2)

Model Existing Conditions and with-Project Conditions

- 2-D Hydraulic Modeling of FA-128 (Slough 8A) for IFS Proof-of-Concept
- Initial 1-D Bed Evolution Modeling of Middle and Lower Susitna River (to PRM 29.9) for Existing and Max LF OS-1b conditions 50-year
- 2-D Bed Evolution Modeling of FA-128 (Slough 8A) for Existing and Max LF OS-1b conditions

Summary of Results

(ISR Part A Section 5.3 and SIR Section 5.3)

Coordination in Interpretation of Model Results

- Continuous internal coordination on Geomorphology Study 6.5
- External coordination with other studies
- Proof-of-Concept (IFS) meeting (April 2014) was initial demonstration

Study 6.6 Technical Memorandums

- Updated Fluvial Geomorphology Approach – May 2014 includes Attachment A: FA-128 (Slough 8a) 2-Dimensional Hydraulic Modeling Proof of Concept
- Evaluation of 50-Year Simulation Period, Pacific Decadal Oscillation, and Selection of Representative Annual Hydrographs – June 2014
- Winter Sampling of Main Channel Bed Material – September 2014
- Decision Point on Fluvial Geomorphology Modeling of the Susitna River below PRM 29.9 – September 2014
- 2014 Fluvial Geomorphology Model Development – November 2015 as Attachment 1 of SIR includes Appendix A on 1-D Bed Evolution Modeling and Appendix B on 2-D Bed Evolution Modeling of FA-128 (Slough 8A)

Past Decision Points from Study Plan

(ISR Part C Section 7.1.1)

- Selection of Focus Areas
- Extension of 1-D BEM study limit from PRM 79 to PRM 29.9
- Selection of Middle River Tributaries
- Selection of Lower River Tributaries
- Selection of 1-D and 2-D Bed Evolution Models
- To not extend 1-D BEM study limit below PRM 29.9 (Sept. 2014)
- Selection of Representative Hydrology

AEA Proposed Modifications

(Implemented Variances in ISR Part D Section 6.2 and SIR Section 4 to be carried forward)

- Use of Ackers White transport function instead of Wilcock Crowe as originally planned.
- Inclusion of groundwater sources in Focus Area 2-D hydraulic models.
- Not considering PDO for selection of hydrology for representative wet, average and dry years.

AEA Proposed Modifications

(ISR Part D Sections 7.1 and 7.2)

- Exclude dimensionless critical shear as a parameter for the sensitivity analysis as originally indicated in the RSP (based on use of Ackers White sediment transport equation)
- Exclude Bank Energy Index (BEI) analysis for channel bank erosion, though include more detailed evaluation of ice breakup conditions as driver of bank erosion
- Extend Focus Area bed evolution modeling time period when additional information is needed to evaluate tributary fan development.
- Identification of specific 2-D modeling scenarios at the Focus Areas (Future Decision ISR Part C Section 7.1.1.2 and SIR Section 7.1)

Steps to Complete Study 6.6

(ISR Part C, Section 7.2.1 and SIR Section 5.2)

Bed Evolution Model Development, Coordination, and Calibration

- Complete development and calibration of the 1-D BEM for Middle and Lower Susitna River segments
- Complete development of 2-D Hydraulic models and BEMs for remaining Focus Areas
- Finalize development of sediment supply from smaller tributaries
- Evaluate effects of LWD and ice on erosion and sedimentation

Steps to Complete Study 6.6

(ISR Part C, Section 7.2.1 and SIR Section 5.2)

Model Existing and with-Project Conditions

- Perform model runs using final 1-D BEM and 2-D hydraulic and BEMs for Existing (base condition) and with-Project scenarios
- Evaluate uncertainty through sensitivity analyses of models.
- Provide synthesis of Reach-scale and Local-scale analyses.

Steps to Complete Study 6.6

(ISR Part C, Section 7.2.1 and SIR Section 5.2)

Coordination and Interpretation of Model Results

- Continuing coordination with Study 6.5 to review and interpret results in terms of geomorphic response.
- Continuing coordination and feedback between this study and other studies.

Licensing Participants Proposed Modifications to Study 6.6?

- Agencies
- CIRWG members and Ahtna
- Public