

Attachment 6

Initial Study Report Meetings

Action Item for Study 9.12

March 22, 2016

**Susitna-Watana Hydroelectric Project
(FERC No. 14241)**

**Initial Study Report Meetings
March 22, 2016
Action Items**

**Study of Fish Passage Barriers in the Middle and
Upper Susitna River and Susitna Tributaries
Study Plan Section 9.12**



SUSITNA-WATANA HYDRO

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Study 9.12 Study of Fish Passage Barriers Action Items

Action Item 9.12-1. AEA will provide clarification on how many tributary mouths were surveyed as compared to the Revised Study Plan (RSP) for evaluation of current and future potential fish barriers.

Table A, below, was generated by updating Table 2 from the Study of Fish Barriers Implementation Plan (field June 17, 2013) with information on tributary surveys presented in Study 9.12 ISR Part A, Section 4.3.2 and Appendix B; Study 9.12 SIR, Section 5.4; Study 6.6 ISR Part A, Section 5.1.6; and Study 6.6 SIR, Section 5.1.2.3. Twenty three of the 27 streams listed in Table A will be modeled under Study 6.6; the four streams that will not be modeled are denoted by an asterisk. Field surveys indicated that these four tributaries, Unnamed Tributary 115.4, Unnamed Tributary 174.3, Slash Creek, and Gash Creek, had an absence of sediment inputs or an alluvial fan indicating a very low potential for the Project to create barriers related to sediment deposition at the tributary mouths.

Action Item 9.12-2. AEA will provide reference to the documentation on the criteria for selecting tributaries to be included in Study 9.12.

Tributaries to be surveyed were identified in Section 7.4.1 of Study of Fish Passage Barriers Implementation Plan. Within Focus Areas, 10 tributaries were identified from remote imagery (Study of Fish Barriers Implementation Plan, Section 7.3.1); all 10 of these tributaries were selected for survey. In the Middle River, outside of Focus Areas, tributaries were selected for modeling as summarized in Study 6.6 ISR Part C, Section 7.1.1.1.1 and inserted in italics below.

Selection of Middle River Tributaries: AEA will implement the methods presented in ISR Study 6.6 Section 4.1.2.6 to complete the tributary delta modeling. There are 19 tributaries selected for delta modeling in the Middle Susitna River Segment (Table 7.1-1); five tributaries to the Lower Susitna River Segment were previously selected (Tables 5.1-3 and 5.1-8). Prior to coordination with the Study of Fish Passage Barriers in the Susitna Tributaries (Study 9.12) and agency staff during the March 19, 2014, Fisheries Technical Meeting, 15 Middle River tributaries were selected for delta modeling. One result of this coordination is the removal of Unnamed Tributary 115.4 from consideration of tributary delta modeling because of the following observations made during the July 2013 reconnaissance: (1) no evidence of a depositional fan at the tributary mouth, (2) no surface flow at the mouth, and (3) the presence of a wetland between the tributary mouth and the Susitna River. Another result of the coordination is that five additional tributaries were selected for modeling because (1) the presence of a delta could create a barrier to upstream fish passage, and (2) the sediment loading will provide needed input to the 1-D Bed Evolution Model. A total of 19 Middle River tributaries are now selected for tributary delta modeling in the Middle River.

The selection criteria included:

- 1. Contributing drainage area, with greater drainage area being a positive factor influencing selection. Potential for a drainage area to produce sediment and form a delta is greater for larger drainage areas.*

2. *The location of the tributary mouth relative to Focus Areas, with location in a Focus Area being a basis for selection.*
3. *The presence of lakes in the drainage area, with presence of large lakes near the mouth of the tributary being a negative factor in selection because the lakes would trap sediment that would otherwise be transported to the mouth of the tributary.*
4. *The presence and number of resident fish species and salmon species observed during the field efforts for the 2012/2013 Fish Distribution and Abundance in the Middle and Lower Susitna River Study (Study 9.6), with the presence being a positive factor and greater numbers being a positive factor.*
5. *Whether the tributary is selected for evaluation of fish passage barriers (Study 9.12), with selection being a positive factor for tributary delta modeling.*
6. *Evidence of an active depositional fan at the mouth of the creek being a positive factor, because an existing fan indicates conditions conducive to development and maintenance of a delta.*

Upon evaluation of the criteria, selection was based on the following considerations:

1. *If a tributary mouth is located within a Focus Area, then the tributary sediment supply will be modeled to quantify an input for the Bed Evolution Models (1-D and 2-D). If there was no evidence of an active fan at the tributary mouth and if the tributary was not selected for evaluation of fish passage barriers (Study 9.12), the tributary delta will not be modeled; otherwise, the tributary delta will be modeled. If a tributary was not selected for evaluation of fish passage barriers (Study 9.12), the delta modeling will occur as part of the 2-D bed evolution modeling of the Focus Areas.*
2. *If a tributary mouth is located outside of a Focus Area, if there is evidence of an active fan at the tributary mouth, and if the tributary is selected for evaluation of fish passage barriers (Study 9.12), the tributary sediment supply and the delta will be modeled. If the tributary was selected for evaluation of fish passage barriers (Study 9.12), but there was no evidence of an active fan, the tributary sediment supply and delta will not be modeled (i.e., Devil Creek, Cheechako Creek, Jack Long Creek, Little Portage Creek, McKenzie Creek, Little McKenzie Creek, and Chase Creek).*

Action Item 9.12-3. AEA will provide reference to documentation on surrogate species.

Surrogate species for swimming speed capabilities and their velocity criteria were presented Table 5.1-5 of Study 9.12 SIR Section 5.1 (inserted below).

Table 5.1-1. Swimming capabilities and velocity criteria for fish passage based literature values for selected fish species and life stages.

Species	Life stage	Prolonged Speed		Burst Speed	
		ft/s	References	ft/s	References
Arctic Grayling	Adult	1.4 - 4.1	Katapodis (1992)	6.9 - 13.9	Bell (1991)
	Juvenile	0.5 - 0.8	Deegan et al. (2005)	NR	NR
Arctic Lamprey	Adult	0.2 - 0.8	^a Robinson and Bayer (2005), ^a Clemens et al. (2012)	2.5 - 10	^a Mesa et al. (2003), ^a Keefer et al. (2010)
	Juvenile	0.3 - 0.6	^a Sutphin and Hueth (2010)	1.0 - 2.5	^a Sutphin and Hueth (2010)
Burbot	Adult	1.3 - 2.6	Jones et al. (1974), Schwalme et al. (1985)	1.1 - 4.0	Bell (1991)
	Juvenile	1.1 - 1.3	Jones et al. (1974)	NR	NR
Dolly Varden	Adult	2.0 - 3.3	^b Beamish (1980)	4.2 - 7.5	^b Mesa et al. (2004)
	Juvenile	0.5-1.6	^c Mesa et al. (2004)	NR	NR
Humpback Whitefish	Adult	1.0 - 2.3	Jones et al. (1974), Beamish (1980)	3.0 - 4.0	Bell (1991)
	Juvenile	0.2 - 1.3	Jones et al. (1974)	NR	NR
Northern Pike	Adult	1.9 – 2.0	Peake (2008) ^d	5.7 – 17.4 ^e	Peake (2008)
	Juvenile	0.4 – 1.2	Peake (2008) ^d	NR	NR
Chinook Salmon	Adult	2.9 - 11.0	Bell (1991)	11.0 - 22.1	Bell (1991)
	Juvenile	0.5 - 0.9	Furniss et al. (2008)	2.0 - 2.3	Randall et al. (1987)
Coho Salmon	Adult	3.1 - 10.9	Lee et al. (2003)	11.7 - 21.0	Bell (1991)
	Juvenile	0.4 - 2.1	Bell (1991)	NR	NR
Chum Salmon	Adult	1.7 - 5.1	Aaserude and Orsborn (1985)	6.0 - 12.6	Powers and Orsborn (1985)
	Juvenile	0.4 - 0.6	Smith and Carpenter (1987)	NR	NR
Pink Salmon	Adult	2.9 - 11.0	Lee et al. (2003), Bell (1991)	11.0 – 21.0	Bell (1991)
	Juvenile	0.4 - 0.5	Smith and Carpenter (1987)	7.7 – 11.0	Powers and Orsborn (1985)
Sockeye Salmon	Adult	4.0 – 8.8	Bell (1991)	10.0 - 21.9	Bell (1991), Bainbridge (1960)
	Juvenile	1.4 - 2.1	Bell (1991)	NR	NR
Rainbow Trout	Adult	2.1 - 2.6	Furniss et al. (2008)	14.0 - 20.3	Bell (1991)
	Juvenile	1.0 - 2.0	Bainbridge (1960)	2.4 - 7.2	Bainbridge (1960)

^a Pacific Lamprey is used as a surrogate; ^b Arctic Char is used as a surrogate; ^c Bull Trout is used as a surrogate; ^d Converted from metric U_{Crit} speeds at temperature greater than 12°C; ^e Maximum swimming speed for 20.7 to 35.8 cm Northern Pike at 15°C; ⁺ for Bull Trout; NR = no reference available

Table A. Tributary mouths in the Middle Susitna River selected and surveyed for barrier assessment.

Tributary PRM	Tributary	Focus Area	2013; ISR Study 9.12	2014; SIR Study 9.12	2013; ISR Study 6.6	2014; SIR Study 6.6
<i>Middle River Downstream of Devils Canyon</i>						
105.1	Whiskers Creek	FA-104			X	
110.5	Chase Creek		X			
113.7	Unnamed Tributary 113.7	FA-113			X	
114.9*	Slash Creek	FA-113			X	
115*	Gash Creek	FA-113			X	
115.4*	Unnamed Tributary 115.4	FA-115			n/a*	
117.2	Lane Creek		X		X	
119.7	Lower McKenzie Creek			X		
120.2	McKenzie Creek			X		
121.4	Little Portage Creek			X		
124.4	Deadhorse Creek		X			
127.3	Fifth of July Creek		X			
128.1	Skull Creek	FA-128			X	
134.1	Sherman Creek		X			
134.3	Fourth of July Creek		X			
140.1	Gold Creek		X+		X+	
142.1	Indian River	FA-141			X	
144.6	Unnamed Tributary 144.6	FA-144			X	
148.3	Jack Long Creek			X		
152.3	Portage Creek	FA-151				X
<i>Middle River Within Devils Canyon</i>						
155.9	Cheechako Creek			X		
160.5	Chinook Creek			X		
<i>Middle River Upstream of Devils Canyon Impediment 3</i>						
164.8	Devil Creek			X		
<i>Middle River Upstream of Devils Canyon (PRM 166.1)</i>						
173.8	Unnamed Tributary 173.8	FA-173				X
174.3*	Unnamed Tributary 174.3	FA-173			n/a*	X
179.3	Fog Creek			X		X
184.6	Tsusena Creek	FA-184		X		X

Notes:

* Excluded from modeling in ISR Study 6.6 based on field observations of low sediment production and absence of a fan as described in Study 9.12 ISR Part A, Tables 4.3-3, Study 6.6 ISR Part C, Table 7.1-1. In addition, Slash and Gash Creek mouths were surveyed but were dropped from modeling due to the absence of an active fan, Study 6.6 ISR Part C, Table 7.1-1.