Input - Forcing Data							
Ice model	**Dataset**	**Minimum Spatial Extent**	**Minimum Spatial Resolution**	**Minimum Temporal Resolution**	**Anticipated source**	**Desired level of accuracy (optional)**	**Comments**
River1D Dynamic Ice Modeling	Cross-section geometry	Susitna Middle River (PRM 80 to 187)	Optimally, 0.6 mi spacing w/ 0.2 mi interpolated cross sections in between	Non-varying w/Projected updates at +25 yr and +50 yr	Survey, LiDAR, Geomorphology Model for projected updates	< 0.5 ft bed/1 ft floodplain	
	Channel flow resistance	Model extent	One value per cross section	N/A	ISF Flow-Routing Model and direct observation		Initial Manning's *n* values are modified during model calibration
	Overbank flow resistance	Model extent	One value each left and right overbank	N/A	ISF Flow-Routing Model, direct observation, aerial photography		Initial Manning's n values are modified during model calibration
	River discharge	Middle River upstream boundary (PRM 187)	N/A	hourly	ISF Flow-Routing Model, Reservoir Operations Model, USGS 15291700, ESS 70		
	River Stage or Stage-Discharge Rating Curve	Middle River downstream boundary & intermediate locations	As required	hourly	USGS gages and ESS stations		Downstream boundary required for model; Intermediate locations support calibration
	Tributary and groundwater inflows	Chulitna, Talkeetna, and other distributed sources	As available	hourly	ISF Flow-Routing Model, USGS gages, GWS modeling		Distributed tributary sources estimated by difference between upstream and downstream gages
	Air temperature	Model extent	As available	hourly	ESS and ESM stations		
	Water temperature	Middle River upstream boundary & intermediate locations	As available	hourly	USGS gages and ESS stations		Upstream boundary required for model; intermediate locations support calibration
	Ice bridging locations	Model extent	N/A	N/A	Contemporary and historical observations		
River2D Focus-Area Modeling	Bathymetry/Topography	Focus Area plus U/S and D/S area for adequate boundary condition locations	Bank-to-Bank number of elements ranging from 3 in small channels to 9 in main channel. Up to 60-m elements in floodplains	Non-varying w/Projected updates at +25 yr and +50 yr	Survey, LiDAR, Geomorphology Model for projected updates	< 0.75 ft bed/1.5 ft floodplain	
	Channel and overbank flow resistance or roughness	Model extent	Main channel, principal side channels, floodplain		Geomorphology Model, bed-roughness data, direct-observation, aerial photographs		Initial roughness values are modified during model calibration
	Ice-cover thickness and roughness	Susitna and focus-area tributaries	Single value at representative River1D cross sections	N/A	Ice Processes River1D, direct observation, professional experience		
	River/tributary discharge	Upstream boundaries: Susitna and principal focus-area tributarie and side channels	N/A	hourly	ISF Flow-Routing Model, River1D Dynamic Ice Model		
	Stage or Stage-Discharge Rating Curve	Downstream boundaries: Susitna and principal focus-area tributaries	N/A	hourly	ISF Flow-Routing Model, River1D Dynamic Ice Model		
	Groundwater discharge	As required	N/A	hourly	Groundwater Model, measured data		Required only where GW discharge and temperature are significant

Input - Parameters							
Ice model	**Dataset**	**Minimum Spatial Extent**	**Minimum Spatial Resolution**	**Minimum Temporal Resolution**	**Anticipated source**	**Desired level of accuracy (optional)**	**Comments**
River1D Dynamic Ice Modeling	Channel flow resistance (Manning's *n*)	Model extent	Model extent	N/A	ISF Flow-Routing Model, Surface Bed Material, and calibration		
	Floodplain flow resistance (Manning's n base plus vegetation)	Model extent	Model extent	N/A	ISF Flow-Routing Model, Field observations and aerial photography		
	River/Tributary Discharge	Model upstream boundary, point-source and distributed tributary inflows	As required	hourly	ISF Flow-Routing Model, Reservoir Operations Model, USGS gages, ESS stations		
	River Stage or Stage-Discharge Rating Curve	Model downstream boundary and intermediate locations	As available	hourly	USGS gages and ESS stations		
	Air temperature	Model extent	As available	hourly	ESS and ESM stations		
	Water temperature	Model upstream boundary and intermediate locations	As available	hourly	USGS gages and ESS stations		
	Groundwater discharge	distributed or point source	As required	hourly	ISF routing model and GWS modeling		GW inflows unlikely to be significant to 1D modeling
River2D Focus-Area Modeling	Channel flow resistance (Manning's *n*)	Model extent	Model extent	N/A	ISF Flow-Routing Model, Surface Bed Material, and calibration		
	Floodplain flow resistance (Manning's n base plus vegetation)	Model extent	Model extent	N/A	ISF Flow-Routing Model, Field observations and aerial photography		
	River/tributary discharge	Upstream boundaries: Susitna and principal focus-area tributaries	N/A	hourly	ISF Flow-Routing Model, River1D Dynamic Ice Model		
	Stage or Stage-Discharge Rating Curve	Downstream boundaries: Susitna and principal focus-area tributaries	N/A	hourly	ISF Flow-Routing Model, River1D Dynamic Ice Model		
	Groundwater discharge	As required	N/A	hourly	Groundwater Model, measured data		Required only where GW discharge and temperature are significant
	Ice-cover thickness and roughness	Susitna and focus-area tributaries	Single value at representative River1D cross sections	N/A	Ice Processes River1D, direct observation, professional experience		

Input - Calibration Data							
Ice model	**Dataset**	**Minimum Spatial Extent**	**Minimum Spatial Resolution**	**Minimum Temporal Resolution**	**Anticipated source**	**Desired level of accuracy (optional)**	**Comments**
River1D Dynamic Ice Modeling	Channel flow resistance (Manning's *n*)	Model extent	Model extent	N/A	ISF Flow-Routing Model, Surface Bed Material, and calibration		
	Floodplain flow resistance (Manning's n base plus vegetation)	Model extent	Model extent	N/A	ISF Flow-Routing Model, Field observations and aerial photography		
	River discharge or stage	As available	N/A	hourly	USGS gages and ESS stations		
	Ice-front progression	Model extent	N/A	N/A	Contemporary and historical observations		
	Ice thickness and frazil concentration	Model extent	N/A	N/A	Contemporary and historical observations		
River2D Focus-Area Modeling	Channel flow resistance (Manning's *n*)	Model extent	Model extent	N/A	ISF Flow-Routing Model, Surface Bed Material, and calibration		
	Floodplain flow resistance (Manning's n base plus vegetation)	Model extent	Model extent	N/A	ISF Flow-Routing Model, Field observations and aerial photography		
	Channel discharge, stage, or velocity	As available	N/A	hourly	USGS gages and ESS stations		

Output - Predicted Quantities							
Ice model	**Dataset**	**Minimum Spatial Extent**	**Minimum Spatial Resolution**	**Minimum Temporal Resolution**	**Anticipated source**	**Desired level of accuracy (optional)**	**Comments**
River1D Dynamic Ice Modeling	Discharge hydrographs	As required at any model node	Approximately 0.2-mi spacing	hourly			
	Stage hydrographs	As required at any model node	Approximately 0.2-mi spacing	hourly			
	Ice-front progression	As required at any model node	Approximately 0.2-mi spacing	hourly			
	Ice thickness and frazil concentration	As required at any model node	Approximately 0.2-mi spacing	hourly			Jam locations
	Water temperature	As required at any model node	Approximately 0.2-mi spacing	hourly			
River2D Focus-Area Modeling	Discharge hydrographs or areal-averaged velocities	As required	Channel cross section of interest	hourly			As modified by specified ice cover
	Velocity vector plots	As required	Channel cross section of interest	Model timestep			As modified by specified ice cover
	Stage hydrographs	As required	Channel cross section of interest	hourly			Cross-sectional area of open water and ice cover

Model Assumptions		
Ice Models	**Assumption**	**Comment**
River1D Dynamic Ice Modeling	Ice bridges occur at specified locations and times	Contemporary and historical observations, engineering judgement
	Ice cover in hydrostatic balance within each model element	Ice cover does not behave as a rigid sheet
River2D FA Modeling	Specified ice cover does not evolve with time	Can approximate temporal changes in the ice cover by modeling distinct intervals in the projected evolution
	Ice cover is in hydrostatic balance within each model element	Ice cover does not behave as a rigid sheet
	Ice cover is fixed in space horizontally	Ice does not drift downstream or move laterally; however, the ice cover will move vertically with changes in stage