Input - Forcing Data							
FGM Model	**Dataset**	**Minimum Spatial Extent**	**Minimum Spatial Resolution**	**Minimum Temporal Resolution**	**Anticipated source**	**Desired level of accuracy (optional)**	**Comments**
Tributary Sediment Modeling	Cross sections	3 channel widths	4 cross sections up to 2 channel width intervals	N/A	Tt Survey	Ground shots elev. <0.1 ft, station <0.5 ft, section spacing <2 ft	
	Bed Material	Model extent	Model Extent	N/A	Tt field data collection	< half-phi	
	Range of Flows	Model extent	N/A	N/A	ISF-Routing	N/A	
	Boundary Stage-Discharge relationship	D/S and possibly U/S boundaries	N/A	N/A	Tt Survey and ISF-Routing	< .5 ft	
1-D Morphology Modeling	Cross sections	Susitna PRM187 to PRM30, 4 miles Talkeetna, 8 miles Chulitna	3.2 miles max, 0.8 m avg D/S and 0.9 m avg U/S Devil's Canon - Interpolate sections as needed	N/A	Survey and LiDAR	< 0.5 ft bed/1 ft floodplain	
	Channel Width	Model extent	Geomorphic reach	update every 10 years?	Apply Rate Law based on 2-yr flow or effective Q		Consistency of approach applied to each operational scenario
	Bed Material gradations	Model extent	Geomorphic reach, sampled every 2 miles MR and 4 miles LR	N/A	Tt field data collection	< half-phi	
	50-yr continuous flow hydrographs	Susitna, Chulitna, Talkeetna, Yenta and selected smaller tributaries	As required	hourly and daily	ISF-Routing	<10% main channel and primary tributaries, <25% minor tributaries	
	Sediment vs. flow rating curves by size fraction of sand and larger material	Susitna, Chulitna, Talkeetna, Yenta U/S boundaries and selected smaller tributaries	As required	N/A	USGS gage stations and tributary sediment modeling (Tt)	Within the 90 percent confidence interval of the regression relationships	Silt? Silt concentrations from WQ EFCD reservoir and River models?
	Boundary Stage-Discharge relationship	Downstream boundary	N/A	update as required	Susitna Station Gage (USGS)	< 0.5 ft	
2-D Morphology FA 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	Updated for yr-25 and yr-50	Survey and LiDAR for yr-0, Tt 1-D FGM, Geomorph, Ice, and ISF-Riaparian to update yrs-25 and 50	< 0.75 ft bed/1.5 ft floodplain	Coarse mesh is less accurate
	Bed Material gradations	Distributed over model extent (main channel and other lateral features)	Feature (main channel, side channel, other lateral feature) extent	Possibly update yr-25 and yr-50	Tt field data collection for yr-0, Tt 1-D FGM to update yrs-25 and 50	< half-phi	
	<1yr continuous flow hydrographs for dry, average and wet conditions with warm and cool PDO	Susitna and tributaries in FA	N/A	hourly, possibly update yrs-25 and 50	ISF-Routing	<15% main channel, <25% minor tributaries	Dry, average, and wet conditions with warm and cool PDO need to be determined.
	Sediment vs. flow rating curves by size fraction of sand and larger material	Susitna and tributaries in FA	N/A	separate relationships for yrs-0, 25, and 50	Tt 1-D Morphology Modeling	Within the 90 percent confidence interval of the regression relationships	
	Boundary Stage-Discharge relationship	Downstream boundary	N/A	separate relationships for yrs-0, 25, and 50	Tt 1-D Morphology Modeling	< 0.5 ft	
2-D Hydraulic FA Modeling	Bathymetry/Topography	Focus Area plus U/S and D/S area for adequate boundary condition locations	10 m main channel, 2 m habitat areas, 30 m floodplain	Updated for yr-25 and yr-50	Survey and LiDAR for yr-0, Tt 1-D and 2-D FGM to update yrs-25 and 50	< 0.5 ft bed/1 ft floodplain	
	Range of Flows	Susitna and tributaries in FA	N/A	N/A	ISF-Routing, ISF-habitat	N/A	
	Boundary Stage-Discharge relationship	Downstream boundary	N/A	separate relationships for yrs-0, 25, and 50	Tt 1-D Morphology Modeling	< 0.5 ft	

Input - Parameters							
FGM Model	**Dataset**	**Minimum Spatial Extent**	**Minimum Spatial Resolution**	**Minimum Temporal Resolution**	**Anticipated source**	**Desired level of accuracy (optional)**	**Comments**
Tributary Sediment Modeling	Channel flow resistance (Manning n or roughness height)	Model extent	Model extent	N/A	Surface Bed Material and calibration	10 percent	
	Floodplain flow resistance (base plus vegetation)	Model extent	Model extent	N/A	Field observations and aerial photography	20 percent	
	Expansion/Contraction loss parameters (standard values)	Model extent	Model extent	N/A	standard values		
1-D Morphology Modeling	Channel flow resistance (Manning n or roughness height)	Model extent	Main channel, side channels and other lateral features	N/A	Surface Bed Material, calibration, LWD	10 percent	
	Floodplain flow resistance (base plus vegetation)	Model extent	Flooplain/island features	Possibly update as required	Field observations and aerial photography, ISF-Riparian, Geomorphology	20 percent	
	Expansion/Contraction loss parameters (standard values)	Model extent	Model extent	N/A	standard values		
	Hydraulic and Sediment trasnport time step	Model extent	N/A	As required	Sensitivity		
	Bed layer thicknesses	Model extent	Geomorphic Reach	N/A	Bed material gradations and calibration or sensitivity		
2-D Morphology FA Modeling	Channel flow resistance (Manning n or roughness height)	Model extent	Main channel, side channels and other lateral features	Possibly update as required	Surface Bed Material, calibration, LWD	10 percent	
	Floodplain flow resistance (base plus vegetation)	Model extent	Flooplain/island features	Possibly update as required	Field observations and aerial photography, ISF-Riparian, Geomorphology	20 percent	
	Turbulence exchange coefficients	Model extent	Model or feature extent	N/A	normal range, calibration		
	Transmissivity (for wetting and drying algorithm in River2D)	Model extent	Model or feature extent	N/A	calibration or sensitivity		
	Hydraulic and Sediment transport time step	Model extent	N/A	As required	Sensitivity		anticipate ~5 seconds
	Bed layer thicknesses	Model extent	feature extent	Possibly update as required	Bed material gradations and calibration or sensitivity		
2-D Hydraulic FA Modeling	Channel flow resistance (Manning n or roughness height)	Model extent	Main channel, side channels and other lateral features	Possibly update as required	Surface Bed Material, calibration, LWD	10 percent	
	Floodplain flow resistance (base plus vegetation)	Model extent	Flooplain/island features	Possibly update as required	Field observations and aerial photography, ISF-Riparian, Geomorphology	20 percent	
	Turbulence exchange coefficients	Model extent	feature extent	N/A	normal range, calibration		
	Transmissivity (for wetting and drying algorithm in River2D)	Model extent	Model or feature extent	N/A	calibration or sensitivity		

Input - Calibration Data							
FGM Model	**Dataset**	**Minimum Spatial Extent**	**Minimum Spatial Resolution**	**Minimum Temporal Resolution**	**Anticipated source**	**Desired level of accuracy (optional)**	**Comments**
Tributary Sediment Modeling	Observed water surfaces at time of survey	Model extent	cross sections	N/A	Tt survey and ISF-Routing stage recorders		
1-D Morphology Modeling	Observed water surfaces at cross sections and gage locations	Model extent	cross sections including major side channels	N/A	Survey, Tt field observations, USGS gages, various study stage recorders		
	ADCP velocity and discharge measurements for flow distribution within channel and in multiple channels	Model extent	cross sections including major side channels	N/A	Brailey ADCP		
	Sediment transport measurements at gages	Model extent	Gage locations	as available	USGS		
	Comparative cross sections	Model extent	coincident locations of cross sections from 1980s to present	as available	Survey and prior studies		
	Channel thalweg profiles	Model extent	as available	as available	Survey and prior studies		
	Specific gage plots	Model extent	Gage locations	as available	USGS		
2-D Morphology FA Modeling	Observed water surfaces in Focus Areas	Model extent	as available	N/A	Survey, Tt field observations, USGS Gold Cr. gage, various study stage recorders		
	ADCP velocity magnitude and direction and flow distribution within channel and in multiple channels	Model extent	varies, selected by ISF-Habitat and FGM	N/A	Brailey ADCP		
	Sediment transport measurements at Gold Cr. Gage for FA138	N/A	Gage location	as available	USGS		
	Comparative cross sections	Cross sections in and adjacent to FAs	coincident locations of cross sections from 1980s to present	as available	Survey and prior studies		
	Channel thalweg profiles	Model extent	as available	as available	Survey and prior studies		
	Specific gage plots at Gold Cr. gage for FA138	N/A	Gage location	as available	USGS		
2-D Hydraulic FA Modeling	Observed water surfaces in Focus Areas	Model extent	as available	N/A	Survey, Tt field observations, USGS Gold Cr. gage, various study stage recorders		
	ADCP velocity magnitude and direction and flow distribution within channel and in multiple channels	Model extent	varies, selected by ISF-Habitat and FGM	N/A	Brailey ADCP		

Output - Predicted Quantities							
FGM Model	**Predicted/Simulated Quantity**	**Spatial Extent**	**Spatial Resolution**	**Temporal Resolution**	**Level of accuracy**	**Anticipated user**	**Comments**
Tributary Sediment Modeling	Sediment Supply (sediment vs flow rating curve)	tributary mouth	tributary mouth	N/A	Factor of 2 from actual	FGM 1-D and 2-D morphology models	Assumes transport capacity is supply
1-D Morphology Modeling	Sediment transport, sediment balance, effective discharge	Model extent (PRM30 - PRM187)	all cross sections including interpolated to geomorphic reach	continuous hourly/daily	within 90 percent confidence interval absolute - much better relative	FGM 2-D morphology models	
	Main channel and large side channel change (aggradation and degradation)	Model extent	all cross sections including interpolated to geomorphic reach	Annual with emphasis on yrs 25 & 50	Not yet known	FGM 2-D morphology models, ISF-Habitat, ISF-Barriers, ISF-Riparian, ISF-Routing	Note: all temporal resolutions noted as annual can be more frequent if required
	Change in main channel and large side channel bed material composition and mobility	Model extent	all cross sections including interpolated to geomorphic reach	Annual with emphasis on yrs 25 & 50	Not yet known	FGM 2-D morphology models, ISF-Habitat	
	Bank Energy Index for estimating bank erosion rates	Model extent	Bends and Curved banklines	Annual to decades	Not yet known	bank erosion rates/turnover analysis for LWD, ISF-Riparian, Others?	
	Stage change over time	Model extent	all cross sections including interpolated to geomorphic reach	Annual	unknown, likely 2 ft absolute, much better relative	ISF-Habitat, ISF-Barriers, ISF-Riparian, ISF-Routing, GW, flooding analysis	
2-D Morphology FA Modeling	Sediment transport, sediment balance trends	FA Models extents	coarse mesh scale resolution	hour to annual	within 90 percent confidence interval absolute - much better relative	Geomorphic analysis	Models are for yrs 0, 25 and 50 so trends are developed for these periods
	Main channel and lateral feature bed elevation trends (aggradation and degradation)	FA Models extents	coarse mesh scale resolution	week to annual	Not yet known	FGM 2-D hydraulic models, ISF-Habitat, ISF-Barriers, ISF-Riparian, Ice?	
	Trends in main channel and lateral featrues bed material composition and mobility	FA Models extents	coarse mesh scale resolution	Annual	Not yet known	ISF-Habitat	
	Stage change trends over time	FA Models extents	coarse mesh scale resolution	Annual	Not yet known	ISF-Habitat, ISF-Barriers, ISF-Riparian, GW	
2-D Hydraulic FA Modeling	Velocity, depth, water surface elevation	FA Models extents	fine mesh scale resolution	N/A, yrs 0, 25 and 50	Not yet known	ISF-Habitat, ISF-Barriers, ISF-Riparian	Models are for yrs 0, 25 and 50
	Bank Energy Index for estimating bank erosion rates	FA Models extents	Bends and curved banklines	yrs 0, 25 and 50	Not yet known	bank erosion rates/turnover analysis for LWD, ISF-Riparian, Others?	

Model Assumptions		
FGM Model	**Assumption**	**Comment**
Tributary Sediment Modeling	Computed transport capacity is supply at mouth	
1-D Morphology Modeling	Downstream flow-stage boundary condition is either stationary, can be updated periodically, or can be represented by energy slope	
	Tributary flow and sediment inflow consistent for existing and all operational scencario models	
	Sediment supply at dam site and tributaries consistent with sediment transport relationships within 90 percent confidence interval	
	Width change over time can be correlated to existing width and flow frequency (2-yr or effective discharge) and can be represented using rate law and operational scenario flow frequency	Collaboration to develop rate law properties for each geomorphic reach
	Armor layer gradation correlates to channel roughness and sub-armor gradation represents material in transport after armor layer breakup.	Sediment sizes not in armor layer are supply limited prior to armor layer breadkup.
	Flow resistance does not change with time	Or can be correlated to changes in bed and floodplain characteristics through time
	Sediment is supply limited in Devil's canyon	
2-D Morphology FA Modeling	Downstream flow-stage boundary condition is stationary for <1yr simulation periods and can be updated for yrs 25 and 50 simulations	
	Main channel geometry (elevation and width) can be transferred from 1-D morphology model results	
	Sediment transport in main channel and tributaries consistent with 1-D model results and inflow can be provided by 1-D models	
	Trends from <1-yr model runs are adequate to estimate change (aggradation/degradation, materail composition, mobility) in lateral features for yrs 25 and 50	
	Flow resistance does not change with time during <1yr simulations can can be correlated to changes in bed and floodplain characteristics through time	
	Floodplain accretion rates can be estimated from ISF-Riparian, Ice processes and geomorphology studies	
2-D Hydraulic FA Modeling	Downstream flow-stage boundary condition is stationary for yrs 0, 25 and 50 simulations	
	Main channel, lateral feature, and floodplain geometry (elevation and width) and flow resistance can be transferred from 1-D and 2-D morphology model results	