Input - Forcing Data								
WQ Model	**Project Area**	**Dataset**	**Minimum Spatial Extent**	**Minimum Spatial Resolution**	**Minimum Temporal Resolution**	**Anticipated source**	**Desired level of accuracy (optional)**	**Comments**
Hydrodynamic Model	Reservoir	Shoreline	Model extent	Model extent		LiDAR derived elevation contours		
		Elevation	Model extent	Model extent		LiDAR		
		Resistance	Model extent	Model extent		LiDAR derived vegetation cover		
		Historical Discharge	Model extent	Model extent		USGS gage, data used for routing model, data for groundwater interaction		
		Operational Discharge	Model extent	Model extent		Annual time scale outflow from operational conditions, reservoir operations model and/or routing model		
	Riverine	Shoreline	Model extent	Model extent		LiDAR derived nominal river shoreline		
		Elevation	Model extent	Model extent		Cross sections with LiDAR derived elevation extension		
		Resistance	Model extent	Model extent		Roughness based on bed composition and bed forms. Manning coefficient from routing model, Bed composition from geomorphic model		
		Historical Discharge	Model extent	Model extent		Historical flow at gages along river and from tributaries, data from routing model and groundwater interaction		
		Operational Discharge	Model extent	Model extent		Annual time scale outflow from operational conditions, reservoir operations model and/or routing model		
Temperature and Ice Model	Reservoir	Wind	Model extent	Model extent		Project MET stations supplemented by NCDC station data		
		Atmospheric Conditions	Model extent	Model extent		Project MET stations supplemented by NCDC station data		
		Radiation	Model extent	Model extent		Project MET stations supplemented by NCDC station data		
		Ice Cover Fraction and Thickness	Model extent	Model extent		Model predicted, uses wind, atmoshperic conditions and radiation		
		Thermal Loads	Model extent	Model extent		River and tributary flows and in-stream temperature observations. USGS flows and instream temperature data		
	Riverine	Wind	Model extent	Model extent		Project MET stations supplemented by NCDC station data		
		Atmospheric Conditions	Model extent	Model extent		Project MET stations supplemented by NCDC station data		
		Radiation	Model extent	Model extent		Project MET stations supplemented by NCDC station data		
		Ice Cover Fraction and Thickness	Model extent	Model extent		Provided by river ice modeling		
		Thermal Loads	Model extent	Model extent		River and tributary flows and in-stream temperature observations. Need to coordinate with ice routing model for consistent thermal loads.		
		State Variables	Model extent	Model extent		Water quality observational study		

Nutrient Cycling Model	Reservoir	External Loads	Model extent	Model extent		Historical river flow at reservoir site and upper middle river water quality observations		
		Internal Loads	Model extent	Model extent		Primary production and decaying organic matter in flooded reservoir		
		Initial Conditions	Model extent	Model extent		Flooded organic matter distribution and seeding concentrations		
		Parameters	Model extent	Model extent		High latitude lake and reservoir literature data and inferred from observational data		
	Riverine	State Variables	Model extent	Model extent		Based on water quality observation study		
		External Loads	Model extent	Model extent		Historical and operational river flow at reservoir site, tributary flows, and estimated ungaged inflow corresponding water quality observations and reservoir model output.		
		Internal Loads	Model extent	Model extent		Primary production		
		Initial Conditions	Model extent	Model extent		Observation		
		Parameters	Model extent	Model extent		Literature review and observational data		
Solids Transport Model	Reservoir	State Variables	Model extent	Model extent		Inorganic based info from geomorphic modeling. Organic consistent with nutrient cycling model		
		External Loads	Model extent	Model extent		Upstream inorganic sediment from geomorphic study and reservoir model. Organic load estimated by downstream observations.		
		Internal Loads	Model extent	Model extent		Internal organic solids load from nutrient cycling model		
		Initial Conditions	Model extent	Model extent		Inorganic from geomorphic study		
		Parameters	Model extent	Model extent		Inorganic from geomorphic study		
	Riverine	State Variables	Model extent	Model extent		Inorganic based info from geomorphic modeling. Organic consistent with nutrient cycling model		
		External Loads	Model extent	Model extent		Upstream inorganic sediment from geomorphic study and reservoir model. Organic load estimated by downstream observations and reservoir model		
		Internal Loads	Model extent	Model extent		Internal organic solids load from nutrient cycling model		
		Initial Conditions	Model extent	Model extent		Inorganic from geomorphic study		
		Parameters	Model extent	Model extent		Inorganic from geomorphic study		
		State Variables	Model extent	Model extent		Elemental, divalent, and methyl from water column and bed		
		External Loads	Model extent	Model extent		River flow at reservoir site and tributaries and mercury study observational data. Observational data		

Mercury Cycling and Contaminant Model	Reservoir	Internal Loads	Model extent	Model extent		Based on soil levels within reservoir foot print. Observational data to be analyzed.		
		Initial Conditions	Model extent	Model extent		Water column not sensitive. Bed consistent with internal loads, mercury study to provide data		
		Parameters	Model extent	Model extent		Mercury reaction pamraters from literature for high latitude lakes and reservoirs and from study		
	Riverine	State Variables	Model extent	Model extent		Elemental, divalent, and methyl from water column and bed		
		External Loads	Model extent	Model extent		River flow at reservoir site and tributaries and mercury study observational data. Observational data		
		Internal Loads	Model extent	Model extent		Signifigance to be determined		
		Initial Conditions	Model extent	Model extent		Water column not sensitive. Signifigance of bed to be determined.		
		Parameters	Model extent	Model extent		River and tributary flows and in-stream temperature observations. Review in progress.		

Input - Parameters								
WQ Model	**Project Area**	**Dataset**	**Minimum Spatial Extent**	**Minimum Spatial Resolution**	**Minimum Temporal Resolution**	**Anticipated source**	**Desired level of accuracy (optional)**	**Comments**
Hydrodynamic Model	Reservoir	Shoreline	Model Extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		LiDAR derived elevation contours		
		Elevation	Model Extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		LiDAR		
		Resistance	Model Extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		LiDAR derived vegetation cover		
		Historical Discharge	Model Extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		USGS gage, data used for routing model, data for groundwater interaction		
		Operational Discharge	Model Extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Annual time scale outflow from operational conditions, reservoir operations model and/or routing model		
	Riverine	Shoreline	Model Extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		LiDAR derived nominal river shoreline		
		Elevation	Model Extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Cross sections with LiDAR derived elevation extension		
		Resistance	Model Extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Roughness based on bed composition and bed forms. Manning coefficient from routing model, Bed composition from geomorphic model		

		Historical Discharge	Model Extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Historical flow at gages along river and from tributaries, data from routing model and groundwater interaction		
		Operational Discharge	Model Extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Annual time scale outflow from operational conditions, reservoir operations model and/or routing model		
	Reservoir	Wind	Model Extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Project MET stations supplemented by NCDC station data		
		Atmospheric Conditions	Model Extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Project MET stations supplemented by NCDC station data		
		Radiation	Model Extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Project MET stations supplemented by NCDC station data		
		Ice Cover Fraction and Thickness	Model Extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Model predicted, uses wind, atmospheric conditions and radiation; ice dynamics with a range of complexity levels		
		Thermal Loads	Model Extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		River and tributary flows and in-stream continuous temperature observations. USGS flows and instream temperature data		
ce Model		Wind	Model Extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Project MET stations supplemented by NCDC station data		

Temperature and Ic	Riverine	Atmospheric Conditions	Model Extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Project MET stations supplemented by NCDC station data		
		Radiation	Model Extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Project MET stations supplemented by NCDC station data		
		Ice Cover Fraction and Thickness	Model Extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Import ice cover information from ice routing model or use observation based space and time varying ice cover		
		Thermal Loads	Model Extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		River and tributary flows and in-stream continuous temperature observations. Need to coordinate with ice routing model for consistent thermal loads.		
	Reservoir	State Variables	Model Extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Water quality observational study		
		External Loads	Model Extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Historical river flow at reservoir site and upper middle river water quality observations		
		Internal Loads	Model Extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Primary production and decaying organic matter in flooded reservoir		
		Initial Conditions	Model Extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Flooded organic matter distribution and seeding concentrations		

Nutrient Cycling Model		Parameters	Model Extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		High latitude lake and reservoir literature data and inferred from observational data		
	Riverine	State Variables	Model Extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Based on water quality observation study		
		External Loads	Model Extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Historical and operational river flow at reservoir site, tributary flows, and estimated ungaged inflow corresponding water quality observations and reservoir model output.		
		Internal Loads	Model Extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Primary production		
		Initial Conditions	Model Extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Observation		
		Parameters	Model Extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Literature review and observational data (Baseline Water Quality Monitoring; Mercury Assessment Monitoring)		
		State Variables	Model Extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Inorganic based info from geomorphic modeling. Organic consistent with nutrient cycling model		

Solids Transport Model	Reservoir	External Loads	Model Extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Upstream inorganic sediment from geomorphic study and reservoir model. Organic load estimated by downstream observations.		
		Internal Loads	Model Extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Internal organic solids load from nutrient cycling model		
		Initial Conditions	Model Extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Inorganic from geomorphic study		
		Parameters	Model Extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Inorganic from geomorphic study		
	Riverine	State Variables	Model Extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Inorganic based info from geomorphic modeling. Organic consistent with nutrient cycling model		
		External Loads	Model Extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Upstream inorganic sediment from geomorphic study and reservoir model. Organic load estimated by downstream observations and reservoir model		
		Internal Loads	Model Extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Internal organic solids load from nutrient cycling model		
		Initial Conditions	Model Extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Inorganic from geomorphic study		

		Parameters	Model Extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Solids transport- multiple classes of cohesive and non-cohesive sediment, multiple classes of organic solids from nutrient cycling model or externally specified.		
Mercury Cycling and Contaminant Model	Reservoir	State Variables	Model Extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Elemental, divalent, and methyl from water column and bed		
		External Loads	Model Extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		River flow at reservoir site and tributaries and mercury study observational data. Observational data		
		Internal Loads	Model Extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Based on soil levels within reservoir foot print. Observational data to be analyzed.		
		Initial Conditions	Model Extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Water column not sensitive. Bed consistent with internal loads, mercury study to provide data		
		Parameters	Model Extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Mercury reaction parameters from literature for high latitude lakes and reservoirs and from study		
		State Variables	Model Extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Elemental, divalent, and methyl from water column and bed		
		External Loads	Model Extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		River flow at reservoir site and tributaries and mercury study observational data. Observational data		

	Riverine	Internal Loads	Model Extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Significance to be determined		
		Initial Conditions	Model Extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Water column not sensitive. Significance of bed to be determined.		
		Parameters	Model Extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		River and tributary flows and in-stream temperature observations. Review in progress.		

Input - Calibration Data								
WQ Model	**Project Area**	**Dataset**	**Minimum Spatial Extent**	**Minimum Spatial Resolution**	**Minimum Temporal Resolution**	**Anticipated source**	**Desired level of accuracy (optional)**	**Comments**
		Reservoir	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		MatSu LiDAR based bathymetry, Historic USGS gaged inflows, Scenario inflow and outflow from reservoir operations model		Reservoir model cannot be calibrated
	Riverine	Riverine	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Existing and new cross sections supplemented by LiDAR for bathymetry, bathymetry consistent with routing and geomorphic models, Historic USGS gaged flows, Scenario flows consistent with routing models		Calibrate to historic stage and discharge hydrographs
Temperature and Ice Model	Reservoir	Full thermal balancing including ground coupling	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Atmospheric data , project MET stations supplemented by NCDC reporting stations. Inflowing temperature based pre-reservoir observational data		Reservoir model cannot be calibrated
		Atmospheric Data		75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Atmospheric data , project MET stations supplemented by NCDC reporting stations. Inflowing temperature based pre-reservoir observational data		Reservoir model cannot be calibrated
		Ice dynamics with a range of complexity levels	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Atmospheric data , project MET stations supplemented by NCDC reporting stations. Inflowing temperature based pre-reservoir observational data		Reservoir model cannot be calibrated
	Riverine	Import ice cover information from ice routing model or use observation based space and time varying ice cover	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Inflowing temperature for existing conditions and tributaries based on observations, inflow temperature for post-reservoir conditions from reservoir model, ice cover from ice-routing model.		Calibrate to subset of observational data
		Atmospheric Data	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Inflowing temperature for existing conditions and tributaries based on observations, inflow temperature for post-reservoir conditions from reservoir model, ice cover from ice-routing model.		Calibrate to subset of observational data
		State Variables- DO, POC, DOC, NH3, NOX, PON, DON, PO4d, PO4p, POP, DOP, labile and organic class splits, multiple algal species.	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Initial conditions and most inflow concentrations/ loads developed from observational data, potential loading from groundwater monitoring upwelling, Driven by EFDC hydrodynamic and temperature models with no other data dependencies.		Reservoir model cannot be calibrated

Nutrient Cycling Model	Reservoir	Sediment diagenesis model- sediment oxygen demand and nutrient fluxes	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Initial conditions and most inflow concentrations/ loads developed from observational data, potential loading from groundwater monitoring upwelling, Driven by EFDC hydrodynamic and temperature models with no other data dependencies.		Reservoir model cannot be calibrated
		Ice related effects- re-aeration, light attenuation	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Initial conditions and most inflow concentrations/ loads developed from observational data, potential loading from groundwater monitoring upwelling, Driven by EFDC hydrodynamic and temperature models with no other data dependencies.		Reservoir model cannot be calibrated
	Riverine	State Variables- DO, POC, DOC, NH3, NOX, PON, DON, PO4d, PO4p, POP, DOP, labile and organic class splits, multiple algal species.	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Initial conditions and most inflow concentrations/ loads developed from observational data, potential loading from groundwater monitoring upwelling, Driven by EFDC hydrodynamic and temperature models with no other data dependencies.		Calibrate to subset of observational data
		Sediment diagenesis model- sediment oxygen demand and nutrient fluxes	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Initial conditions and most inflow concentrations/ loads developed from observational data, potential loading from groundwater monitoring upwelling, Driven by EFDC hydrodynamic and temperature models with no other data dependencies.		Calibrate to subset of observational data
		Ice related effects- re-aeration, light attenuation	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Initial conditions and most inflow concentrations/ loads developed from observational data, potential loading from groundwater monitoring upwelling, Driven by EFDC hydrodynamic and temperature models with no other data dependencies.		Calibrate to subset of observational data
		Solids transport- multiple classes of cohesive and non-cohesive sediment, multiple classes of organic solids from nutrient cycling model or externally specified.	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Initial conditions and most inflow concentrations/ loads developed from observational data, potential loading from groundwater monitoring upwelling, Driven by EFDC hydrodynamic and temperature models with no other data dependencies. Geomorphic model.		Reservoir model cannot be calibrated

Solids Transport Model	Reservoir	Contaminant transport and fate- arbitrary number of sorptive (organics and metals) contaminants, three phase equilibrium partitioning including DOC complexated	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Initial conditions and most inflow concentrations/ loads developed from observational data, potential loading from groundwater monitoring upwelling, Driven by EFDC hydrodynamic and temperature models with no other data dependencies. Geomorphic model.		Reservoir model cannot be calibrated
		Reservoir sediment transport- model of reservoir sediment trapping, light attenuation for water quality processes.	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Initial conditions and most inflow concentrations/ loads developed from observational data, potential loading from groundwater monitoring upwelling, Driven by EFDC hydrodynamic and temperature models with no other data dependencies. Geomorphic model.		Reservoir model cannot be calibrated
		Solids concentrations for partitioning and light attenuation from geomorphic modeling	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Initial conditions and most inflow concentrations/ loads developed from observational data, potential loading from groundwater monitoring upwelling, Driven by EFDC hydrodynamic and temperature models with no other data dependencies. Geomorphic model.		Reservoir model cannot be calibrated
	Riverine	Solids transport- multiple classes of cohesive and non-cohesive sediment, multiple classes of organic solids from nutrient cycling model or externally specified.	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Initial conditions and most inflow concentrations/ loads developed from observational data, potential loading from groundwater monitoring upwelling, Driven by EFDC hydrodynamic and temperature models with no other data dependencies. Geomorphic model.		Calibrate to subset of observational data
		Contaminant transport and fate- arbitrary number of sorptive (organics and metals) contaminants, three phase equilibrium partitioning including DOC complexated	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Initial conditions and most inflow concentrations/ loads developed from observational data, potential loading from groundwater monitoring upwelling, Driven by EFDC hydrodynamic and temperature models with no other data dependencies. Geomorphic model.		Calibrate to subset of observational data
		Reservoir sediment transport- model of reservoir sediment trapping, light attenuation for water quality processes.	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Initial conditions and most inflow concentrations/ loads developed from observational data, potential loading from groundwater monitoring upwelling, Driven by EFDC hydrodynamic and temperature models with no other data dependencies. Geomorphic model.		Calibrate to subset of observational data

		Solids concentrations for partitioning and light attenuation from geomorphic modeling	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Initial conditions and most inflow concentrations/ loads developed from observational data, potential loading from groundwater monitoring upwelling, Driven by EFDC hydrodynamic and temperature models with no other data dependencies. Geomorphic model.		Calibrate to subset of observational data
Mercury Cycling and Contaminant Model	Reservoir	State Variables-Water column and dissolved elemental mercury, water column and bed dissolved and particulate divalent mercury, water column and bed dissolved and particulate methyl mercury	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Initial conditions and most inflow concentrations/ loads developed from observational data, potential loading from groundwater monitoring upwelling, Driven by EFDC hydrodynamic and temperature models with no other data dependencies.		Reservoir model cannot be calibrated
		Equilibrium partitioning-particulate and dissolved organic carbon, inorganic sediment solids	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Initial conditions and most inflow concentrations/ loads developed from observational data, potential loading from groundwater monitoring upwelling, Driven by EFDC hydrodynamic and temperature models with no other data dependencies.		Reservoir model cannot be calibrated
		Spatial and temperature dependent oxidation and reduction, bacterial de-methylation, volatilization.	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Initial conditions and most inflow concentrations/ loads developed from observational data, potential loading from groundwater monitoring upwelling, Driven by EFDC hydrodynamic and temperature models with no other data dependencies.		Reservoir model cannot be calibrated
	Riverine	State Variables-Water column and dissolved elemental mercury, water column and bed dissolved and particulate divalent mercury, water column and bed dissolved and particulate methyl mercury	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Initial conditions and most inflow concentrations/ loads developed from observational data, potential loading from groundwater monitoring upwelling, Driven by EFDC hydrodynamic and temperature models with no other data dependencies.		Calibrate to subset of observational data
		Equilibrium partitioning-particulate and dissolved organic carbon, inorganic sediment solids	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Initial conditions and most inflow concentrations/ loads developed from observational data, potential loading from groundwater monitoring upwelling, Driven by EFDC hydrodynamic and temperature models with no other data dependencies.		Calibrate to subset of observational data

		Spatial and temperature dependent oxidation and reduction, bacterial de-methylation, volatilization.	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Initial conditions and most inflow concentrations/ loads developed from observational data, potential loading from groundwater monitoring upwelling, Driven by EFDC hydrodynamic and temperature models with no other data dependencies.		Calibrate to subset of observational data

Output - Predicted Quantities								
WQ Model	**Project Area**	**Dataset**	**Spatial Extent**	**Spatial Resolution**	**Minimum Temporal Resolution**	**Level of accuracy**	**Anticipated user**	**Comments**
Hydrodynamic Model	Reservoir	Shoreline	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Performance should be at least 4 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Elevation	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Performance should be at least 4 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Resistance	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Performance should be at least 4 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Historical Discharge	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Performance should be at least 4 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Operational Discharge	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Performance should be at least 4 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Shoreline	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Performance should be at least 8 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Elevation	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Performance should be at least 8 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project

	Riverine	Resistance	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Performance should be at least 8 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Historical Discharge	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Performance should be at least 8 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Operational Discharge	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Performance should be at least 8 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
	Reservoir	Wind	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Performance should be at least 4 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Atmospheric Conditions	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Performance should be at least 4 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Radiation	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Performance should be at least 4 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Ice Cover Fraction and Thickness	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Performance should be at least 4 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Thermal Loads	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Performance should be at least 4 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project

Model

Temperature and Ice	Riverine	Wind	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Performance should be at least 8 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Atmospheric Conditions	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Performance should be at least 8 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Radiation	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Performance should be at least 8 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Ice Cover Fraction and Thickness	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Performance should be at least 8 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Thermal Loads	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Performance should be at least 8 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
	Reservoir	State Variables	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Performance should be at least 4 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		External Loads	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Performance should be at least 4 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Internal Loads	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Performance should be at least 4 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project

Nutrient Cycling Model		Initial Conditions	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Performance should be at least 4 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Parameters	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Performance should be at least 4 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
	Riverine	State Variables	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Performance should be at least 8 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		External Loads	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Performance should be at least 8 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Internal Loads	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Performance should be at least 8 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Initial Conditions	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Performance should be at least 8 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Parameters	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Performance should be at least 8 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	Analysis of overall reservoir and riverine conditions	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		State Variables	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Performance should be at least 4 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	input to the mercury model	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project

Solids Transport Model	Reservoir	External Loads	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Performance should be at least 4 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	input to the mercury model	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Internal Loads	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Performance should be at least 4 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	input to the mercury model	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Initial Conditions	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Performance should be at least 4 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	input to the mercury model	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Parameters	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Performance should be at least 4 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	input to the mercury model	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
	Riverine	State Variables	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Performance should be at least 8 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	input to the mercury model	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		External Loads	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Performance should be at least 8 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	input to the mercury model	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Internal Loads	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Performance should be at least 8 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	input to the mercury model	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Initial Conditions	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Performance should be at least 8 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	input to the mercury model	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project

		Parameters	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Performance should be at least 8 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	input to the mercury model	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
Mercury Cycling and Contaminant Model	Reservoir	State Variables	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Performance should be at least 4 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	model initialization, loadings, and parameterization	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		External Loads	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Performance should be at least 4 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	model initialization, loadings, and parameterization	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Internal Loads	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Performance should be at least 4 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	model initialization, loadings, and parameterization	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Initial Conditions	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Performance should be at least 4 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	model initialization, loadings, and parameterization	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Parameters	Model extent	75-150 m lateral resolution, 400-800 m longitudinal resolution, 2.5-25 m vertical resolution, 20-32 vertical layers		Performance should be at least 4 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	model initialization, loadings, and parameterization	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		State Variables	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Performance should be at least 8 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	model initialization, loadings, and parameterization	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		External Loads	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Performance should be at least 8 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	model initialization, loadings, and parameterization	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project

	Riverine	Internal Loads	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Performance should be at least 8 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	model initialization, loadings, and parameterization	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Initial Conditions	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Performance should be at least 8 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	model initialization, loadings, and parameterization	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project
		Parameters	Model extent	3 to 7 cells laterally in bank in middle river with transition to and from higher resolution focus areas, EFDC wetting and drying capabilities, 250 to 1000 m longitudinal resolution with higher resolution in focus areas		Performance should be at least 8 years simulated per cpu day, 50 year simulation feasible, multiple scenarios on multiple computers	model initialization, loadings, and parameterization	Predicts nutrient and mercury cycling in the reservoir, nutrient and mercury cycling downstream river for preexisting and post reservoir conditions, predicts toxics fate and transport for organic contaminants and metals in the reservoir and riverine portion of the project

Model Assumptions			
WQ Model	**Project Area**	**Assumption**	**Comment**
Hydrodynamic Model	Reservoir	Three-dimensional hydrostatic primitive equations apply	
	Riverine	Two-dimensional hydrostatic shallow water equations apply	
Temperature and Ice Model	Reservoir	Approximate formulations for ice cover and thickness with be used	
	Riverine	Ice cover and thickness will be provided by ice routing model	
Nutrient Cycling Model	Reservoir	Twelve state variable nutrient cycling formulation is appropriate	
	Riverine	Twelve state variable nutrient cycling formulation is appropriate	
Solids Transport Model	Reservoir		
	Riverine		
Mercury Cycling and Contaminant Model	Reservoir		
	Riverine		