

Surface Water Modeling System (SMS) Toolbox for Dredging Models and Data

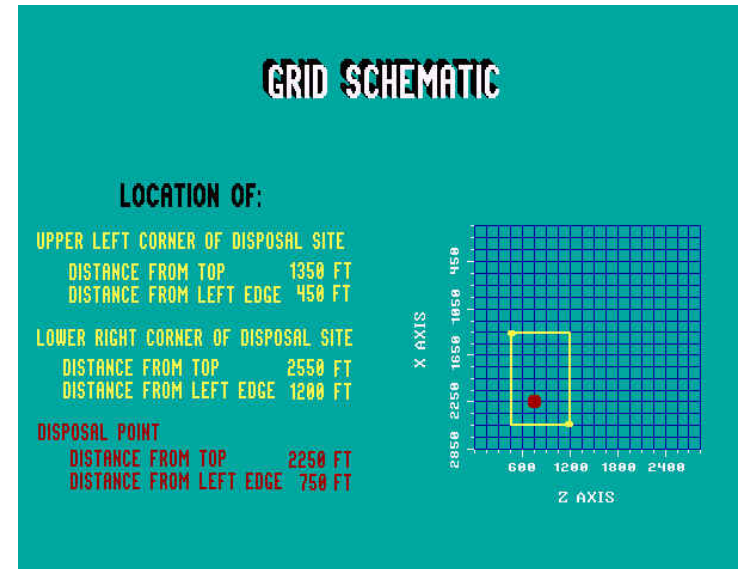
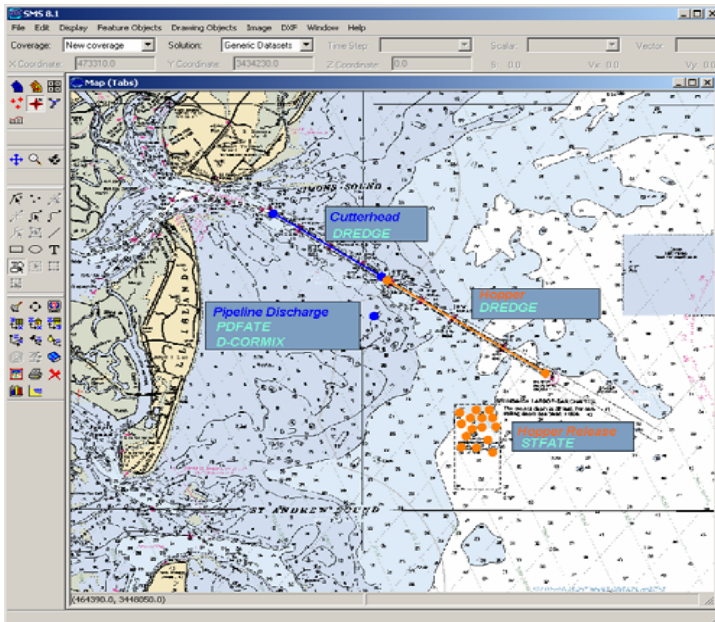
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Motivation/Solution

MOTIVATION:

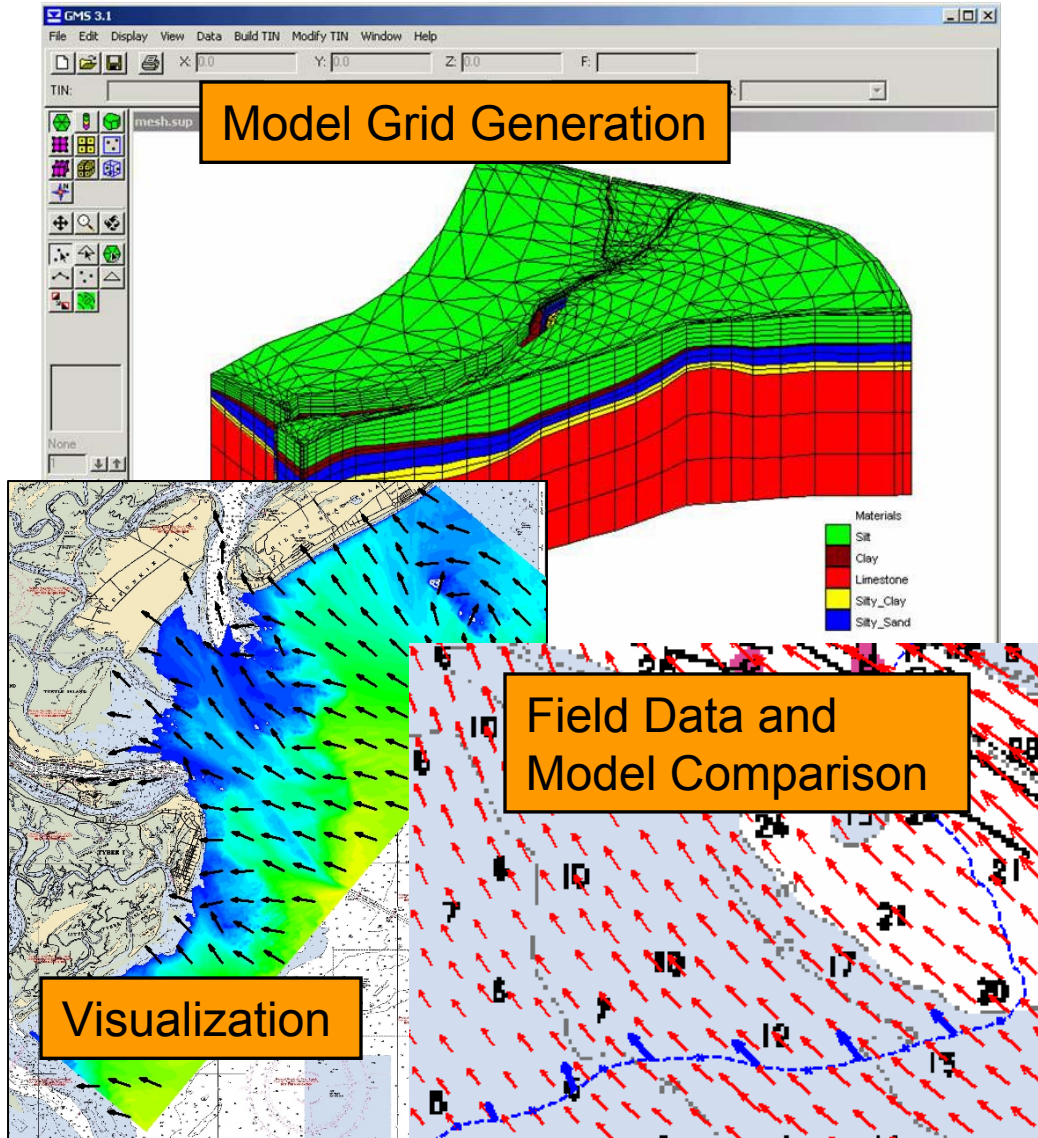
- Dredging models are stand alone
- Inefficient and time consuming to set up models, incorporate data sources, process output
- Powerful models under-utilized due to lack of interconnectivity



SOLUTION:

- Incorporate dredging models and data sources into Corps-supported data/model mgmt system (SMS)
- Interconnect dredging and other Corps models/tools/databases
- Develop system for rapid dredge data integration, analysis, visualization

SMS Model & Data Mgmt



- Includes Corps hydro, wave, WQ, watershed, water resource, and groundwater models
- Used for: grid generation, model setup, visualization, post-processing,
- Interaction between models
- Incorporate data from multiple sources: GIS, time series, etc.
- Interconnectivity to web-based data sources
- Data analysis and interpolation tools
- Common data input include
 - Bathymetry and boundaries
 - Structures
 - Hydrodynamic and wave data
 - Sediment
 - Water Chemistry
 - Resources
 - Dredge data/schedule
 - Time series

SMS Georeferencing

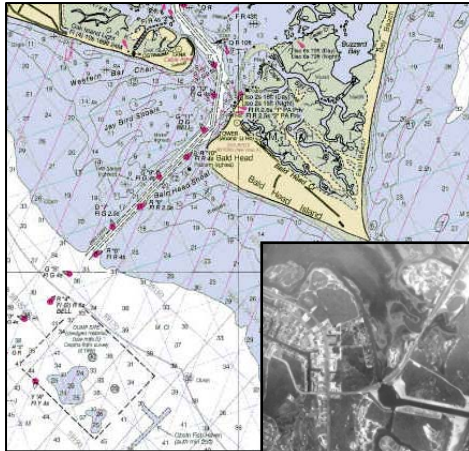
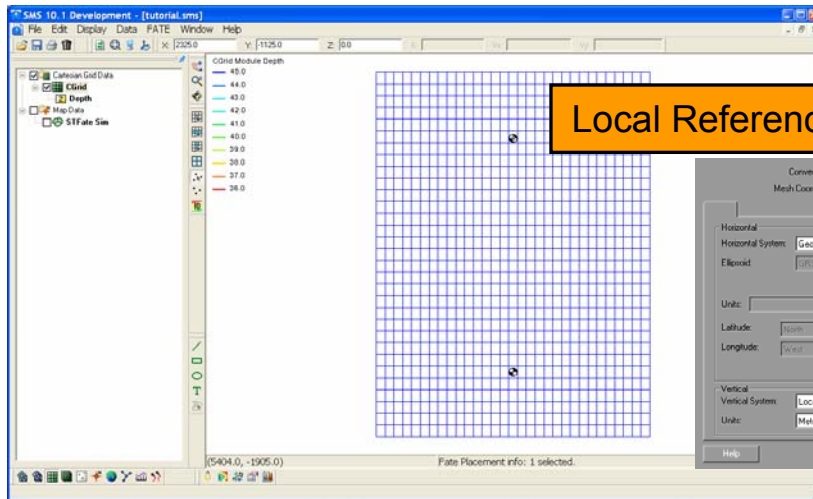
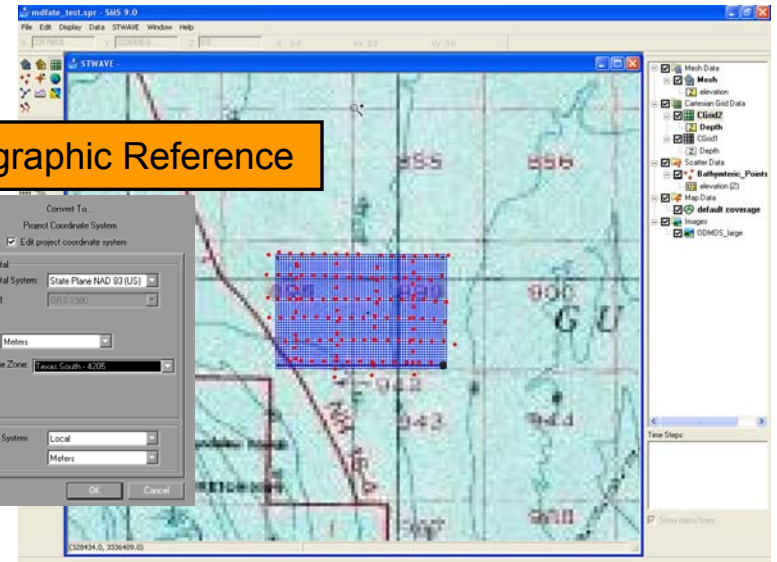
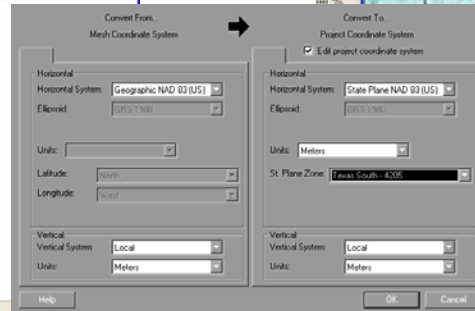


Image
Registration

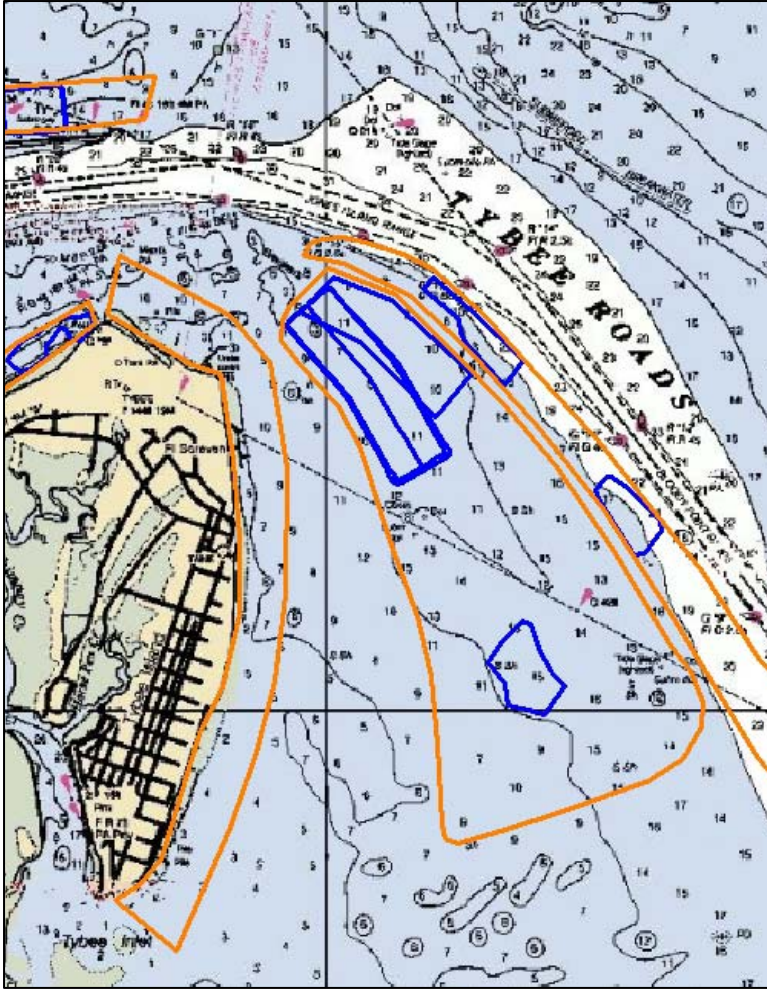
- Data sources are diverse and no standard coordinate system exists
- SMS tool: Georeference data sources and model output
- Coordinate conversion
- GIS shape files
 - Import
 - Create
- Image registration
 - NOAA maps
 - Google Earth Images
 - Other Aerial Photography and maps



Local Reference → Geographic Reference



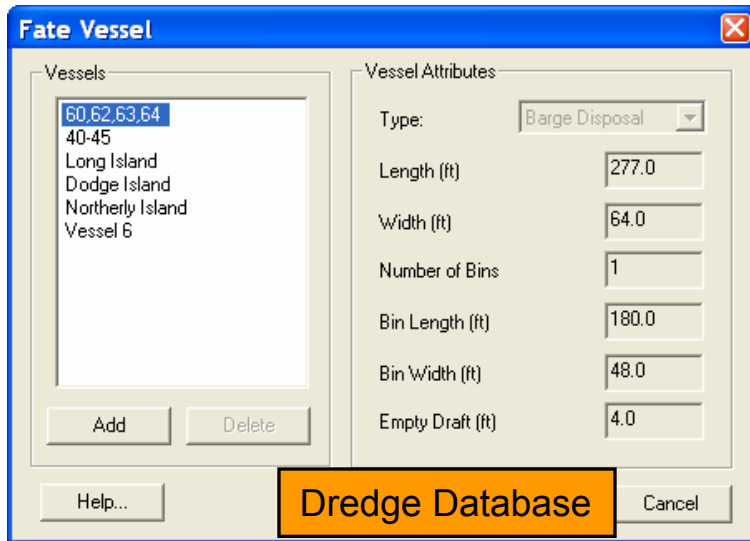
Dredging Toolbox in SMS



Approach: Provide Dredging Project Staff with:

- Comprehensive management system for models and data
- Interconnectivity with other Corps models (hydro, waves, etc)
- Efficient connectivity to external data sources
- Dredge-specific databases
- Interconnectivity between dredging models
- Efficient model setup
- Visualization and analysis tools

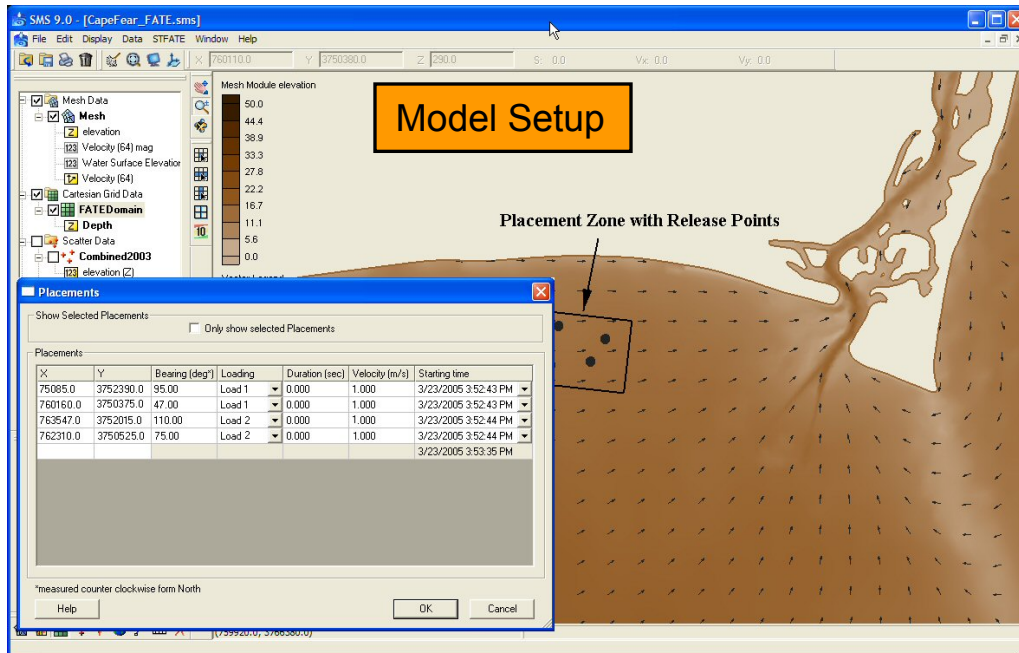
Dredging Toolbox in SMS



- Tools currently in SMS
 - STFATE
 - Dredge Database
 - PTM
 - Dredging Source Models
 - Analysis tools

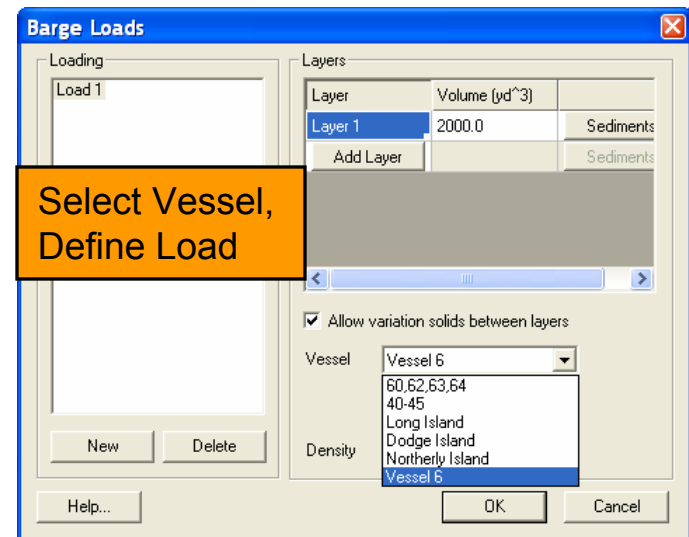
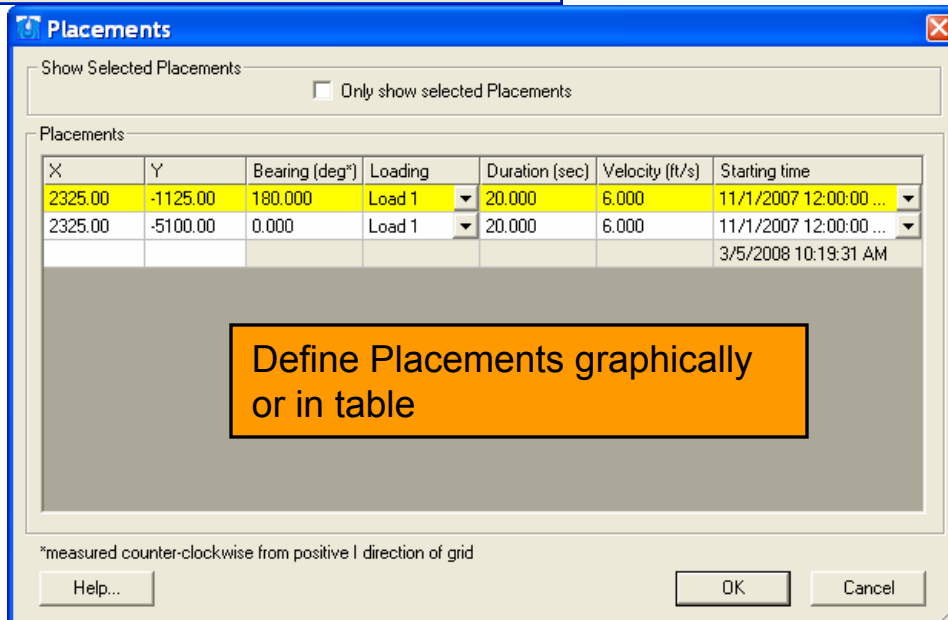
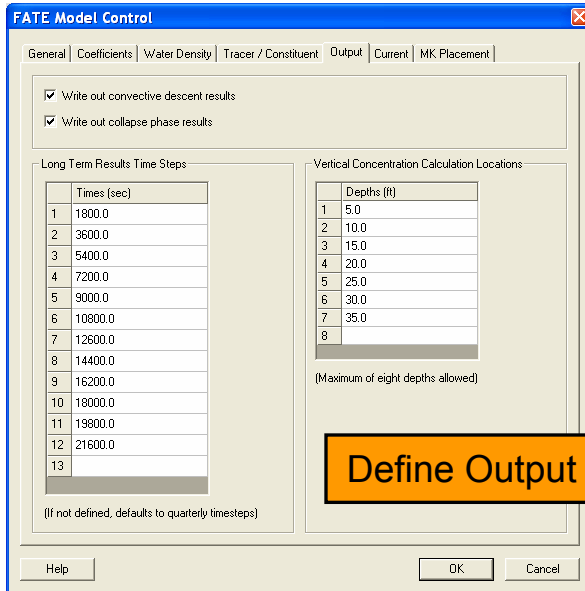
- Tools presently being incorporated (FY08)
 - MPFATE
 - LTFATE

- Beyond 2008
 - Additional databases
 - Additional analysis tools
 - PTM-WQ



STFATE in SMS

- GUI for Model Setup
 - Lead user through model input windows
 - Provide/indicate data sources for model input
 - Execute model
 - Display model output
 - Provide data reports



STFATE in SMS

STFATE Compliance Report

Requirements

A. Concentrations must not exceed the threshold concentration outside the site boundary.
B. Concentrations can only exceed the threshold concentration inside the site boundary for a period of 4 hours following the placement.

Threshold Concentrations

Material	Concentration
clay	0.07000000298
lead	0.0099999997765

Simulation Results

Simulation	Meets Requirement		
	A	B	A & B
placement1	Yes	Yes	Yes
placement2	No	Yes	No

Maximum Concentrations Outside Site

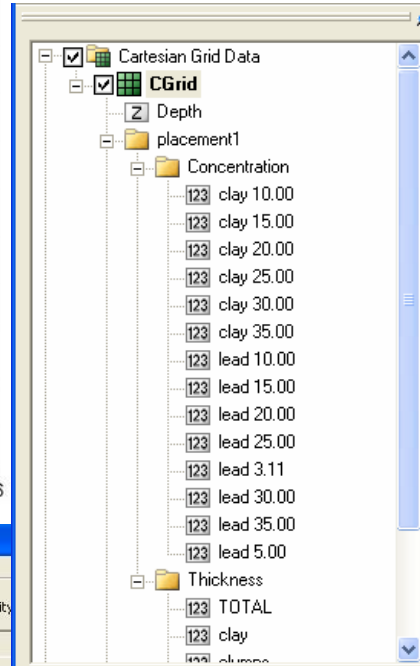
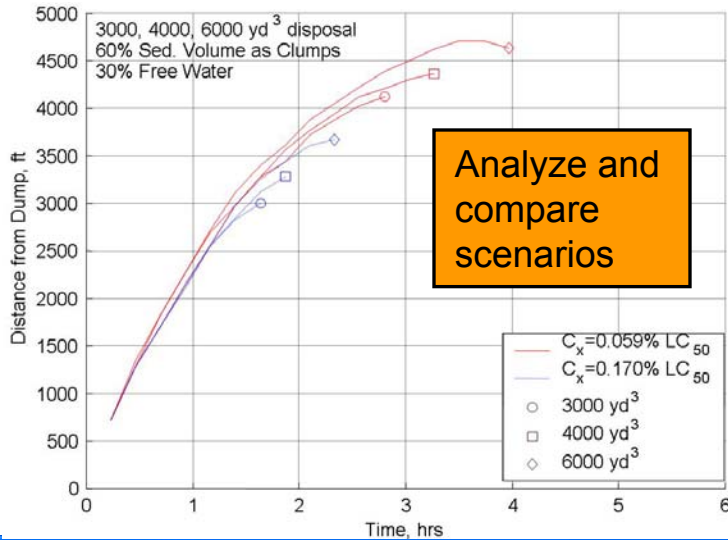
	clay	lead
placement1	0.0649035	0.000127619
placement2	270.925	0.00112605

Maximum Concentrations Within Site After 4 Hours

	clay	lead
placement1	0	0.000115822
placement2	0	0.000115822

- Data Reports and stored data
 - Html data report
 - Color coded for compliance
 - Automatically replaced, if desired when new simulation performed
 - Save model input for easy modification of scenario
 - All output saved for further analysis
 - Output formatted for input to far-field transport models

STFATE in SMS



- Data analysis tools
- Scenario comparison tools
- Create input files for far-field models
- Save at each timestep
- Sub-folders for each cloud at each timestep
- Sub-folders for deposition

STFATE Clouds To PTM Sources

Materials: Clay, Clump, Sand

Cloud Information

PTM source name: Clay Calculate settling (fall) velocity

Grain size (d50): 0.0 mm Standard deviation: 0.0

	U...	X	Y	De...	H Rad...	V Rad...	Mass	Set. Velo...
	(m)	(m)	(m)	(m)	(m)	(m)	(kg)	(m/s)
1	<input checked="" type="checkbox"/>	723.3	-912.5	1.4	5.5	0.469	621.66	0.00061
2	<input checked="" type="checkbox"/>	723.3	-911.3	1.7	5.6	0.47	621.34	0.00061
3	<input checked="" type="checkbox"/>	723.3	-910.2	2	5.6	0.472	621.17	0.00061
4	<input checked="" type="checkbox"/>	723.3	-909	2.3	5.6	0.474	618.46	0.00061
5	<input checked="" type="checkbox"/>	723.3	-907.8	2.6	5.7	0.476	618.57	0.00061
6	<input checked="" type="checkbox"/>	723.3	-906.6	2.9	5.7	0.477	618.31	0.00061
7	<input checked="" type="checkbox"/>	723.3	-905.4	3.2	5.7	0.479	615.08	0.00061
8	<input checked="" type="checkbox"/>	723.3	-904.2	3.5	5.8	0.48	615.61	0.00061
9	<input checked="" type="checkbox"/>	723.3	-902.9	3.8	5.8	0.481	612.06	0.00061
1.	<input checked="" type="checkbox"/>	723.3	-910.4	1.9	6.2	1.5	581.36	0.00061
1.	<input checked="" type="checkbox"/>	723.3	-901.3	4.2	7.7	3.43	170670	0.00061

Source Generation Information

Minimum number of parcels per cloud: 10

Maximum mass per parcel: 400.0 kg

WSE: 0.0 m

Total parcels: 14950

Number of resulting parcels: 6212

Time steps:

0 00:30:00
0 01:00:00
0 01:30:00
0 02:00:00
0 02:30:00
0 03:00:00
0 03:30:00
0 04:00:00
0 04:30:00
0 05:00:00
0 05:30:00

Sub-folders for each time, constituent

Output for other models

Help... Generate Cancel

PTM in SMS

- Lagrangian Particle Tracking model for predicting fate of sediment and constituent from multiple sources
- Sources often derived from other dredging models (STFATE, MPFATE, LTFATE, Dredging Source)
- Computationally efficient for multiple scenarios
- Widely applied for dredging operations
- Subject of next presentation

Benefits to User

- Connectivity to most digital data, including maps and photographs
- Connectivity to other models
- Decreased time needed for CSM and model scenario development
- Increased time efficiency and product quality for model applications
- Increased performance of model-derived lines of evidence through improved input, calibration and validation
- Powerful array of data analysis and interpolation tools
- Improved communication of results (data analysis conclusions) through improved visualization and analysis tools

