

Waukegan River 516(e) All Hands Meeting

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**February 11th, 2009
Hampton Inn – Detroit Metropolitan Airport**



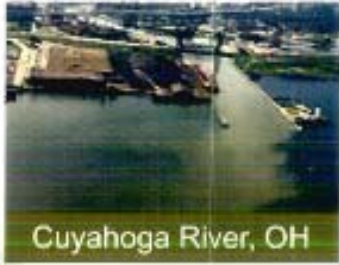
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Nemadji River, MN/WI



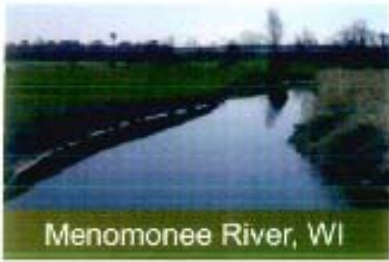
Cuyahoga River, OH

Status Key

- Completed
- Under Development
- Coordination and scoping



Buffalo River, NY



Menomonee River, WI



Burns Waterway, IN



Upper Auglaize River, OH

Waukegan River 516(e) Building Upon Previous Work

- A LOT of great work has been done by many!
- This 516(e) effort will build upon that work:
 - Established close working relationships
 - Expertise & site specific experience of stakeholders
 - Input and calibration data for models
 - Additional data collection as necessary
- Information from various projects will be used:
 - Waukegan River Watershed Management Plan
 - Waukegan River National Monitoring Program
 - Waukegan Harbor Remedial Action Plan
 - Several stream restoration & stabilization projects
 - Other data collection and analysis efforts...

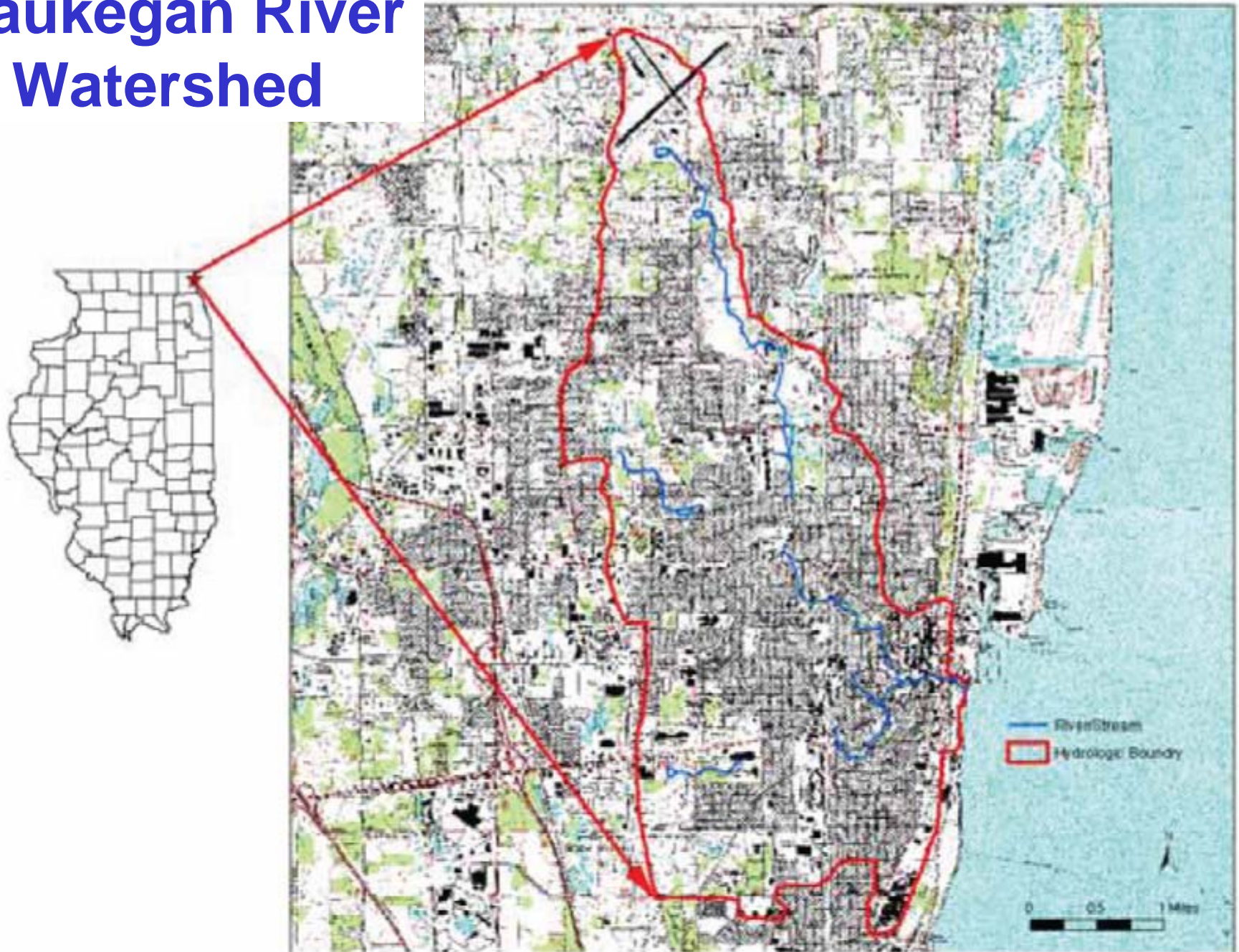


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Waukegan River Watershed



Waukegan River Watershed Characteristics

- 12 square mile drainage basin
- Mouth just south of Waukegan Harbor AOC
- Heavily urbanized (only 13% open / agriculture)
- Highly industrialized watershed
- Very little undisturbed land in the watershed
- Armoring on 46% of the channel
- 19% of river channel is enclosed
- 48 stormwater basins in the watershed
- Currently on Illinois 303(d) list for impaired waterways – partial support to aquatic life



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Waukegan River Hydrologic & Hydraulic Issues

- Imperviousness cause “Flashy” runoff
- Channel encroachment
- Lack of natural floodplain areas
- Channel downcutting
- Flows carry urban stormwater contaminants
- Identified problem discharge points
- Failed hydraulic structures
- Unstable and collapsing banks
- Contaminated sediments



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Waukegan River 516(e) Desired Model Capabilities

- Non-Proprietary Model
- Non-Proprietary GIS Interface
- Web-Based Interface
- Long-Term Simulations
- Runoff Hydrographs
- Sediment Delivery from Basin
- Sediment Transport within Channel
- Pollutant Loading / Water Quality
- Designed for Sewer Networks
- Used in Urban Environments
- Integrated Urban BMPs



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	L-THIA	HEC-HMS v3.2	SWAT2005	SWMM v5.0	GSSHA v2.0	HSPF v11.0
Non-Proprietary Model	✓	✓	✓	✓	✓	✓
Non-Proprietary GIS Interface	✓	HEC-GeoHMS is a GIS-based tool used for model development.	✓	N	N	✓
Web-Based Interface	✓	N	N	N	N	N
Long-Term Simulations	Uses long-term precipitation records in developing average annual results.	✓	✓	✓	✓	✓
Runoff Hydrographs	N	✓	✓	✓	✓	✓
Sediment Delivery from Basin	Utilizes coarse computations based on unit area contaminant contributions per land use	Not currently part of the model, however unit area contaminant contributions per land use could be applied.	✓	✓	✓	✓
Sediment Transport within Channel	N	N	Has capability, but utilizes coarse fixed-bed computations.	Has capability, but utilizes coarse fixed-bed computations.	Has capability, but movable bed computations limited to sand fraction only; silts and clays are assumed wash load.	Has capability, but utilizes coarse fixed-bed computations.
Pollutant Loading / Water Quality	Utilizes coarse computations based on unit area contaminant contributions per land use	Not currently part of the model, however unit area contaminant contributions per land use could be applied.	✓	✓	✓	✓
Designed for Sewer Networks	N	N	N	✓	N	N
Used in Urban Environments	✓	✓	Model not typically applied to urban environments.	✓	✓	✓
Integrated Urban BMPs	Integration of urban BMPs currently under development.	N	N	Has ability to add removal efficiencies for BMPs .	N	Toolkit available that adds functionality for urban BMPs.
Model Development Cost/Effort	\$	\$\$	\$\$	\$\$	\$\$	\$\$\$
Model Documentation	http://www.ecn.purdue.edu/runoff/lthia/lthia_index.htm	http://www.hec.usace.army.mil/software/hec-hms/whatsnext.html	http://www.brc.tamus.edu/swat/index.html	http://www.epa.gov/ednrmrl/models/swmm/index.htm	http://chl.ercd.usace.army.mil/gssha	http://www.epa.gov/ceampubl/swater/hspf/index.htm
Overall Assessment	L-Thia does not have the level of model sophistication required to meet the goals of the Waukegan River study.	HEC-HMS does not currently have sediment delivery, channel sediment transport, or water quality simulation capability, but is under development.	SWAT has a GIS interface through BASINS 3.1 and have been used extensively for evaluating sediment erosion and soil conservation, but is more suited for agricultural based watersheds.	SWMM was specifically designed for modeling stormwater runoff, sewers and other drainage systems in urban watersheds. In many ways, it is the best fit for the Waukegan River study.	GSSHA has many desirable features, but some functionality required for this project, particularly sewer network routing and urban BMPs are only available in conjunction with WMS v7.0 which has limited distribution.	HSPF has many desirable features including a non-proprietary GIS interface through BASINS 4.0, yet model has large input data requirements making development and calibration more intensive.

Waukegan River 516(e) Recommendations: Hydrologic Model – SWMM v5.0

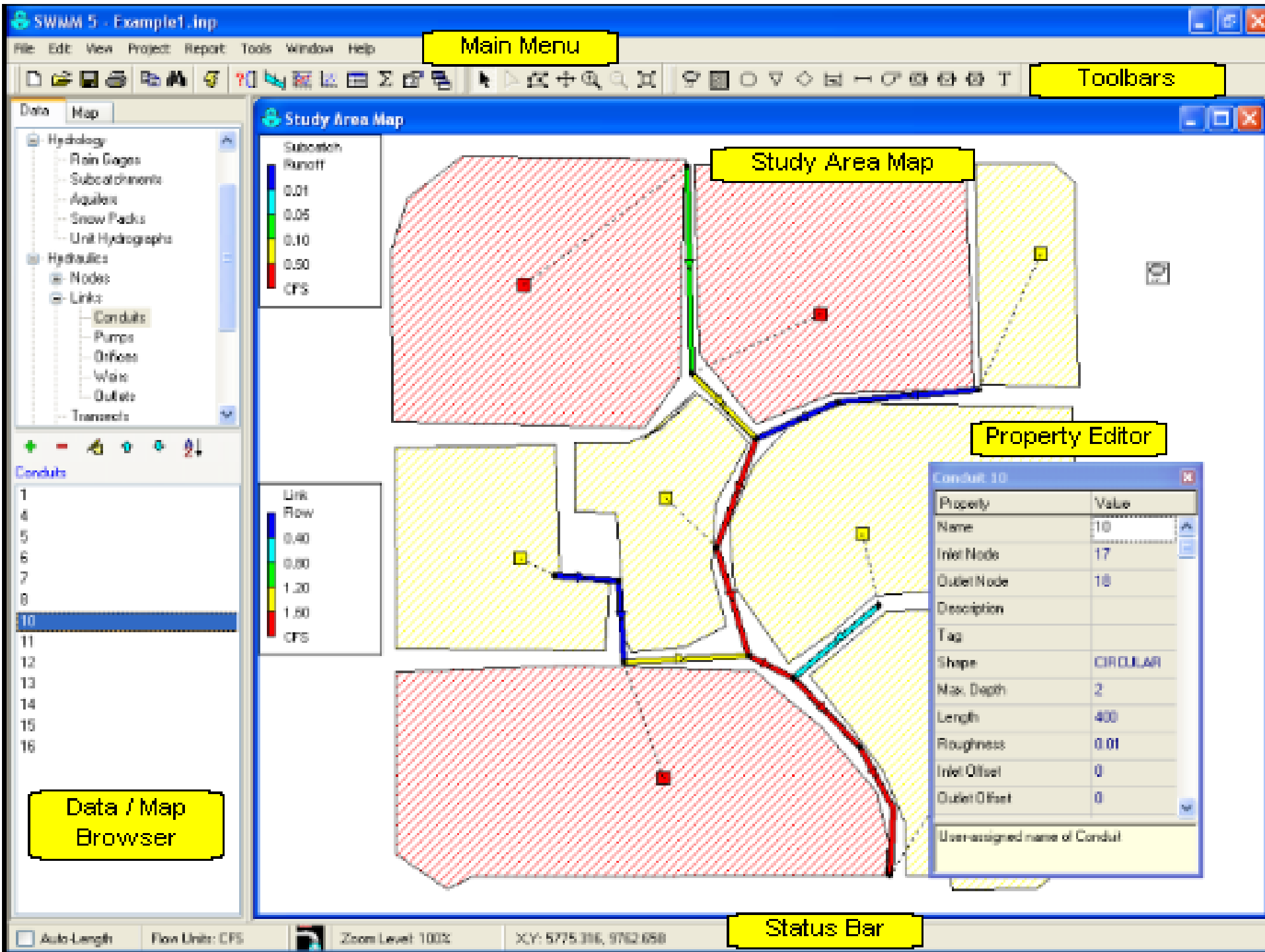
- Current version developed by USEPA and CDM
- Widely used in urban areas including Chicago area
- Integrated capabilities for routing flow through sewer systems
- Runoff and infiltration can be calculated using SCS Curve Number method
- BMP removal efficiency can be tied to a particular land use
- Snow accumulation and melting
- Improved capabilities available through proprietary XP-SWMM software



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Waukegan River 516(e) Recommendations: Hydraulic Model – HEC-RAS v4.0

- **Developed by USACE / widely used**
- **1-Dimensional hydraulic model**
- **GIS interface can be used for data input**
- **Ability to model moveable bed sediment transport and water quality dynamics**
- **Not designed for modeling bank collapses**
- **Water quality parameters: temperature, dissolved nitrogen constituents, dissolved phosphorus constituents, algae, CBOD, DO, user-assigned conservative and non-conservative constituents**

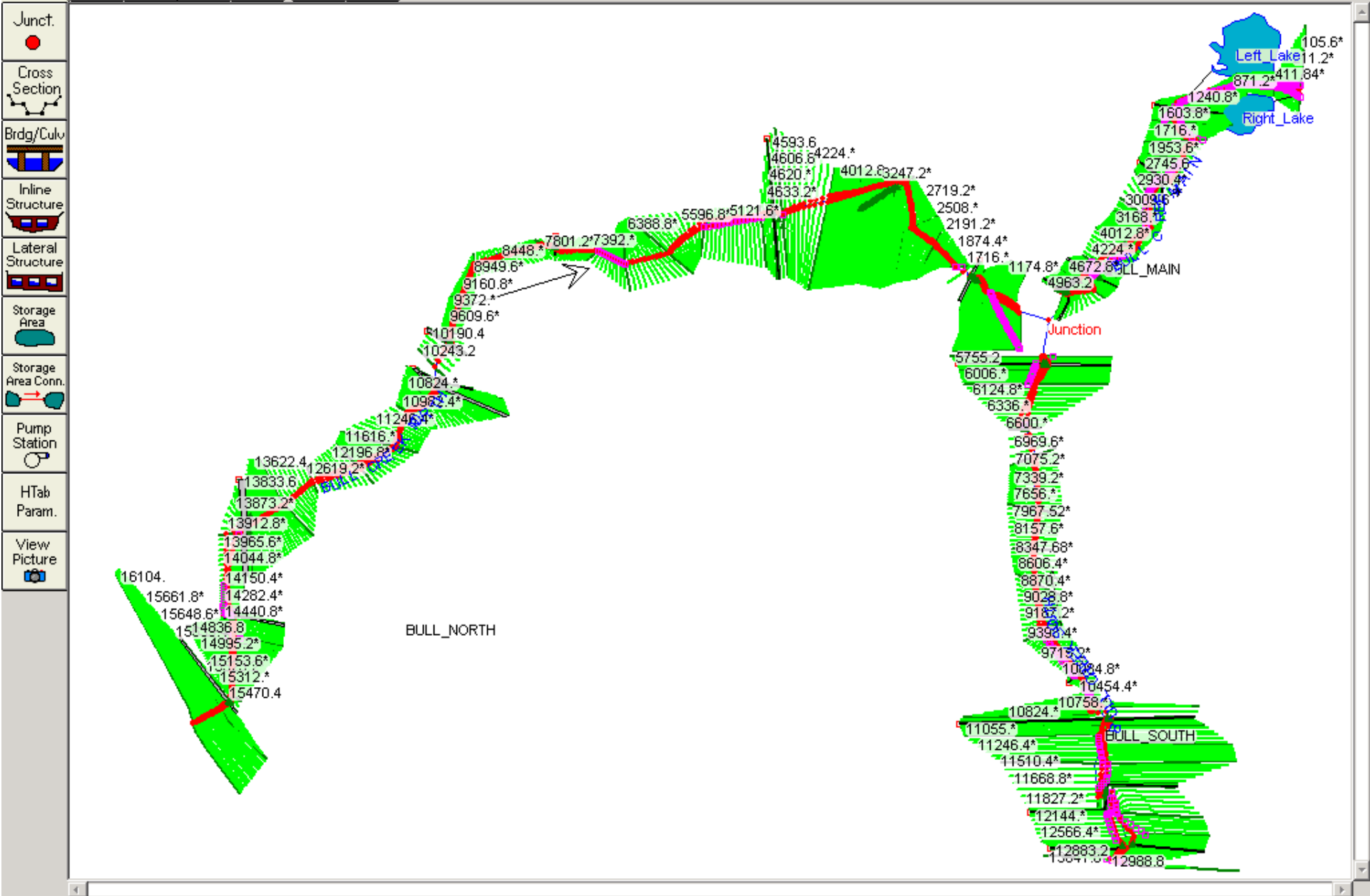


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Tools: River Reach, Storage Area, S.A. Conn., Pump Station, RS, Plot WS extents for Profile: (none)



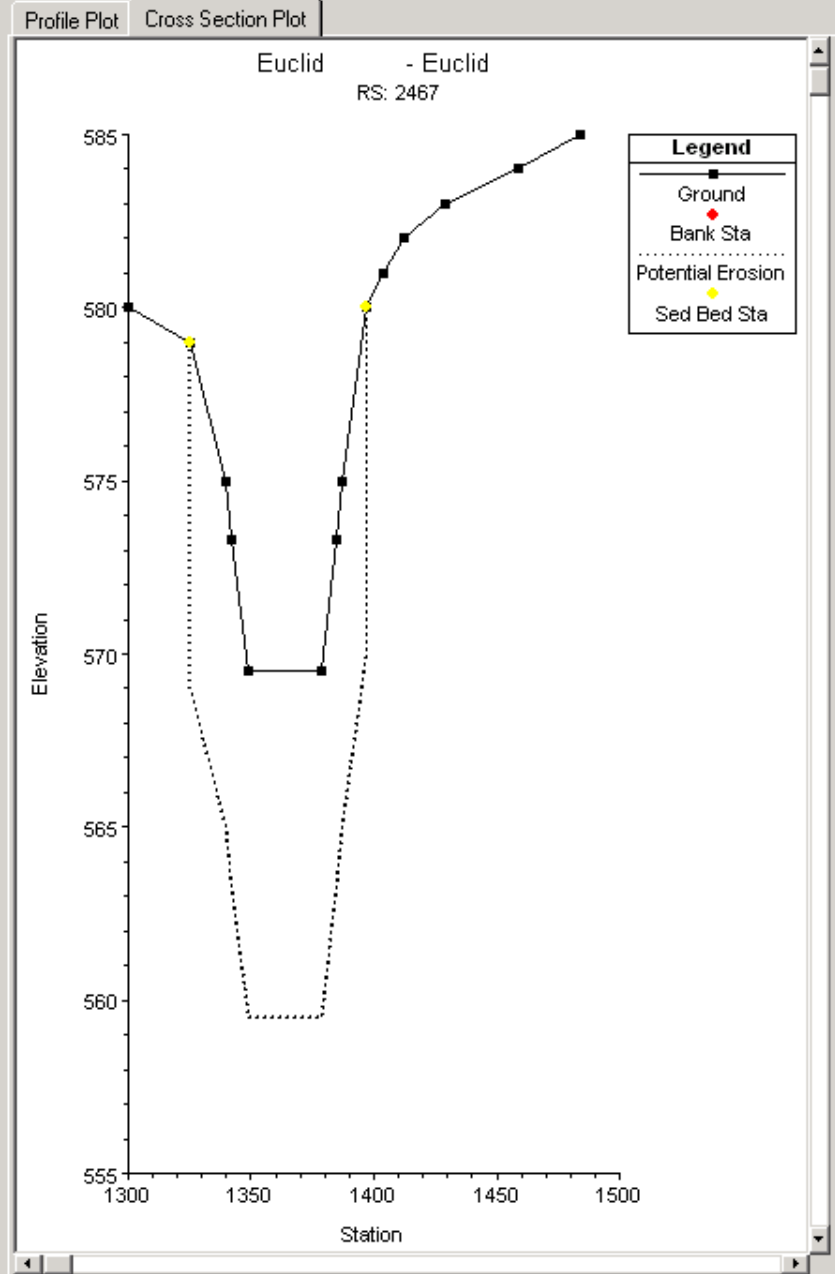
Sediment Data - Sediment Series

File Options View Help

Initial Conditions and Transport Parameters | Boundary Conditions

River: (All Rivers) Transport Function: Yang Define/Edit Bed Gradation ...
 Reach: Sorting Method: Exner 5
 Fall Velocity Method: Ruby

	River	Reach	RS	Invert	Max Depth	Min Elev	Sta Left	Sta Right	Bed Gradation
20	Euclid	Euclid	4075	571.481	10		62.9	202.1	Sample 4
21	Euclid	Euclid	4025	571.444	10		69.9	208.1	Sample 4
22	Euclid	Euclid	4000	571.425	10		64.9	208.1	Sample 3
23	Euclid	Euclid	3975	571.406	10		69.9	203.1	Sample 3
24	Euclid	Euclid	3925	571.369	10		49.9	178.1	Sample 3
25	Euclid	Euclid	3900	571.35	10		49.9	178.1	Sample 3
26	Euclid	Euclid	3825	571.295	10		39.9	178.1	Sample 3
27	Euclid	Euclid	3800	571.275		571.275	47.9	180.1	Sample 3
28	Euclid	Euclid	3775	571.256		571.256	29.9	180.1	Sample 3
29	Euclid	Euclid	3750	571.238		571.238	47.9	195.1	Sample 3
30	Euclid	Euclid	3725	571.219		571.219	44.9	165.1	Sample 3
31	Euclid	Euclid	3714	571.2		571.2	93.95	184.05	Sample 3
32	Euclid	Euclid	3632	571		571	93.95	184.05	Sample 3
33	Euclid	Euclid	3600	570.9		570.9	32.9	142.105	Sample 3
34	Euclid	Euclid	3550	570.65		570.65	49.9	182.1	Sample 3
35	Euclid	Euclid	3500	570.43	10		1004.9	1173.1	Sample 3
36	Euclid	Euclid	3450	570.3		570.3	294.9	418.1	Sample 2
37	Euclid	Euclid	3400	570.27		570.27	177.9	300.1	Sample 2
38	Euclid	Euclid	3350	570.24		570.24	177.9	304.1	Sample 2
39	Euclid	Euclid	3300	570.21		570.21	176.9	304.1	Sample 2
40	Euclid	Euclid	3256	570.2	10		1027.9	1170.1	Sample 2
41	Euclid	Euclid	3195	570.17	10		1033.9	1177.1	Sample 2
42	Euclid	Euclid	3024	570.09	10		1031.9	1159.1	Sample 2
43	Euclid	Euclid	3000	570.08	10		1032.9	1154.1	Sample 2
44	Euclid	Euclid	2972	570.07	10		1035.9	1154.1	Sample 2
45	Euclid	Euclid	2802	570	10		1029.9	1150.1	Sample 2
46	Euclid	Euclid	2750	569.9	10		1027.9	1151.1	Sample 2
47	Euclid	Euclid	2723	569.9	10		1026.9	1149.1	Sample 2
48	Euclid	Euclid	2650	569.8	10		1026.9	1155.1	Sample 2
49	Euclid	Euclid	2602	569.8	10		1025.9	1155.1	Sample 2
50	Euclid	Euclid	2467	569.5	10		1324.9	1397.1	Sample 2
51	Euclid	Euclid	2400	569.4	10		1380.9	1457.1	Sample 2
52	Euclid	Euclid	2200	569.1	10		1540.9	1610.1	Sample 2
53	Euclid	Euclid	1906	569	10		1412.9	1497.1	Sample 1
54	Euclid	Euclid	1700	568.6	10		1419.9	1520.1	Sample 1



Use Banks for Extents Interpolate Gradations

Waukegan River 516(e) Data Required for Models

SWMM

- Meteorological data
- Land Use data
- Soils Data
- Topography
- Sewer network survey data
- Flow for major dischargers
- Runoff contaminant characteristics
- Main channel flow data
- BMP contaminant removal efficiencies

HEC-RAS

- Output from SWMM
- Channel cross section and overbank surveys
- Bridge and structure surveys
- Bed gradation data
- Channel stage data
- In-stream water quality monitoring data



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Waukegan River 516(e) – Next Steps

Activity	Cost	Begin	Complete	Duration
Scoping	\$40k	Oct-07	Nov-08	13 months
SWMM Model Development	\$85k	Dec-08	Jul-09	8 months
SWMM Model Review	\$3k	Aug-09	Aug-09	1 month
SWMM Model Documentation	\$5k	Aug-09	Sep-09	2 months
First Training Workshop	\$2k	Oct-09	Oct-09	1 month
HEC-RAS Model Development	\$55k	Nov-09	Apr-10	6 months
HEC-RAS Model Review	\$3k	May-10	May-10	1 month
HEC-RAS Model Documentation	\$5k	May-10	Jun-10	2 months
Second Training Workshop	\$2k	Jul-10	Jul-10	1 month
Total	\$200k	Oct-2007	July-2010	34 months



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QUESTIONS?



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