Waukegan & Calumet Rivers 516(e) Update All Hands Meeting

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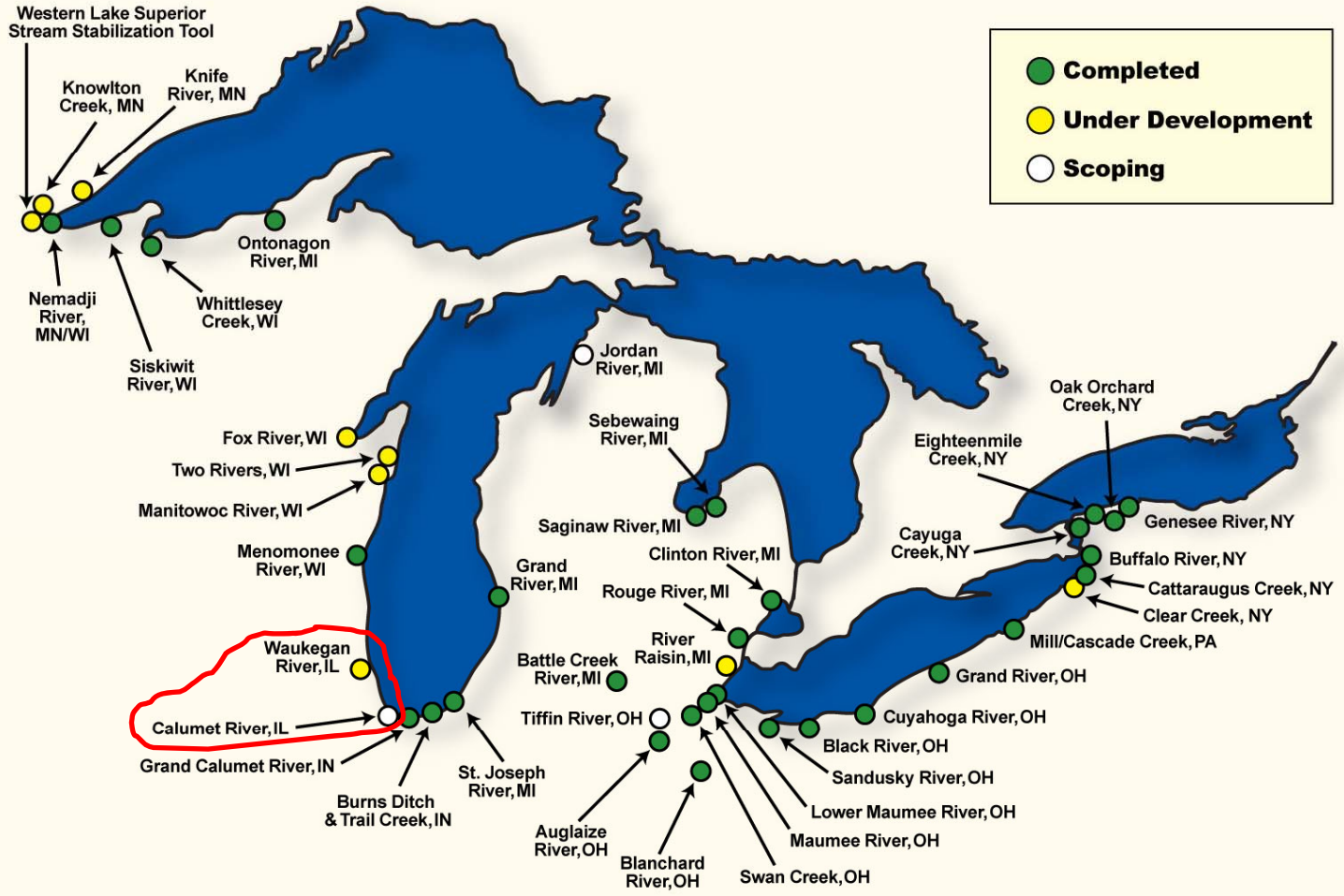
Chicago District, Planning Branch

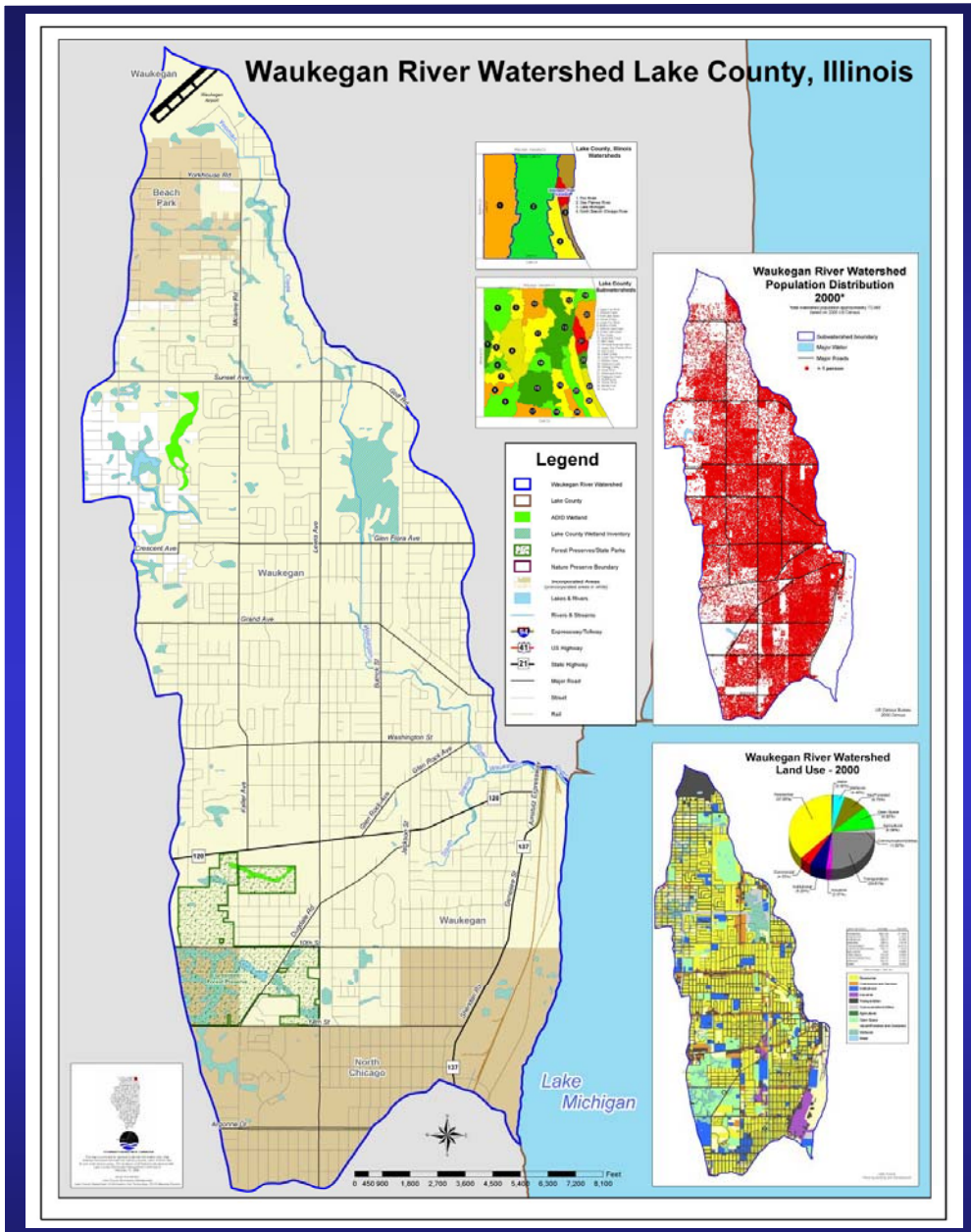
May 18th, 2011
Kensington Court – Ann Arbor, MI

Great Lakes Tributary Modeling Program

Ongoing and Completed Projects April 2011



Waukegan River Watershed Map



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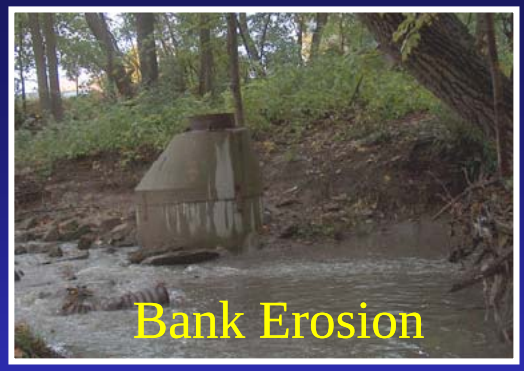
Waukegan River Watershed Characteristics

- 12 mi^2 drainage basin
- Mouth just south of Waukegan Harbor AOC
- Heavily urbanized (only 13% open)
- Highly industrialized 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

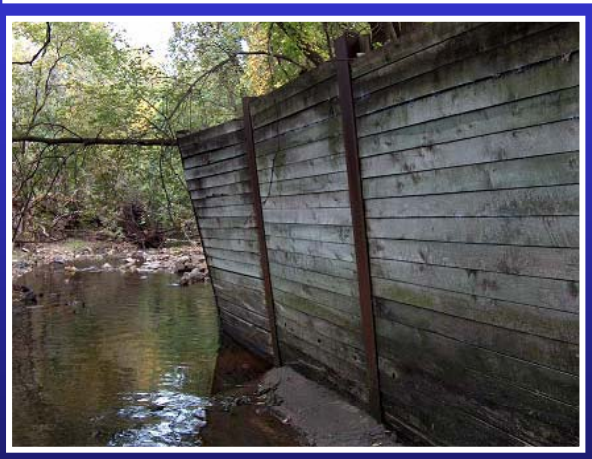
Waukegan River Current Conditions & Problems



Bank Erosion

Discharge Points

Failed Hydraulic Structures



Failing Bank Protection

Sedimentation

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Waukegan River 516(e)
Overall Project Schedule

COMPLETED

Fall '08

- Buy-in on model recommendations
- Establish a plan to fill data gaps by others
- Finalize scoping report / publish on web

COMPLETED

Winter '08 through Spring '11

- Develop SWMM model
  - Using in-house / acquired staff
  - Periodic meetings with stakeholders
  - Develop user manual / training documents

Summer '11

- Training / Tech Transfer Workshops
  - Hands on use of models
  - User feedback

'12 & beyond

- Possible Further Development/Refinement

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

- Current version developed by USEPA & CDM
- Widely used in urban areas including Chicago area
- Integrated capabilities for routing flow through sewer systems & open channels
- Runoff and infiltration can be calculated using a wide variety of methods
- Water quality capabilities
- BMP removal efficiency can be tied to a particular land use (includes LID practices)
- Snow accumulation and melting
- Improved capabilities available through proprietary interfaces (i.e. PCSWMM and XPSWMM)

PCSWMM/SWMM 5.0 Model
Model Assembly

- Data Sources
  - City of Waukegan
    - Sewer maps
    - Culvert dimensions
  - New Survey Completed Summer 2010
    - Filled in data gaps
    - Channel cross sections
    - Sewer and hydraulic structure dimensions and elevations
  - Other Data
    - LIDAR – Slope, Flow path
    - CMAP – Land Use, Imperviousness
    - Lake County SMC – Event Mean Concentrations
    - Soils – Infiltration parameters
    - NOAA – Lake Michigan gage record

PCSWMM/SWMM 5.0 Model
Model Characteristics

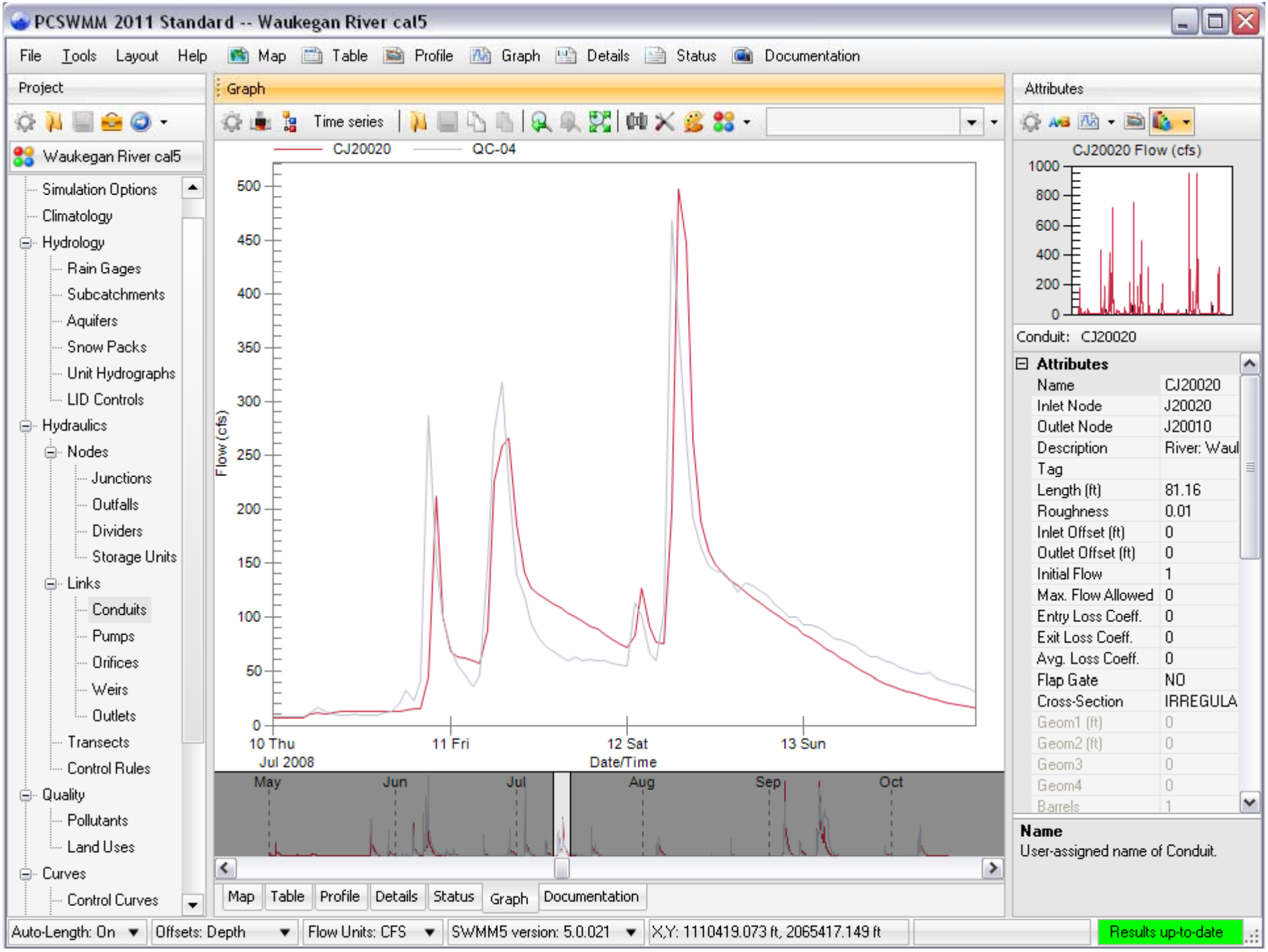
- Climatology
  - 3 Precipitation gages (and 1 computed gage) employed
  - Temperature and wind speed taken from FAA airport gage
  - Computed evaporation rates
- Sewershed Boundaries
  - Original boundaries taken from Waukegan River Watershed Plan (Dec 2007)
  - Further subdivided and adjusted based on sewer maps and new survey
  - 252 subcatchments in the watershed
  - Average subcatchment is 27 acres

PCSWMM/SWMM 5.0 Model
Model Characteristics

- **Sewershed Characteristics**
  - Infiltration based on Green-Ampt methodology
  - Imperviousness calculated using CMAP land use data
  - Slope and Flow length based on DEM
- **Conduits and Nodes**
  - North, South, and Main branch of Waukegan River included
  - Cross sections of channel taken from recent surveys
  - Sewer locations, dimensions, and elevations taken from City of Waukegan database and recent survey
  - Most conduits greater than 15 inches included in the model
- **Water Quality**
  - Event Mean Concentrations by landuse from Lake Co. SMC
  - Model currently includes TSS

PCSWMM/SWMM 5.0 Model
Model Calibration

- Flow Gages
  - 4 gages maintained by Lake County Health Department during 2008 and 2009
  - June-October 2008 period of record used for calibration
  - April-July 2009 period of record used for model verification
- Water Quality
  - Event based monitoring for 6 storms at 2 gages
- Calibration
  - Adjusted travel length and imperviousness
  - Added baseflow and RDII


PCSWMM 2011 Standard -- Waukegan River cal5
File Tools Layout Help Map Table Profile Graph Details Status Documentation
Project
Waukegan River cal5
Simulation Options
Climatology
Hydrology
Rain Gages
Subcatchments
Aquifers
Snow Packs
Unit Hydrographs
LID Controls
Hydraulics
Nodes
Junctions
Outfalls
Dividers
Storage Units
Links
Conduits
Pumps
Orifices
Weirs
Outlets
Transects
Control Rules
Quality
Pollutants
Land Uses
Curves
Control Curves
Graph
Time series
CJ20020
QC-04
Flow (cfs)
500
450
400
350
300
250
200
150
100
50
0
10 Thu
Jul 2008
11 Fri
12 Sat
13 Sun
Date/Time
May
Jun
Jul
Aug
Sep
Oct
Map Table Profile Details Status Graph Documentation
Attributes
CJ20020 Flow (cfs)
1000
800
600
400
200
0
Conduit: CJ20020
Attributes
Name CJ20020
Inlet Node J20020
Outlet Node J20010
Description River: Waul
Tag
Length (ft) 81.16
Roughness 0.01
Inlet Offset (ft) 0
Outlet Offset (ft) 0
Initial Flow 1
Max. Flow Allowed 0
Entry Loss Coeff. 0
Exit Loss Coeff. 0
Avg. Loss Coeff. 0
Flap Gate NO
Cross-Section IRREGULA
Geom1 (ft) 0
Geom2 (ft) 0
Geom3 0
Geom4 0
Barrels 1
Name
User-assigned name of Conduit.
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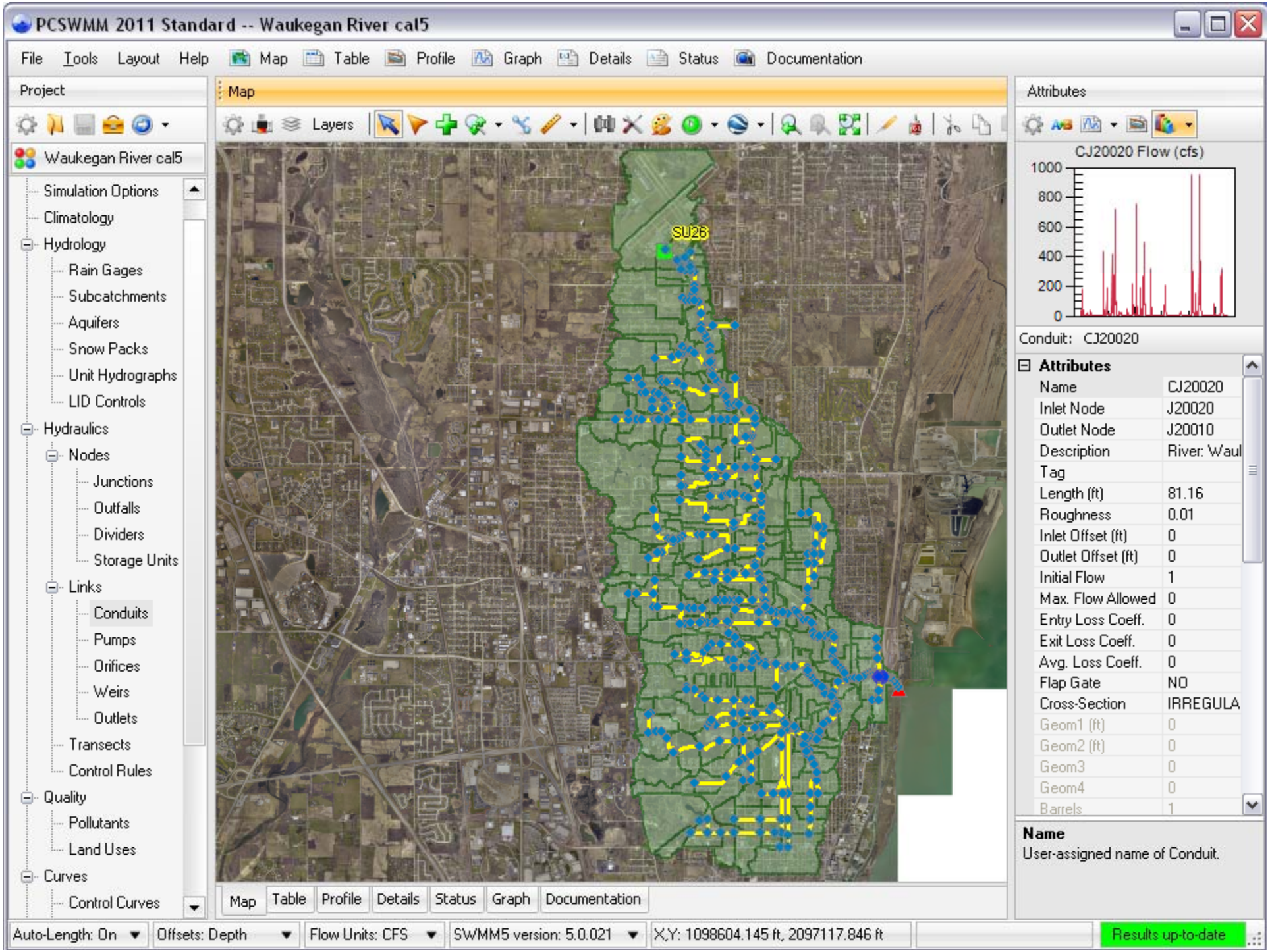
Offsets: Depth
Flow Units: CFS
SWMM5 version: 5.0.021
X,Y: 1110419.073 ft, 2065417.149 ft
Results up-to-date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Map
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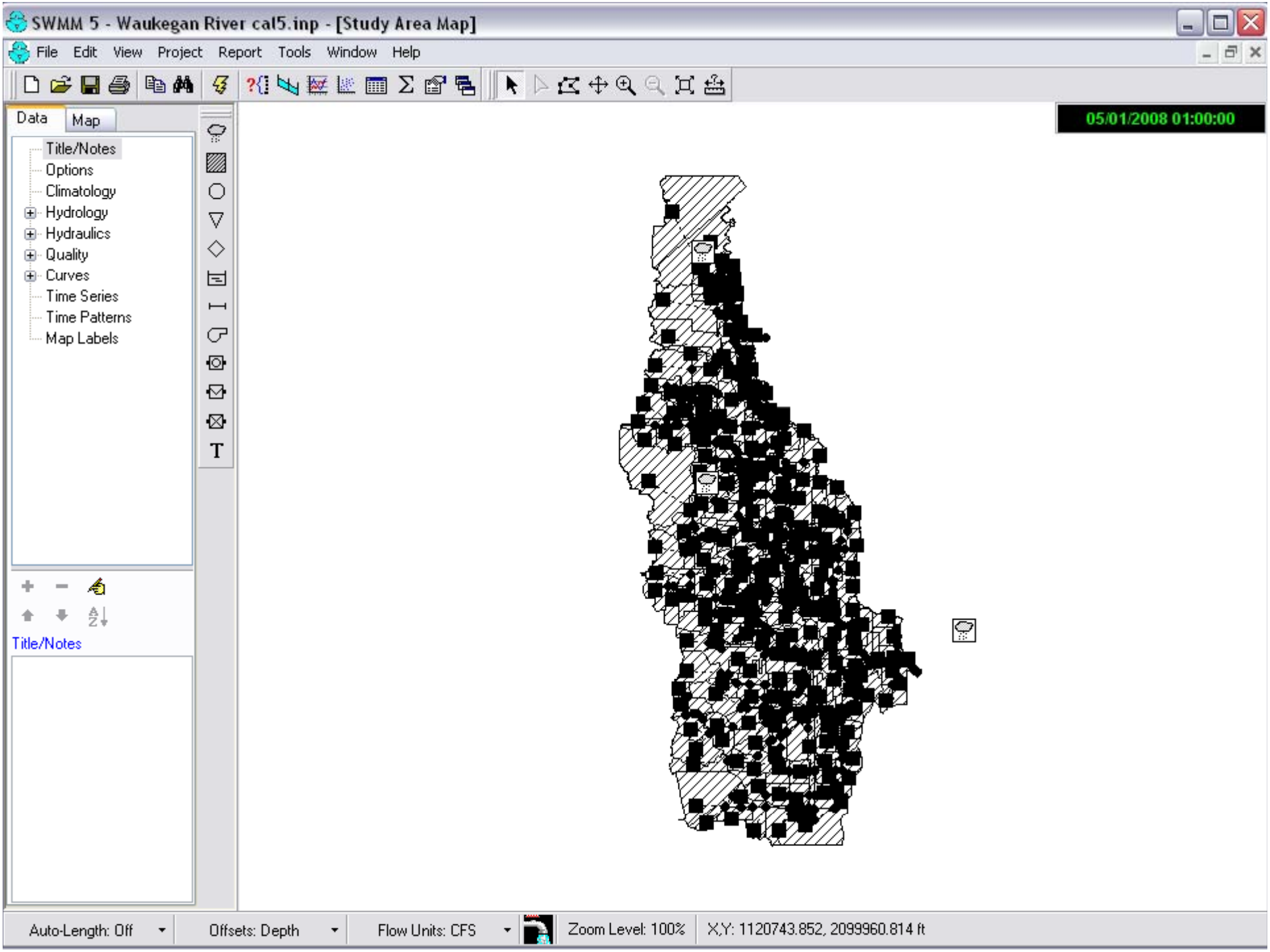
Documentation
Auto-Length: On
Offsets: Depth
Flow Units: CFS
SWMM5 version: 5.0.021
X,Y: 1098604.145 ft, 2097117.846 ft
Results up-to-date


SWMM 5 - Waukegan River cal5.inp - [Study Area Map]
File Edit View Project Report Tools Window Help
Data Map
Title/Notes
Options
Climatology
Hydrology
Hydraulics
Quality
Curves
Time Series
Time Patterns
Map Labels
Title/Notes
05/01/2008 01:00:00
Auto-Length: Off
Offsets: Depth
Flow Units: CFS
Zoom Level: 100%
X,Y: 1120743.852, 2099960.814 ft

Waukegan River 516(e)
Next Steps…

- Training and User Documentation
  - Summary newsletter-style handout
  - Detailed model development report
- Hands-on Technology Transfer (June 2011)
  - SWMM Model
  - Detailed watershed model report
  - User feedback
- Further Model Refinement (as needed)
  - Based on user feedback
  - Available funding