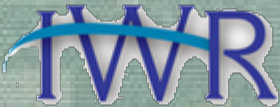


# HEC-RAS Subgrid Technology

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M.ASCE



US Army Corps  
of Engineers



# Objectives

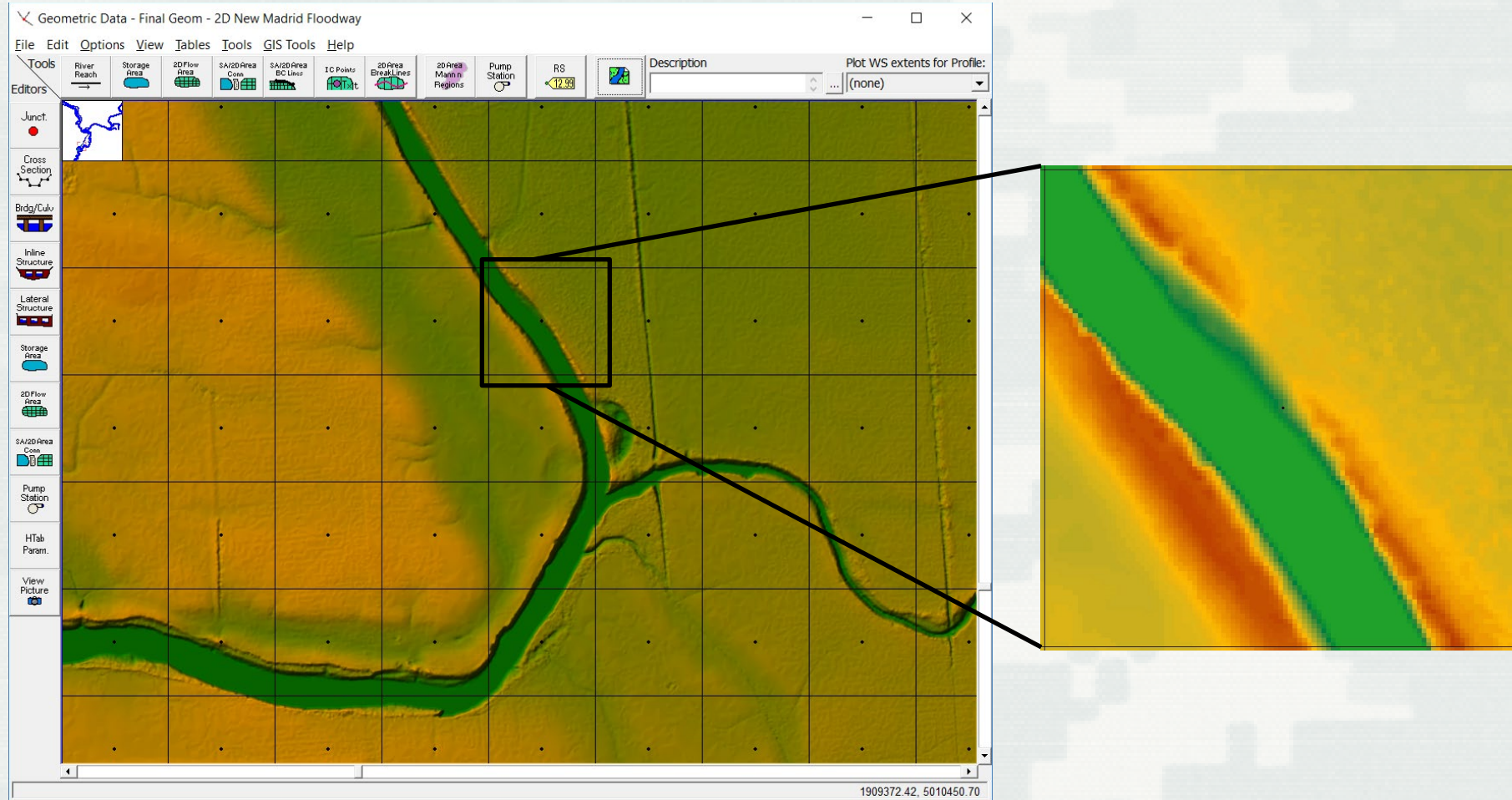
- Overview of the Subgrid Technology in HEC-RAS.

# Cell and Face Pre-Processing

- The 2D Mesh pre-processor computes a **detailed elevation-volume relationship for each cell**.
- **Each face** of a computational cell is pre-processed into **detailed hydraulic property tables** (elevation versus, wetted perimeter, area, roughness, etc...).
- Computational **cells can be partially wet**.
- This allows the user to use **larger computational cells**, without losing too much of the details of the underlying terrain.
- The net effect is that **larger cells means less computations**, which means much **faster run times**.
- Additionally, HEC-RAS will produce **more detailed results for a given cell size than other models** that use a single elevation for each cell and face.

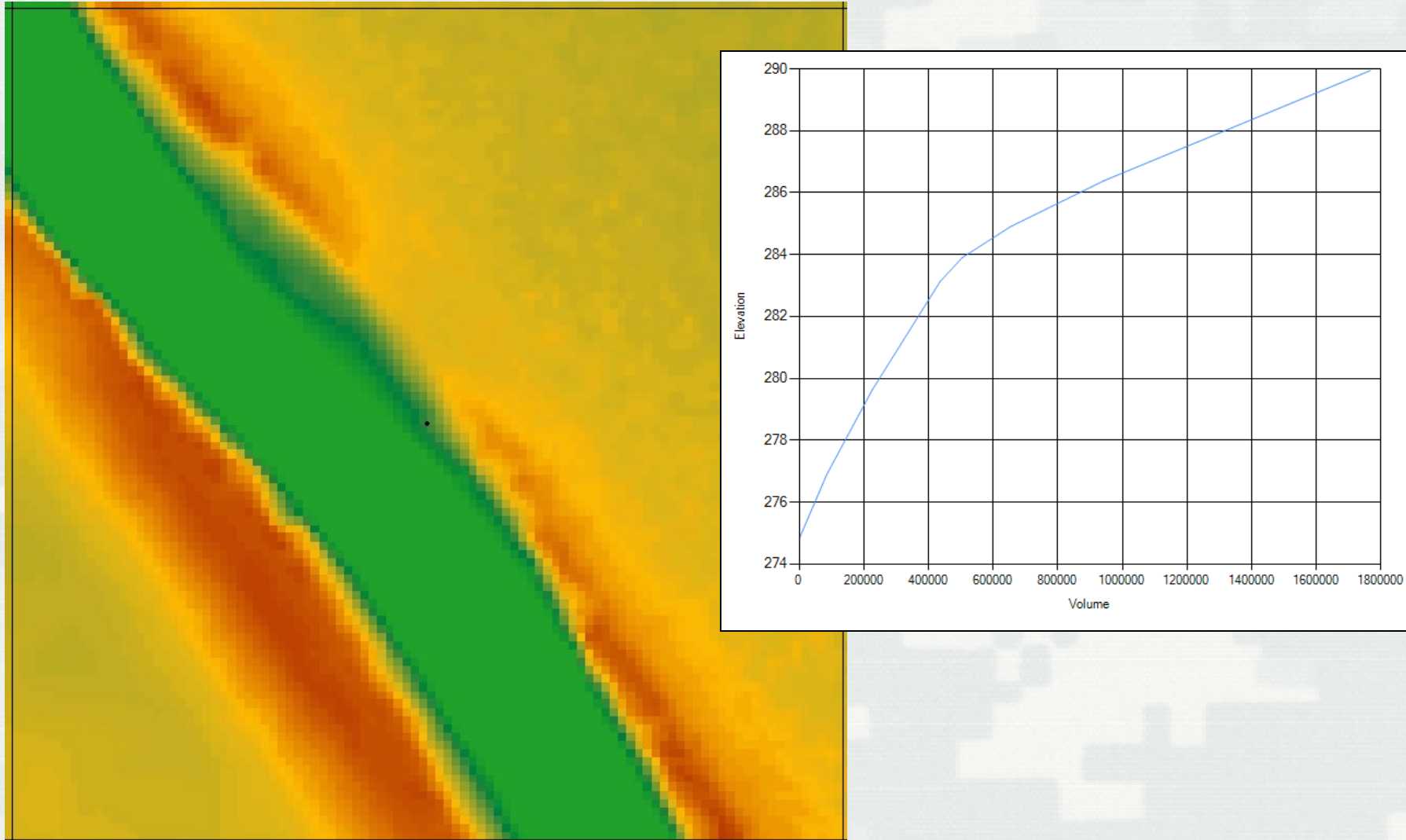


# Computational Mesh with Detailed Sub-grid Terrain Data - Continued

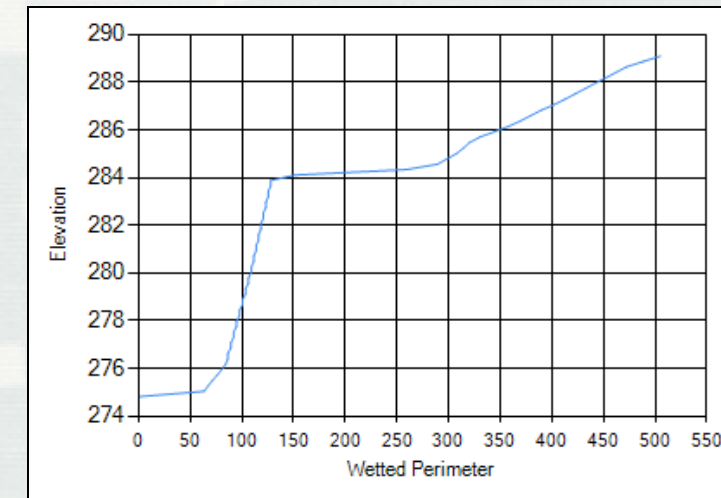
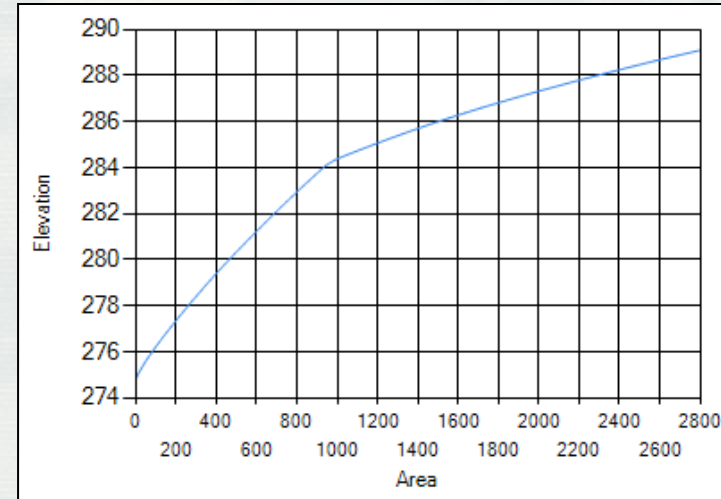
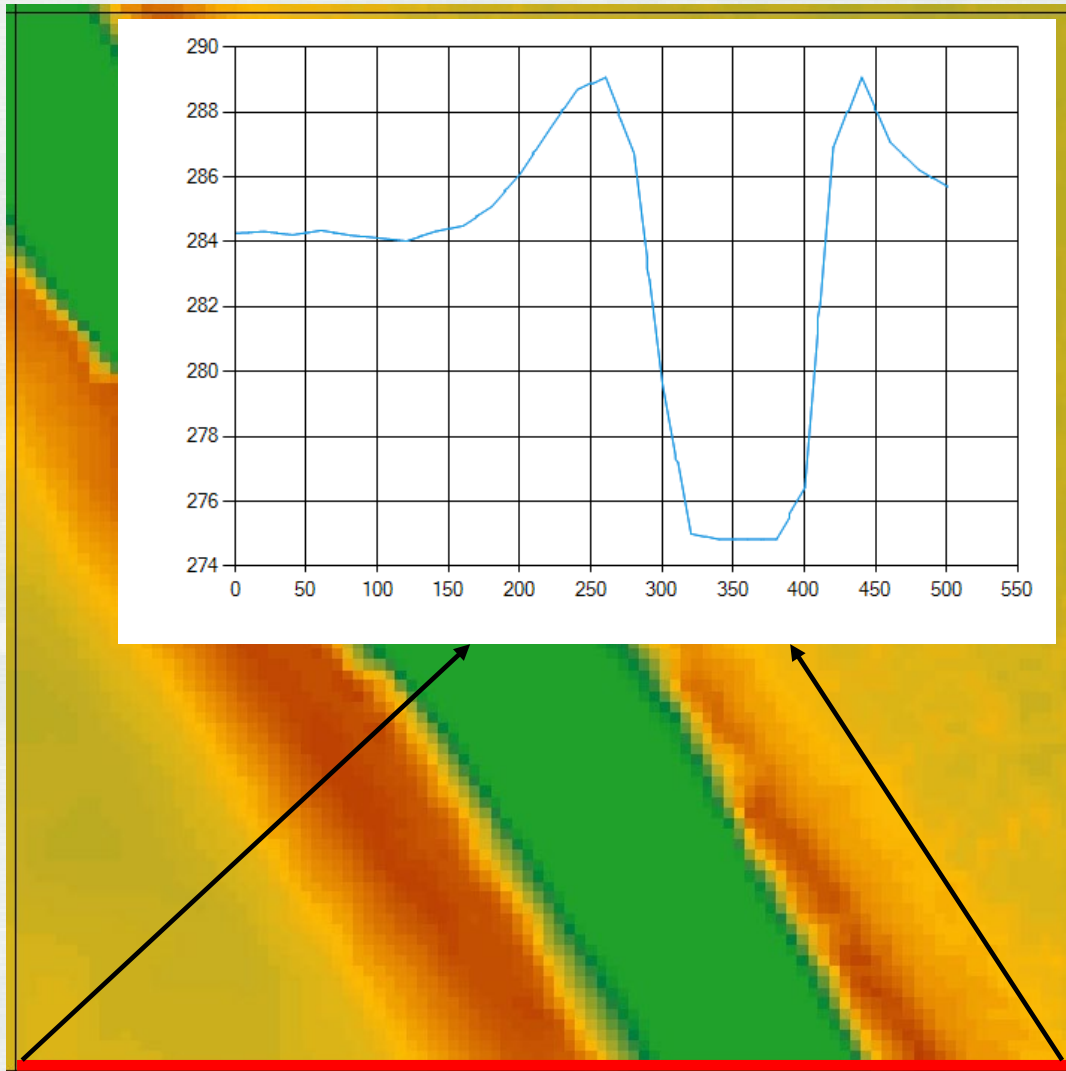


# Computational Cells are Pre-Processed

## Elevation vs. Volume



# Computational Faces are Pre-Processed Elevation vs. Area, Wetted Perimeter, and n





# Benefits of using the detailed sub-terrain for the cell and face hydraulic properties



# Example Application – EU Test 5

- Extremely Rapidly rising hydrograph of a dry bed. From 0.0 to 3000 cms in 5 minutes.
- Compare results at multiple locations for three grid resolutions (25, 50, and 100m)
- Compare Computational times

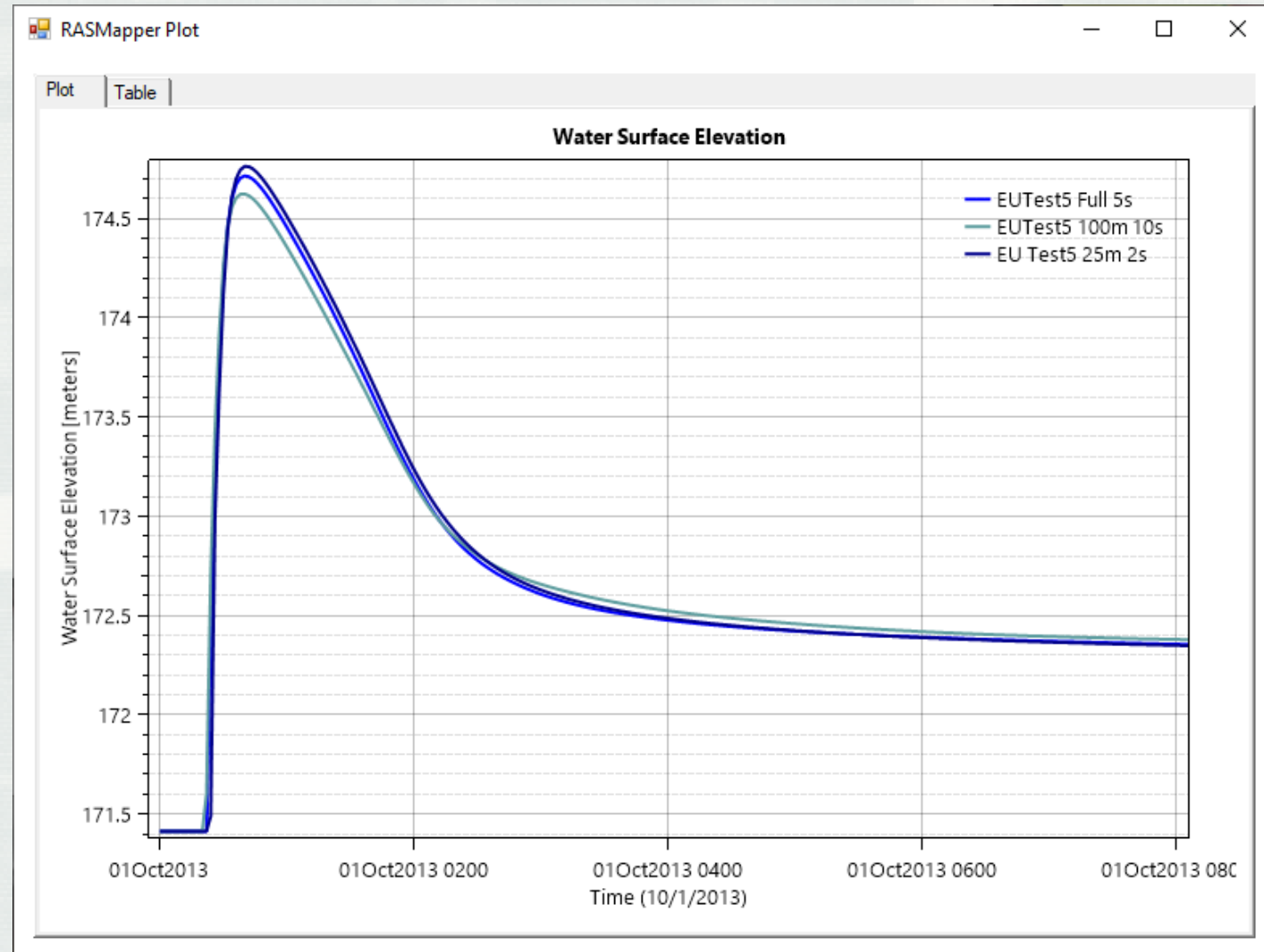




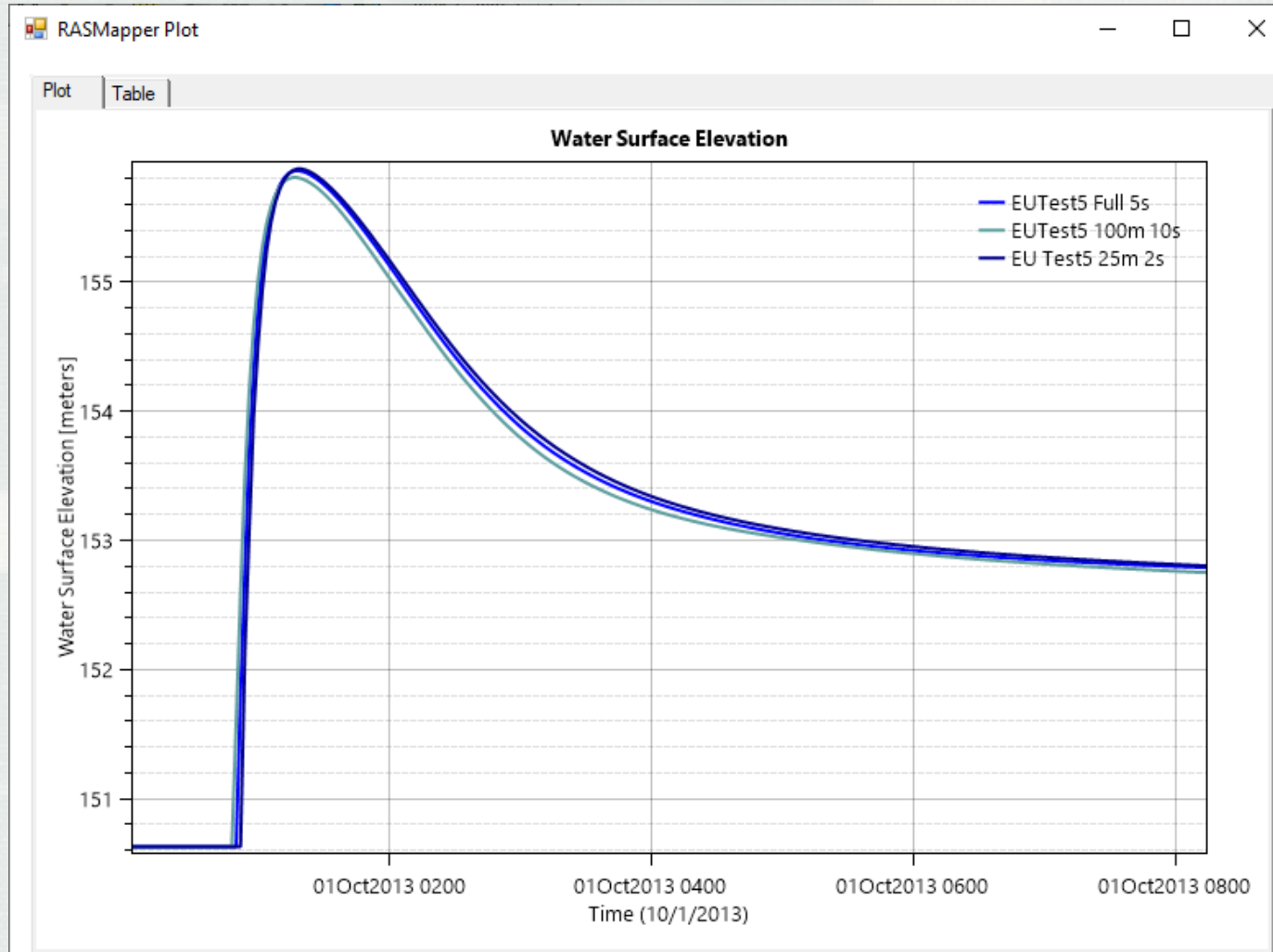
# EU Test 5 – Animation



# EU Test 5 – Location 1

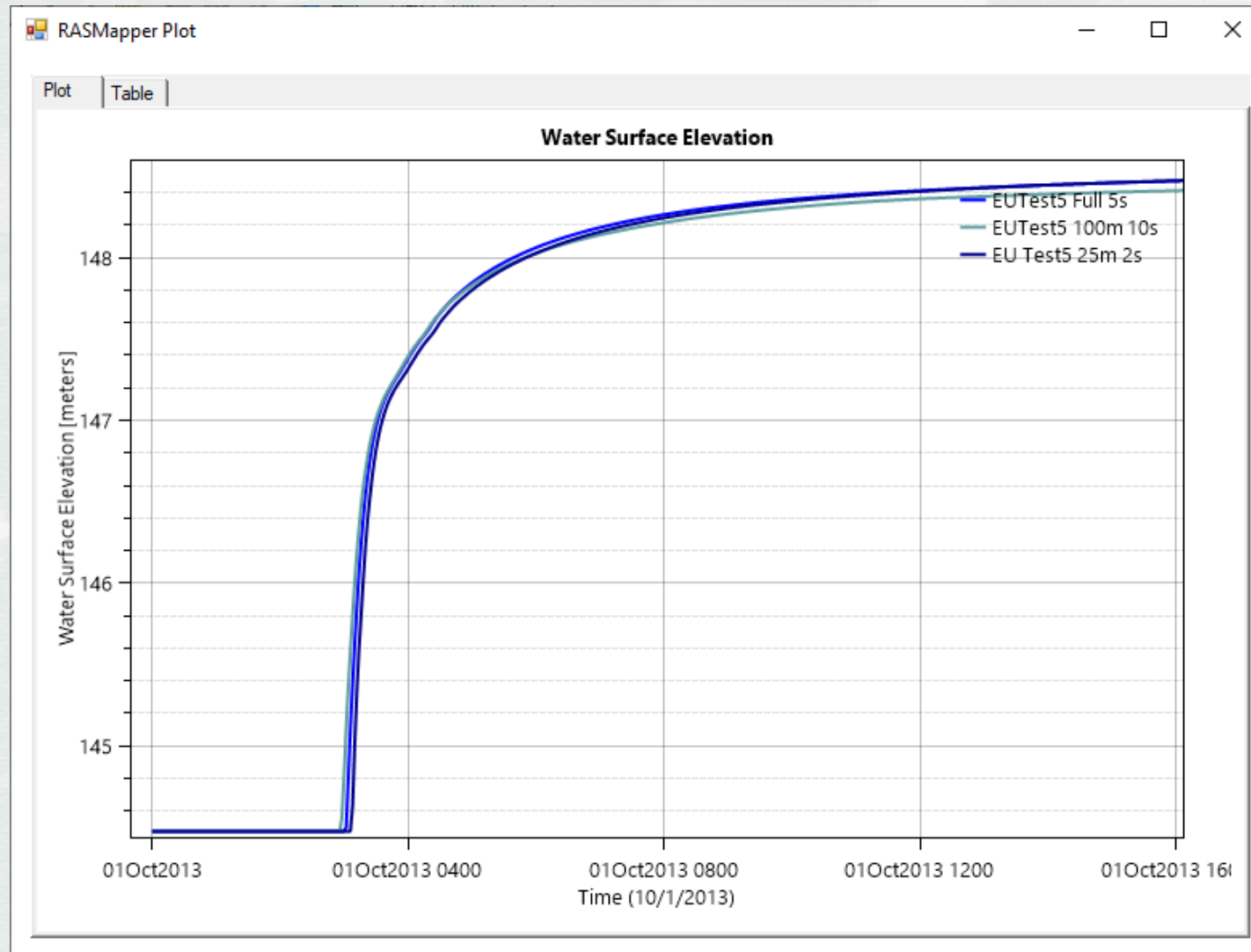


# EU Test 5 – Location 3





# EU Test 5 – Location 5

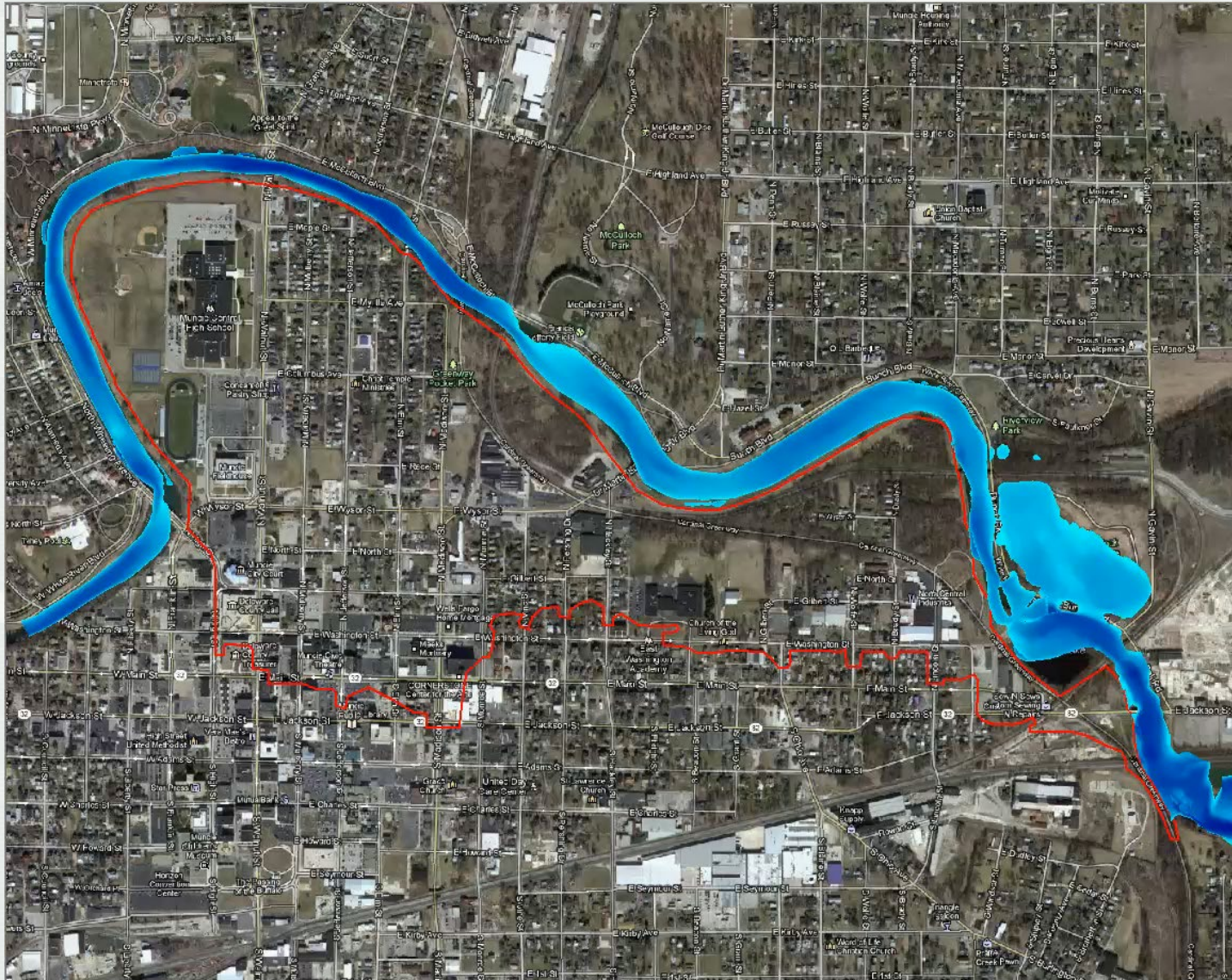


# EU Test 5 – Computational Time

Test No	Grid Size	No. Cells	Time Step	RAS Full Saint Venant
1	25m	30340	2 sec	7 min 34s
2	50m	7460	5 sec	1 min 38s
3	100m	1809	10 sec	13s

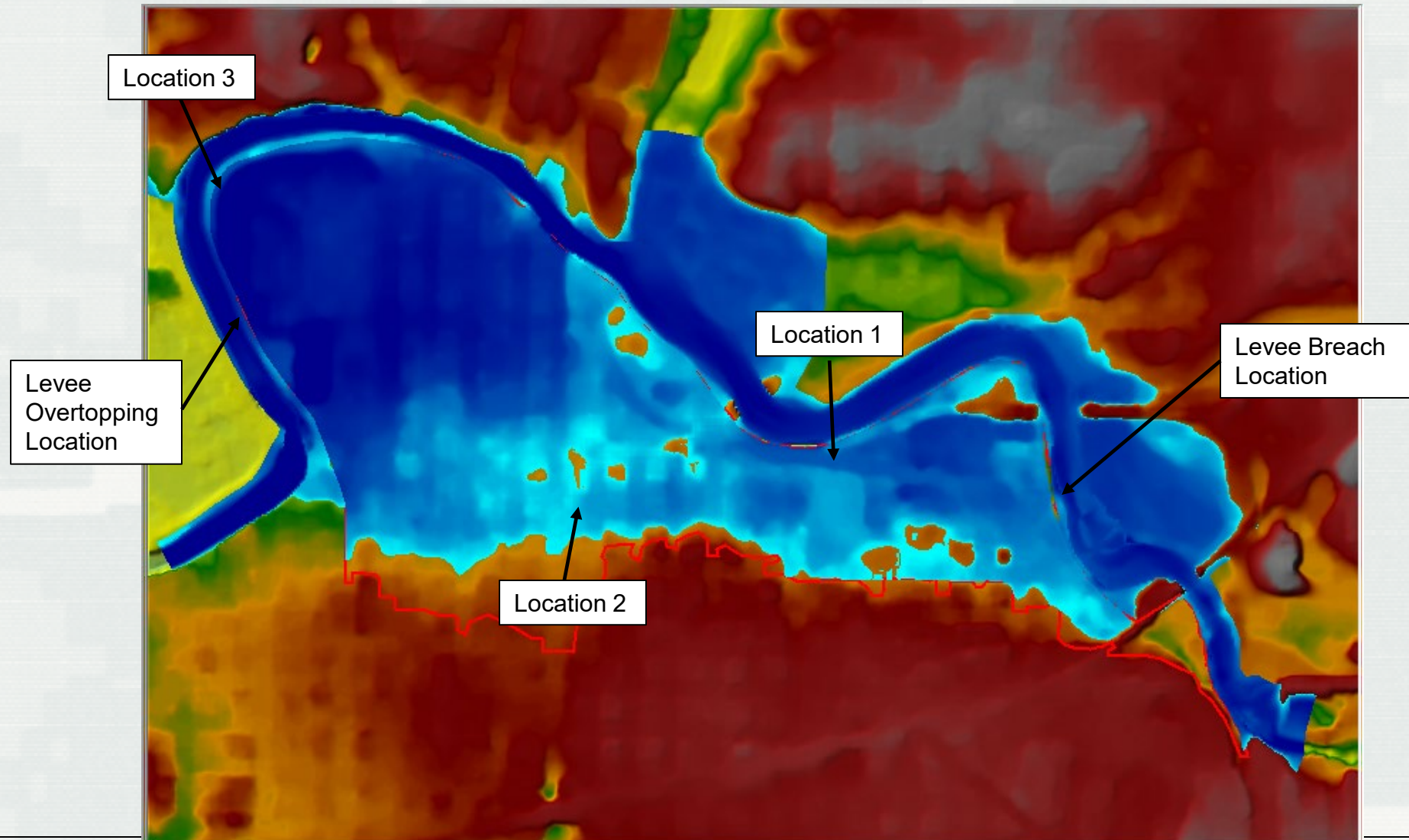


# Example Application - Muncie Indiana

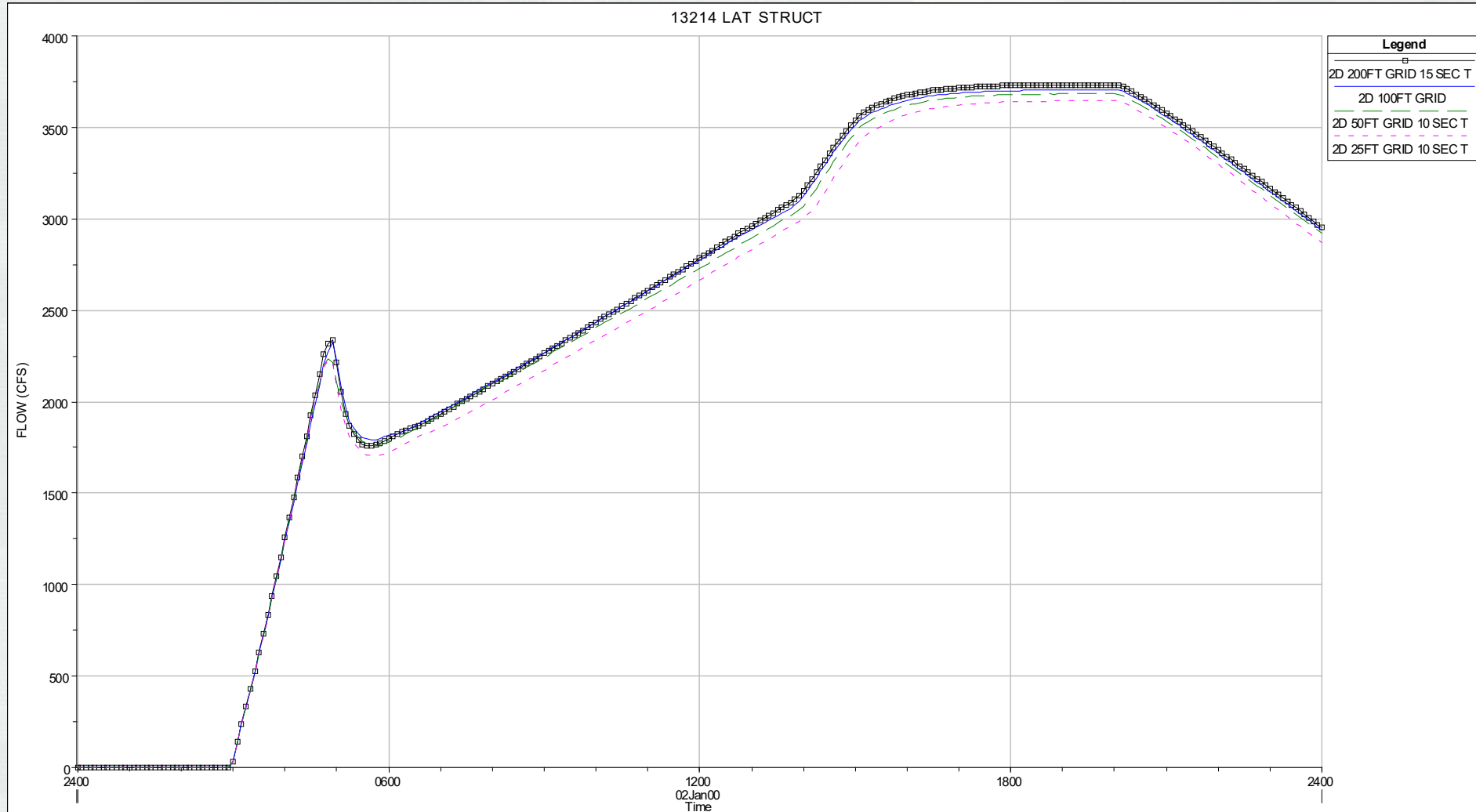




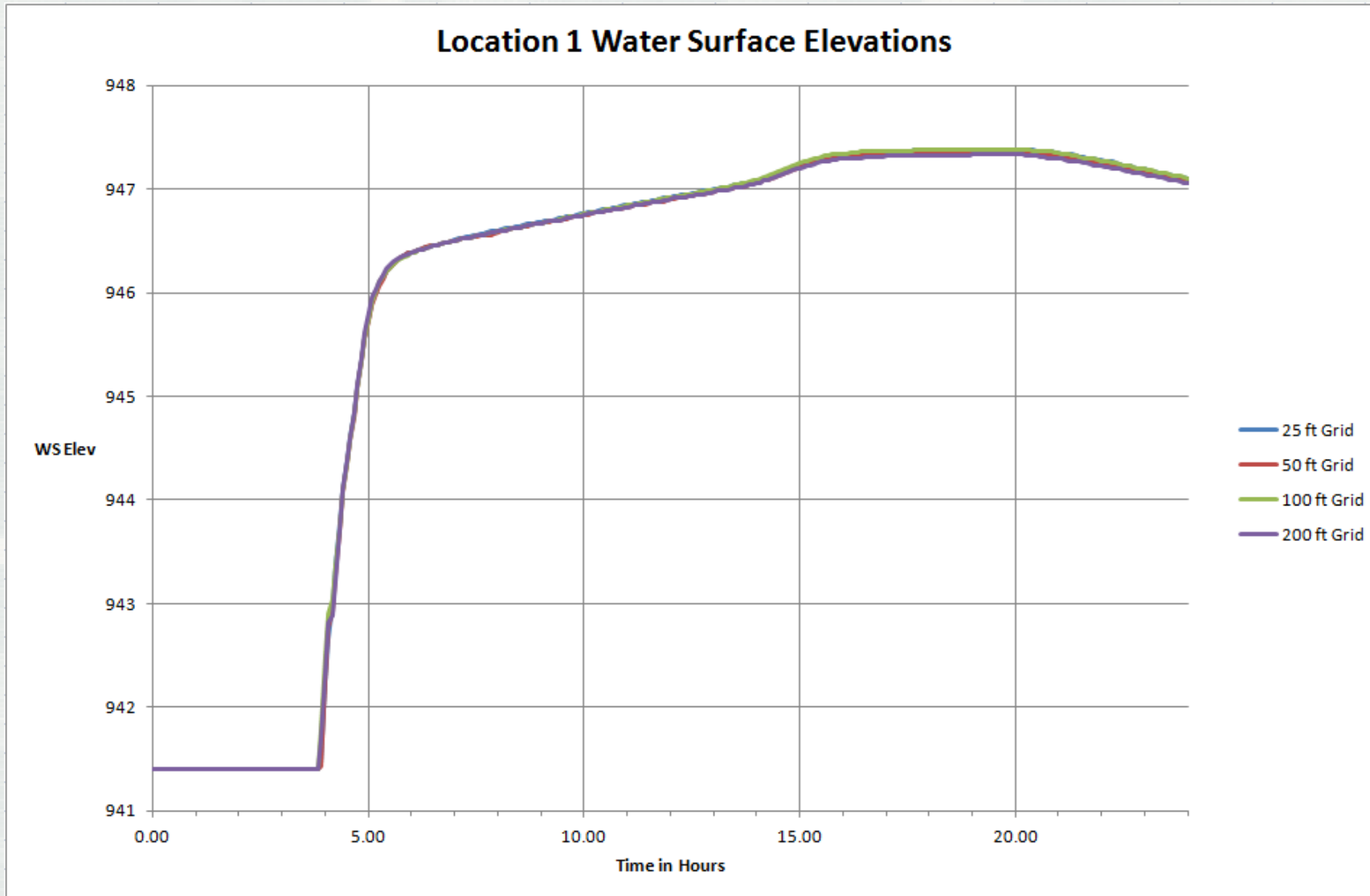
# Muncie Indiana – Grid Resolution Evaluation 200, 100, 50, and 25 ft Grids



# Muncie Breach Flow Hydrographs

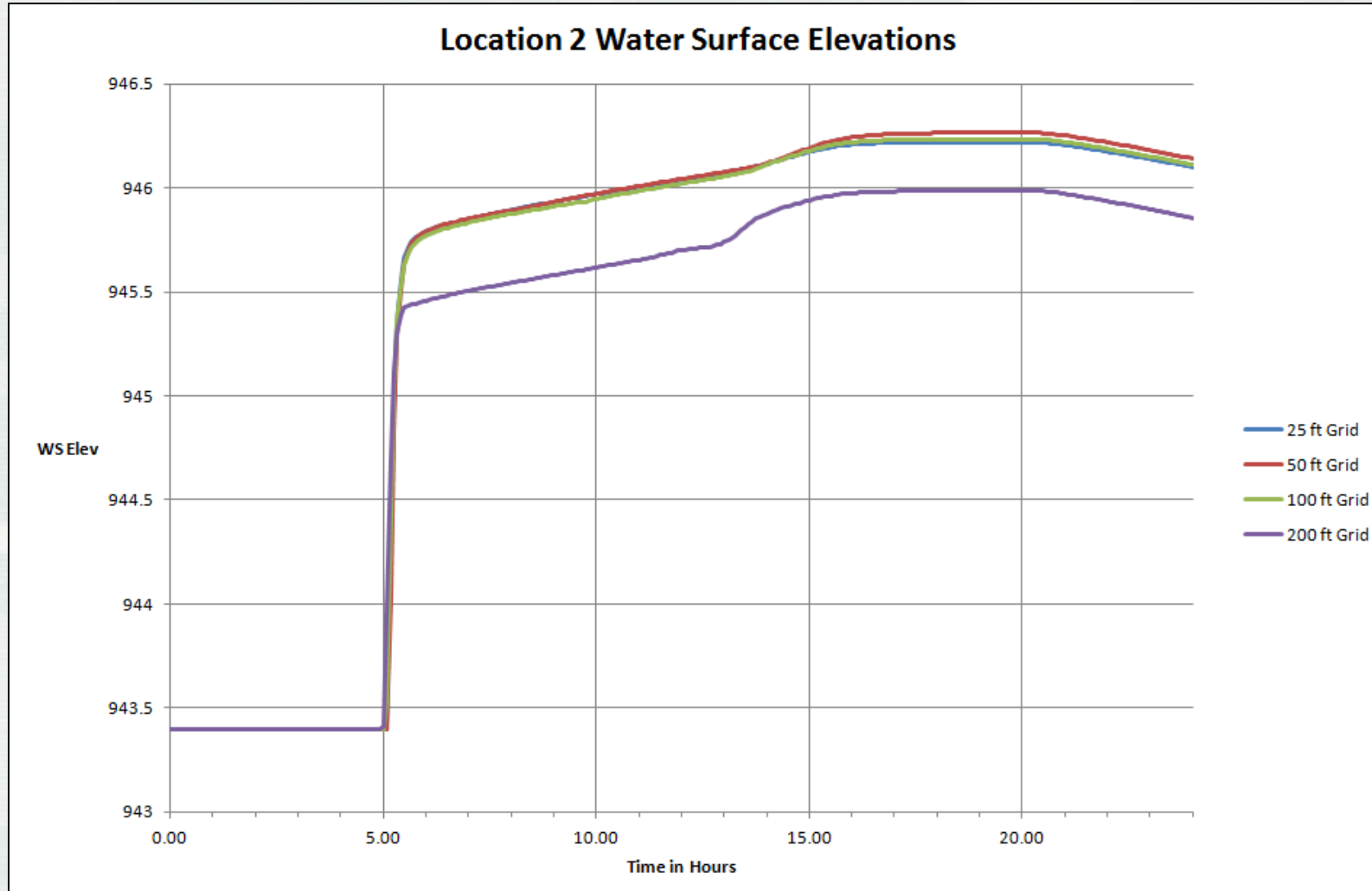


# Muncie Indiana - Location 1

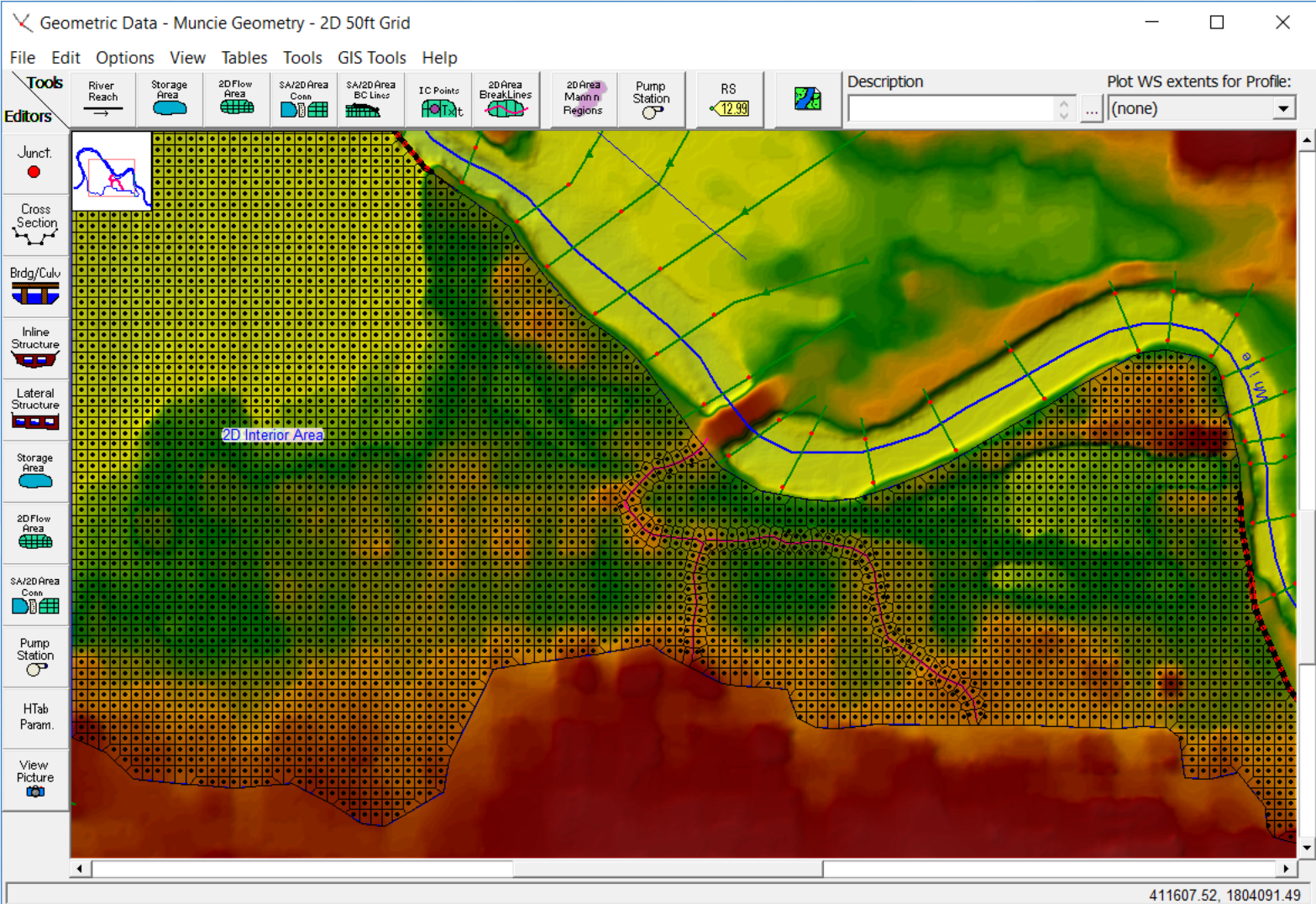




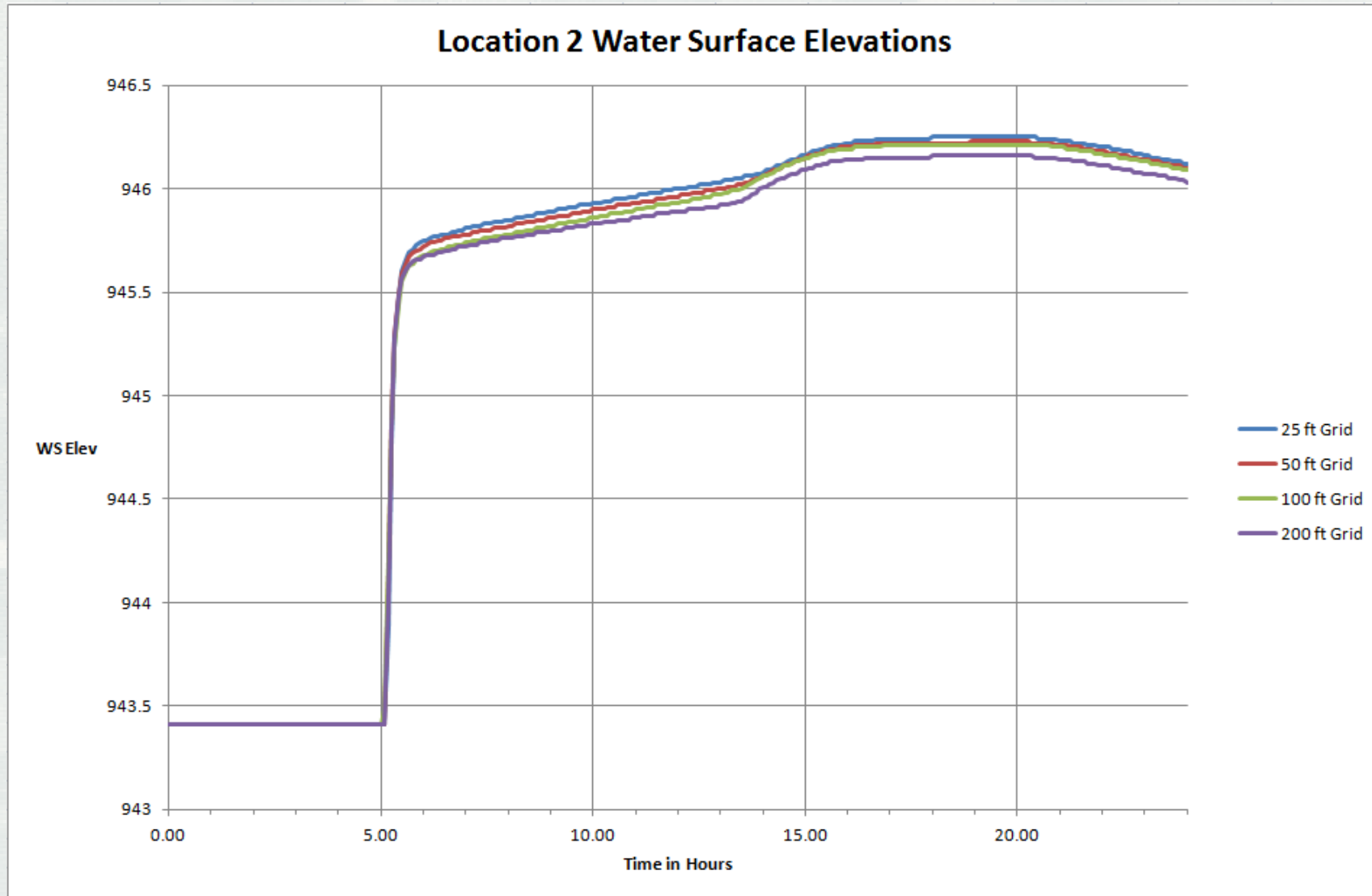
# Muncie Indiana – Location 2



# Break lines Added

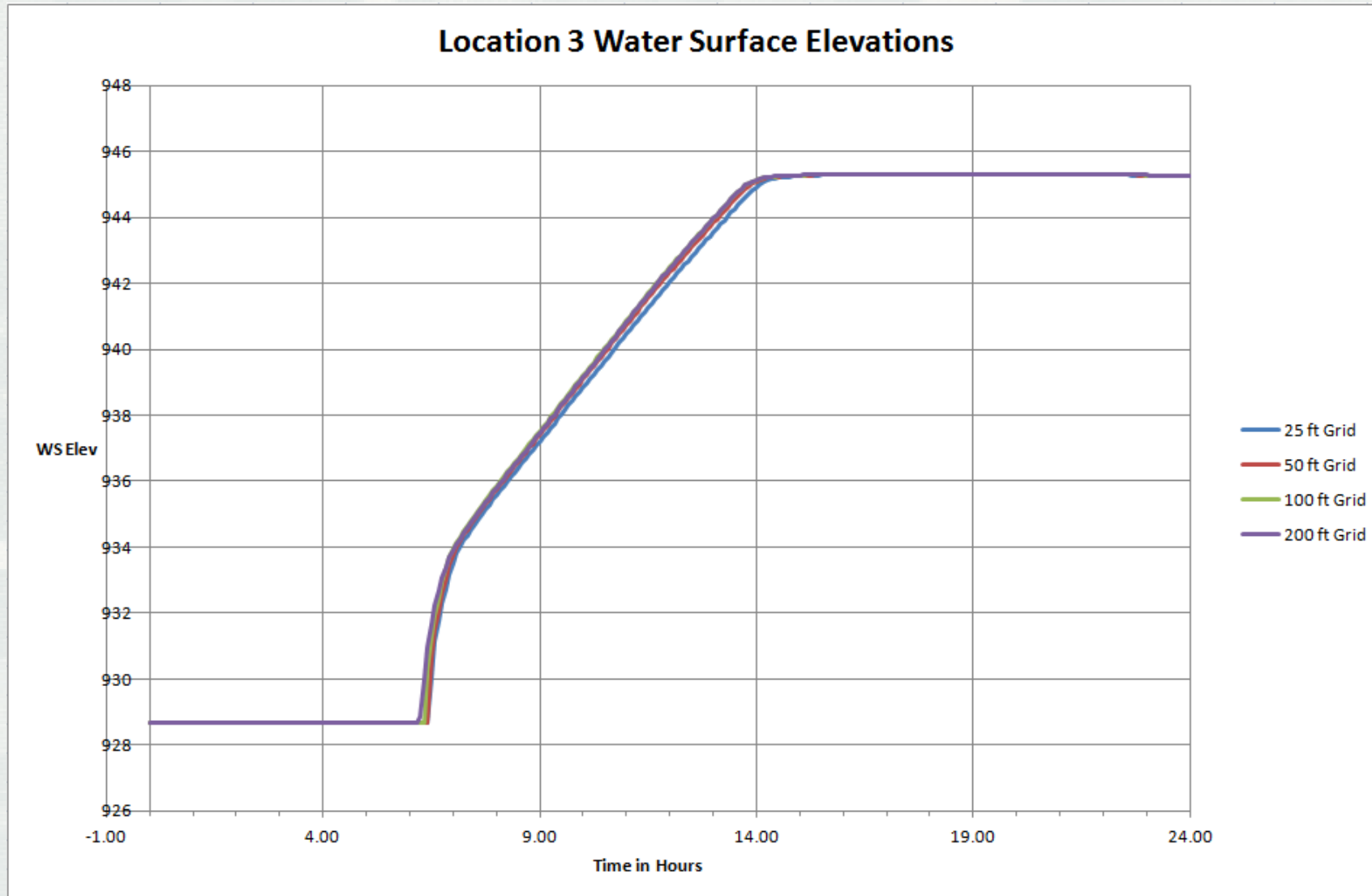


# Location 2 – With Break Lines

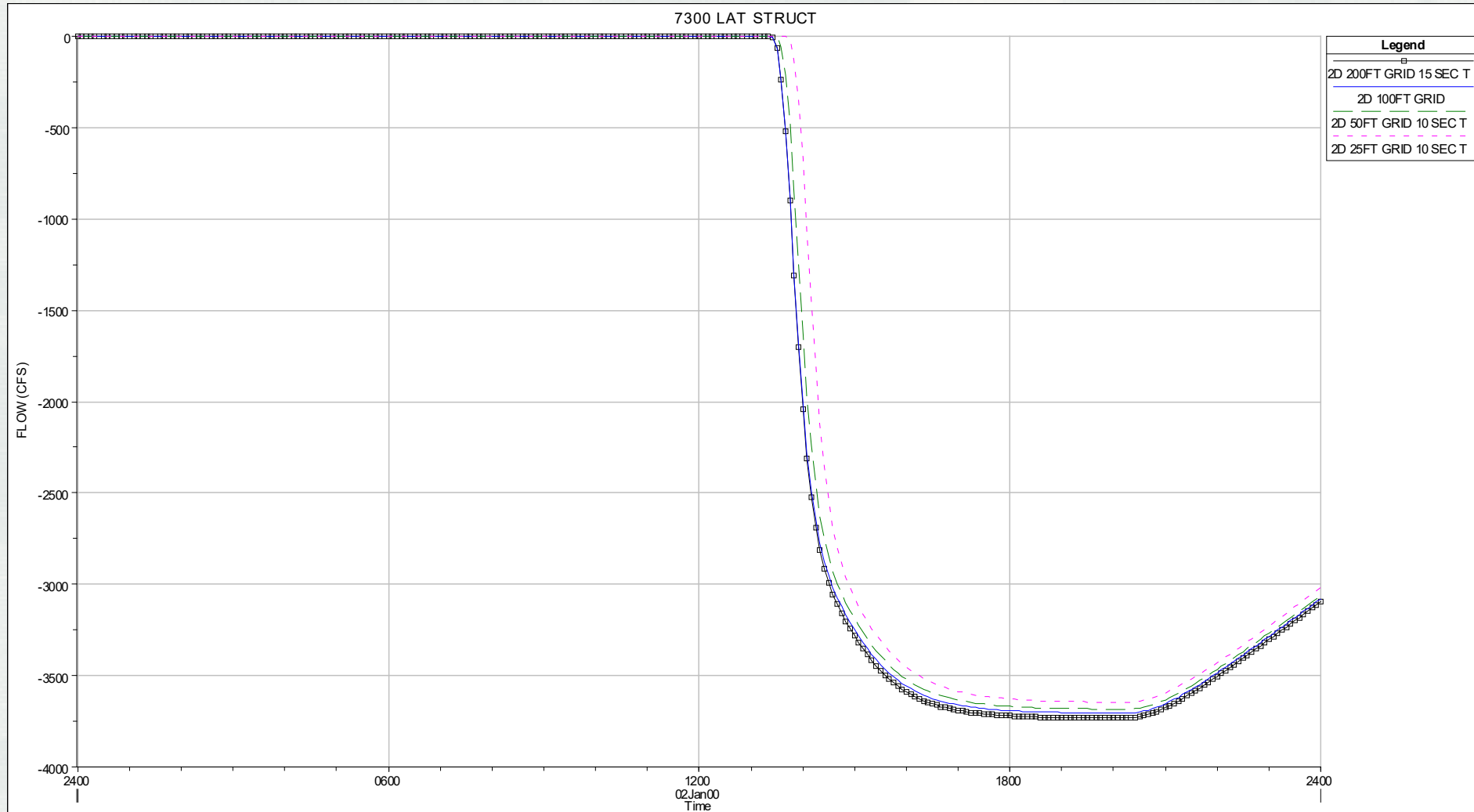




# Muncie Indiana – Location 3



# Muncie Lower Levee Overflow



# Muncie – Computational Time

## 24 hr Simulation, 5 -15s Time Steps

Test No	Grid Size	No. Cells	Time Step	RAS Diff Wave	Time Step	RAS Full Eqns.
1	25ft	21719	10 sec	2 min 19s	4 sec	7 min 34s
2	50ft	5379	15 sec	33s	10 sec	1 min 16s
3	100ft	1323	15 sec	7s	15 sec	15s
4	200ft	321	20 sec	4s	15 sec	6s

# Questions?