Urban Water
Solving Chicago's Water Problem

Group 5 Presentation
UIC Sustainability Institute
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Contents

- Team members
- Chicago water problem
- Underlying assumptions
- Attempted solutions
- Working towards a resolution
- Our proposal
- Barriers associated with proposal
- Next steps
- Summary
- Closing remarks

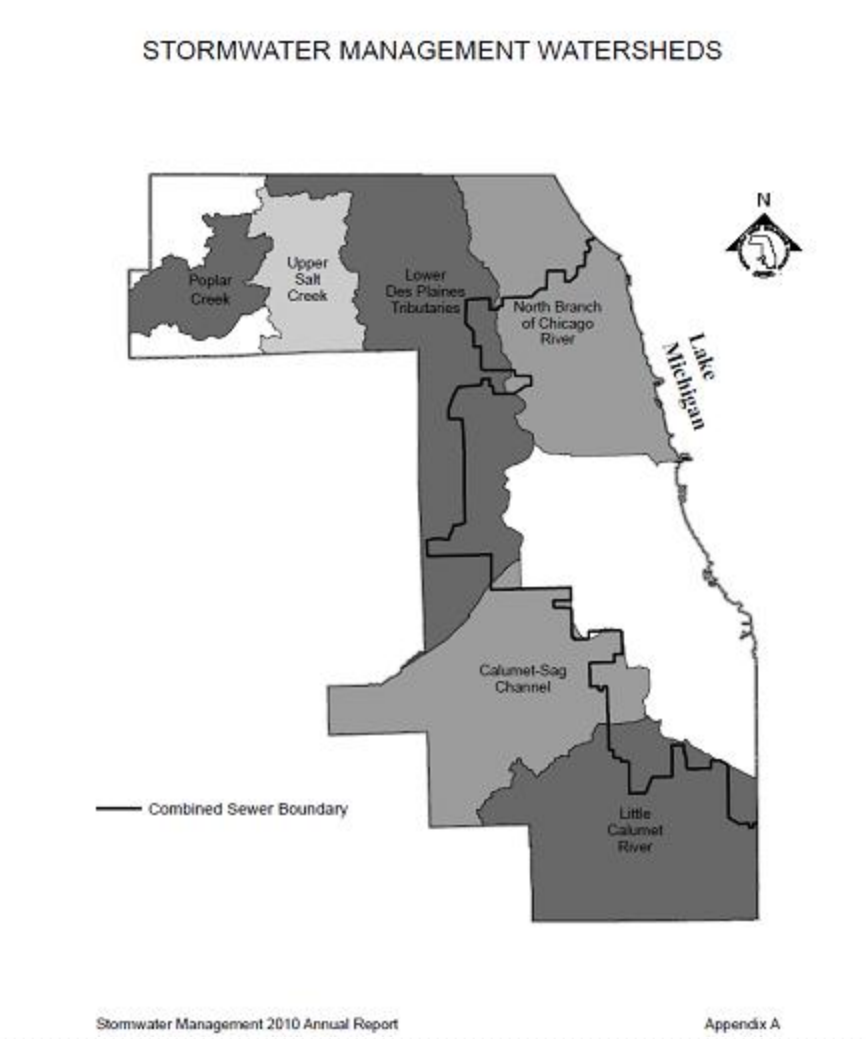
Team Members

- Bryan Tillman – MBA & MS Environmental Management and Sustainability - IIT
- Jessica O' Connell – Communication - UIC
- Lisa Nielsen – Environmental Engineering - IIT
- Rick Lightburn – Energy Engineering - UIC
- Kevin Gurtkowski – Masters of Urban Planning - UIC
- Ting Yuan – PhD in Physics - UIC
- **Jeff Wasil – Sustainability – Roosevelt University**

Chicago's Water Problem

- Much of the storm-water in the Chicago area flows into the sanitary sewers and treated as waste.
  - Combined sewers
  - Flooding
  - Sewer water leaves Great Lakes basin
- Growth of the population of the Chicago area is limited because of limits from Lake Michigan.

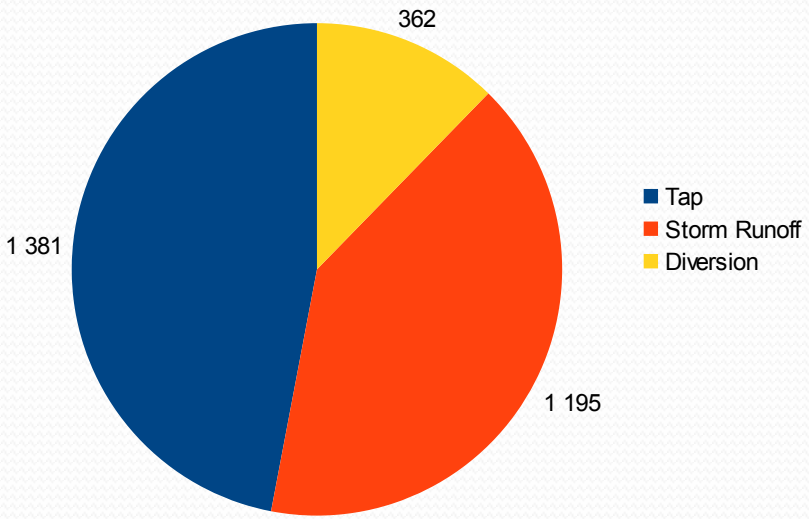
Chicago's Water Problem



- In combined sewer area, storm run-off goes directly *and suddenly* into sanitary sewer, causing it to back-up
- Sewer water enters CSSC leaves basin

Underlying Assumptions

- In 2007 ACE estimates that:
  - 326 billion gallons were taken from Lake Michigan for tap water
  - 282 billion gallons of storm runoff
  - 85 billion gallons was taken into the waterways through locks on Lake Michigan
- 1 cfs = 236 062 200 gallons



Attempted Solutions

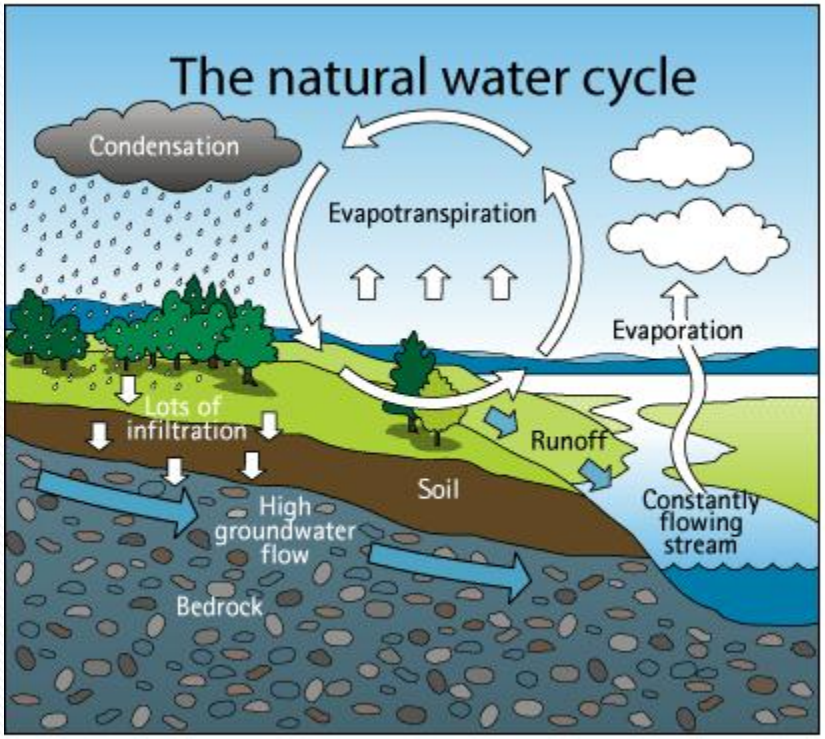
- Green roofs, bio-swales, and other best management practices
- Over 140 alleys have been replaced with porous material
- Rain blocker program (passive)
- Deep Tunnel Project (TARP)

Notes from Mentors

- How will this create jobs?
- Who will pay for this?
- Quantify the problem and potential solutions
- Think about maintenance issues
- **Focus on fewer solutions and dig deeper**
- **Are there any safety issues?**
- Potential nuances?
- What will it be like in winter?

Our Proposal

- Two part approach
  - Slow down and better uniformly control storm-water that needs to be treated
  - Divert Storm-water that does not need treatment
    - Put back into the lake or use as an asset
  - Harmony between technology and green infrastructure



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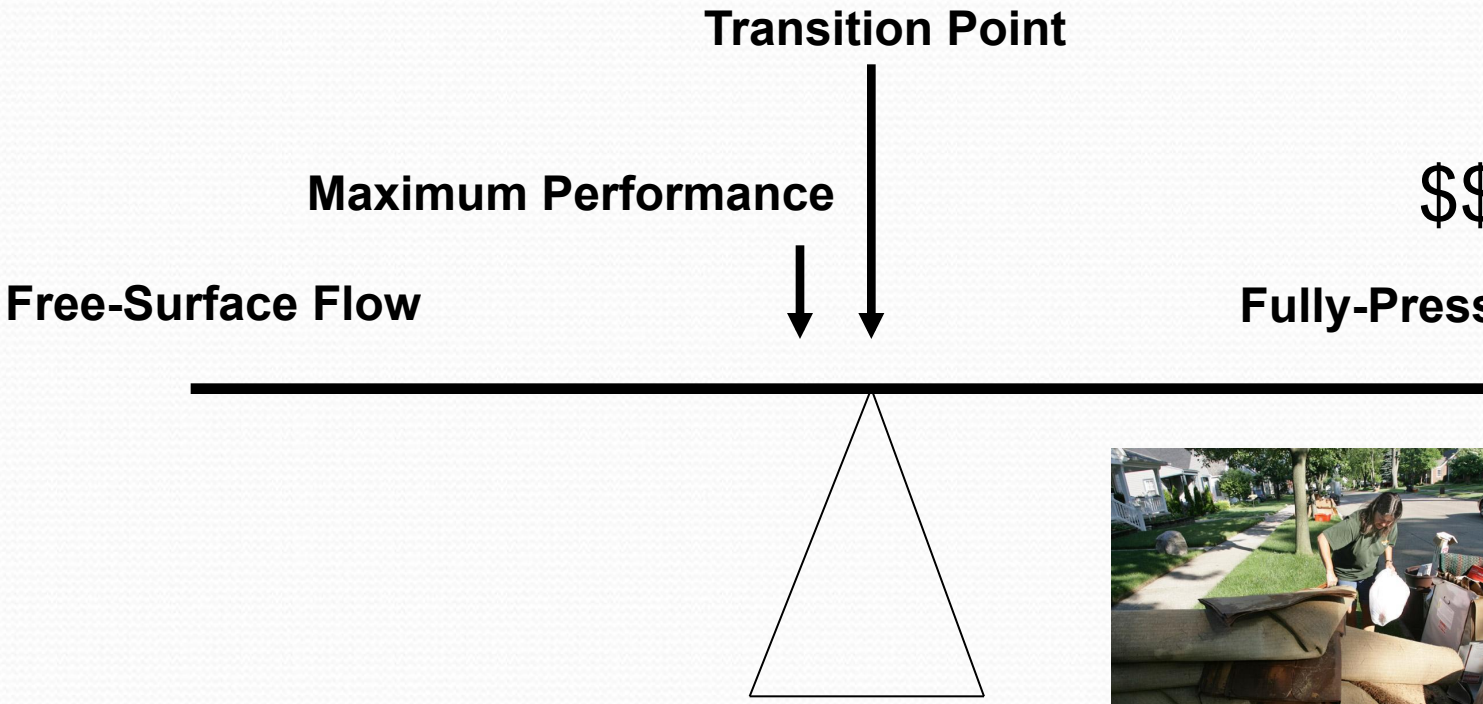
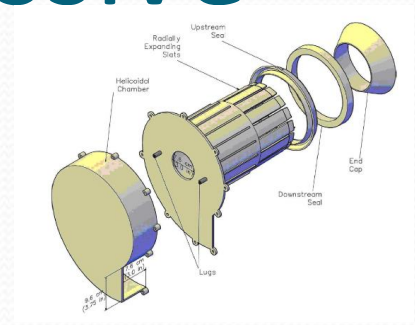
Sewer system control: A delicate balance

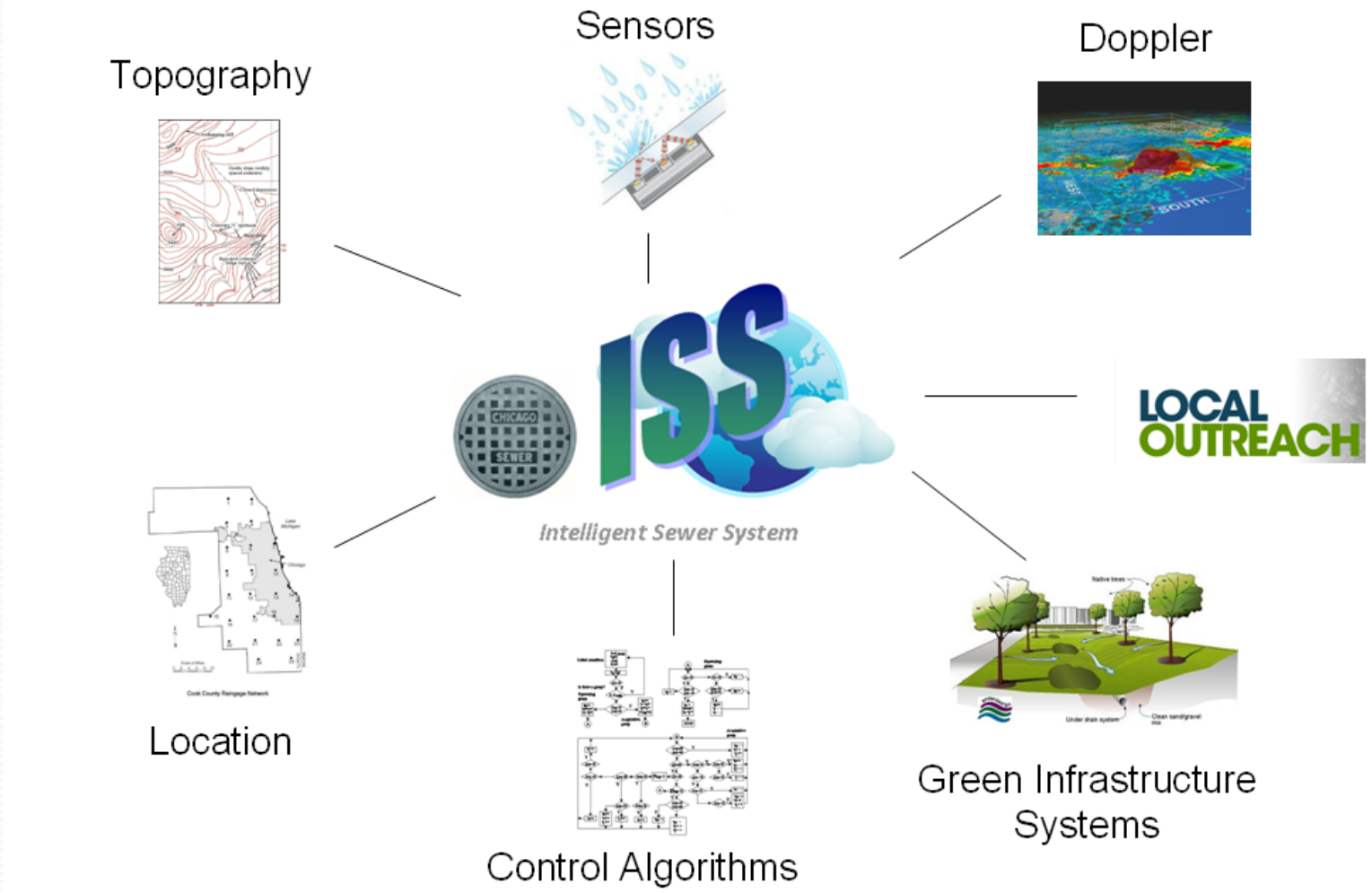


Rain-blocker Program (Passive System)

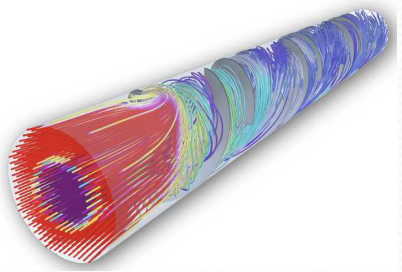


- One size fits all solution
- No adjustment for individual drainage needs
- No mandates enforced for disconnecting gutters from storm drains
  - Many homes were inundated with water over the curb and into the basement windows.
  - Other homes that consistently experienced basement flooding from surging (through sewer pipes) were okay after vortex-flow restrictors installed.
  - Several law suits issued against the City of Chicago

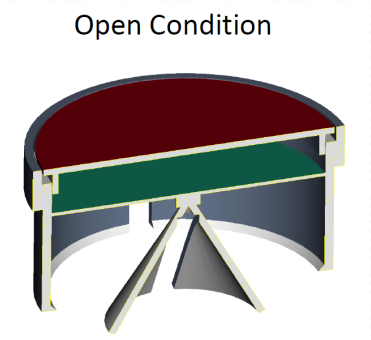
ISS System Overview:



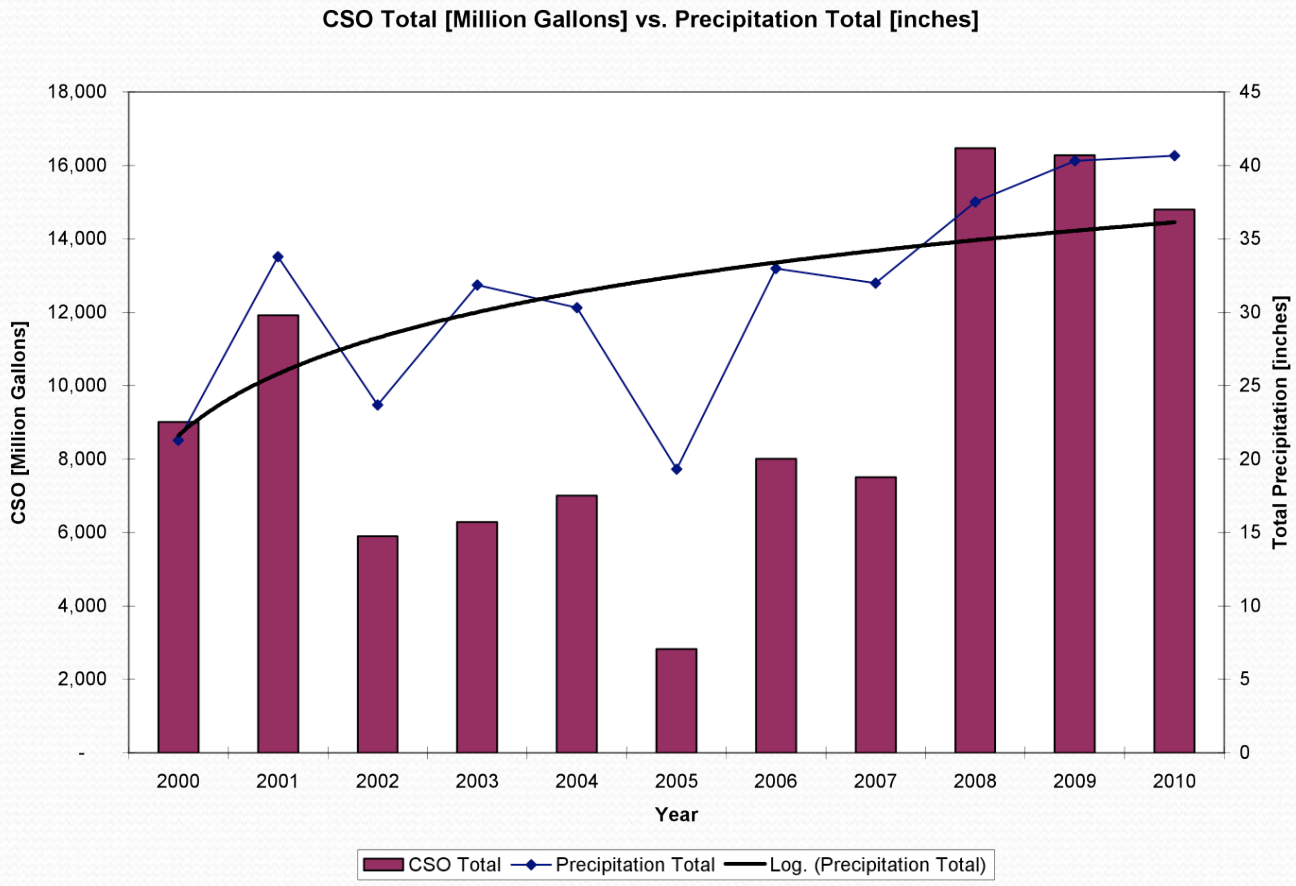
Benefits of Active System



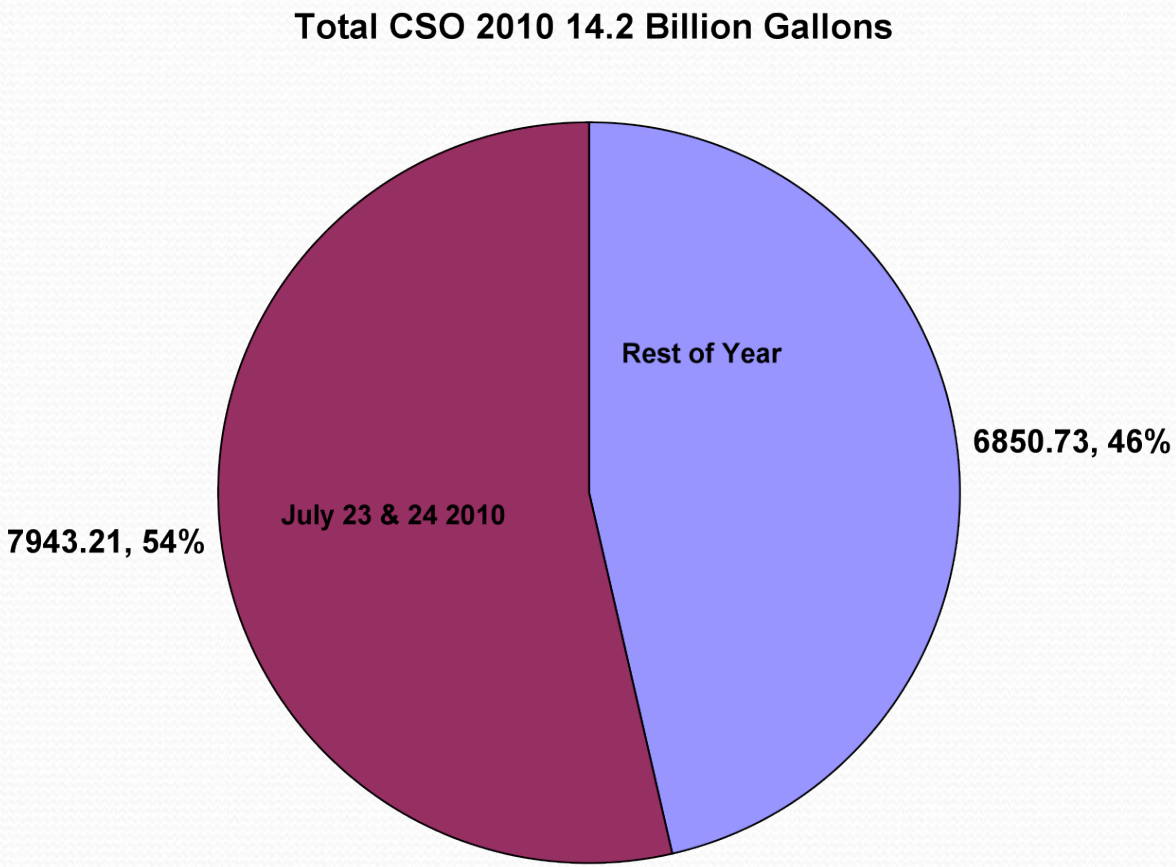
- Intelligent Sewer System (ISS)
  - Real time control of transient sewer flows (reduce fully pressurized flow surcharging)
  - Improve hydraulic performance
  - Together with CFD performance modeling, real-time Doppler, rain and curbing sensors, topography and green infrastructure, optimize control strategies to minimize CSO events
  - Active control of 20% / 80%



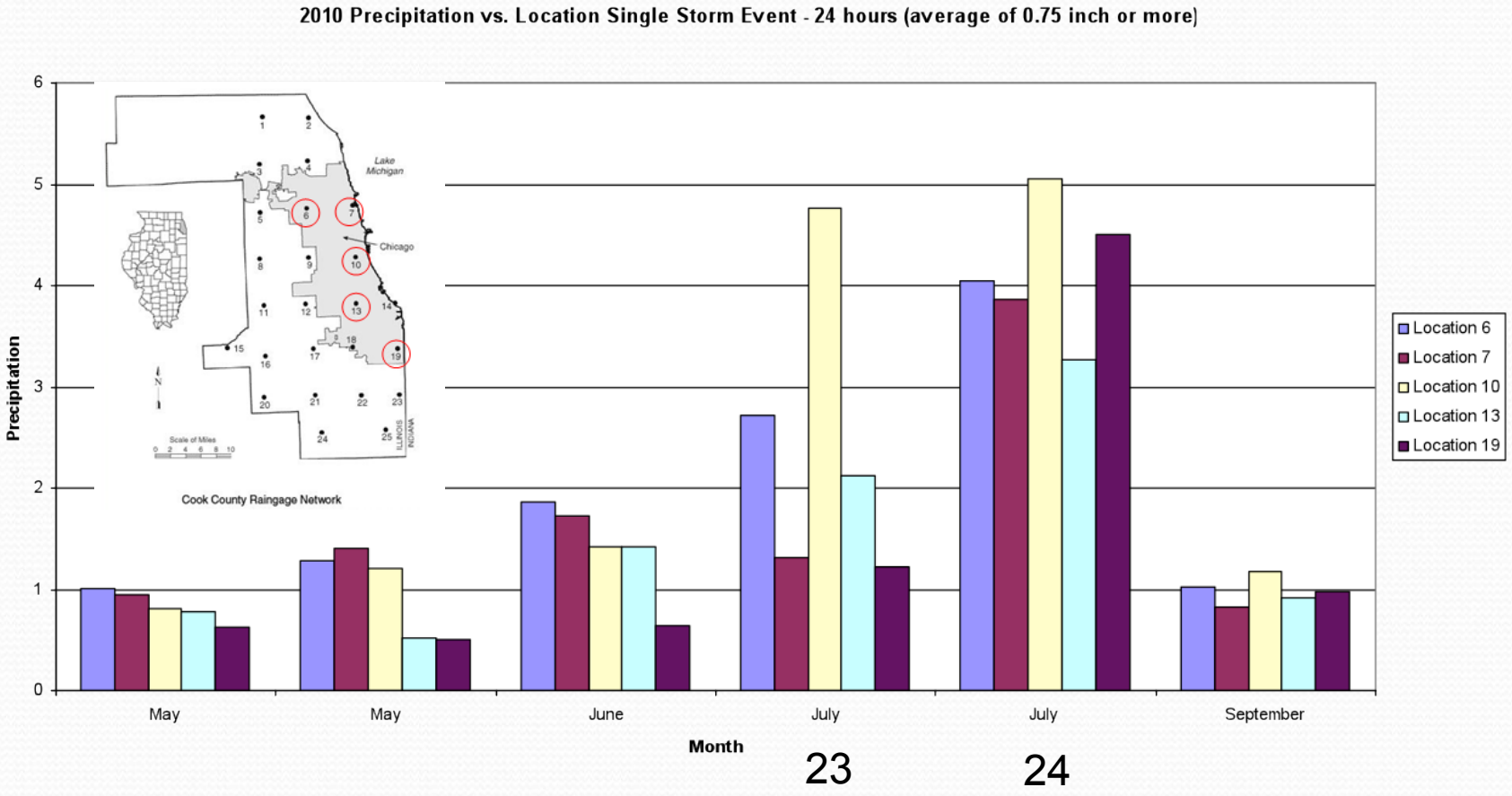
CSO Total per year



2010 Event percentage

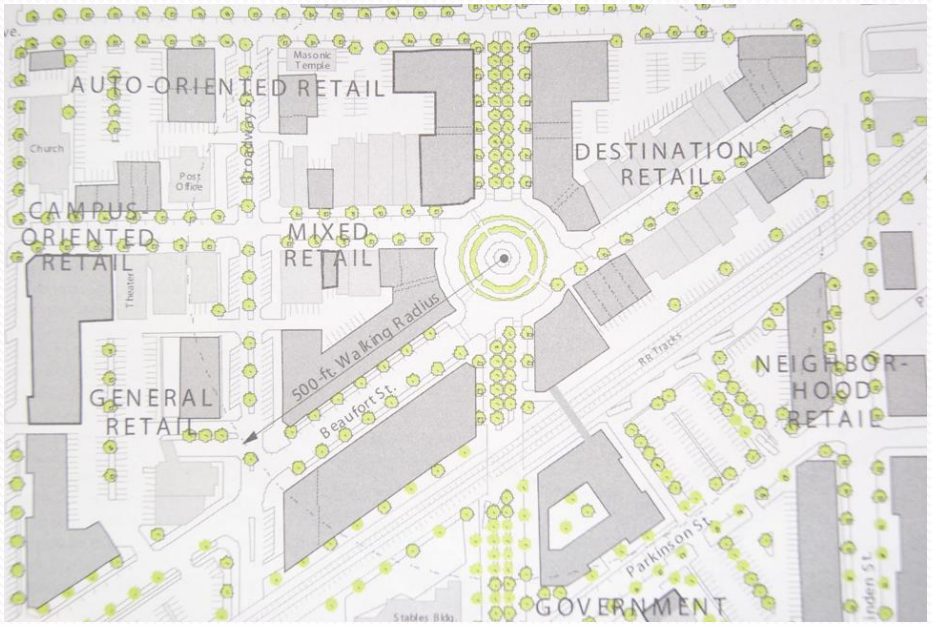


2010 Precipitation by Location (single storm event 24 hours)



Our Proposal

- Storm-water with no need to be treated
- We will put in bio-swales & retention barrels in 10% of the impermeable areas in Chicago
  - This will help keep storm-water runoff out of the combined sewage system
  - Chemical free water for plants



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Our Proposal

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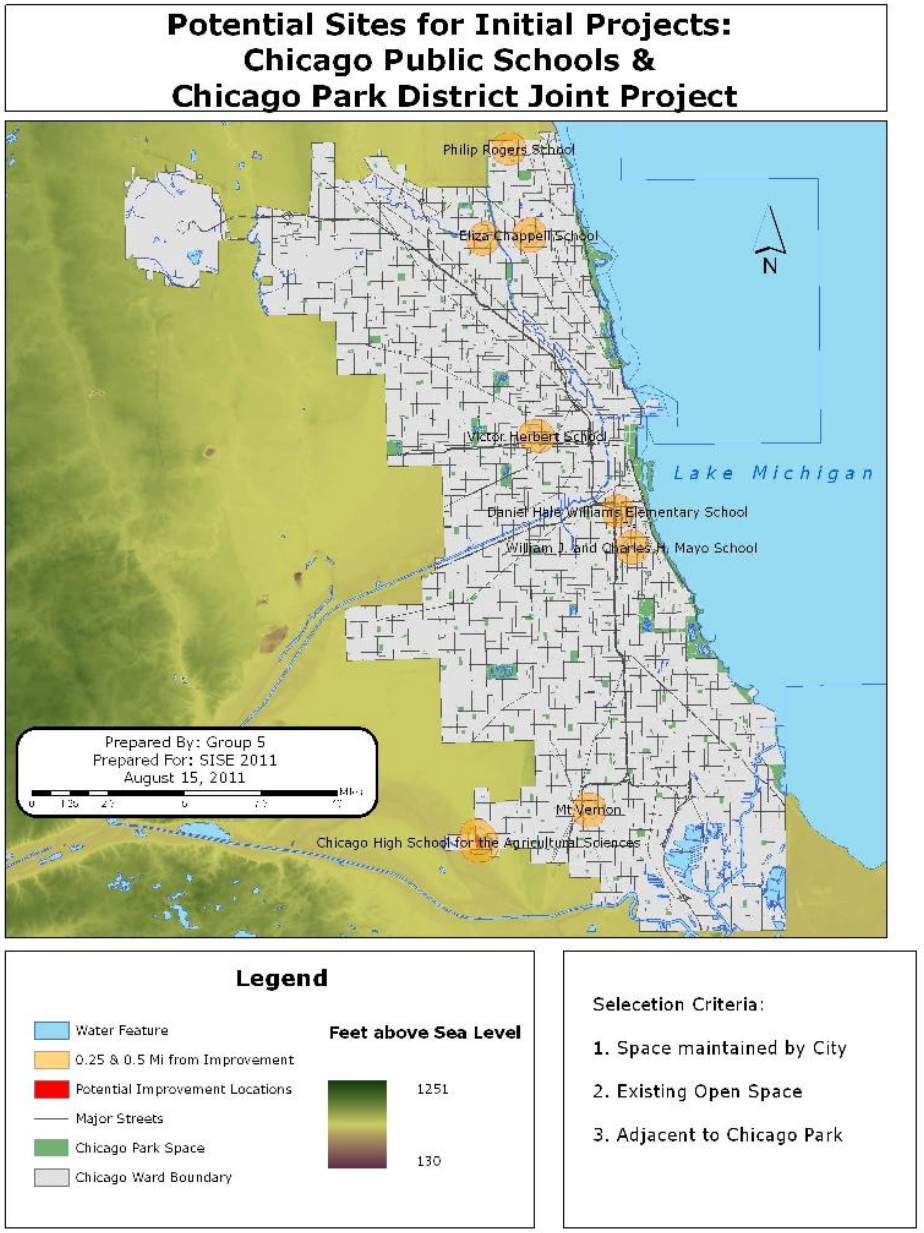
Our Proposal

- Site selection – policy
- Every neighborhood is different and a panel should take the lead on the best locations
  - Focus on alternative transportation routes
    - Colleges and universities
    - Chicago parks
  - Brown-fields
    - Site remediation
  - Streets with minimal traffic
    - Parking meters - internalize parking costs
    - Entire or partial street options

Our Proposal

GIS Selection Criteria:

1. Space maintained by City
2. Existing Open Space
3. Adjacent to Chicago Park



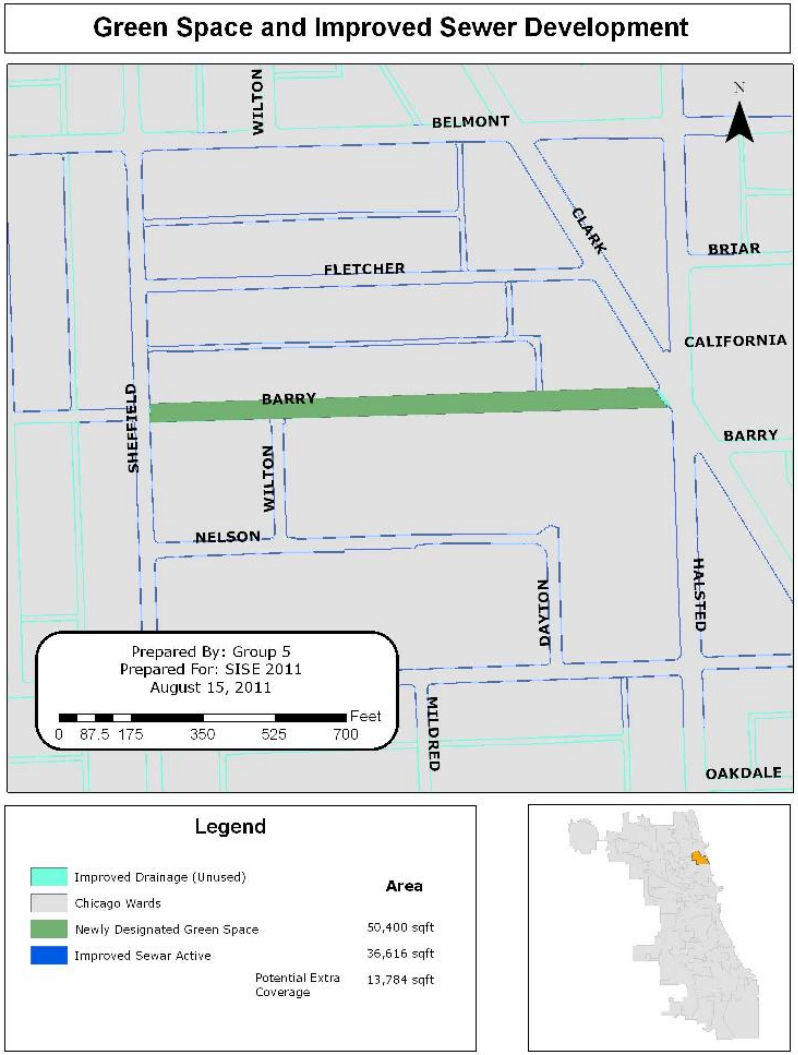
Our Proposal

Example Project Street:

Barry Ave west of Clark Street in the Lakeview neighborhood

Potential to increase storm water management capacity

Creates common open space in a densely populated neighborhood



Our Proposal

- Less parking – parking meters
  - Fewer cars on the road – less dependence on fossil fuels
  - Each car taken off the road keeps more money in the local economy
    - Automobile ownership costs $7,319 annually
    - CTA & I-GO members spend $2,520 annually
    - This keeps $4,800 in the local economy (plus a greater portion of the money spent at I-GO & CTA)
  - More alternative transportation - technology and entrepreneurship
    - Biking
    - Car sharing
    - Public transportation (off peak hours)
    - Bike sharing
    - Bike lockers

Our Proposal

- Our savings
  - Up to 28.2 billion gallons can be diverted from combined sewers (if 10% storm-water is diverted)
  - This could save the water treatment facility $12.4 million/year
    - $2 million/year saved on energy costs
    - $10.4 million/year saved fall under chemical use, solid disposal waste, and maintenance cost
  - Up to 21.6 billion gallons will make its way back to Lake Michigan (about 80% of water collected by bio-swales)

Our Proposal

- Reduce polluted storm-water from entering river
- Improved pedestrian and bicycle safety and opportunities for individuals to exercise
- Reduce basement flooding & sewer backups
- Recharge water inflows into the lake
- Reduce lake water consumption
- Increase urban green space
- Improve air quality & reduce urban heat island effect
- Water collection for urban farms
- Decreased congestion

Our Proposal

- Community engagement
  - Work with local area schools to decorate the eco-paths
  - Parks unite communities
  - Community centric themes and parks

Barriers associated with our proposal

- Development and deployment of ISS
- Green Belt
  - Community acceptance
    - Resistance to fewer parking spaces
  - Coordination with alterative transportation providers
  - Politics
- Cost

RL

Next steps

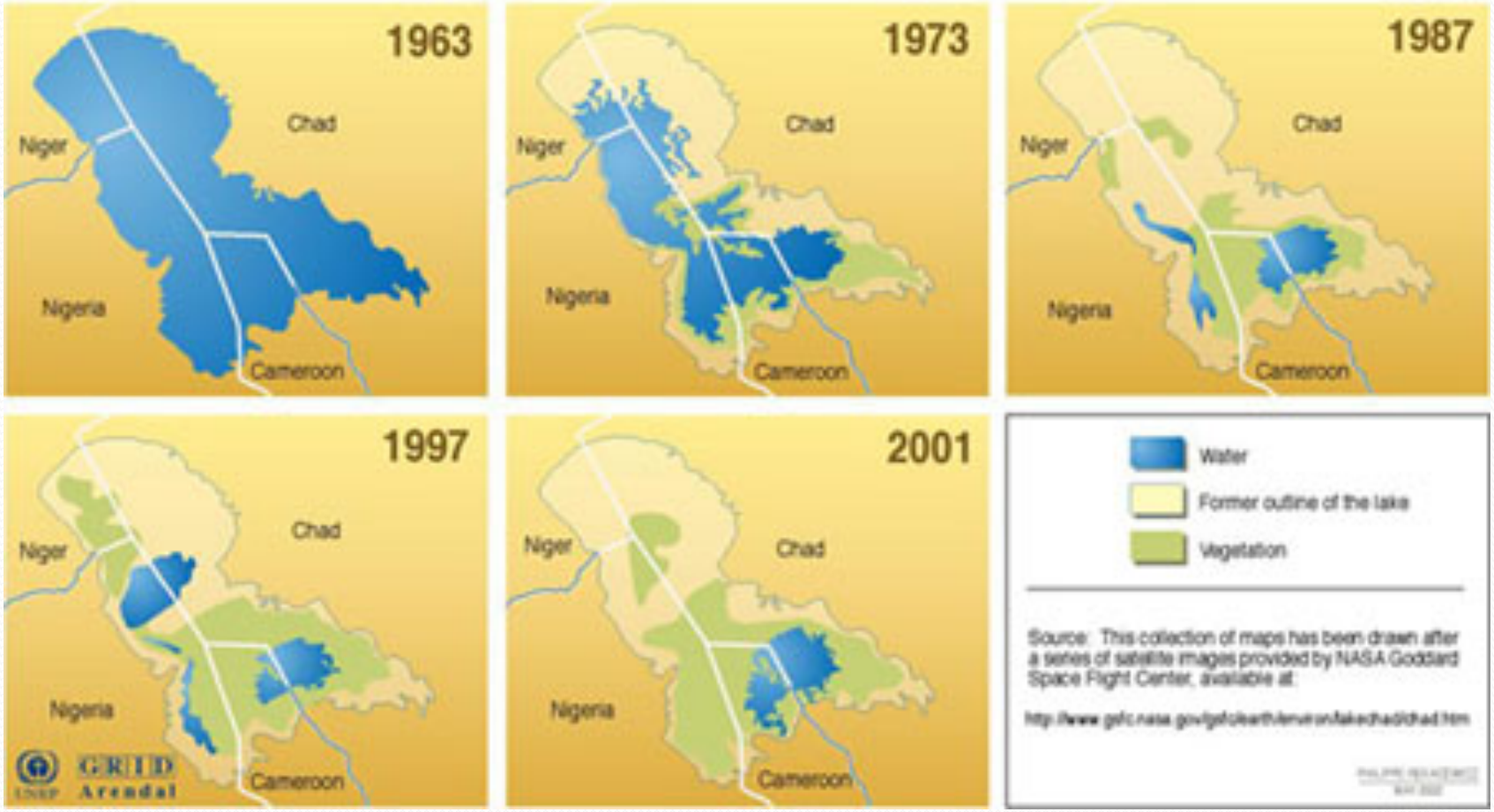
- Build and deploy Intelligent Sewer System prototype
- Green Belt
  - Select pilot location
  - Design pilot Green Belt
  - Get community input
  - Bid out pilot project
  - Coordinate with Partners

Summary

- Reduce combined sewer overflows by approximately 28% utilizing the solutions presented
- Approximately $12.4 million saved per year in water treatment
- Improved transportation diversity
- Improved community quality of life
- Provide additional water for future growth
- First step toward more sustained water management

Closing Remarks

Closing Remarks



Questions