Geosyntec consultants

Innovative Urban Stormwater Management

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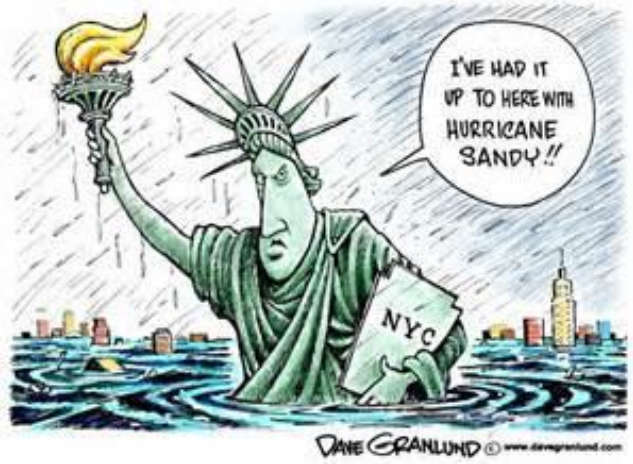
Stormwater Management Has Evolved

Figure 5-9: BMPs incorporated into a wide sidewalk (modified from San Mateo 2009)

- Management techniques
- Drivers
- Public perception



Where has this led us?

- The public expects more
  - They are well informed and engaged
  - They are viewed as customers

- We (as professionals) are challenged to provide more
  - ❑ Holistic solutions (multi beneficial)
  - ❑ Integrated planning (inter agency & department)
  - ❑ Public & stakeholder engagement
  - ❑ Prioritization tools and transparent framework
  - ❑ Optimize budget and resources
  - ❑ Change management / adaptive management
  - ❑ Innovative approaches

Buzz words or Key Elements of Success?

St. Peters, MO

Implementing Comprehensive Urban Stormwater Management

St. Peters, MO

- The community
  - 28 Miles West of St. Louis
  - Population of 57,000
  - MS4 Community
- The program
  - Spending ~$3M annually
  - Combination of public and private ownership
  - Easements placed over all retrofits
  - 100% maintained by City
- The Elements of Success
  - Improvements & retrofits based on prioritized master plan (but room for adaptation)
  - Built trust among the public
  - City progressed through a mixture of locations (public & private)
  - Balanced public engagement

Typical Existing Detention Basins

Concrete low flow channels

Existing Outfall

Concrete reinforced banks

Typical Existing Detention Basins (recently constructed)

Existing Outfall

Concrete low flow channels

Post Construction (1st yr)

Post Construction (2nd yr)

Typical Existing Detention Basins

Concrete low flow channels

Existing Outfall

Post Construction

Key Elements of Success – Basin Retrofits

✓ Holistic Solutions

- Clear design objectives
  - Water quality
  - Flood mitigation
  - Aesthetics
- Flexibility in design
  - Highly interactive design process with staff
  - Transparency of challenges

✓ Public Engagement

- Proactively educate & engage residents
- Identify the leaders & interested parties
- Set limits & expectations

- ❑ Holistic solutions (multi beneficial)
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Channel stabilization & corridor restoration

Existing Condition

Post Construction

Calwood Channel

Understanding the history for:

Engineers & Public

2/1990

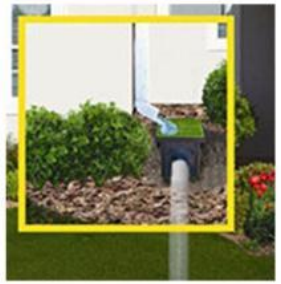
3/1996

3/2002

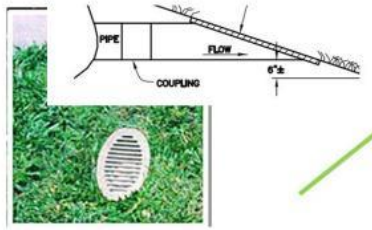
Post Construction (< 1yr)

Pre Construction

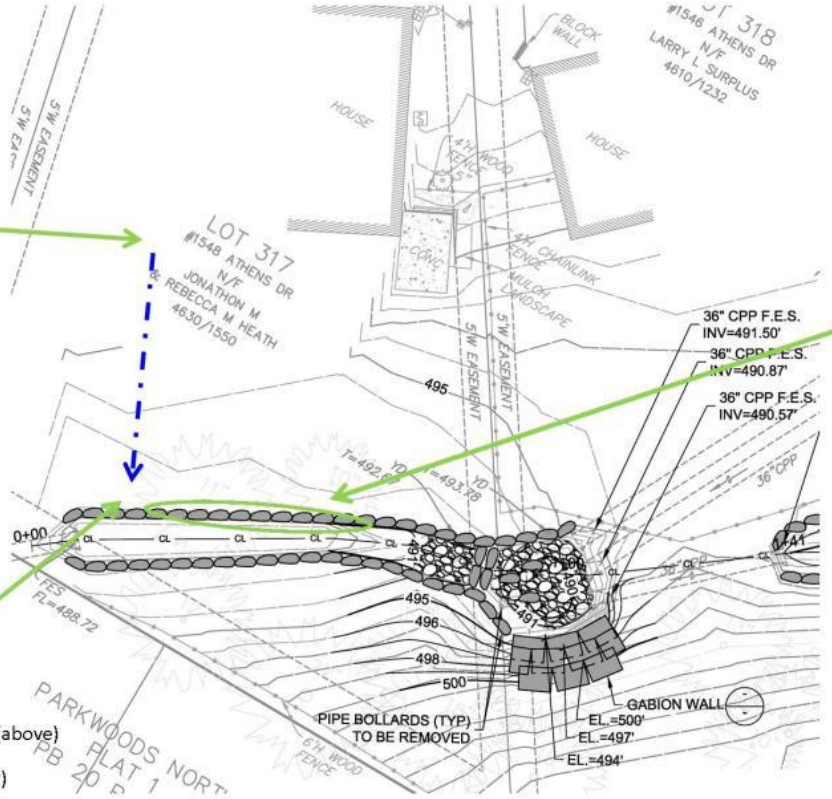
Created Tailored Poster Boards for “trouble” sites & lots



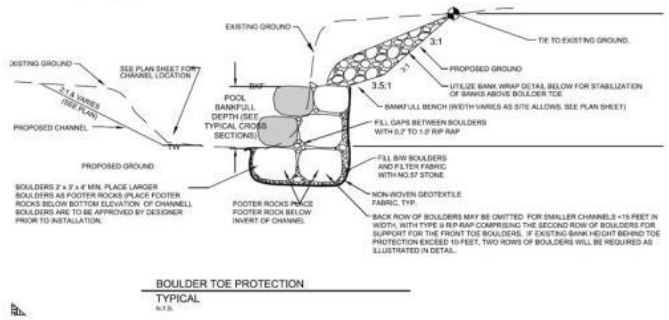
Tie downspouts to drain inlet and drain pipe



Drain pipe outfall can be miter drain at slope (above)
OR
Pop up drain at edge of channel buffer (below)



Channel bank would be stabilized with stone boulder toe protection with native buffer



BOULDER TOE PROTECTION
TYPICAL

Key Elements of Success – Stream Channels

- ✓ Public Engagement
  - Listen: Identify concerns (perceived or real)
  - Manage expectations
    - What is a “natural system”
    - Tree removal, plantings, & armoring
    - Construction process

- ✓ Integrated planning (inter-department coordination)
  - Engineering, construction, & maintenance teams
  - Facilitated by city (not consultant)

- ❑ Holistic solutions (multi beneficial)
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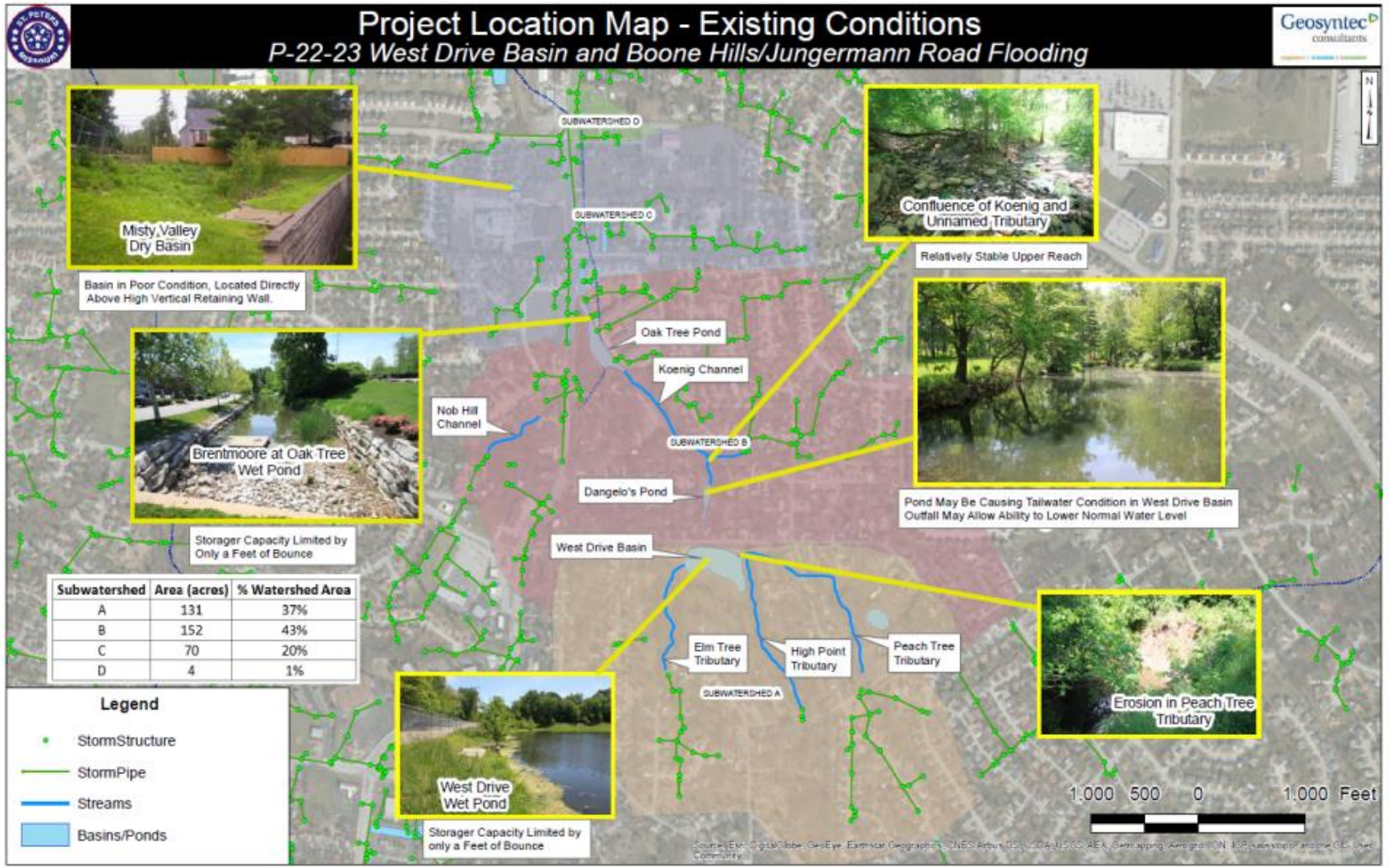
Stormwater Management – Planning, Design, & Implementation

- 356 Acre urban watershed
- Complete re-envisioning of solutions
  - Leveraged existing assets
  - Floodplain enhancement
  - Tunnel repair
  - Storm sewer improvements
  - Channel restoration
  - Basin modifications



Elements of Success – Planning, Design, & Implementation

- ✓ Adaptive Management
  - Openness to new ideas, approaches, & solutions
  - Adaptability of strategic plan
  - Ownership of process by City staff

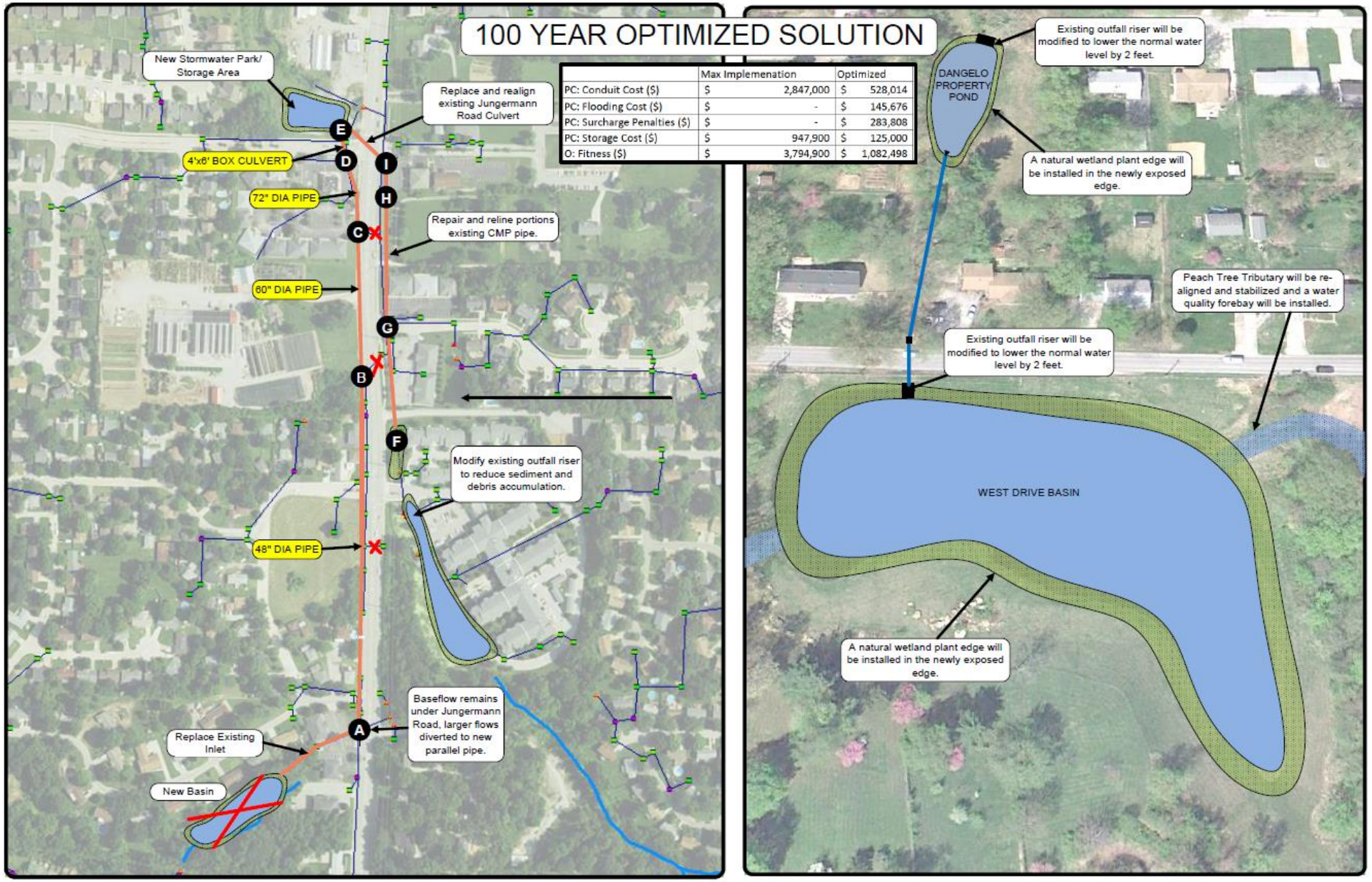
- ✓ Innovative approaches
  - Leverage technology

Optimatics
PLAN SMARTER

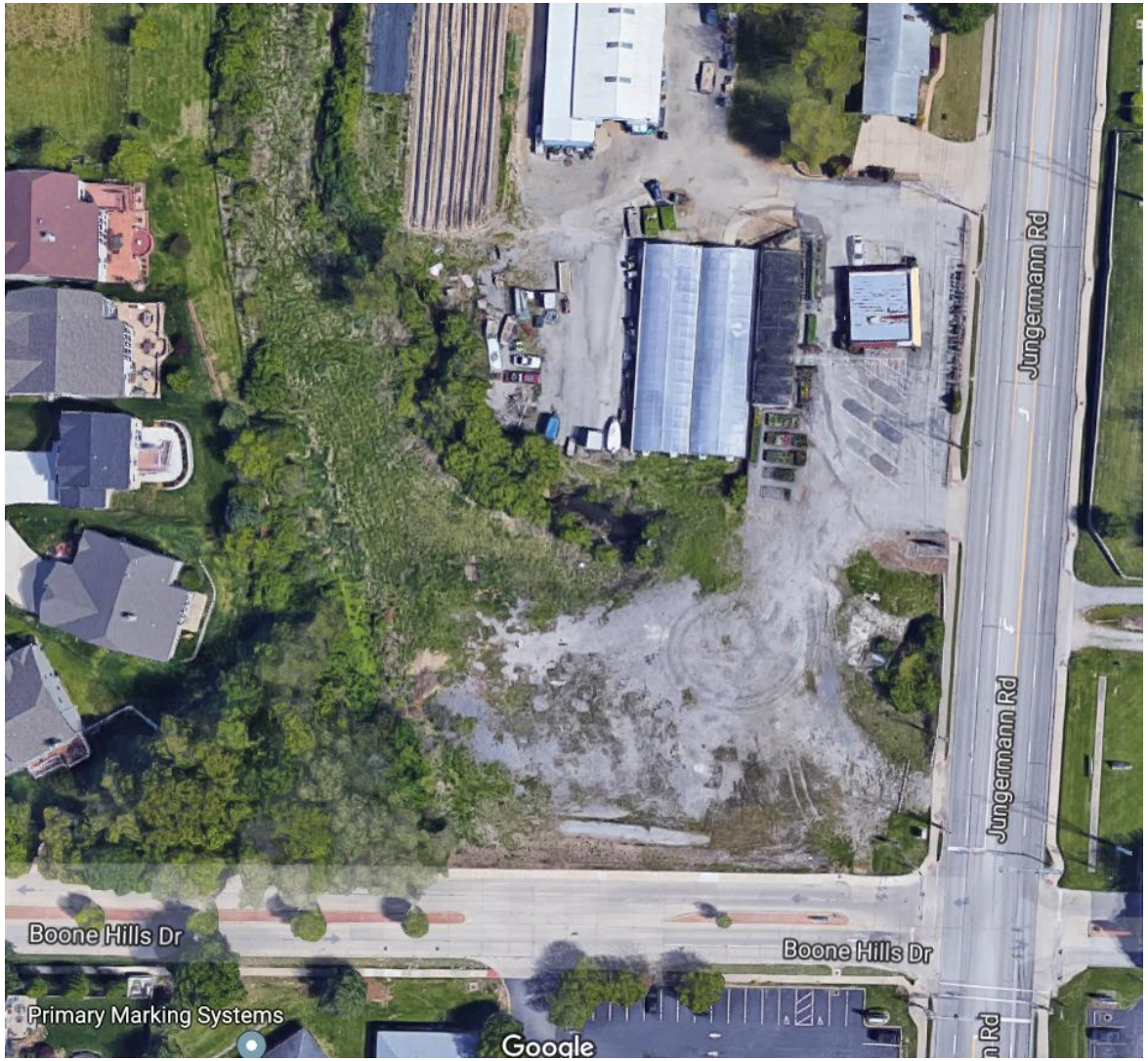
- ✓ Optimize budget & resources
  - Alternative analysis (50,000+ alternatives)

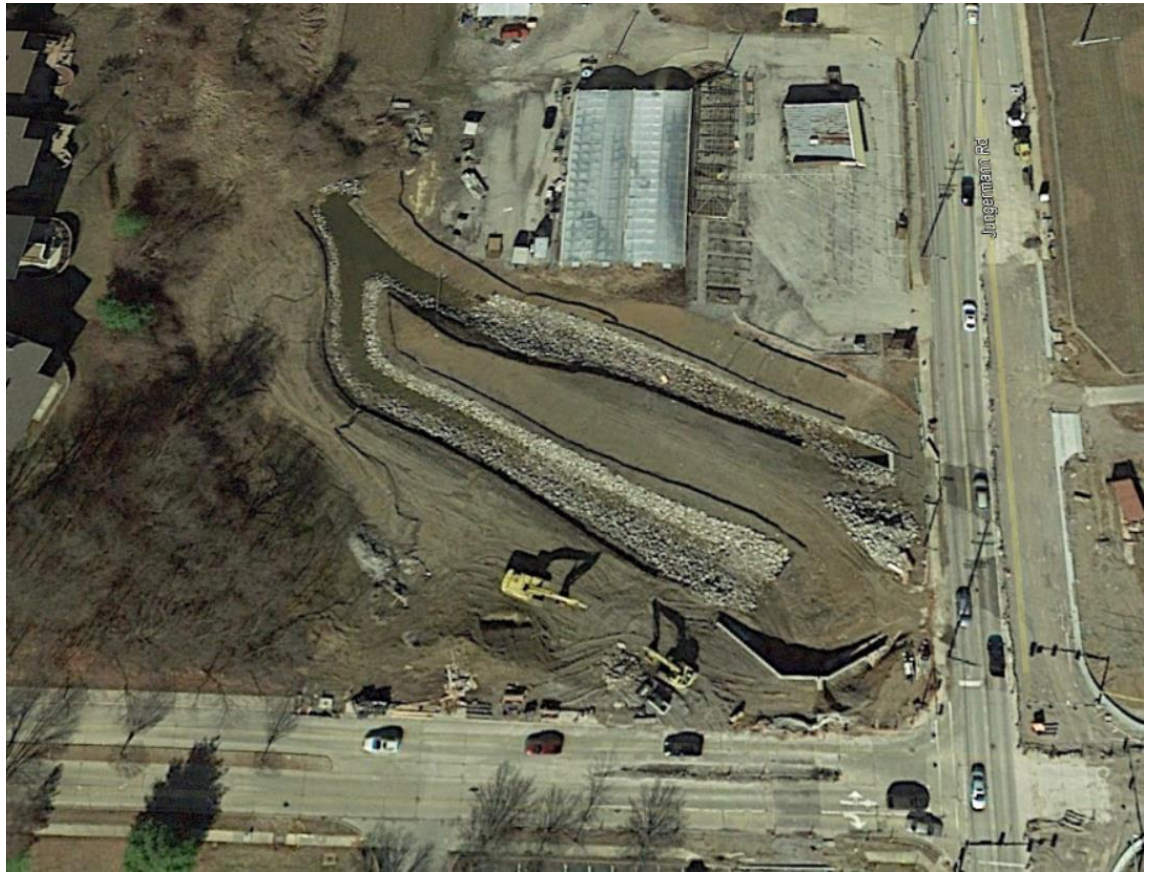
Traditional vs Optimized

Integrated Solutions (public & private)



City purchased land for Stormwater Park





Pre Construction

Post Construction <1yr

RISE:NYC

New York, NY

Resiliency Audits, Planning, and Response

Resiliency Audits, Planning, and Response

- Purpose:
  - Enhance resiliency through response planning
  - Identify potential flood risk and flood vulnerabilities
  - Leveraged technology for advanced warning system: Real-time estimates of flooding risk
- Result:
  - Empowers owners & heightens overall community awareness

RISE:NYC
Resiliency Innovations for a Stronger Economy

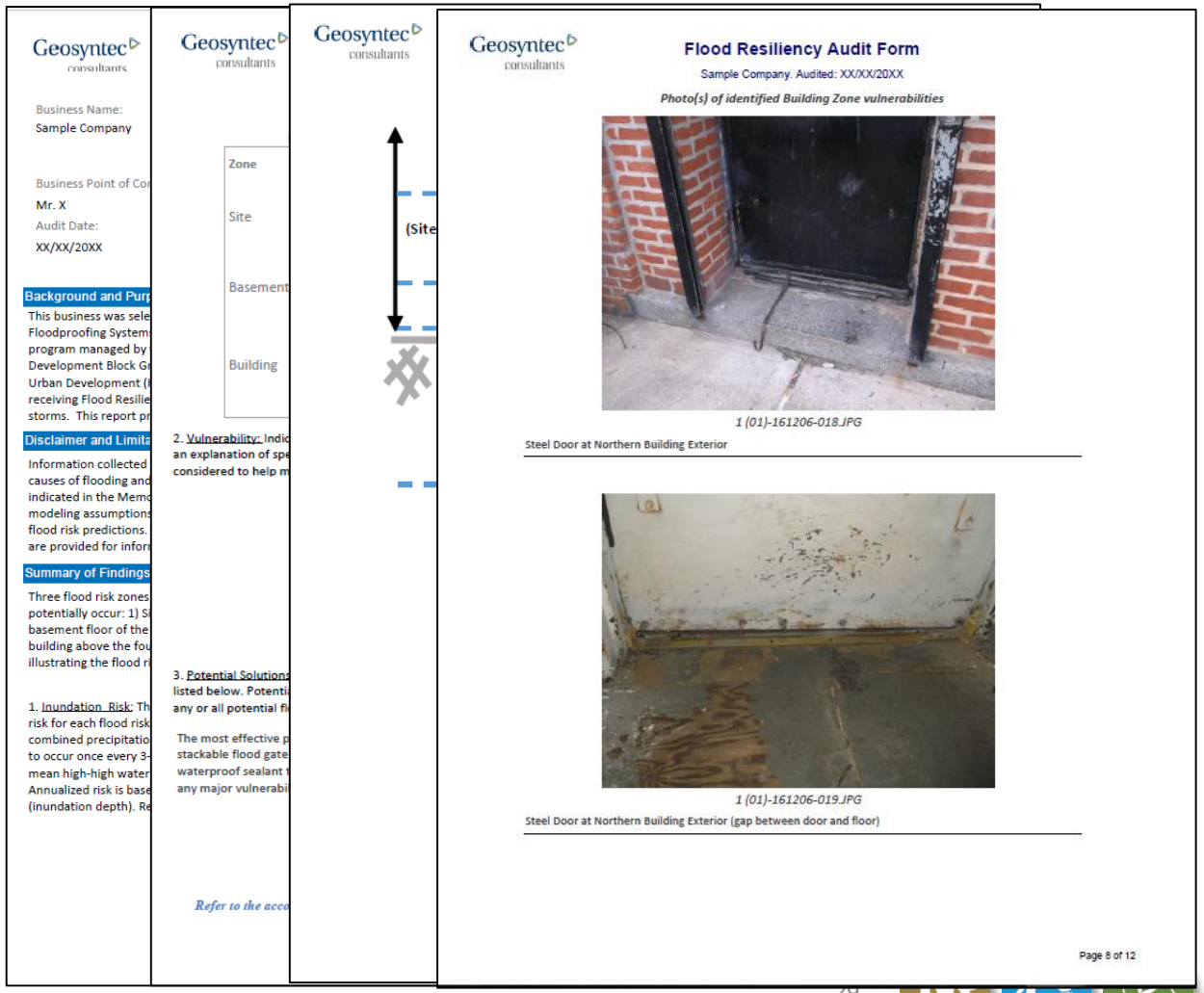
Superstorm Sandy business recovery program managed by NYC EDC

Assessing Exterior Vulnerabilities

Data-Driven Reports & Recommendations

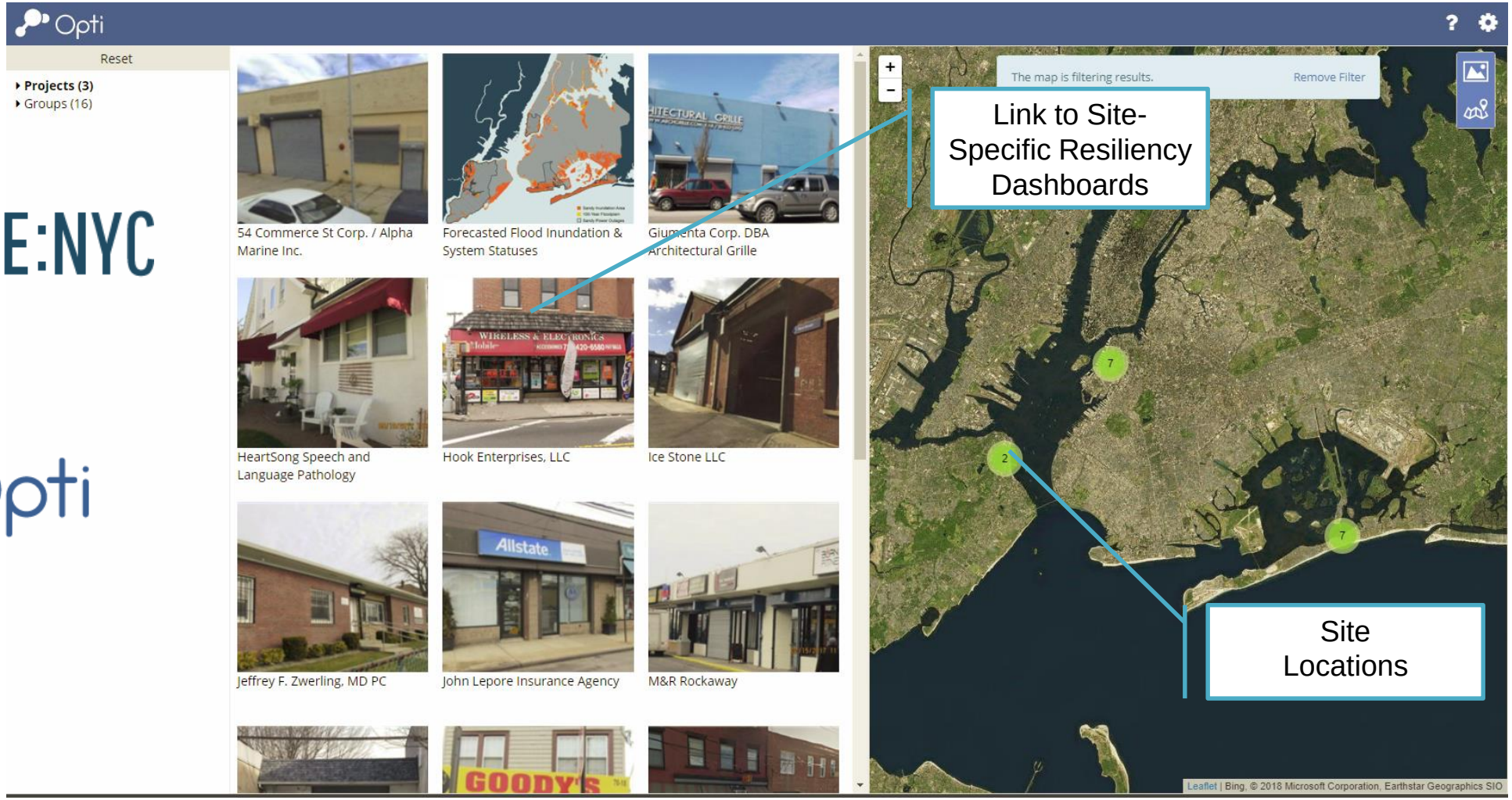
- Location Specific Resiliency Assessments
  - Engage, inform, & empower owners
- Data Collection via. Web-Based Forms
- Auto Generated Reports
  - Modeling Results & Expected Risk
  - Identified Vulnerabilities
  - Recommendations & Fact Sheets

Floodproofing Fact Sheets



Accompanying Fact Sheets

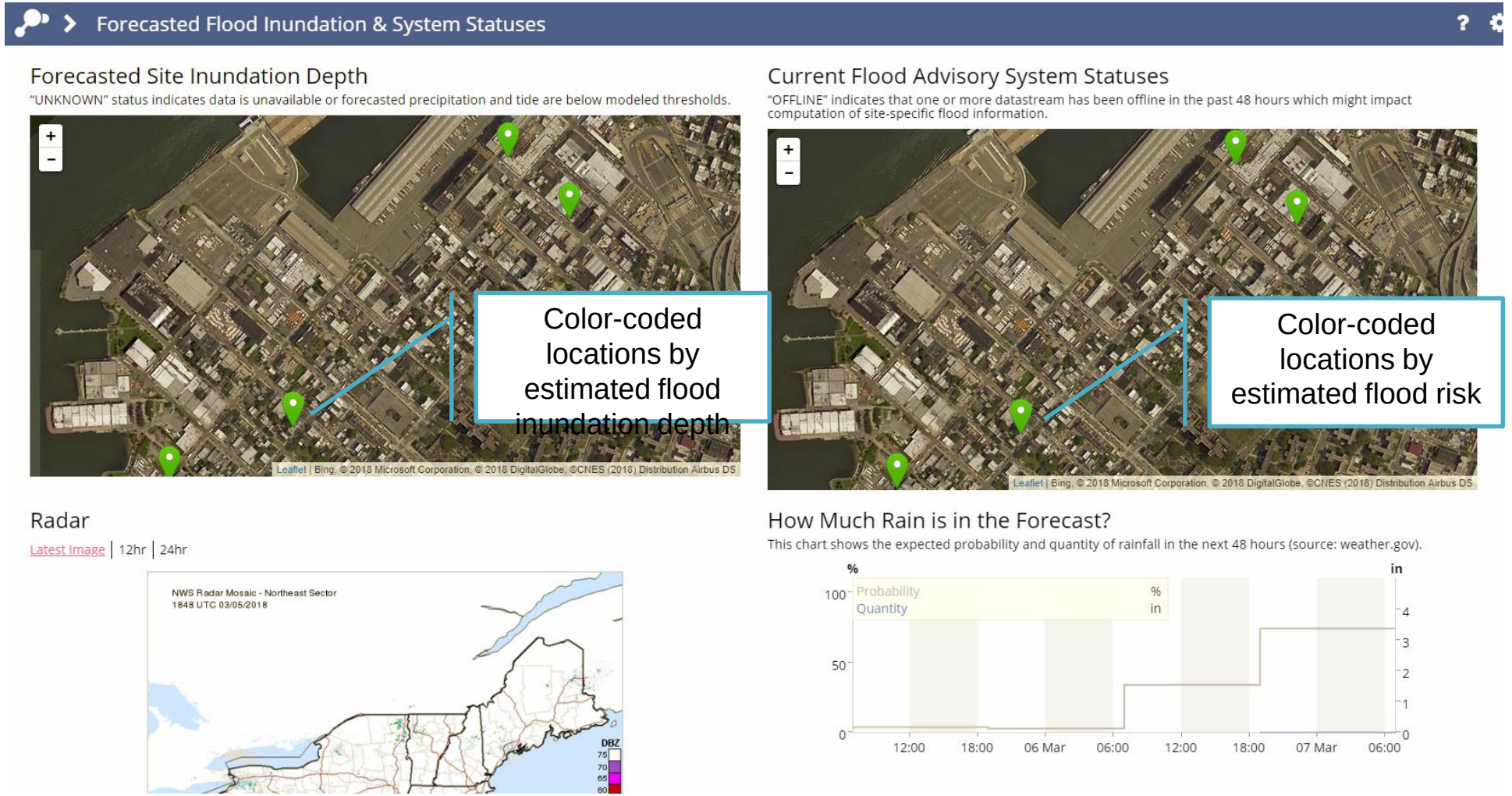
Flood Resiliency Dashboards - Response



RISE:NYC

Opti

Resiliency Dashboards



Elements of Success

- ✓ Innovative Approaches
  - Openness of NYC to leverage technology & new approach
- ✓ Public & Stakeholder Engagement
  - Willingness to engage stakeholders in innovative pilot
- ✓ Optimize Budget & Resources
  - Resiliency through response planning
  - Empowerment of residents

- ❑ Holistic solutions (multi beneficial)
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Distributed BMPs
The case for lot level BMPs

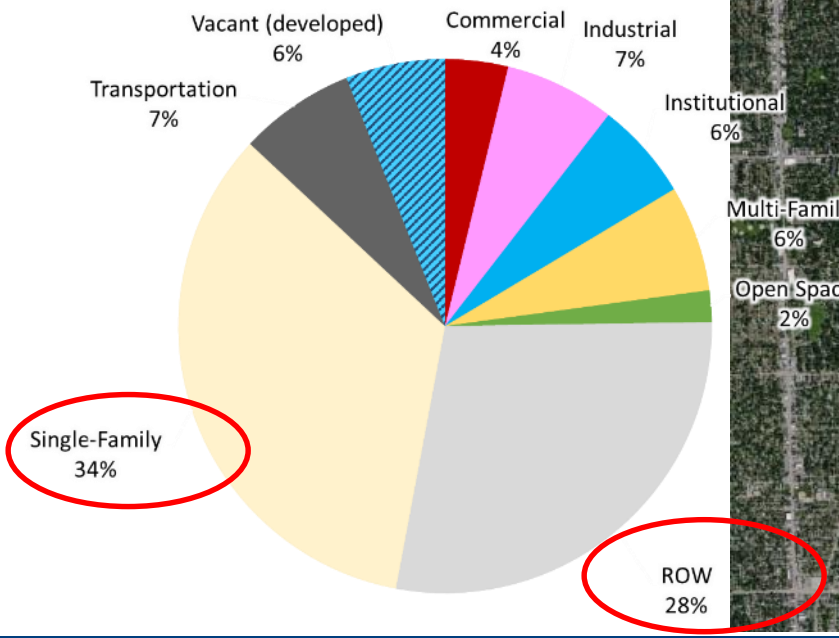
Metropolitan Water Reclamation District of Greater Chicago

Phase II Pilot Study

Geosyntec consultants

Study Area

- 17 square miles
- 44,053 structures (excludes garages)
- Chronic urban flooding
  - Basement backups
  - Surface flooding



Looking for Solutions

- Balance **system engineering** & **outcome engineering**:
  - System – target level of performance of network (the system)
  - Outcome – focuses on desired outcome (protect homes)

- Flooding solutions balance:
  - Conveyance
  - Volume
  - Structural flood protection

system

outcome

- Ensure the question being asked is framed properly

The Big Question: Will BMPs Work?

These are a few follow on questions that should be answered before jumping to the question of how to implement lot level BMPs.

- What level of performance can be expected from BMPs?
- How to quantify performance? How well does it work?
- Does it matter where GI or distributed BMPs are placed?
- Is there a critical mass or threshold of implementation that is needed?
- How can the best location and type of BMP be determined?
- How to compare Green vs Gray vs other solutions?

Results & Findings

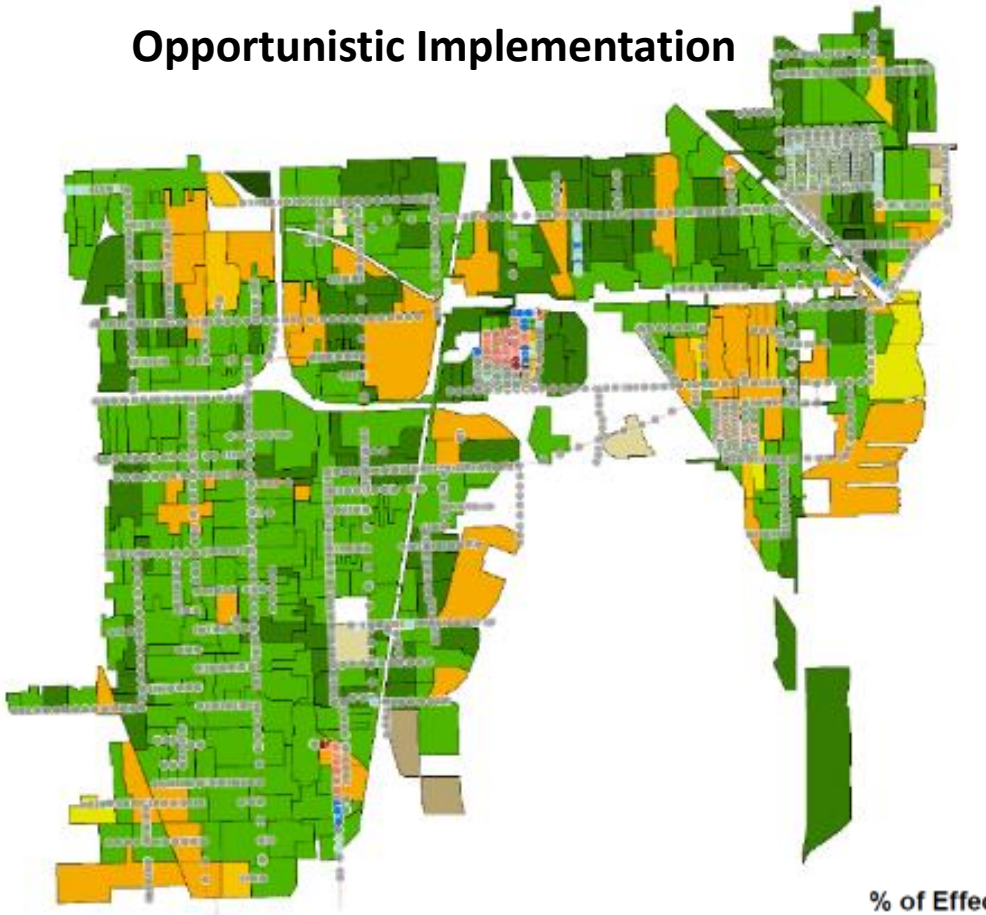
- Explicit modeling of GI in combined sewer model is achievable
  - Provides like-to-like comparison of green and gray
  - Avoids “proxy” modeling of GI
  - Demonstrated integral dependence of green & gray performance

- Optimization protocol demonstrated unique distribution of GI performance
  - Intelligent distribution results in significant implementation cost reduction

Integration of GI with Regional Gray – 100 yr

Maximum GI

Opportunistic Implementation



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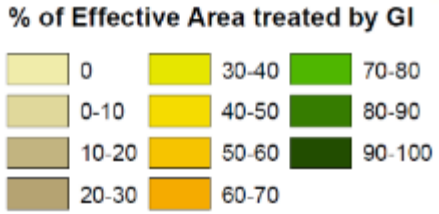
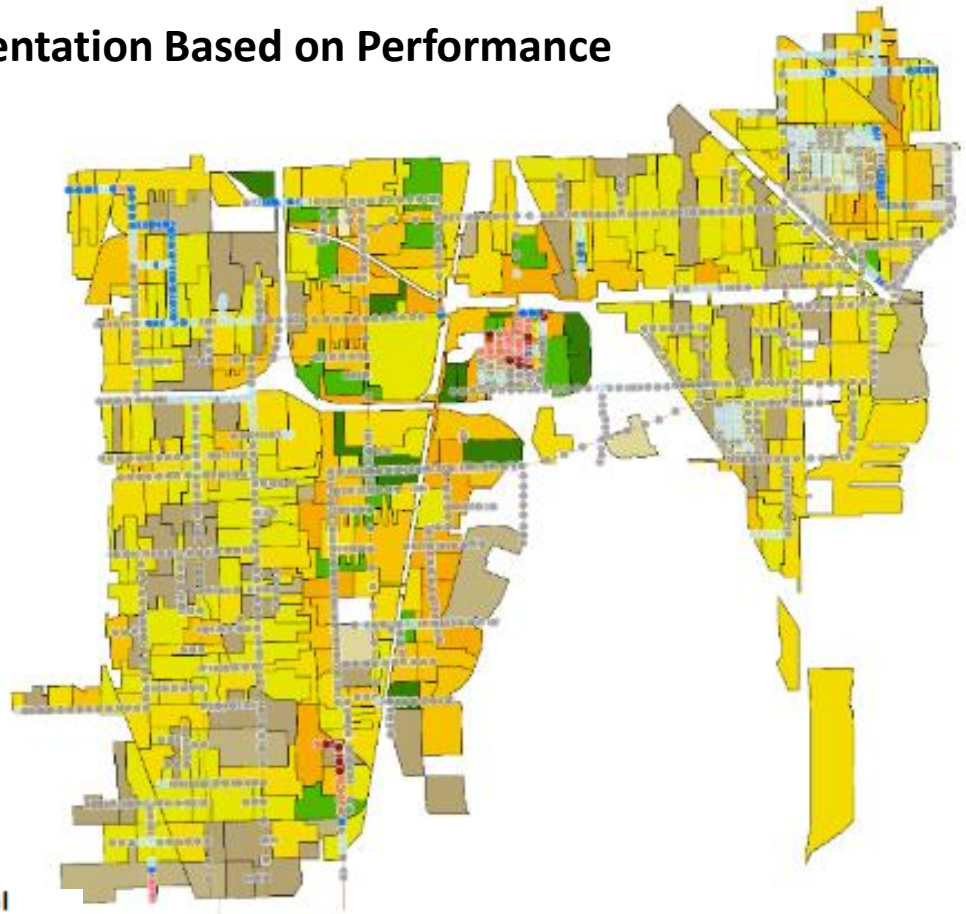


Optimized GI

Implementation Based on Performance



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Elements Leading to Success

- ✓ Innovative Approaches
  - Openness of MWRDGC to leverage technology
- ✓ Prioritization Tools & Transparent Framework
  - Ownership & engagement of MWRDGC staff
- ✓ Optimize Budget & Resources
  - Robust alternative analysis
- ✓ Integrated Planning
  - MWRDGC & City collaboration

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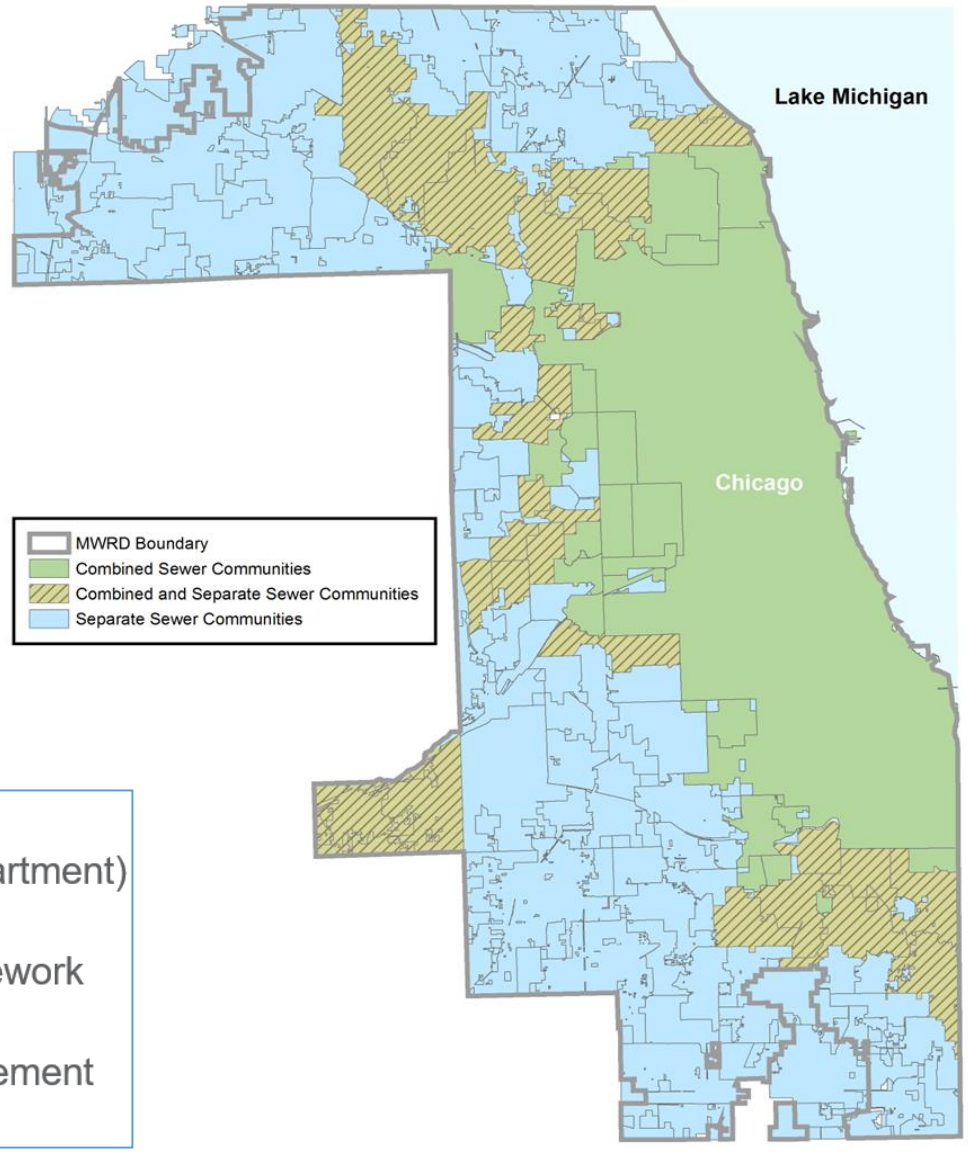
Future Stormwater Master Plans (SMP)

- Richard Fisher (MWRDGC) Presented Overview at Prior MPC Meeting
- Moving Forward:
  - Evaluate master planning needs throughout county
  - Develop adaptive approach, centered on managing local stormwater issues with multiple-disciplined teams
  - Leverage and build upon work of others
  - Develop a repeatable process
  - Create actionable plans



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Questions?

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