

Stormwater Management in Multiple Dimensions

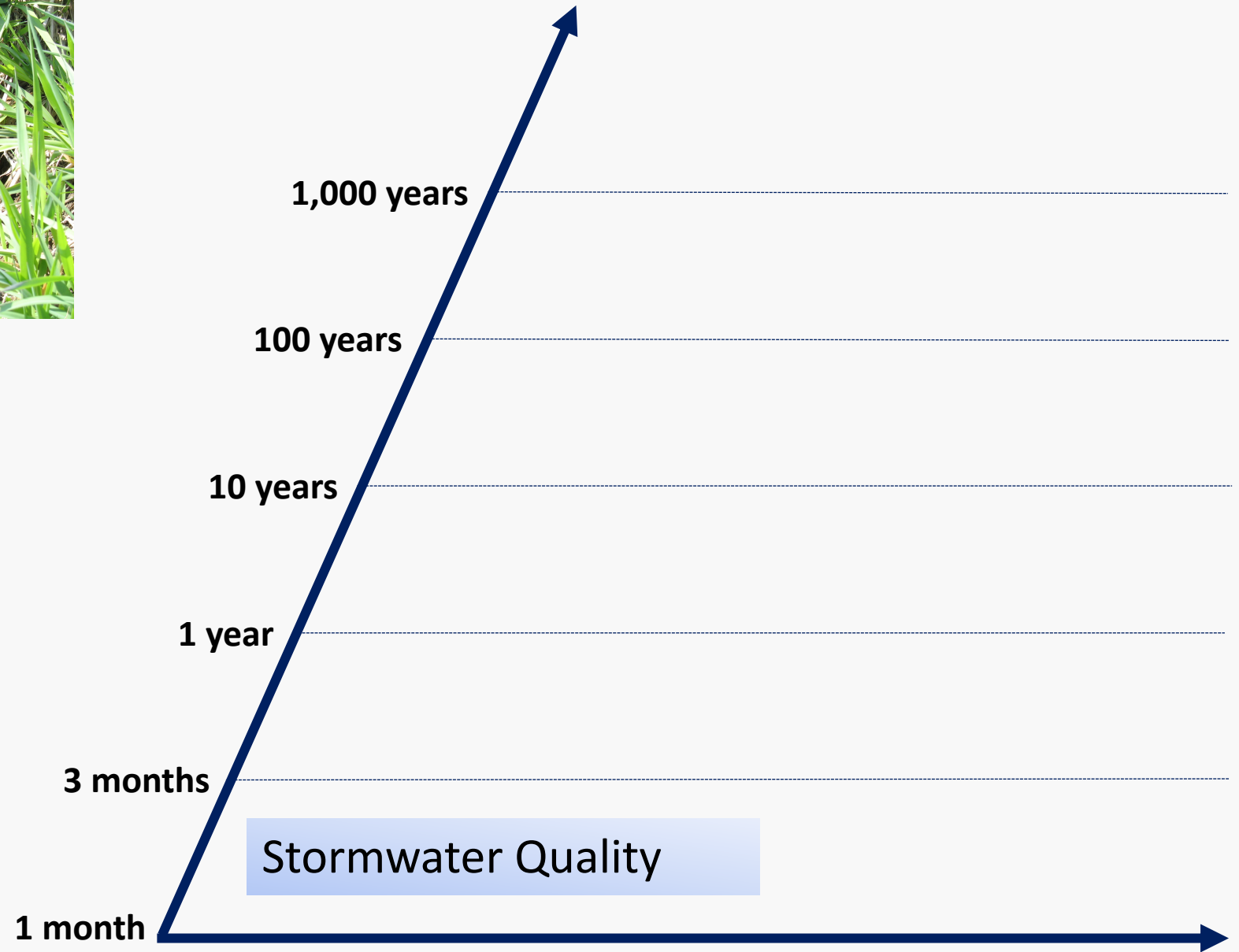
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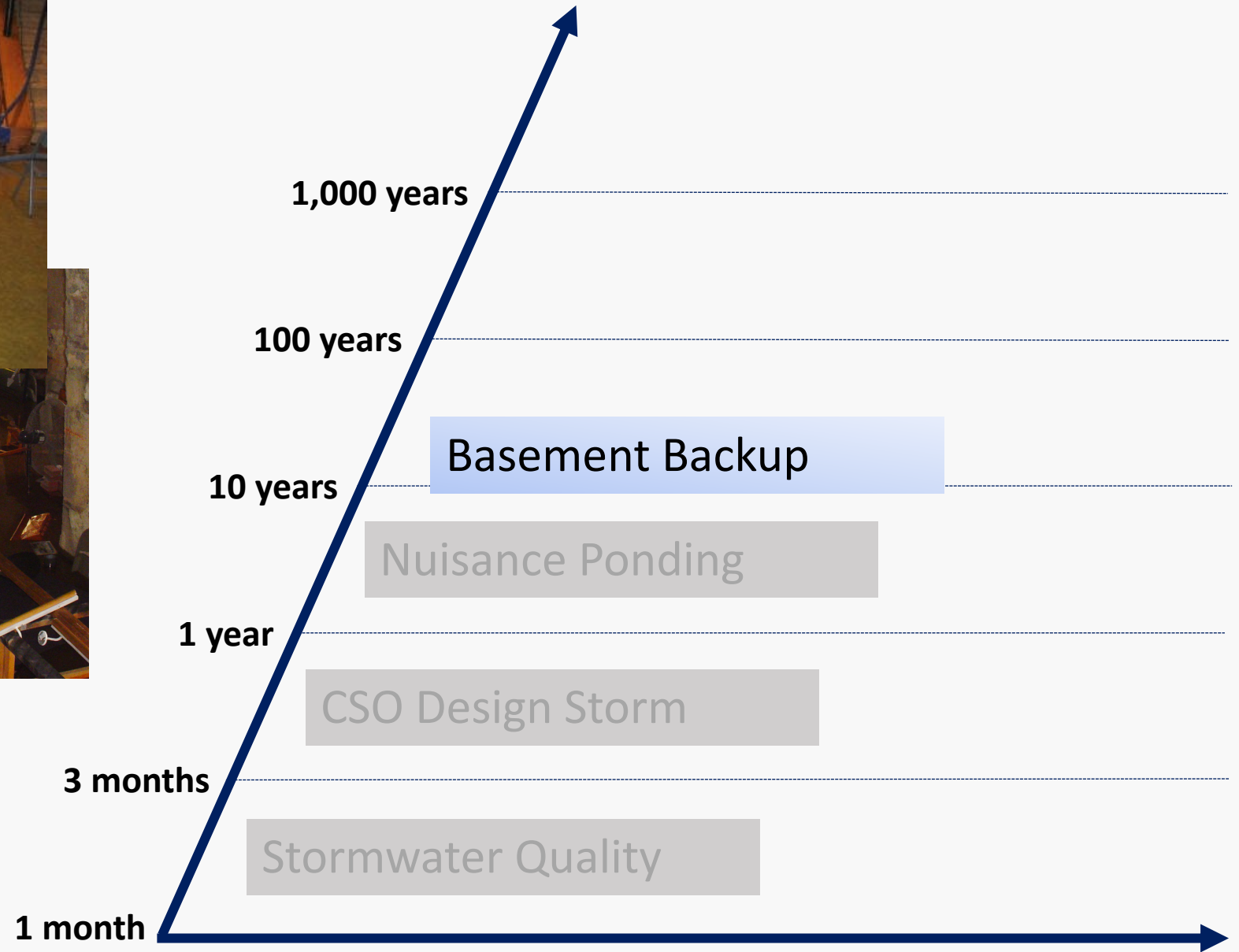
Fundamental Question

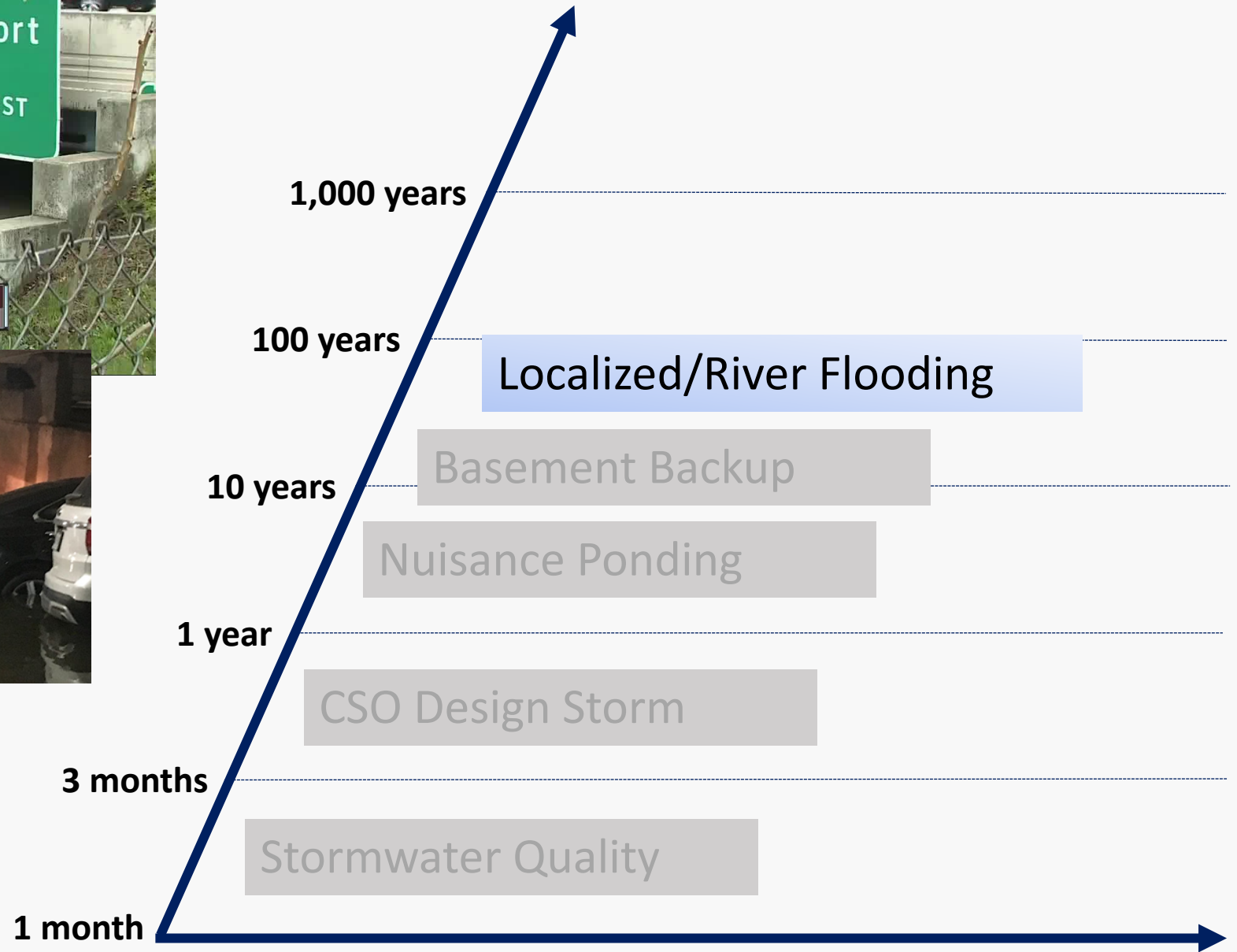
- How can we make sure that the stormwater projects we implement address the broad range of needs?

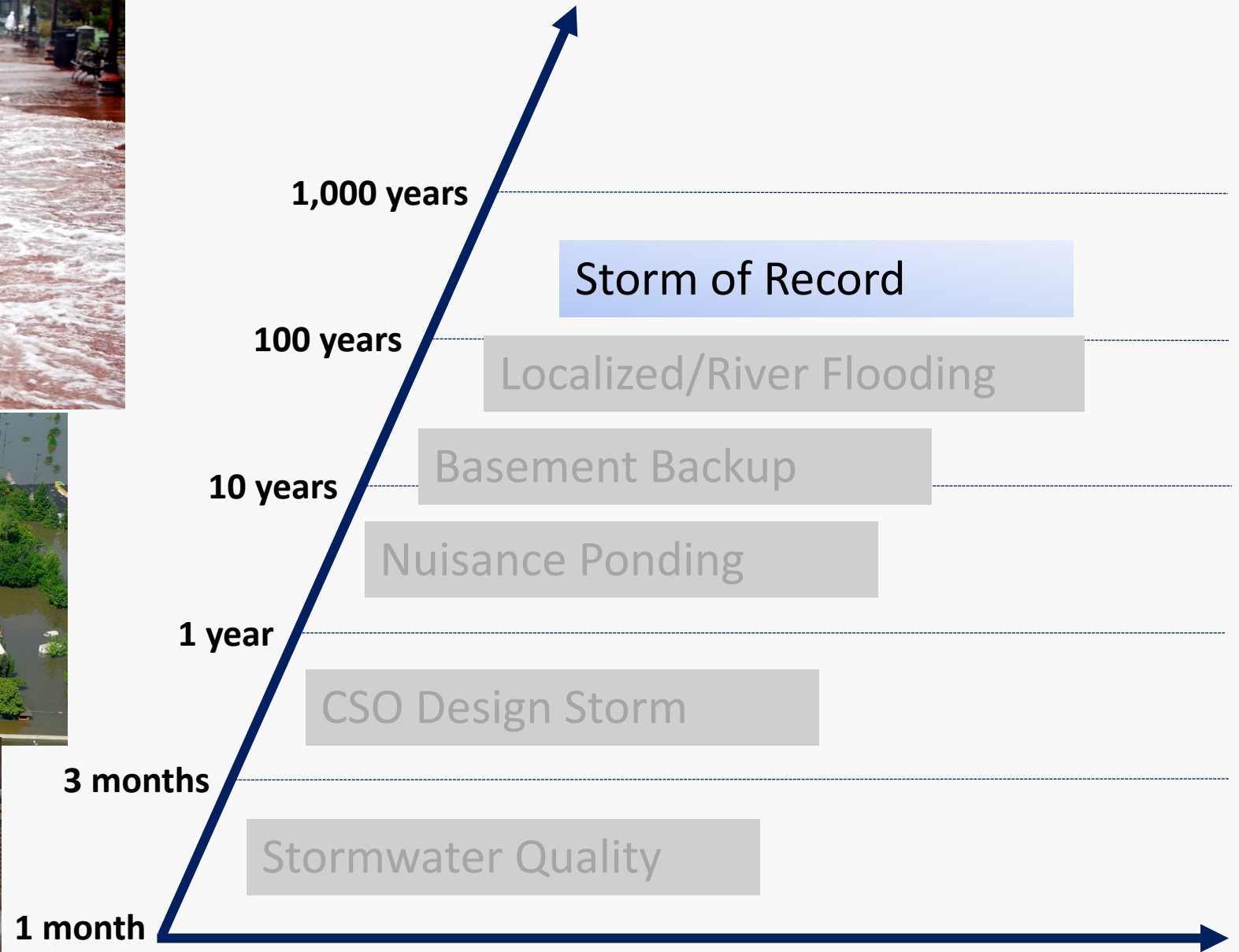












Defining and Addressing the Range of Objectives

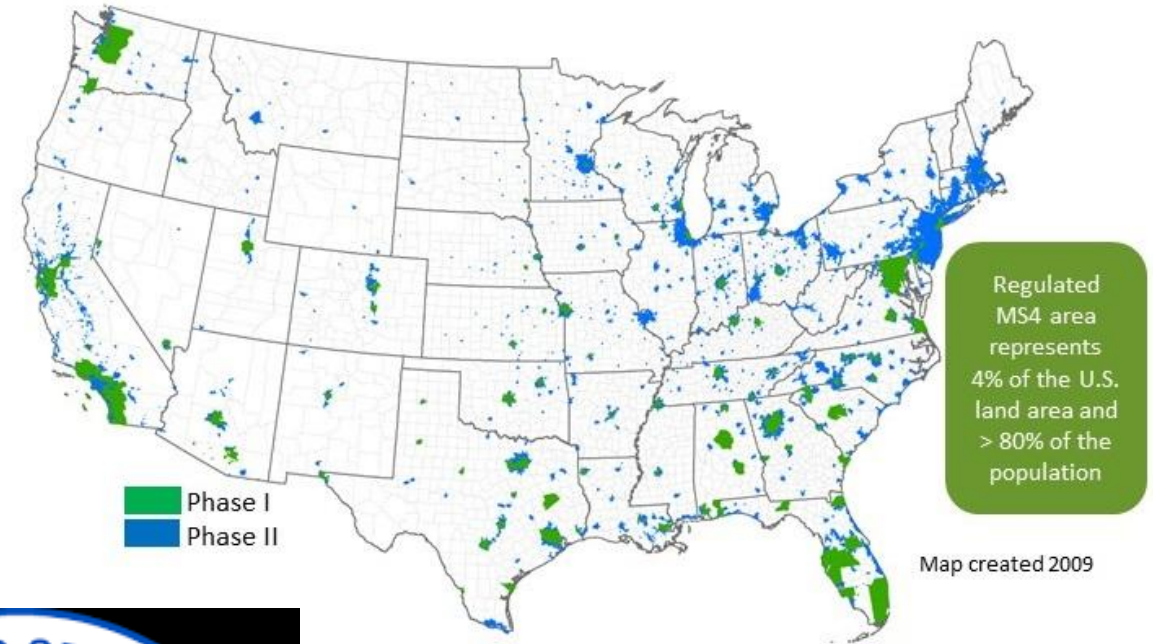


Regulatory Requirements

- Control of stormwater based pollutants
- Control of CSO discharges



National Map of Regulated MS4s



Public Expectations

- Reliable drainage
- No basement backup
- Protection from property damage

Can you tell a resident you are dealing with stormwater and not address their flooding concerns?



Financial Constraints

- Funding limitations
- Restrictions on use of funds
- Avoiding scope creep



Approach

- Identify the primary project purpose
- Identify the broader needs of the area
- Define a dual purpose project that allows for multiple objectives to be achieved.
- Consider the “business case”
- Consider phasing and future opportunities

Single Purpose Planning Study

Project Identification
Outcomes from Planning Study

Testing business case and potential shared funding

Retain flexibility

Example 1: Detroit/ Oakman Blvd

- Primary project purpose:
 - Regulatory requirement to implement GSI for CSO control
- Broader need of the area:
 - Basement backups
- Dual purpose project (objectives):
 - Maximize feasible stormwater control for CSO reduction
 - Reduce flow loading on local sewers
- Project Elements:
 - Bioretention for direct surface flow
 - Subsurface chambers for greater volume management and larger tributary area
 - Reconnecting flow around local bottlenecks/ sensitive areas

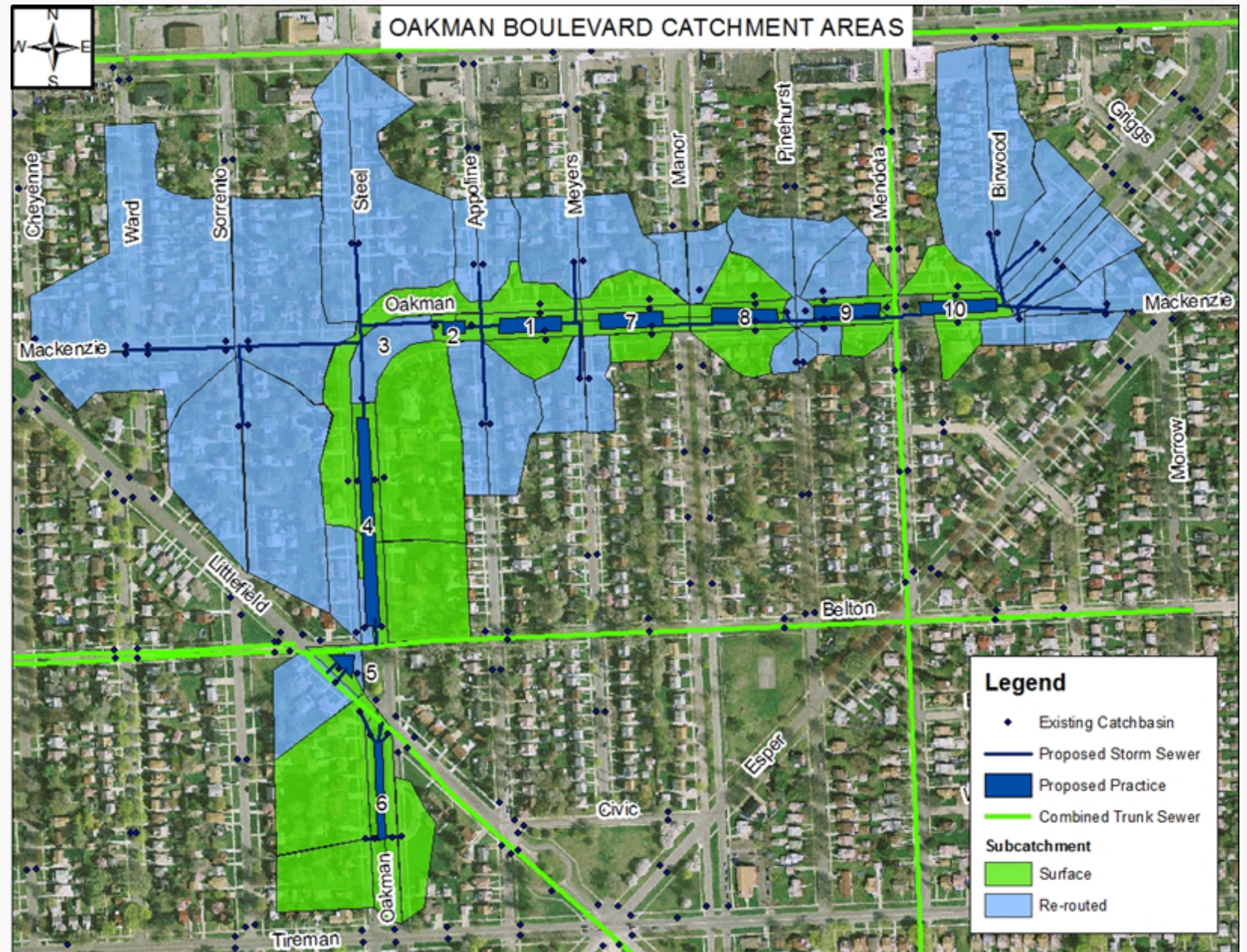
Median Bioretention



Base and Expanded Project Areas

Feasible surface GSI drainage area
20.5 acres

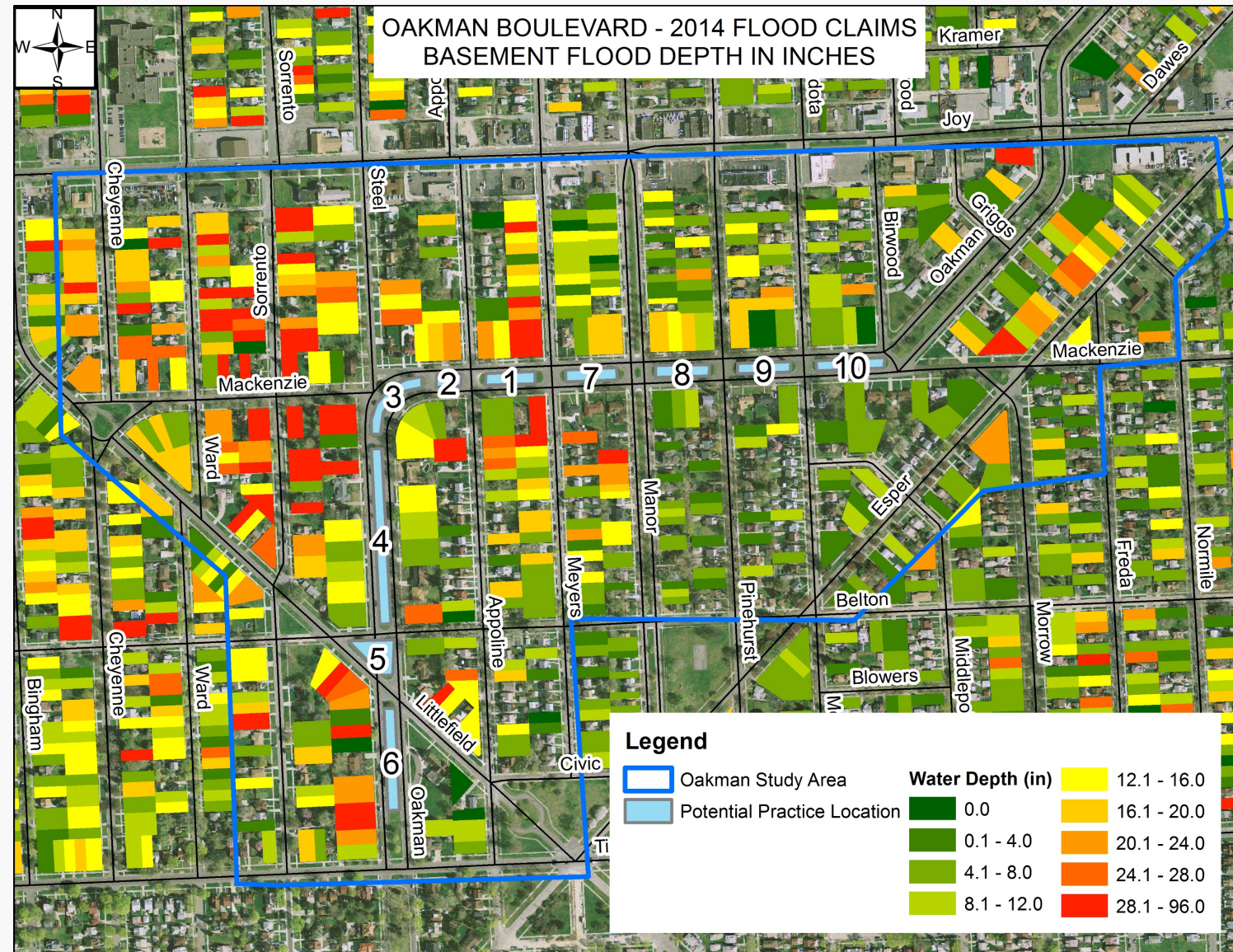
Additional drainage area
42.5 acres

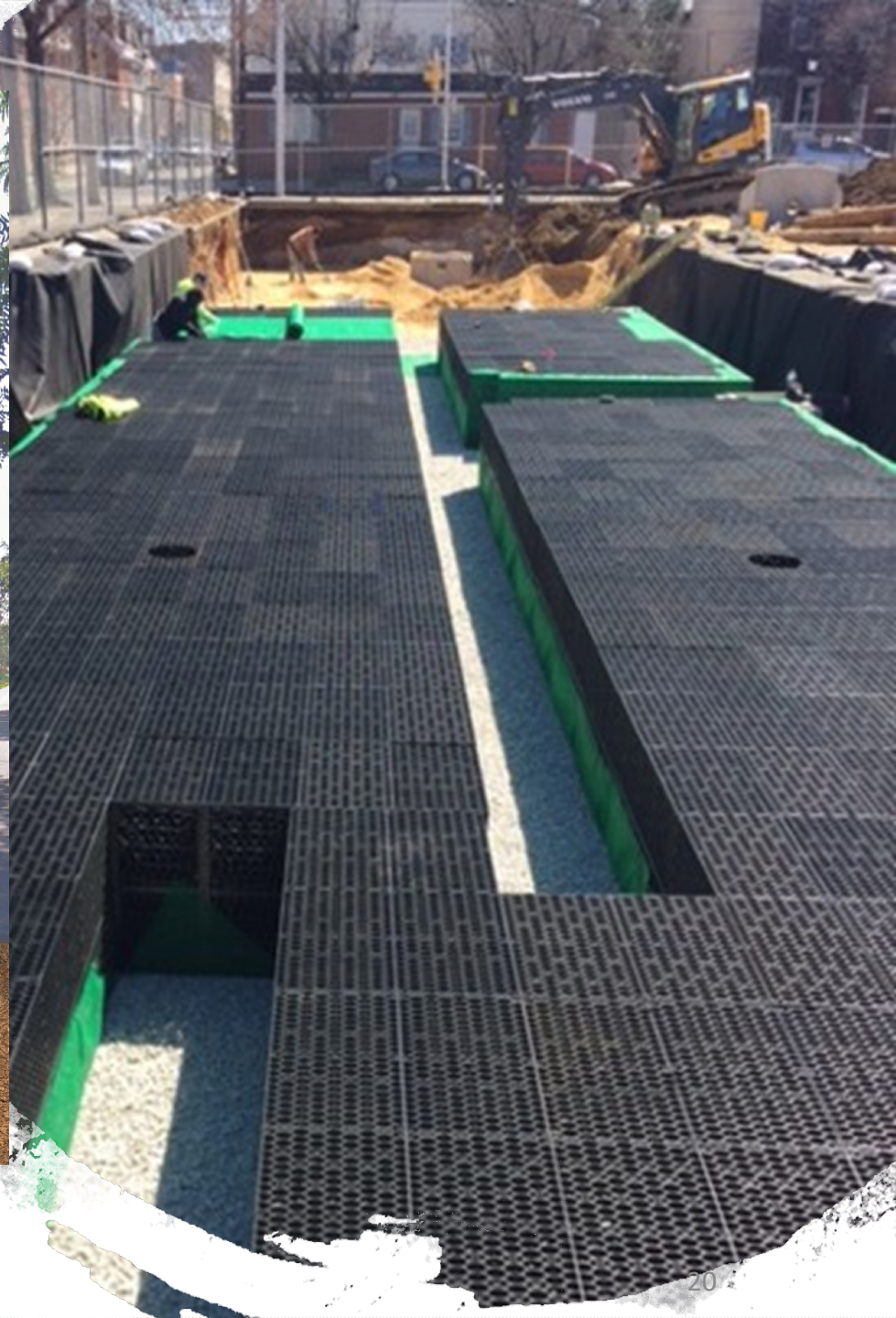


The Expanded Need

450 homes (56%) of the homes in the area suffered basement backup during the 2014 storm

Estimated Economic Impact: \$5,000,000





Project Data

Project Approach	Acres Served	Approximate Cost	Cost/Acre	Level of Control
Surface GSI only	20.5	\$2,020,000	\$98,500	1-inch storm
Expanded to Subsurface	42.5	\$4,300,000	\$101,000	Critical storm basement protection
Overall project	63	\$6,320,000	\$100,000	Varies

Business test:

Regulatory objective: accomplished in the entire area at \$100,000 per acre

Basement backup objective: accomplished within the same per acre cost

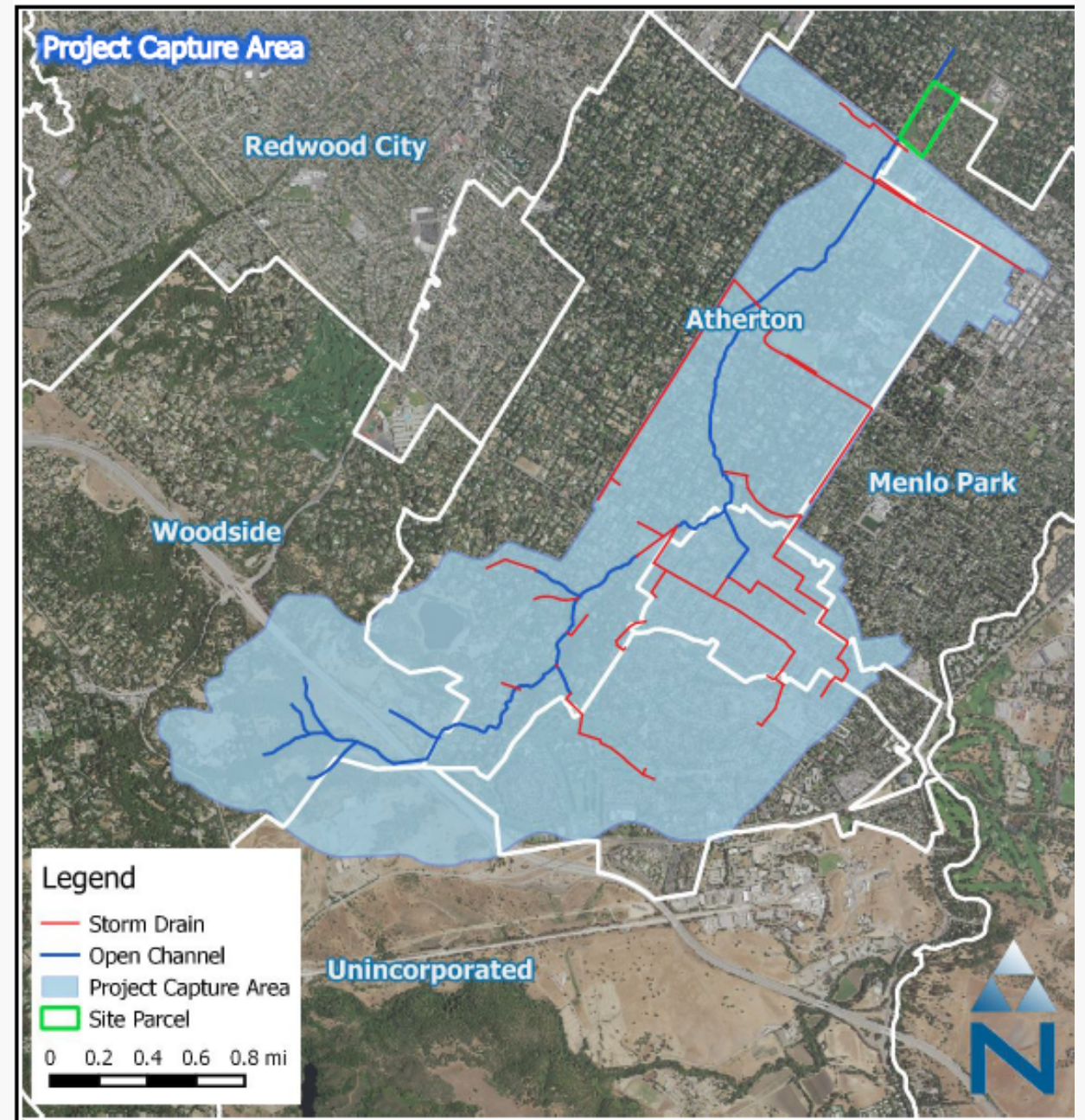
Example 2:

Atherton, CA – Dual Purpose from the Start

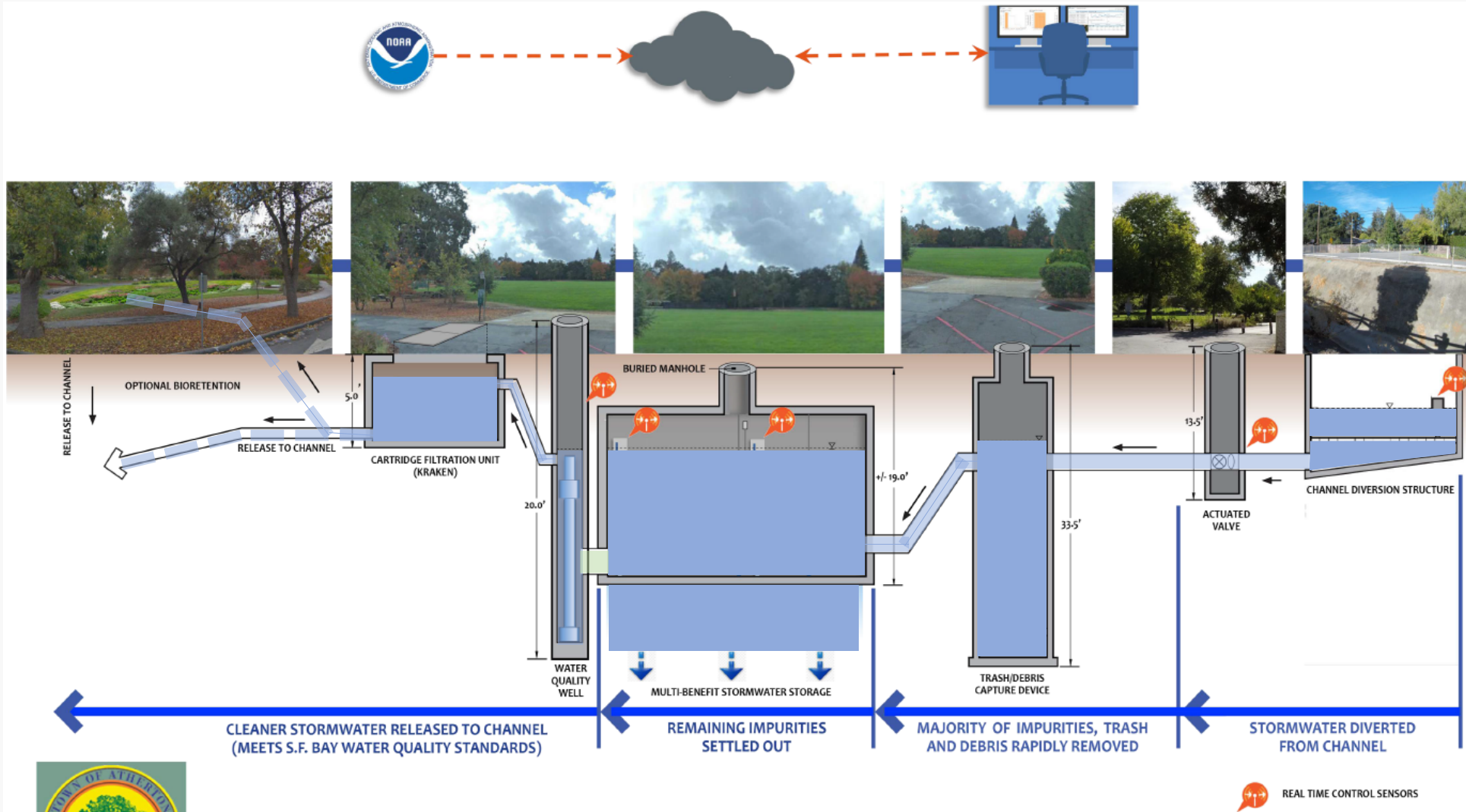
- Regulatory; Water Quality - SF Bay Municipal Regional Permit (MRP)
 - Requires 100% trash load reduction or no adverse impact to receiving waters by July 1, 2022
 - Requires Atherton to develop and implement Green Infrastructure (GI) Plan
 - Reduce contributions by 2020 (end of current MRP term) of PCBs (0.2 g/yr) and Mercury (0.056 g/yr) through GI
- Flood Control
 - 2015 Drainage Study (10 ac-ft of storage needed to manage to the 10-year, 24 hour storm)

Benefits through Scale

- Water Quality Management
- Flood Reduction
- Beneficial Reuse
- Cost Efficiency
- Limit Scale of O&M

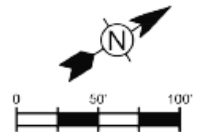
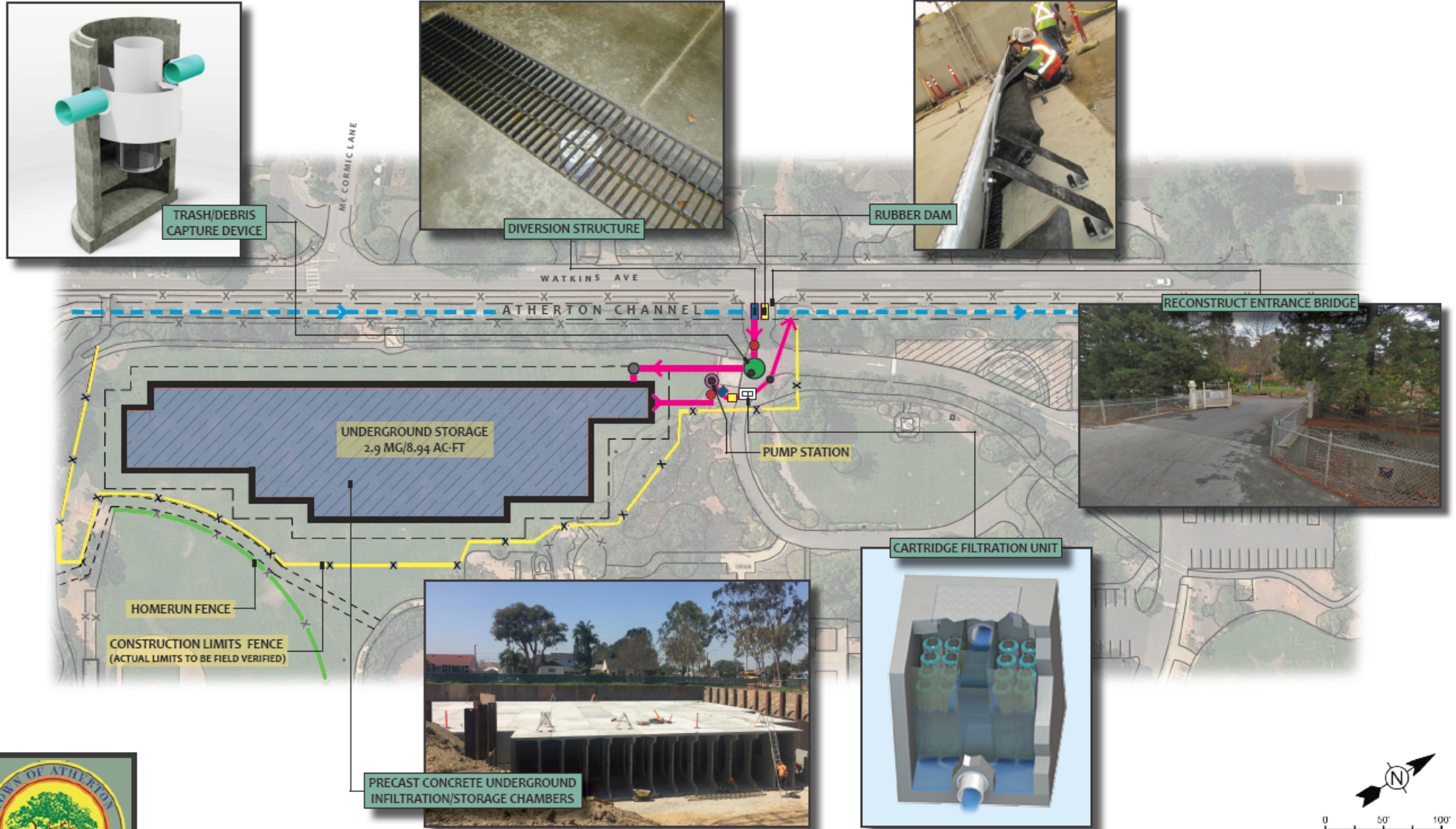


Schematic Layout



Atherton Water Capture Project (Water Flow Process Schematic)

Proposed Site Layout



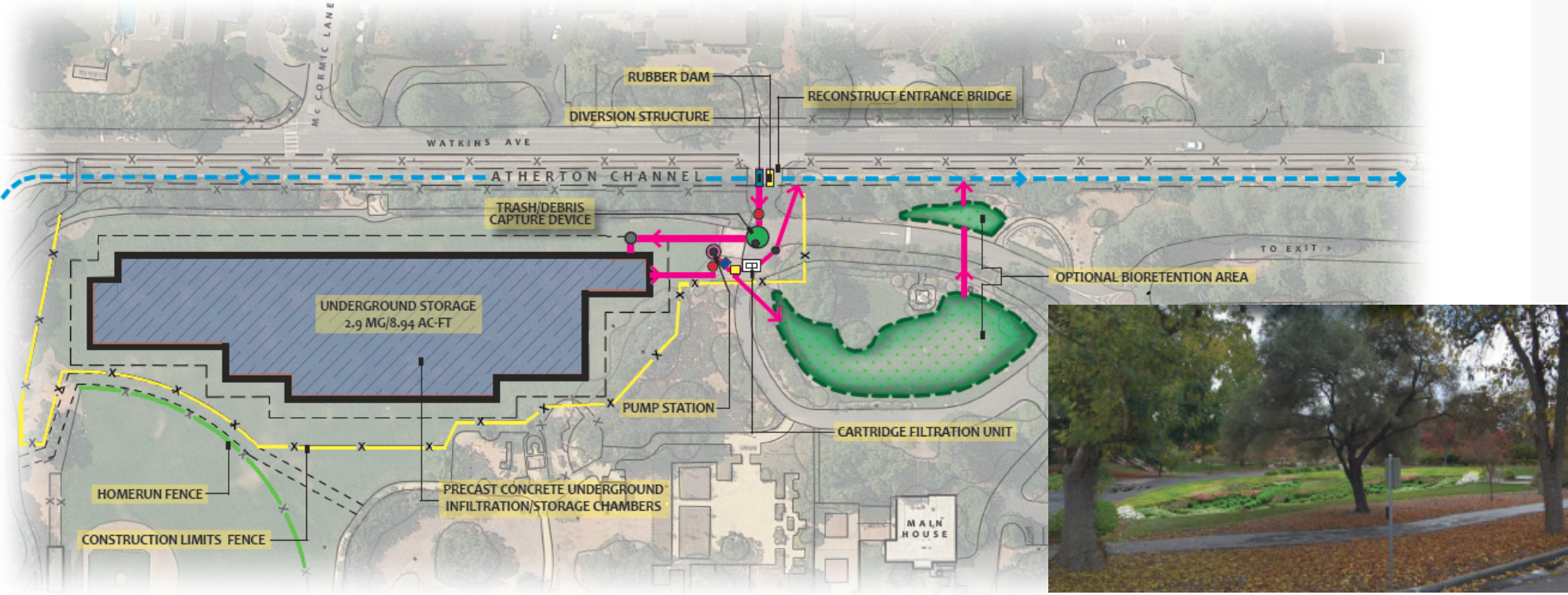
Business Evaluation

- **Regulatory Performance:**
 - Meets Town WQ load reduction requirements
 - Average annual capture = 194 ac-ft
- **Flood Management Performance:**
 - Reduce peak flows by 100 cfs
 - Facility eliminated flooding downstream for largest storm in record (model)
- **Tributary area is 4.4 sq-mi (90% of Atherton size)**

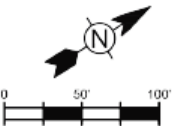
Construction Cost

- \$11.5 million
- \$7.5 million in dual purpose storage
- \$2 million – treatment and reuse
- \$2 general site improvements

Bioretention Addition - Flexibility



Town of Atherton Water Capture Project - Holbrook-Palmer Park
Conceptual Site Plan Alternative 1 (with bioretention)



Design Concepts

Designing for the full spectrum

Stormwater Quality

CSO Design Storm

Nuisance Ponding

Basement Backup

Localized Flooding

Riverine Flooding

Storm of Record

Key Concepts

- Be intentional in developing multipurpose projects
- Be creative in accomplishing project goals
- Added unit cost may be relatively small
- Project budget may be greater – needs to be accounted for in planning
- Maintain flexibility for additional elements that could help enhance goals in the future.



QUESTIONS?

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