



King County

Barton, Murray, Magnolia, and North Beach



**Barton Basin
Technical Information Session
Green Stormwater Infrastructure
August 5, 2010**

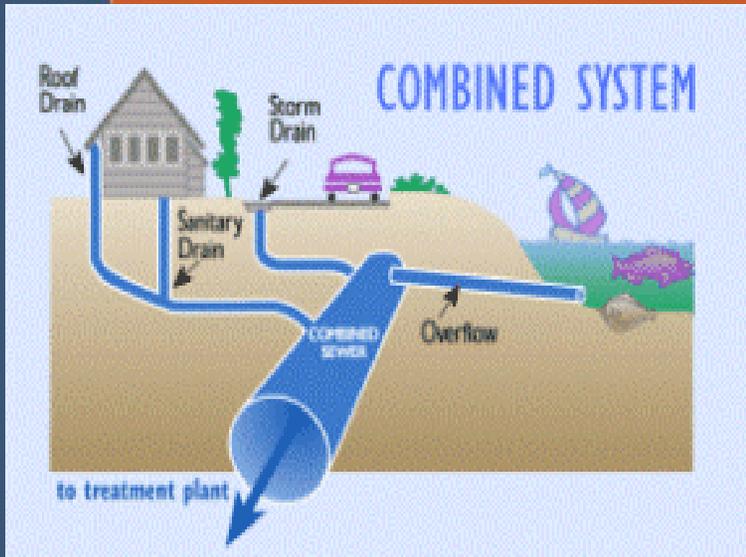
CSO Facilities



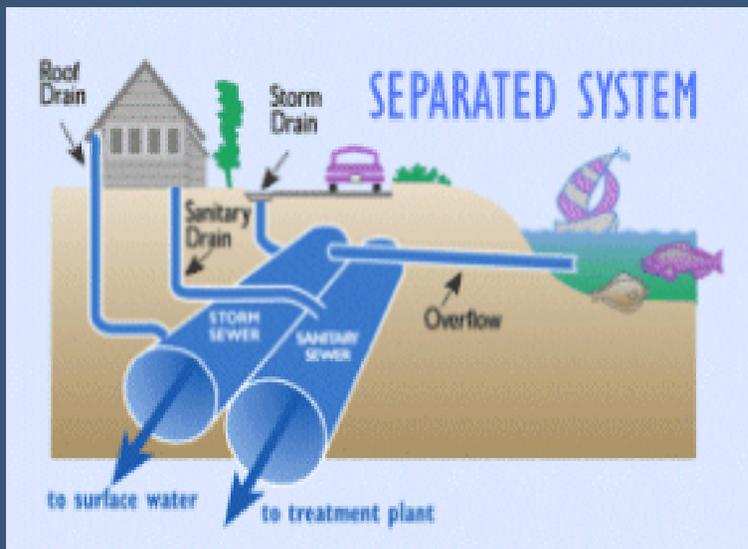
TETRA TECH

And Associated Firms

The Combined Sewer System



- Conveys wastewater & stormwater to treatment plants
- Pipelines & pump stations were sized to capture most of the flow
- Relief points – CSOs – were built to discharge when flows exceed capacity
- Newer systems manage sewage and stormwater separately

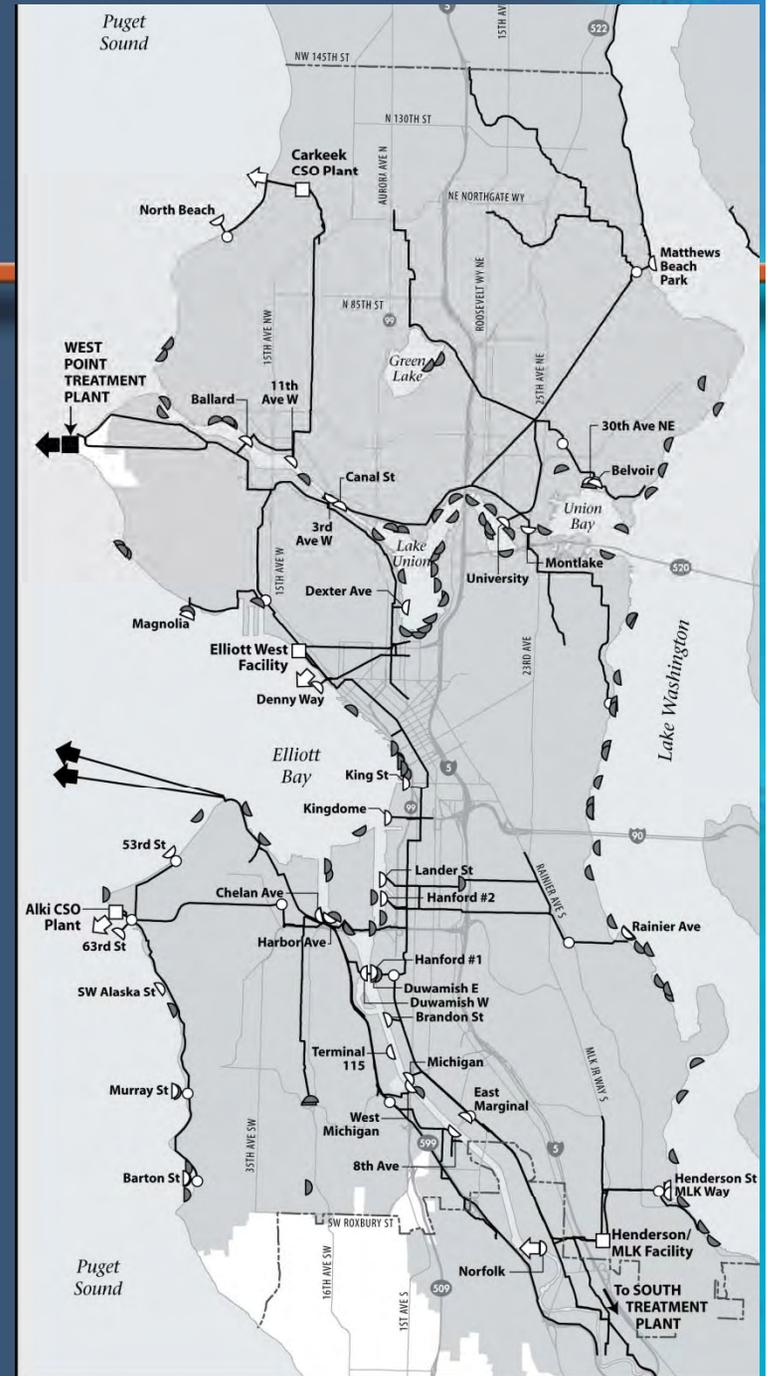


What is the CSO Control Target?

- Set by State Ecology Regulations (WAC 173-245)
- No more than one untreated event per year on a long-term average
- All CSO projects to be implemented by 2030 according to Long-Term Control Plan

Regional Conveyance System

- Barton and Murray basins are the “headwaters” of a regional conveyance system

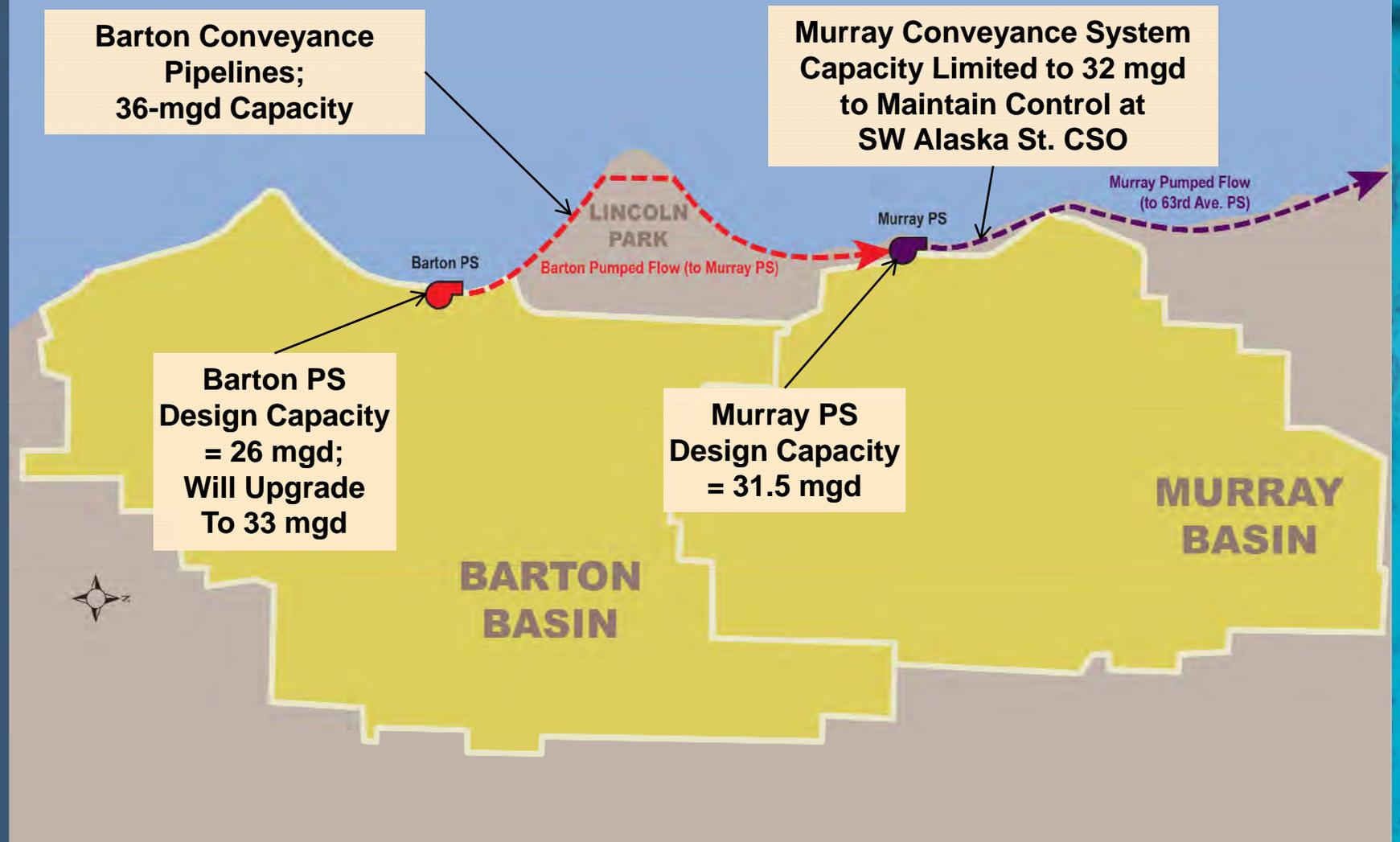


King County and SPU CSO Systems

- Both King County and SPU operate CSO systems in Barton and Murray Basins
- SPU Basins 094 and 091 (Barton) and 090 (Murray) are each controlled

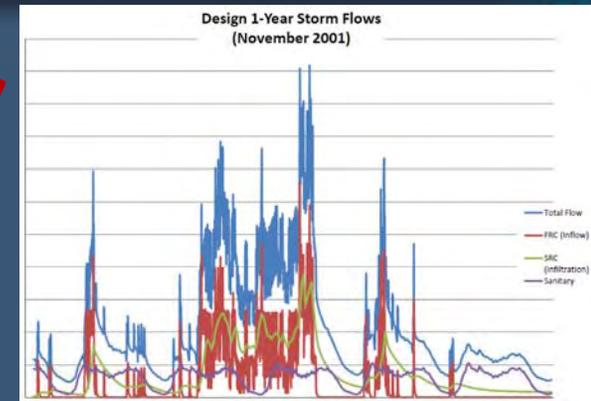


Current Barton and Murray Conveyance System Capacity



Approaches Based on Technical Requirements and Feasibility

- Hydrologic/hydraulic analysis established control requirements
- Range of control approaches considered :
 - Storage
 - On-site Treatment
 - Conveyance and treatment
 - Peak flow reduction



Basin Description and Requirements

- 1,112 acres
- Barton CSOs
 - Average 4 events per year
- Control requirements
 - 110,000 gallons of storage, **or**
 - 12 mgd treatment capacity, **or**
 - 12 mgd additional conveyance capacity **or**
 - Approx. 26 acres of disconnection
- Control requirements include planned Barton Pump Station upgrade



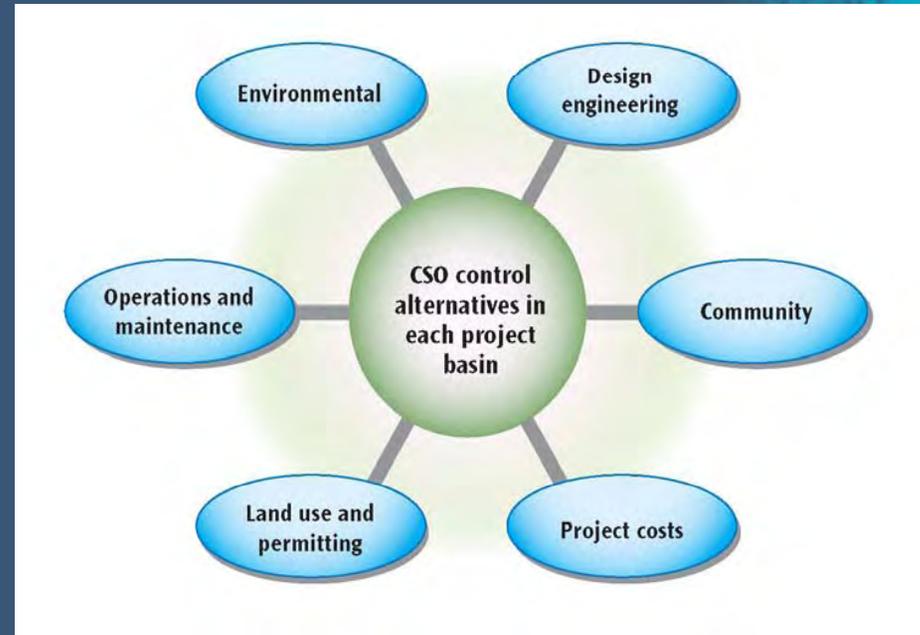
Alternatives Developed to Meet Basin Requirements

- What's required for a workable alternative:
 - Sufficient room to site and construct the facility?
 - Feasible to construct?
 - Will the alternative capture sufficient peak flow?

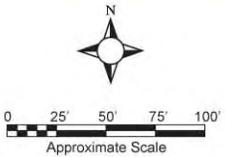
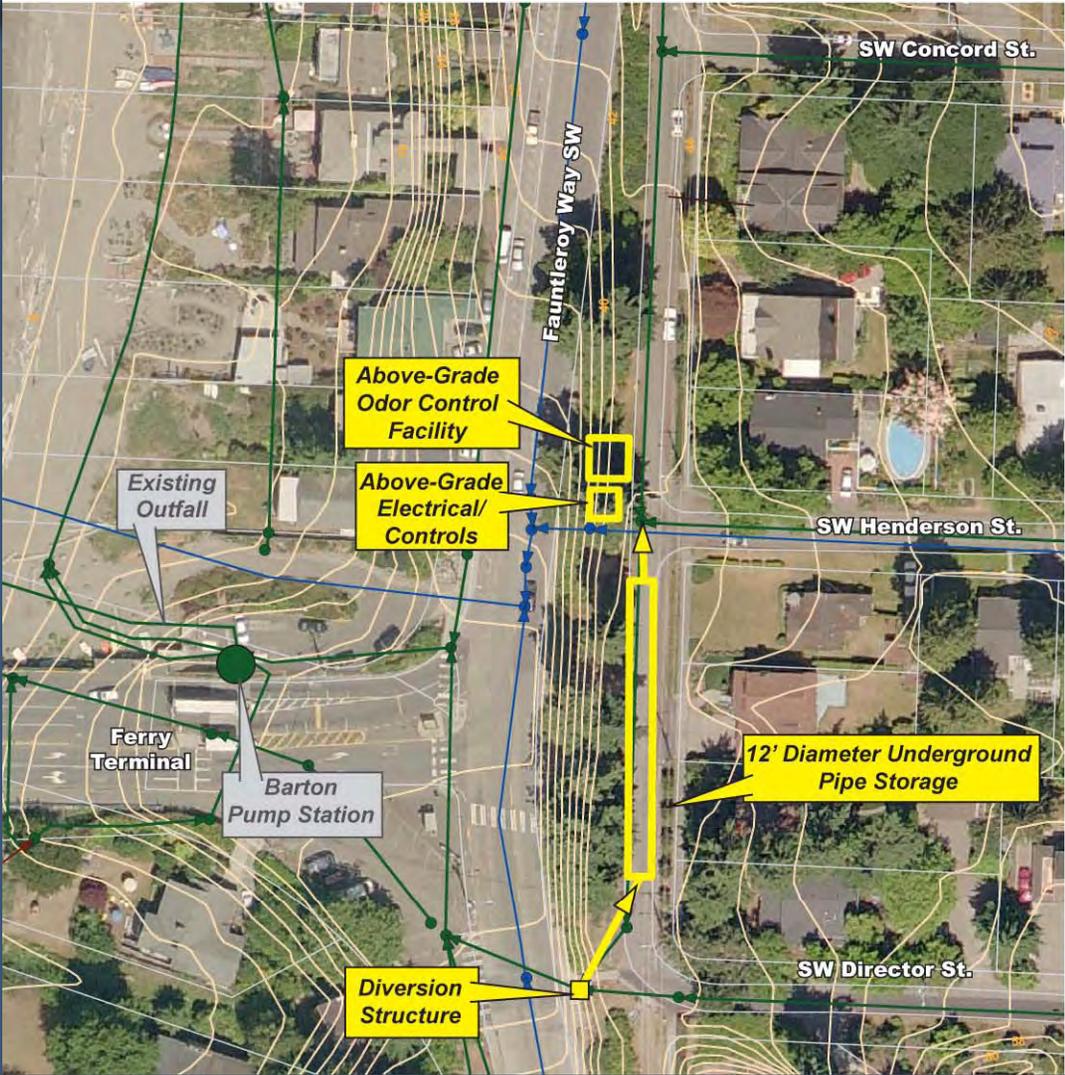


How Were The Alternatives Evaluated?

- Individual alternatives were evaluated using a range of factors:
 - Land Use/Permitting
 - Environmental
 - Community
 - Costs
 - Operations & Maintenance
 - Design and engineering
- Input from the public was used to shape and inform these factors



Upper Fauntleroy Way SW, Underground Storage



Upper Fauntleroy Way SW, Underground Storage

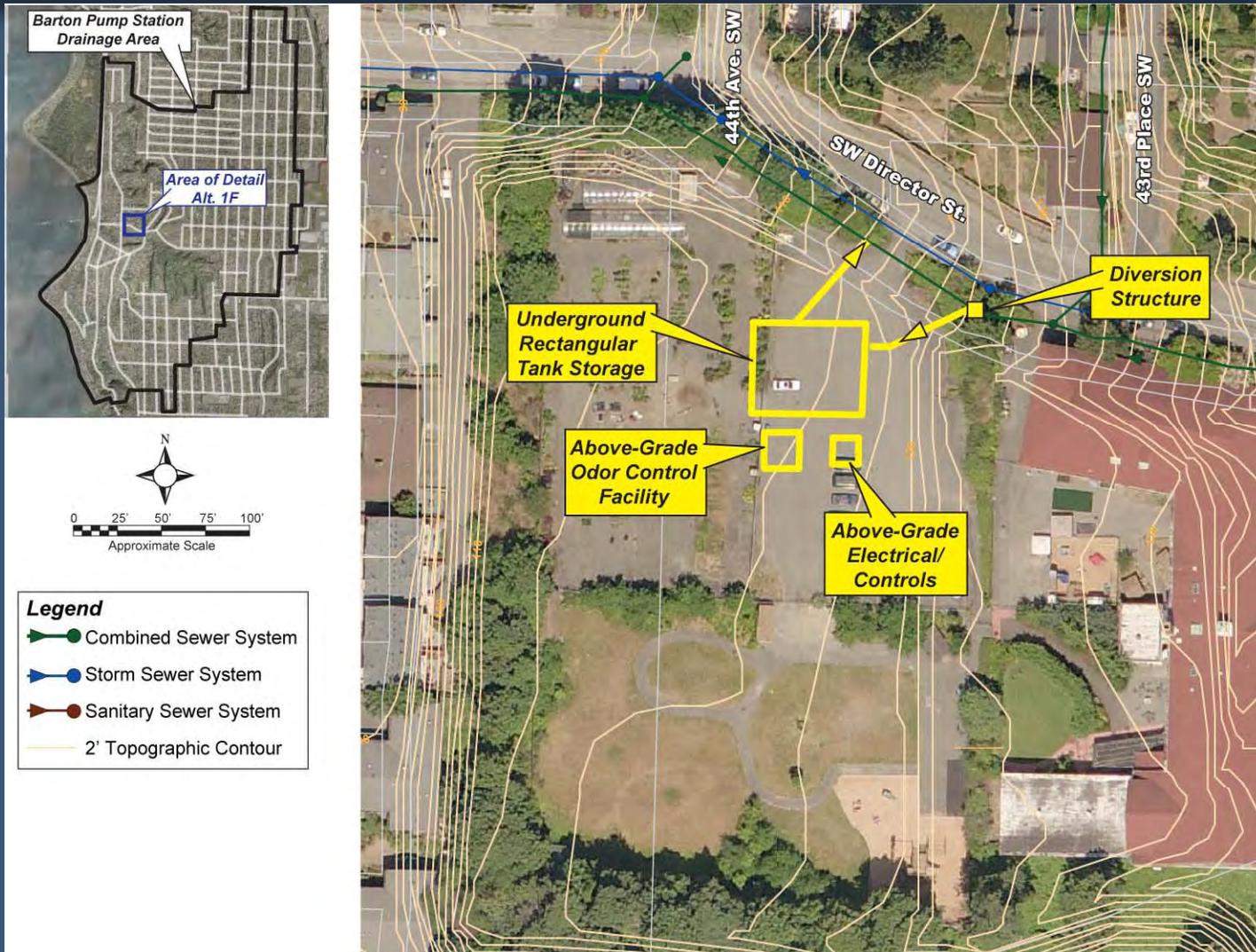
- **Benefits**

- Located in moderate use street
- Safer access for operations and maintenance crew than busy arterials
- Similar to other King County facilities

- **Challenges**

- Protection of landscaping and view
- Limited road width, utility relocation will be required
- Potential archaeological resources in the area
- Traffic and residential access disruptions during construction
- Location is not at the bottom of basin; requiring larger facility size to achieve control
- Lack of construction staging area

Former Fauntleroy School Site, Underground Storage



Former Fauntleroy School Site, Underground Storage

- **Benefits**

- Ample space for facility layout and construction
- Off-street access for operations and maintenance crews
- Similar to other King County facilities

- **Challenges**

- Location is not at the bottom of basin; requiring larger facility size to achieve control
- Involves use of private property

What is Green Stormwater Infrastructure?

- Green Stormwater Infrastructure (GSI)
 - GSI refers to *engineered* infrastructure in relation to stormwater management practices.
 - These practices (BMPs) make use of soils and vegetation, in combination with other decentralized storage and infiltration approaches to infiltrate, evaporate, capture, and reuse stormwater.

Why Use Green Stormwater Infrastructure?

- Green Stormwater Infrastructure (GSI)
- Considerable challenges with using GSI
- King County and SPU worked together to integrate GSI into CSO planning
 - Reduce size of gray infrastructure project
 - Reduce costs of CSO program implementation
 - Reduce stormwater volume over time
 - Adapt to unknown future conditions

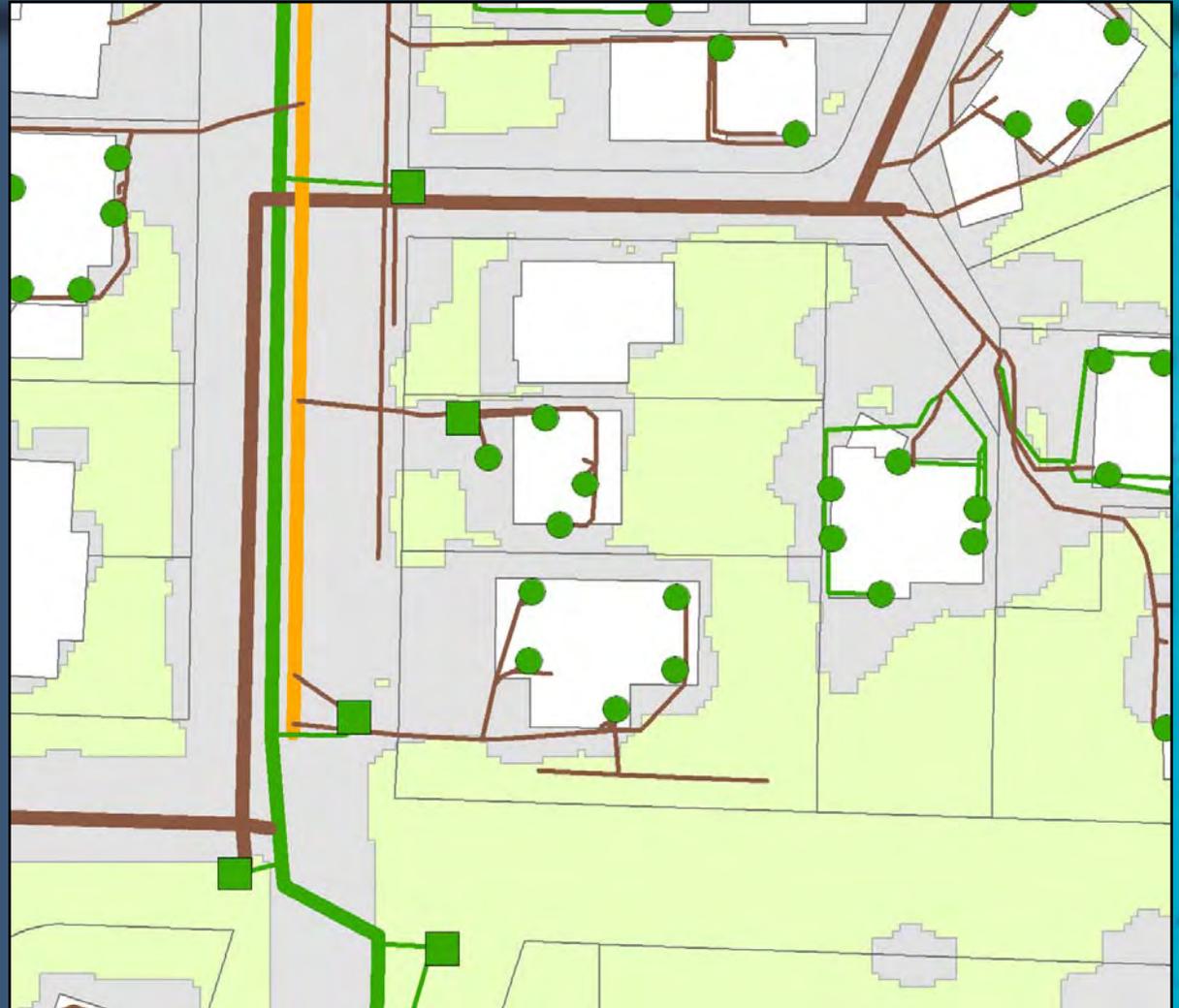
GSI Evaluation

- Where does the flow come from and where is it going?



Three Sources of Flow to the Combined Sewer System

- Roofs
- Impervious areas
- Pervious areas

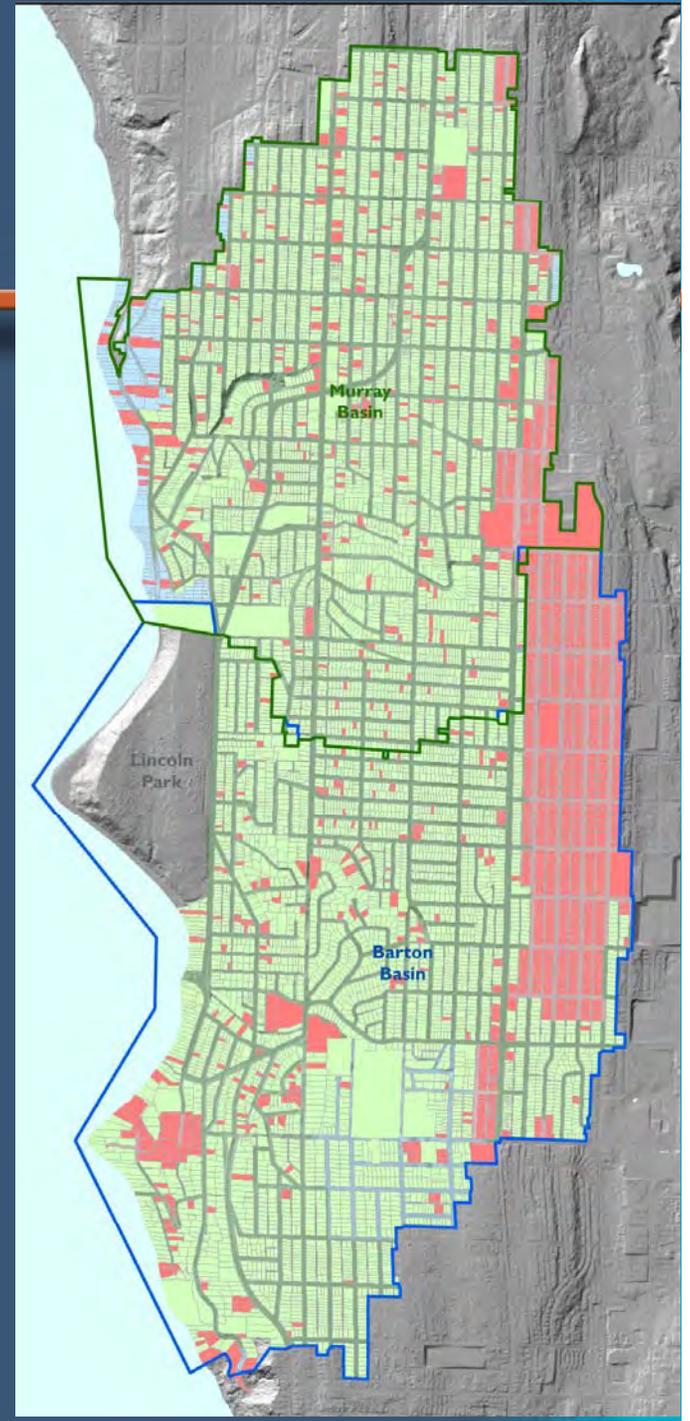


GSI Techniques

- Identify five GSI techniques
 - Ecoroofs/Green Roofs
 - Roof Disconnection
 - Street Trees
 - Bioretention (i.e. Rain Gardens)
 - Permeable Pavement
- Use a set of criteria to identify suitable locations

Results of Analysis

- Maps of connected areas
- Estimation of amount of impervious and pervious areas connected to the combined sewer system
- Feasible area for green techniques



GSI Project in Barton

- Identified Barton basin as having highest feasibility for most green techniques
- Identified large area of streets connected to combined sewer system
- Opportunity to explore a project similar to SPU's Ballard Roadside Rain Gardens project
- Allow SPU and King County to evaluate design, construction and performance of GSI in combined sewer basins

Goal of Barton GSI Alternative

- Eliminate the CSO storage requirement in the Barton Basin

Components of Barton GSI Alternative



- 66+/- modified blocks with potential for green stormwater infrastructure
- Raingardens/bioretention
- Plantings
- Street Trees

Examples of Streets with GSI



Examples of Streets with GSI



Seattle



Port Townsend

Changes to Streetscape with GSI



- Streetscape Benefits
- Street Impacts
- Walkability
- Access
- Landscape Treatment
- Maintenance

Concept Street with GSI Before and After



Streetscape Benefit

- Traffic Calming
 - Narrowing street ends
 - Creating pattern and rhythm (chicanes)
 - Enhanced landscape
 - Street trees



Streetscape Benefit



Seattle



Port Townsend

Street Side Impacts

- Defined Parking
 - Minimal reduction in parking
- Curb Alignment
 - Maintain existing where possible
 - Curb bulbs with landscape enhancements
- Maintain a minimum of one to two on-street parking space for every house

Street Side Impacts



Seattle

Street Side Impacts



Ballard

Walkability

- Creating a sense of pattern and rhythm
- Improve connectivity for habitat
- Enhancing neighborhood character
- Creating a sense of community
 - Pinehurst
 - Broadview
 - High Point



Walkability



Access

- Provide crossable zones from sidewalk to street edge
- Steppable zone next to curb
- Visibility along and across the street
- Durable Plants (Dog and Kid proof)



Landscape Treatment

- Accommodates trees
 - existing trees
 - new trees
 - relocated trees.
- Typically a mix of grasses, native plants and ornamental plants

Landscape Treatment



Seattle

Maintenance Benefits

- Life Cycle Cost Advantage with GSI
- Outreach/Education for staff and public
 - Drainage (Storm event observation)
 - Aesthetics (multiple benefits to infrastructure because it is visible)
- Green Jobs versus Major Equipment
 - Protocols are different from a vault storage approach

Maintenance – King County

- KC would be responsible for major maintenance
- Maintain flow and storage
- Long term function

Maintenance -Property Owner

- Community Outreach
 - Non-Chemical Approach
 - Leaf, Branch and Trash Removal
 - Weed and Pest Control
- Planting guidelines
- Stewardship

How would this Alternate Work?



- Additional Community Outreach
- Design Process
 - Focus on block specific conditions
 - Meet CSO requirement
 - Raingardens detailed to locations
- Construction

Construction



Ballard

Questions?

