

# North Henderson Area Combined Sewer Overflow Reduction Projects



**North Henderson  
Community Meeting**

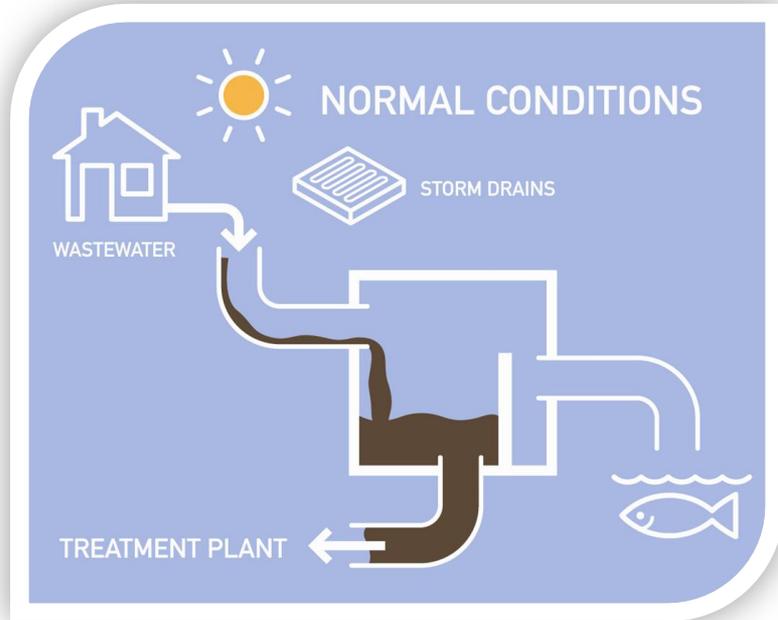
**December 14, 2010**

# **AGENDA:**

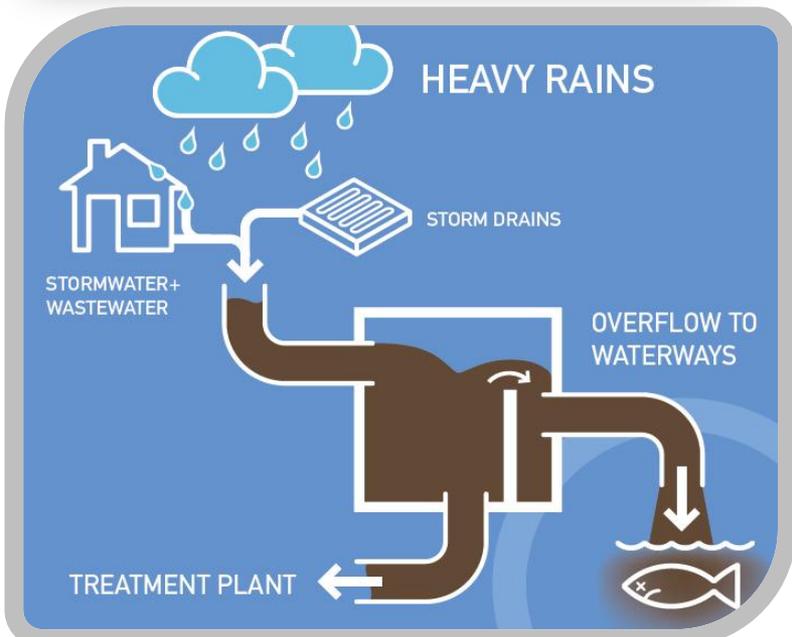
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- I. Welcome (*Marcia Wagoner*)**
- II. CSO Program, North Henderson Project, and Workshop Overview (*Trish Rhay*)**
- III. North Henderson Alternatives (*Andrew Lee*)**
  - I. Distributed Storage***
  - II. Conveyance and Centralized Storage***
  - III. Tunnel Storage***
  - IV. Complete Separation (Inflow/Infiltration Reduction)***
- IV. Evaluation of CSO Alternatives (*Break Out*)**
- V. Report-Outs of Evaluation (*Marcia Wagoner*)**
- VI. Next Steps (*Marcia Wagoner*)**

# What is a Combined Sewer Overflow?



- *Wastewater* (from homes) and *stormwater* (from rooftops, streets) flow in a single pipe - a “combined sewer.”



- During heavy rains, stormwater (~90%) and sewage (~10%) exceed the system, causing a combined sewer overflow (CSO) into nearest waterway.

# Combined Sewer Overflows (CSOs)

- 90 permitted CSO outfalls
- 100 million gallons CSO discharge annually
- About 200 CSO discharge events annually

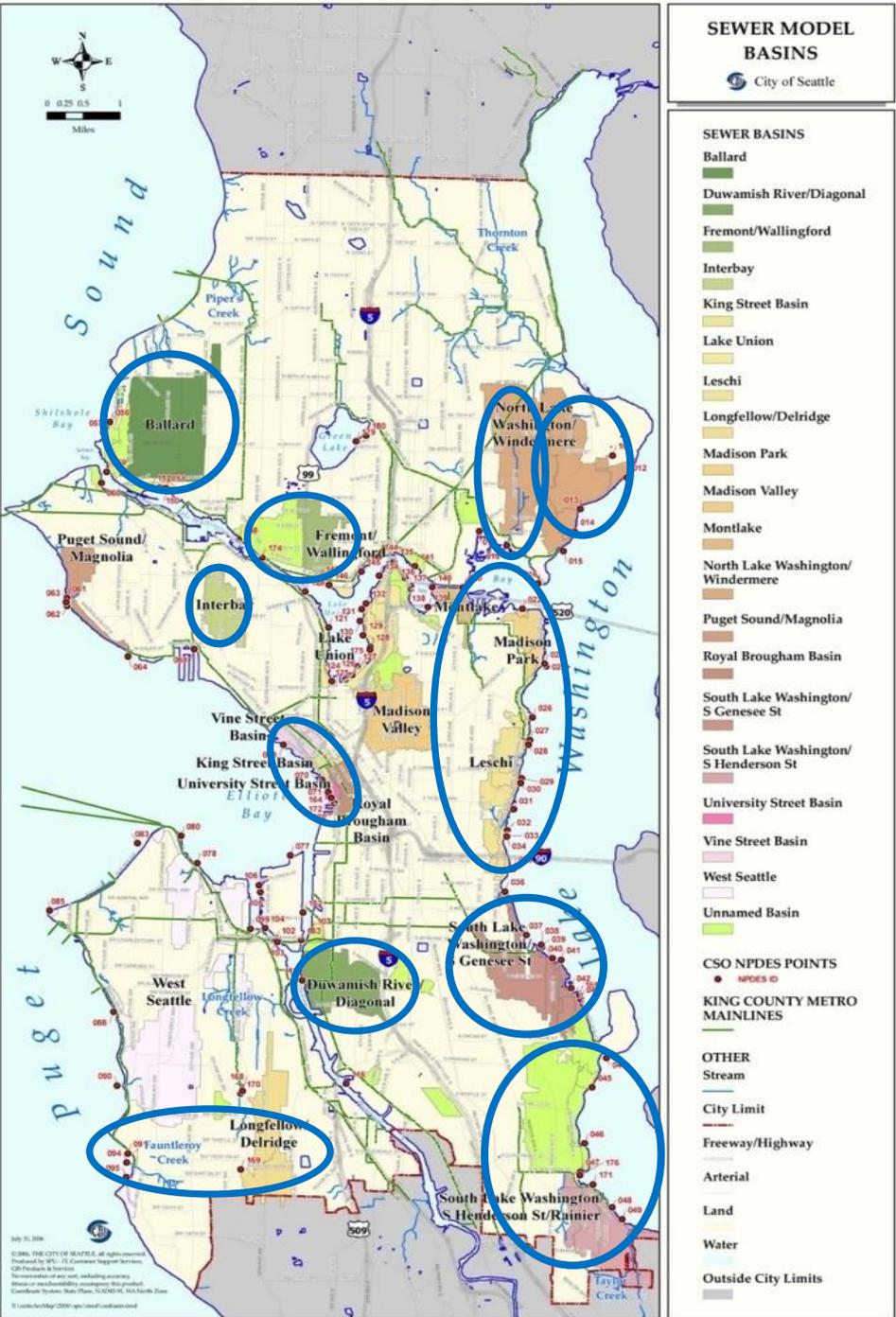


# CSO Reduction Program Goals

- 💧 Comply with Clean Water Act, state/federal regulations
  - 💧 *Goal - Reduce CSOs to no more than average of one overflow per site per year.*
- 💧 Improve water quality
- 💧 Finish historic effort
- 💧 Minimize rate impacts
- 💧 Partner for cost-effective solutions

# Focus on Next 5 Years

- Improve existing system through retrofits
- Construct CSO reduction projects
  - Windermere, Genesee, and Henderson basins
- Pilot green infrastructure projects
- Complete Long-term Control Plan



# North Henderson Workshops



## ***November 18, 2010***

- Presented CSO reduction options (storage, transfer, separation, treatment)
- Obtained feedback to consider separation, inflow/infiltration reduction, and more innovative technologies to reduce CSOs.
- Obtained input on community values and concerns



## ***December 14, 2010 (Today)***

- Present site-specific CSO reduction alternatives
- Obtain feedback on alternatives
- Confirm evaluation criteria (i.e., community values and concerns)
- Weight relative importance of evaluation criteria



## ***January 19, 2011***

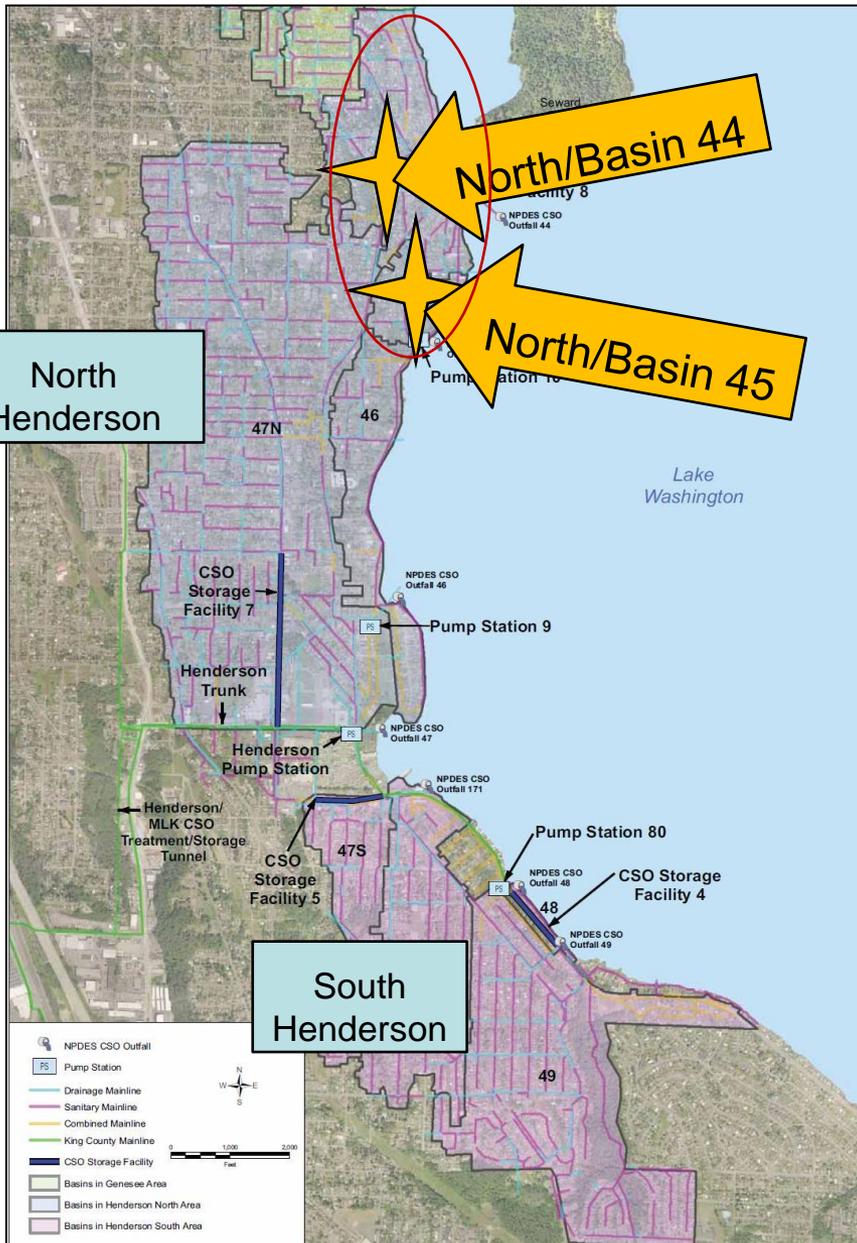
- Present results of alternatives evaluation
- Obtain feedback on results
- Narrow down site-specific alternatives

# Community Values

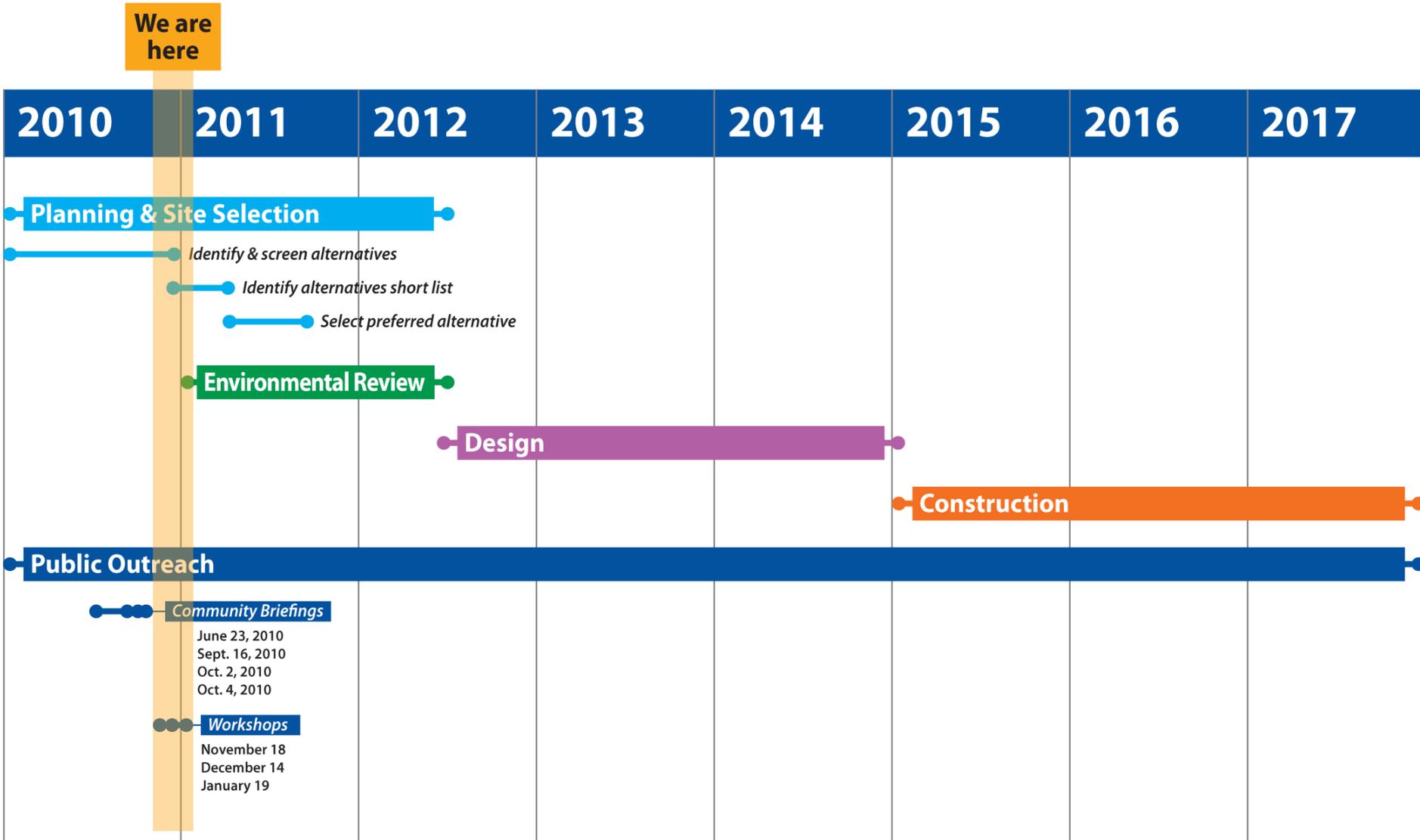
- Preserve current use of parks and character of parks designs
- Limit short-term construction impacts
- Limit disproportionate impacts to individual property owners
- Create an environmental benefit or limit environmental impact
- Limit impact from facility operations & maintenance (i.e., noise, traffic, duration, frequency of operations & maintenance, scale of equipment)

# Henderson CSO Basins

- Top-Priority for CSO reduction
- 1,800 Acres
- Seven basins
- CSOs discharge approximately 17 times per year
- Construction projects to reduce CSOs must begin in 2015



# North Henderson Project Schedule

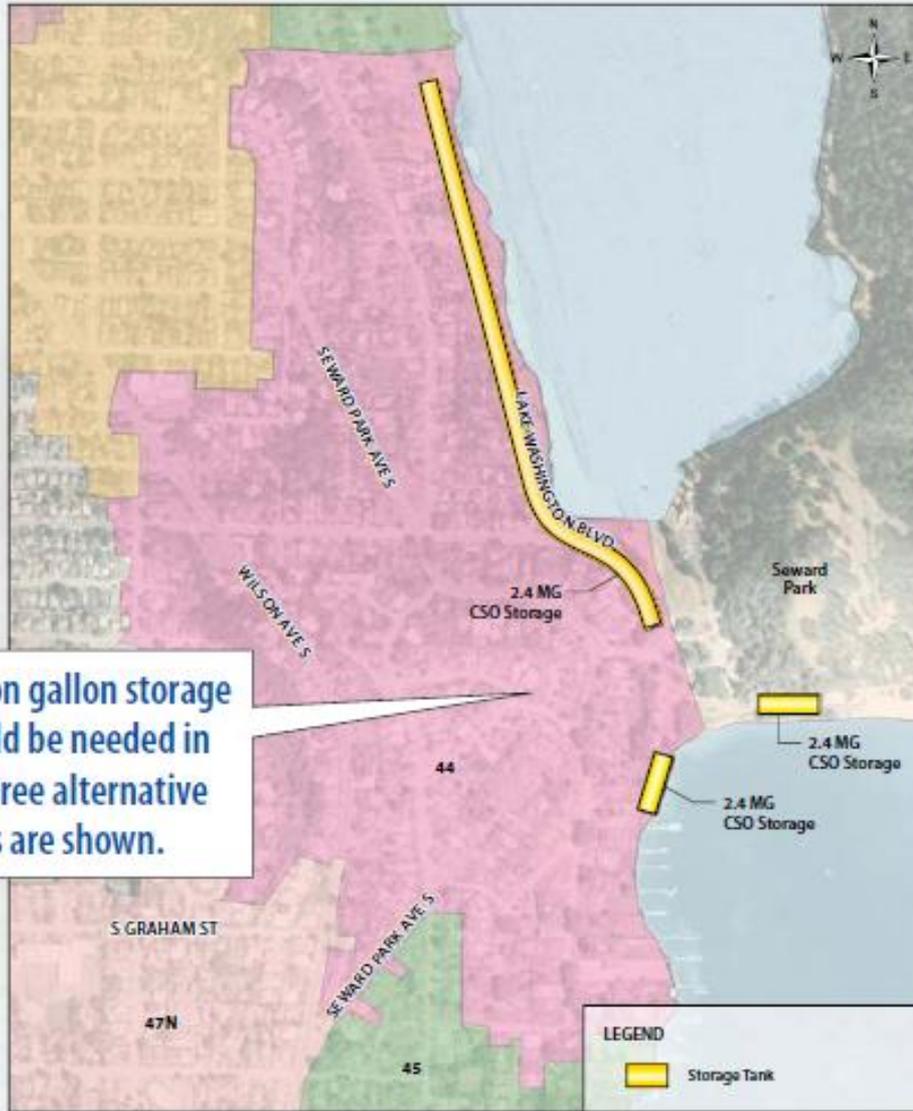


# Summary of Alternatives

- 💧 Distributed Storage
- 💧 Tunnel Storage
- 💧 Conveyance and Storage
- 💧 Complete Sewer Separation (*includes Inflow & Infiltration Reduction*)



# Distributed Storage (Basin 44) Potential Storage Locations



2.4 million gallons (Basin 44) could be constructed under:

- 💧 Seward Park parking lot
- 💧 Lake Washington Boulevard
- 💧 Private property

# Distributed Storage (Basin 44)

## Storage under Lake Washington Boulevard

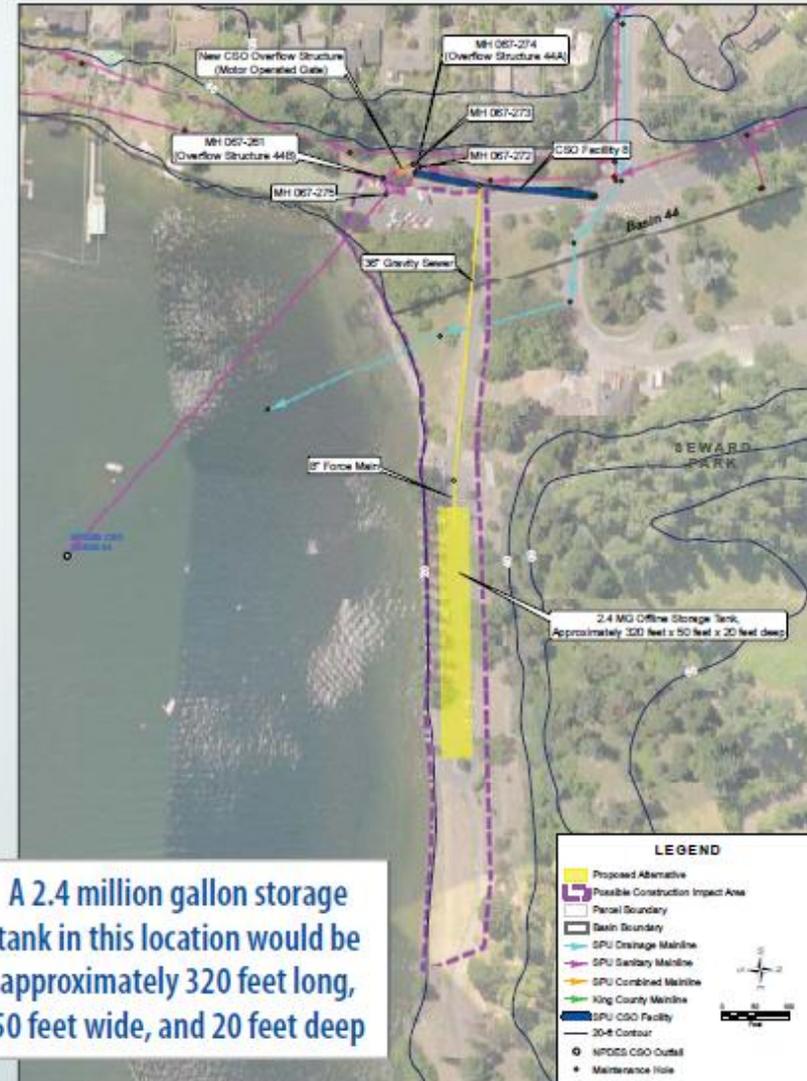
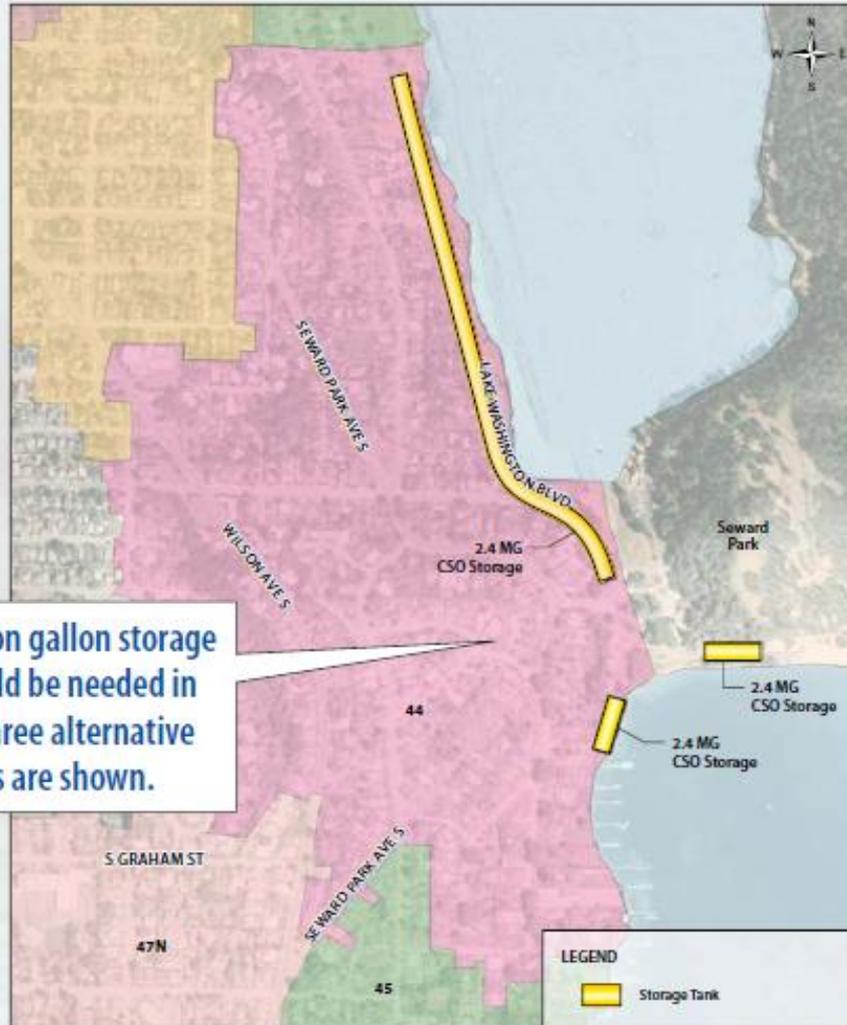
A 2.4 million gallon storage pipeline under Lake Washington Boulevard would require a 12-foot-diameter pipeline approximately 3,000 feet long



Example of storage under Lake Washington Boulevard

# Distributed Storage (Basin 44)

## Storage under Seward Park parking lot

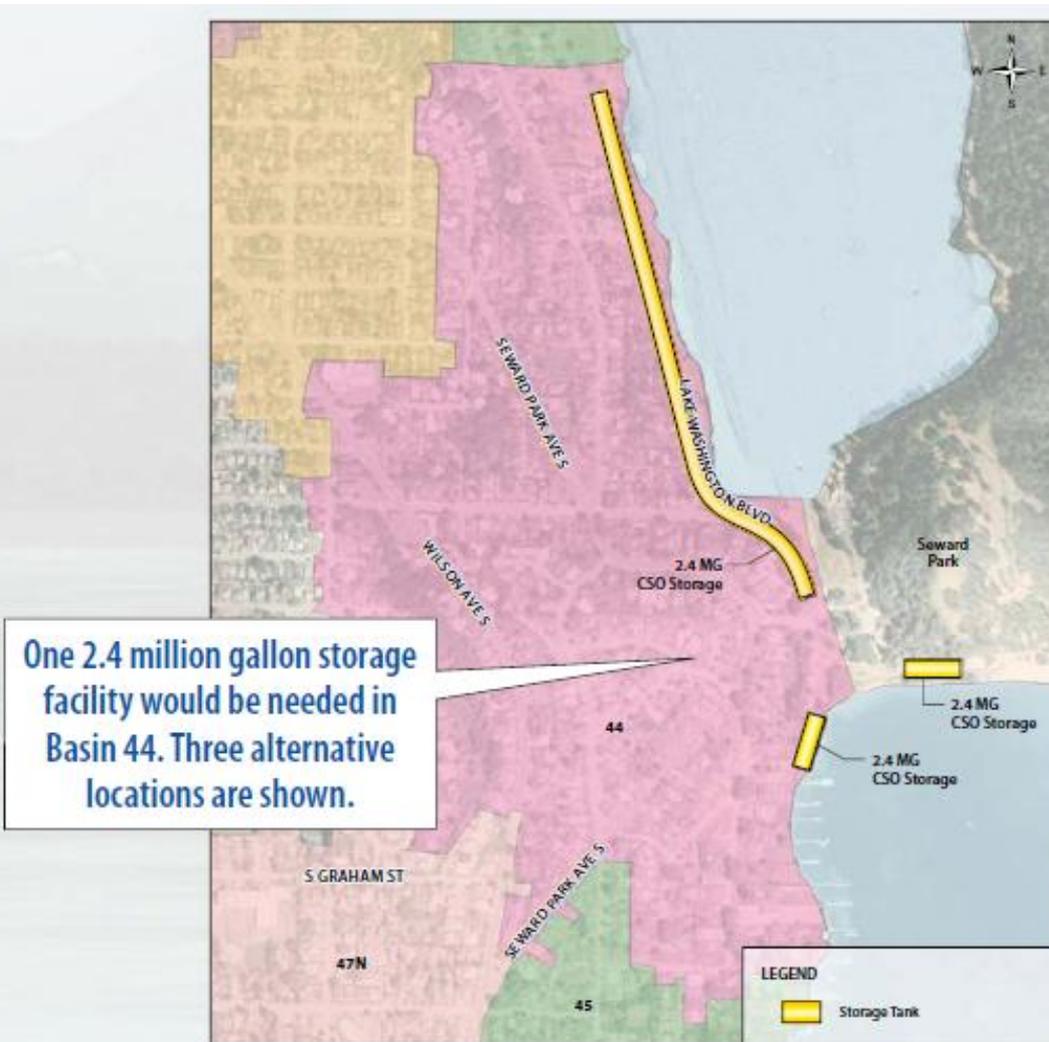


A 2.4 million gallon storage tank in this location would be approximately 320 feet long, 50 feet wide, and 20 feet deep

Example of storage in Seward Park

# Distributed Storage (Basin 44)

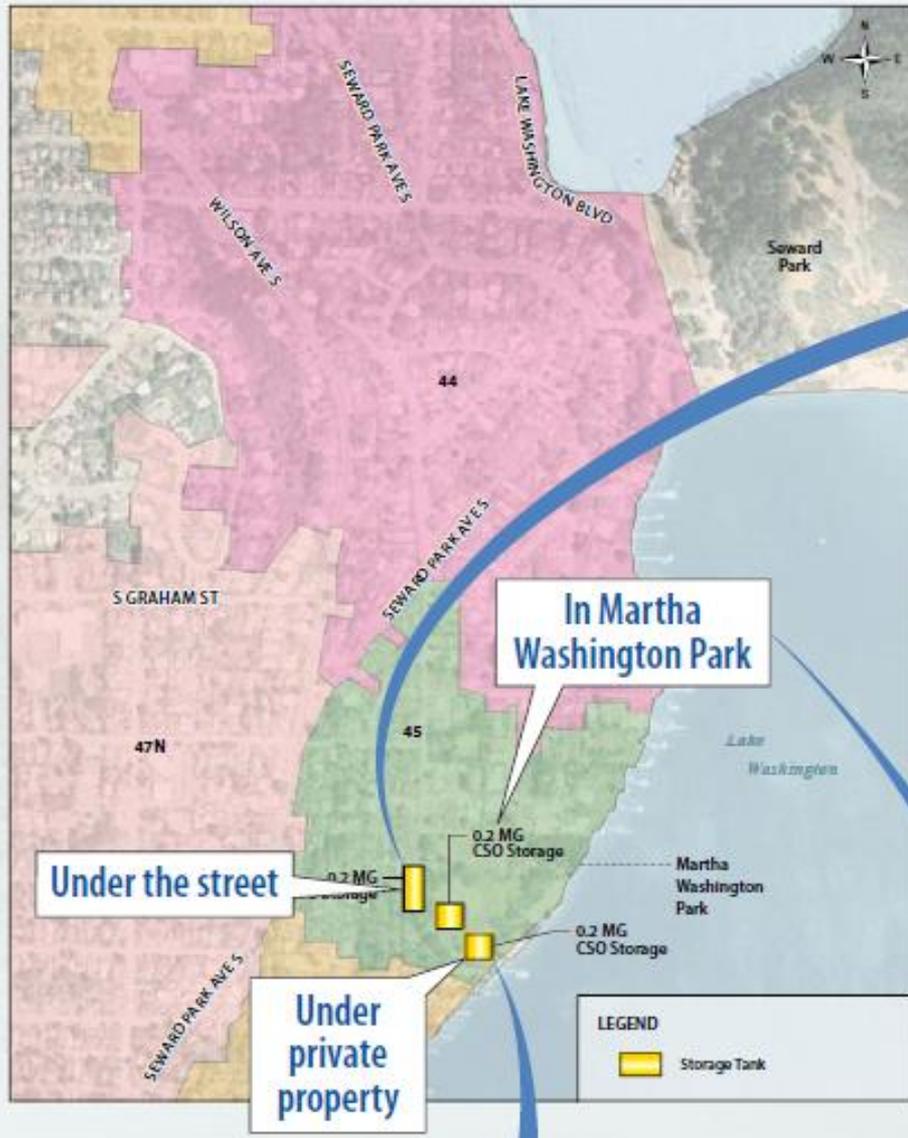
## Storage on private property



# Distributed Storage (Basin 45) Potential Storage Locations

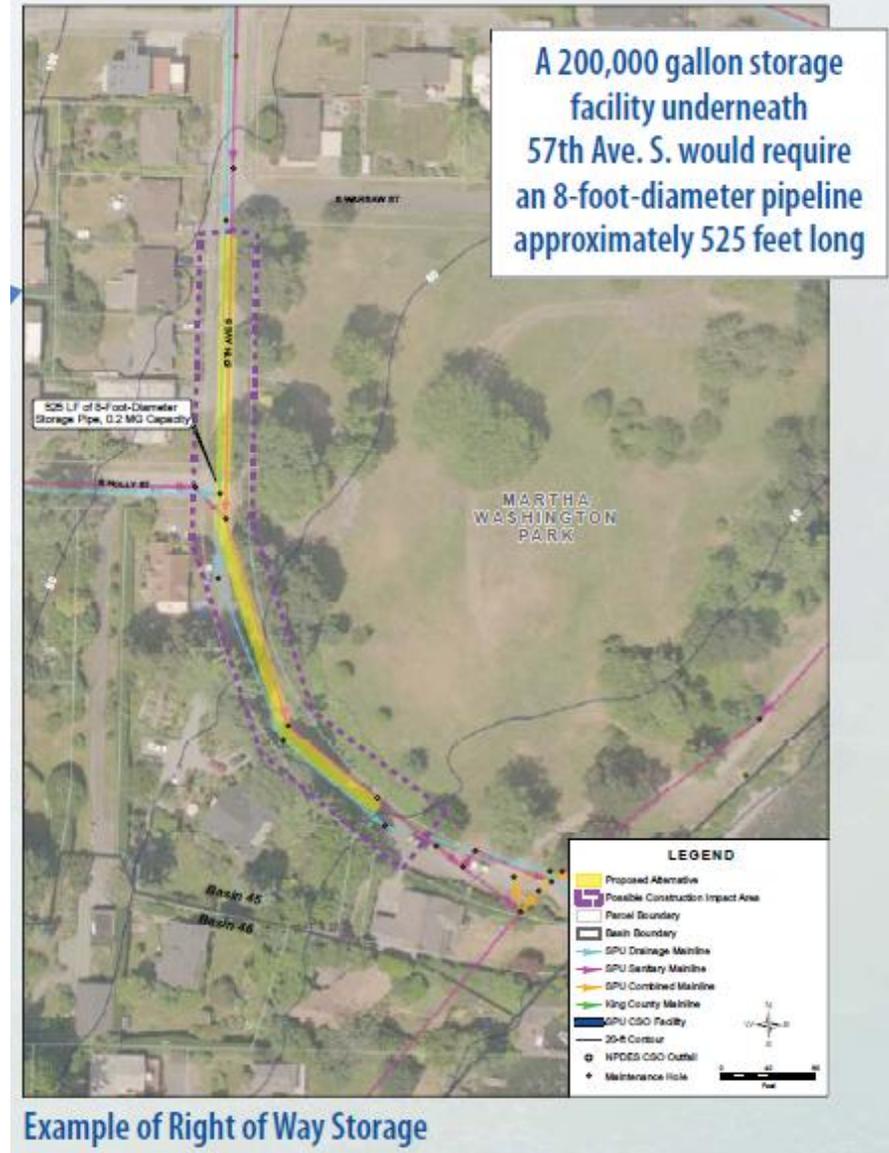
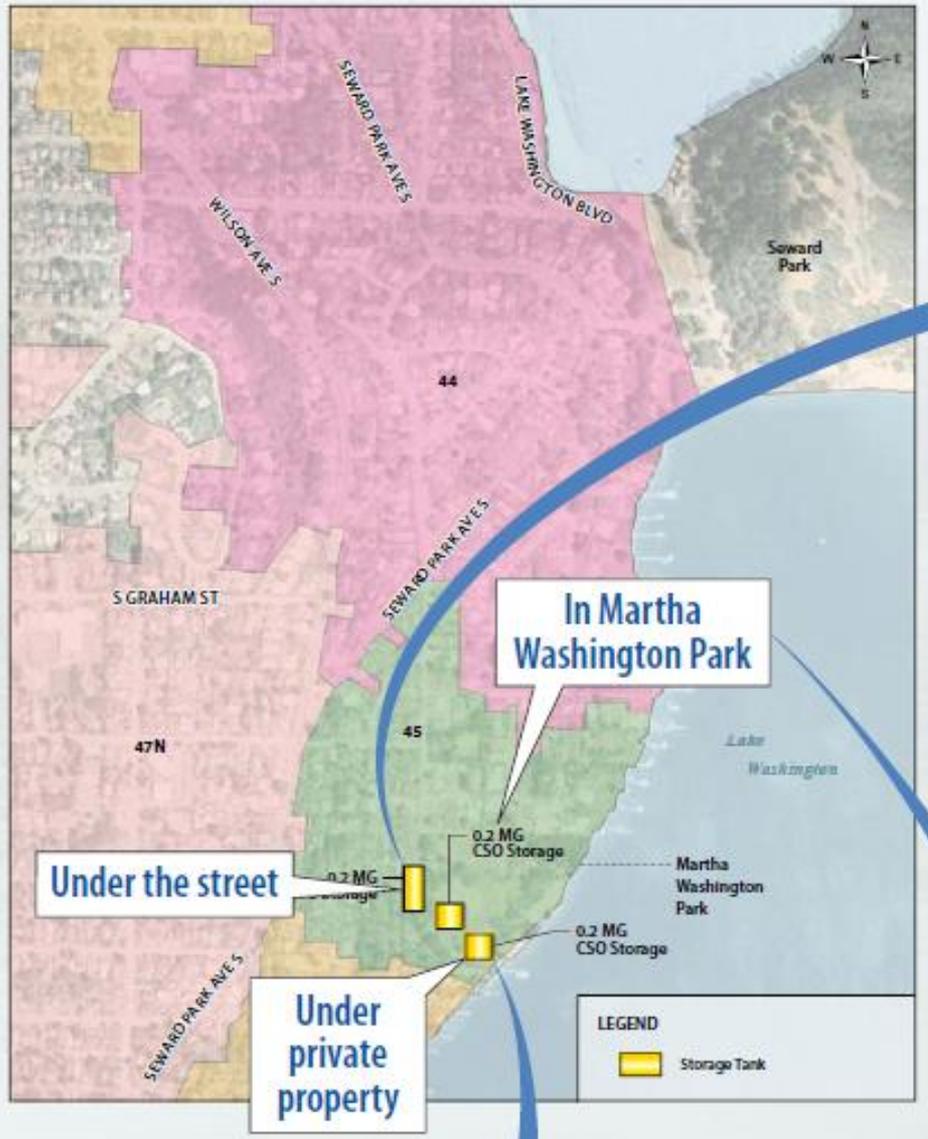
200,000 gallons of underground storage (Basin 45) could be constructed under:

- 57<sup>th</sup> Ave S.
- Martha Washington Park
- Private property



# Distributed Storage (Basin 45)

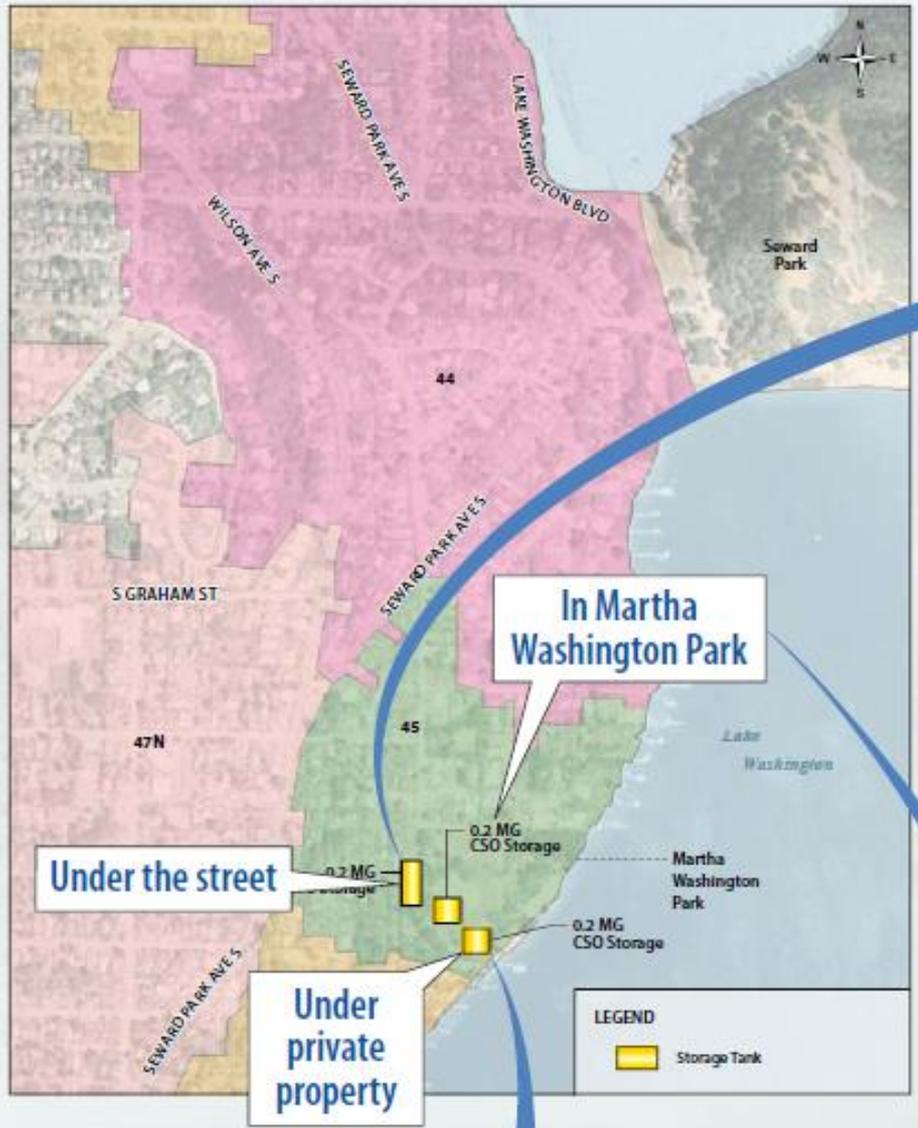
## Storage under 57<sup>th</sup> Ave S.



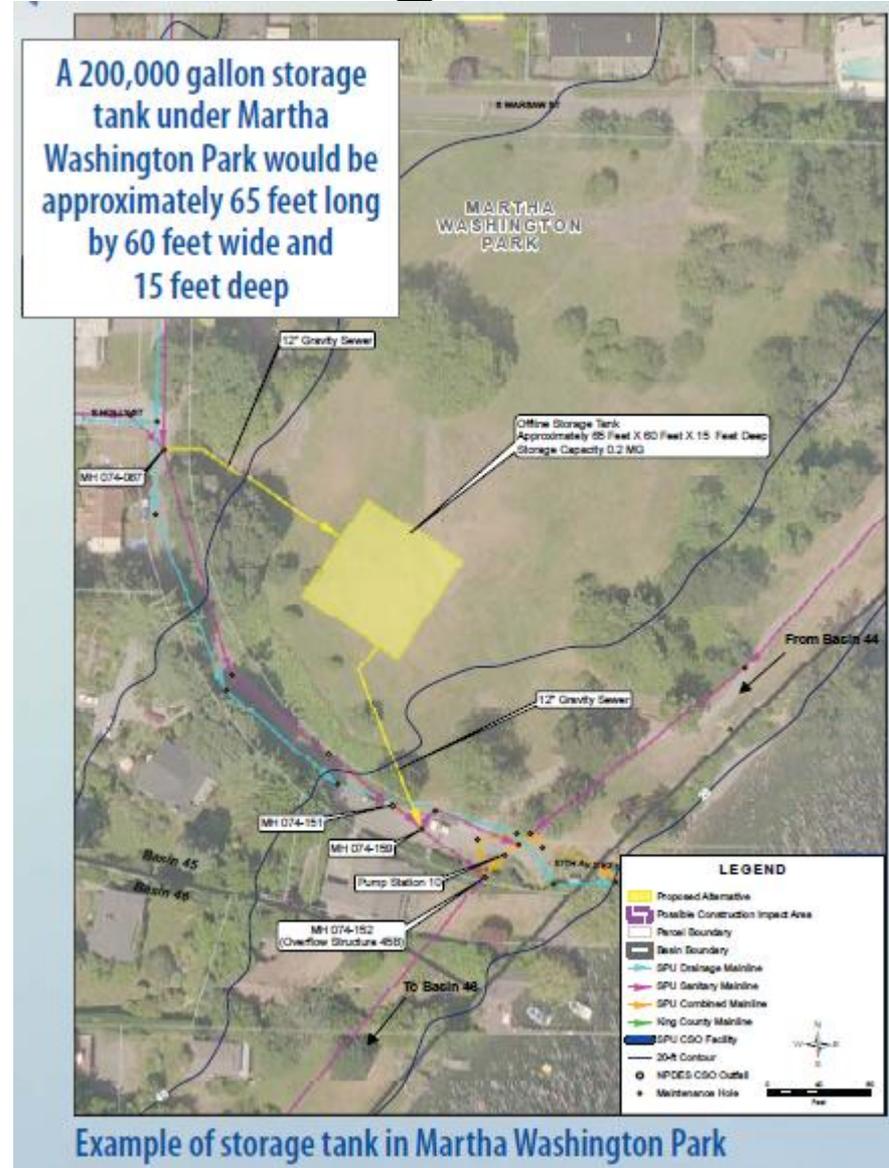
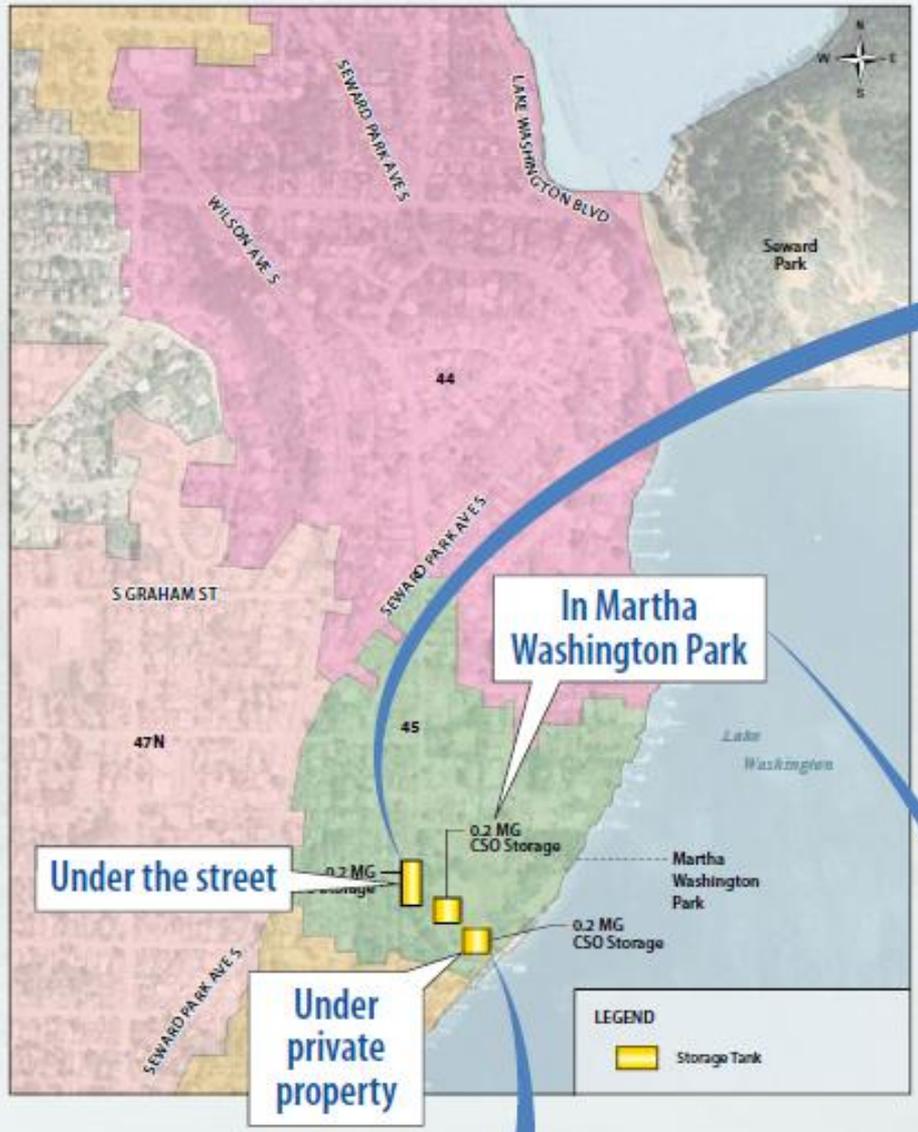
Example of Right of Way Storage

# Distributed Storage (Basin 45)

## Storage on private property



# Distributed Storage (Basin 45) Storage in Martha Washington Park



Example of storage tank in Martha Washington Park

# Distributed Storage Alternative

## During Construction...

Tank construction would last 1-2 years



Tank Construction (Oakwood RTB) Detroit, MI



Excavation and shoring



Tank Construction (Oakwood RTB) Detroit, MI

## After Construction...

Once construction is complete, most of the facility will be underground – some above ground features are required for maintenance access



Surface features of a below-ground pump station  
(53rd Ave. Pump Station) Seattle, WA



Surface features of a below-ground reservoir  
(Cal Anderson Park, Capital Hill) Seattle, WA

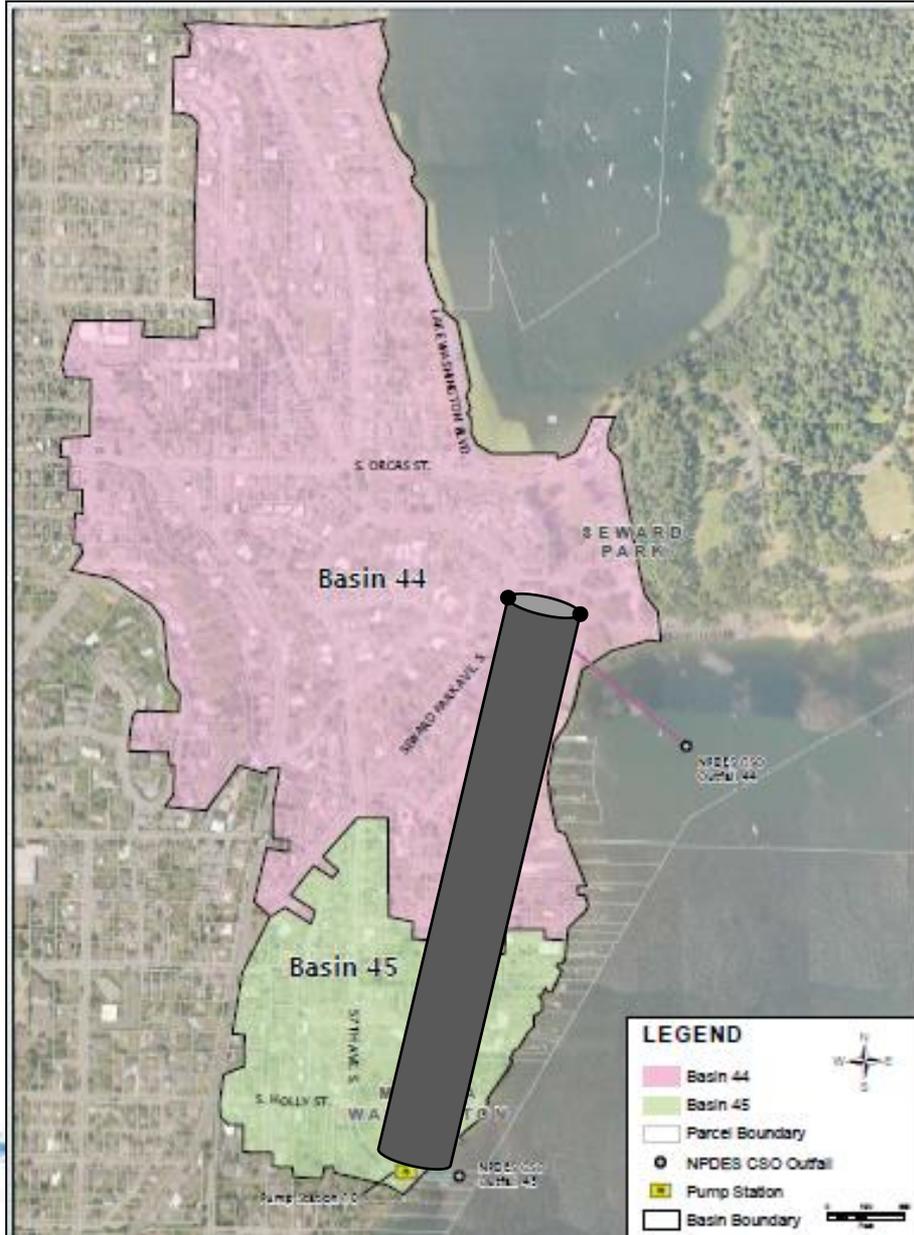


Surface features of a below-ground storage tank  
(North Creek Storage Facility) Bothell, WA

# Tunnel Storage Alternative

Store 2.6 million gallons in a tunnel underneath streets and private properties between Seward Park and Martha Washington Park

- Requires tunnel launch shaft and receiving shaft
- Inherent risks associated with tunneling technologies
- Cost Range: \$45 - \$96 million



# Tunnel Storage Alternative

How Would it be Constructed?



The tunnel would require a construction footprint similar to a large storage tank in order to provide access for the tunnel-boring machine. The entry portal would be approx. 150 feet by 50 feet. The exit portal would be approx. 55 feet by 40 feet.



The tunnel would be approximately 2,400 feet long and 14 feet in diameter. A pump station and odor control facilities would also be needed

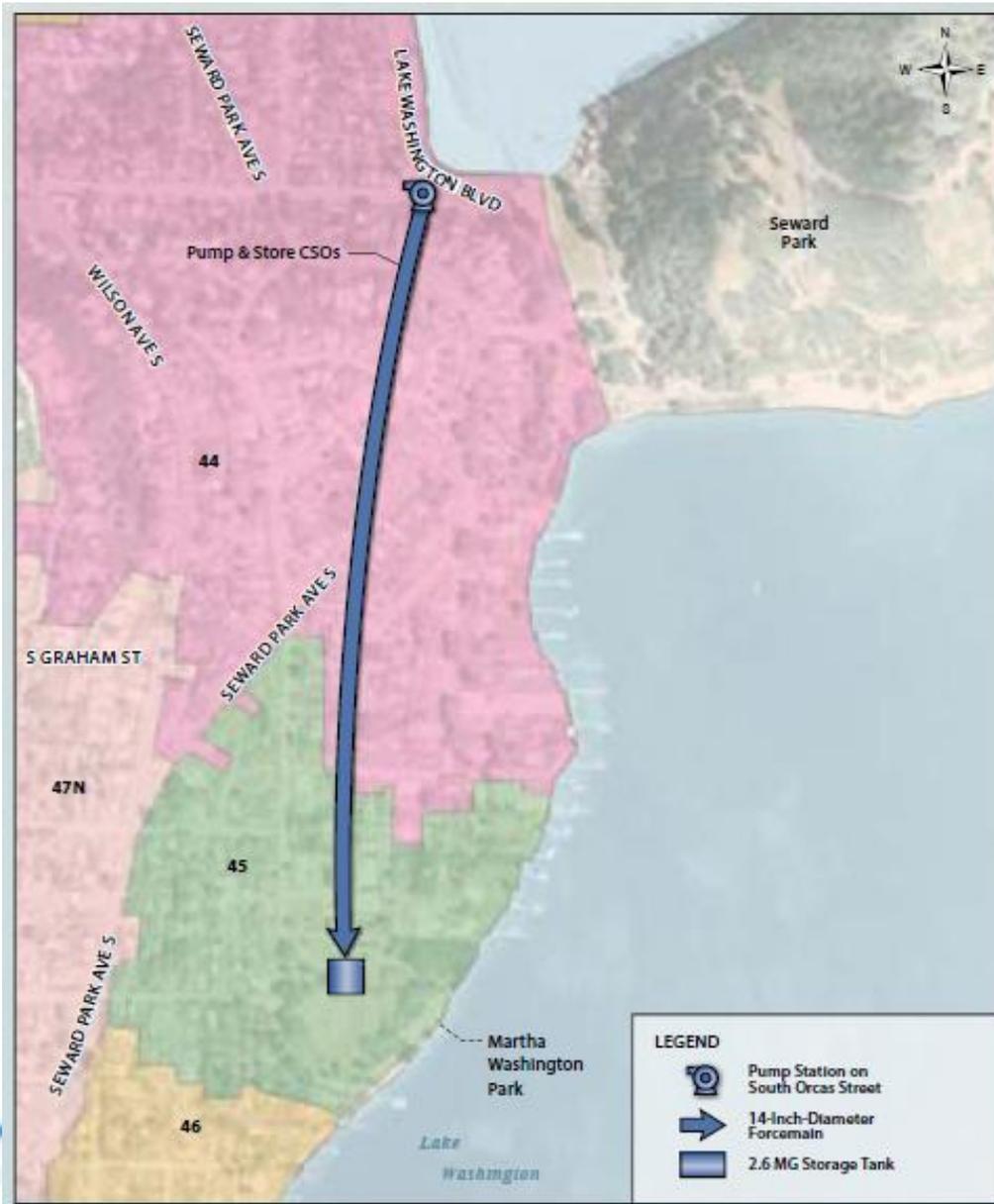


The entrance to the tunnel requires a larger footprint so that the soil and rock excavated from the tunnel can be removed behind the tunnel-boring machine



Easements would be required under 15-20 private properties to allow for tunnel construction

# Convey and Store Alternative



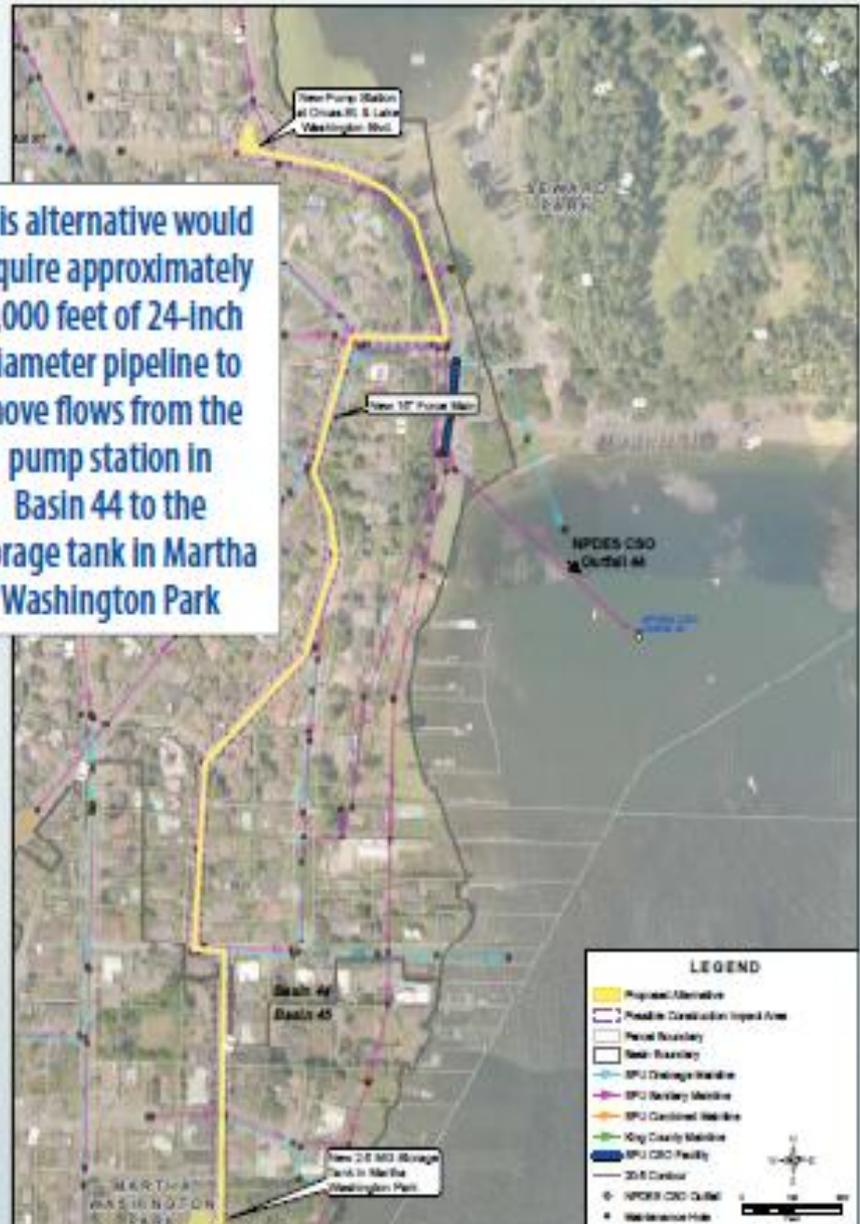
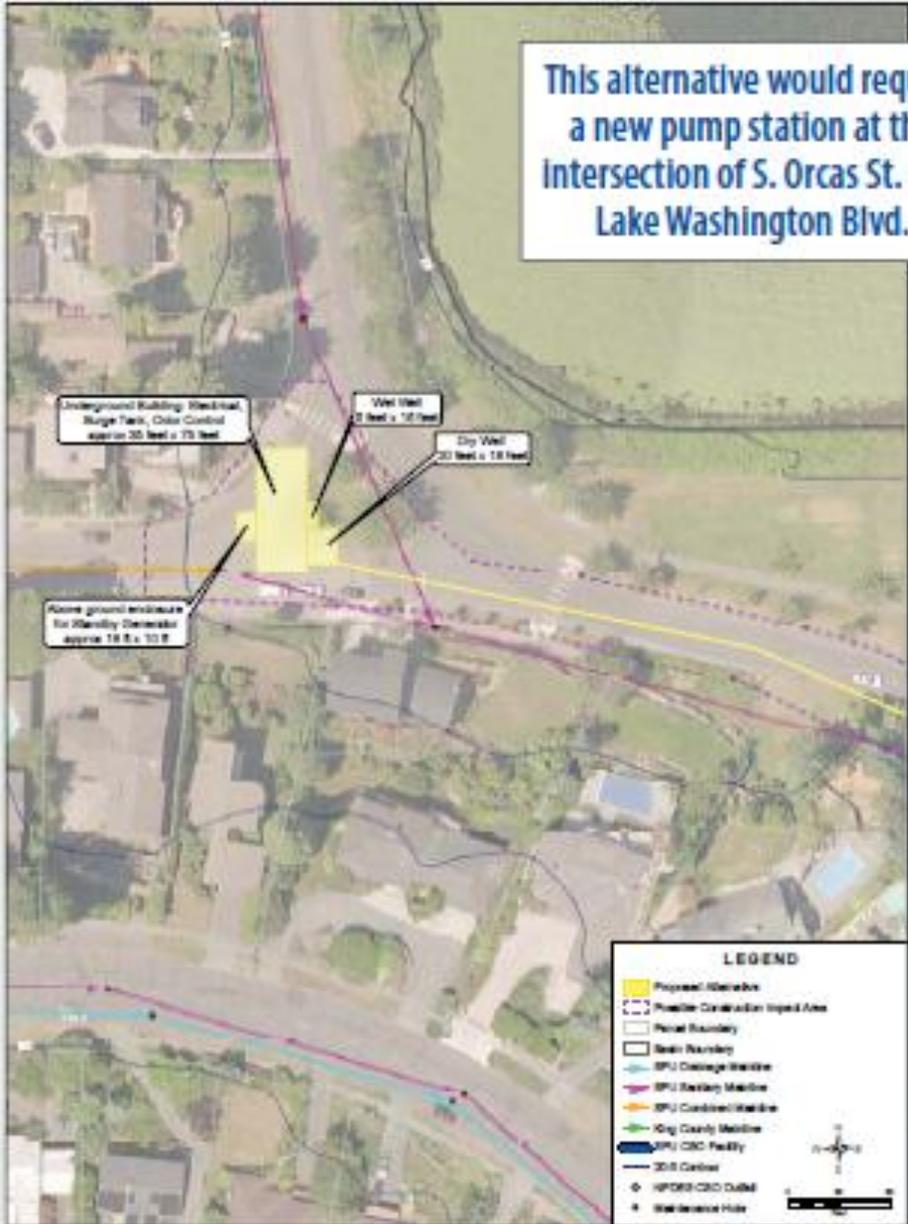
Send flows through a pipeline from Basin 44 to Basin 45 and store them in a 2.6 million gallon underground tank near Martha Washington Park

- 💧 May require new pump station
- 💧 Requires conveyance piping
- 💧 2.6 million gallon underground storage tank could be located in park or underneath private properties
- 💧 Cost Range: \$43 - \$93 million

# Convey and Store Alternative

This alternative would require a new pump station at the intersection of S. Orcas St. and Lake Washington Blvd.

This alternative would require approximately 3,000 feet of 24-inch diameter pipeline to move flows from the pump station in Basin 44 to the storage tank in Martha Washington Park



# Convey and Store Alternative



Requires a 2.6 million-gallon underground storage tank

♦ Could be located in Martha Washington Park or underneath private properties

♦ Example shows 2.6 million underground storage tank in Martha Washington Park

# Convey and Store Alternative

During Construction...



Example of pipeline construction



Example of pump station construction



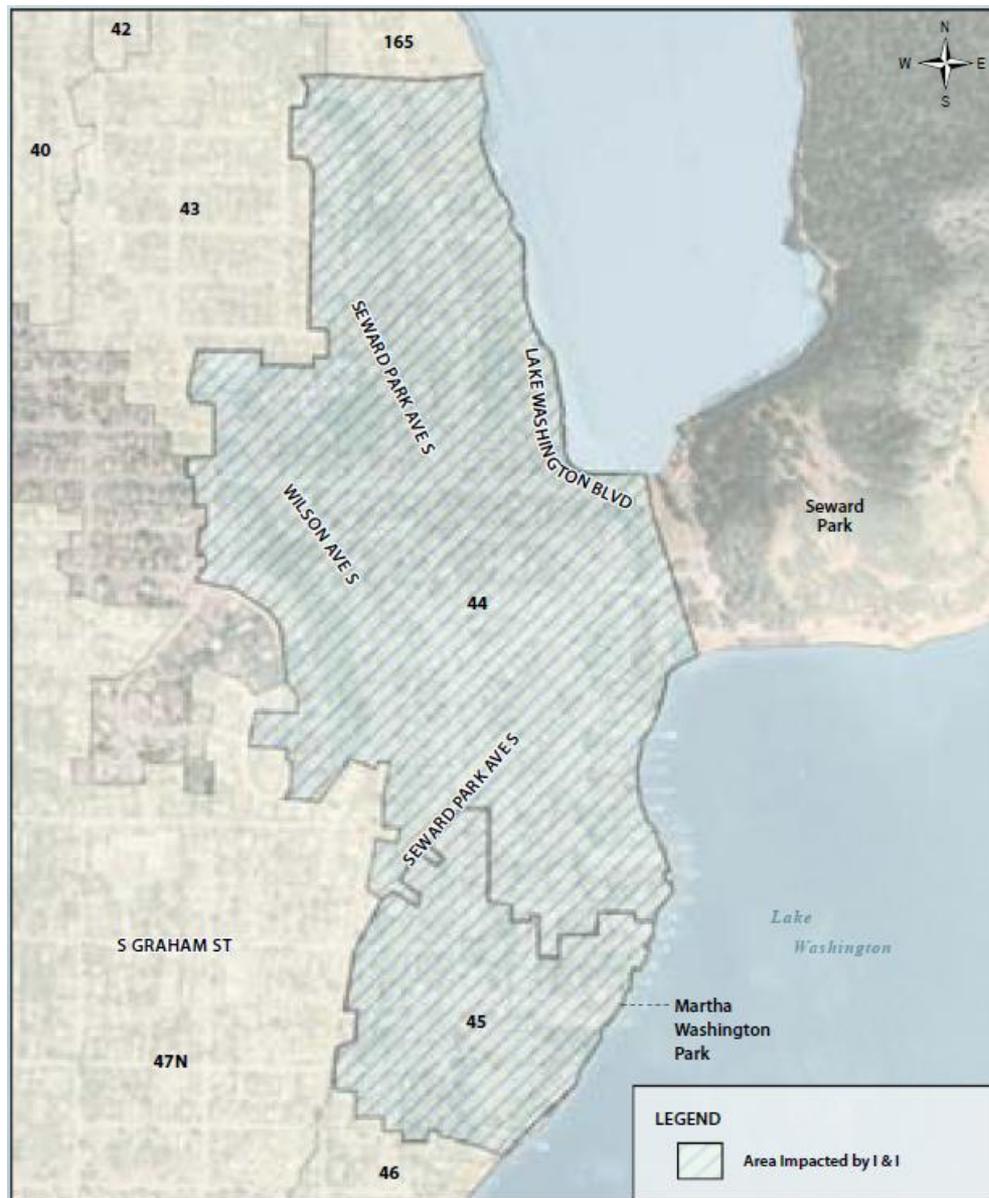
Example of storage tank construction

After Construction...

Once the storage tank is completed, vents, air intakes, and access hatches will be visible on the surface



# Complete Separation Alternative (Includes Inflow & Infiltration Reduction)

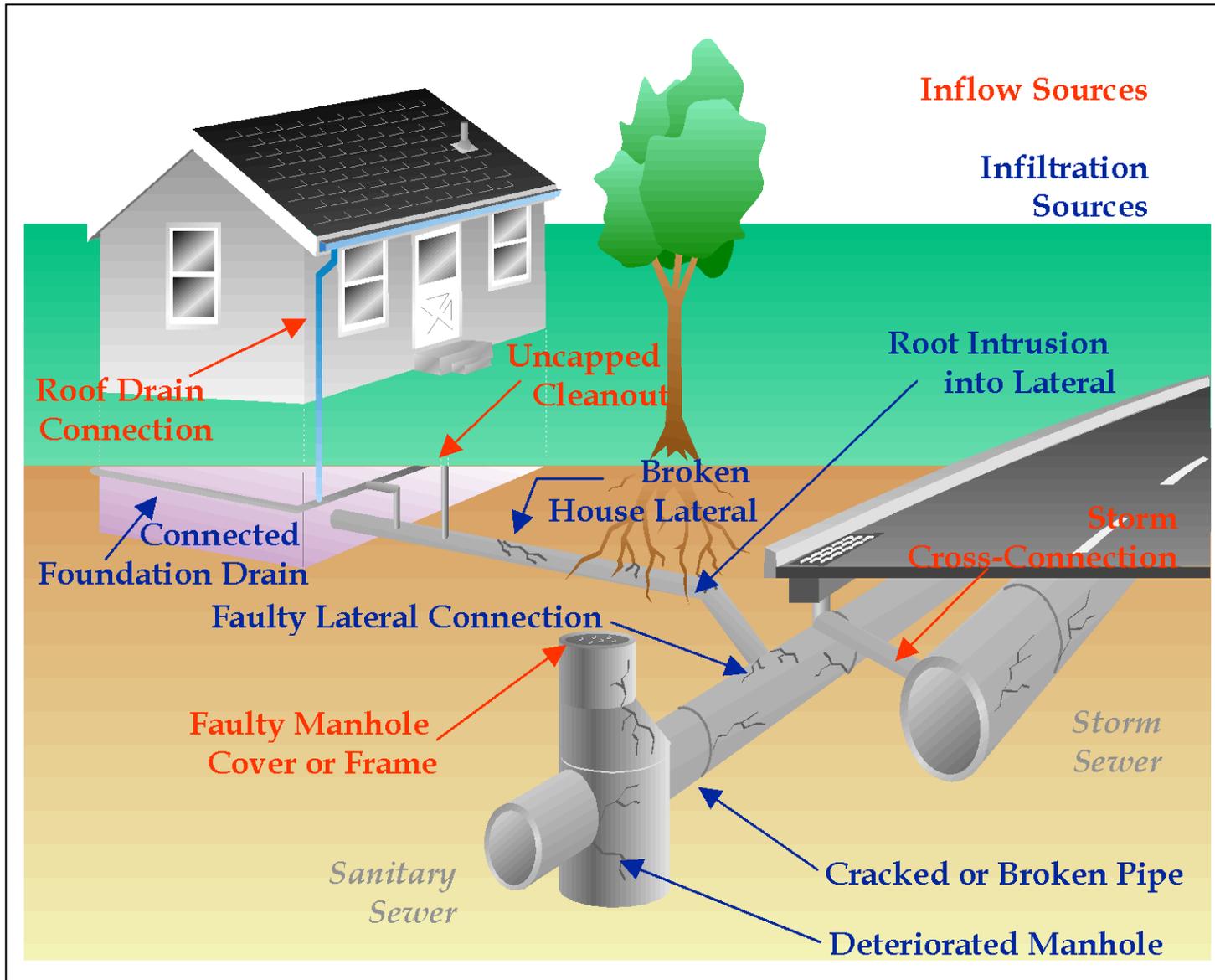


Prevents stormwater runoff and groundwater from entering the combined system. Requires:

- ◆ Sewer main replacement
- ◆ Side sewer replacement
- ◆ Roof leader disconnection
- ◆ New storm lateral or raingarden (if feasible)
- ◆ Storm main extensions
- ◆ Stormwater treatment

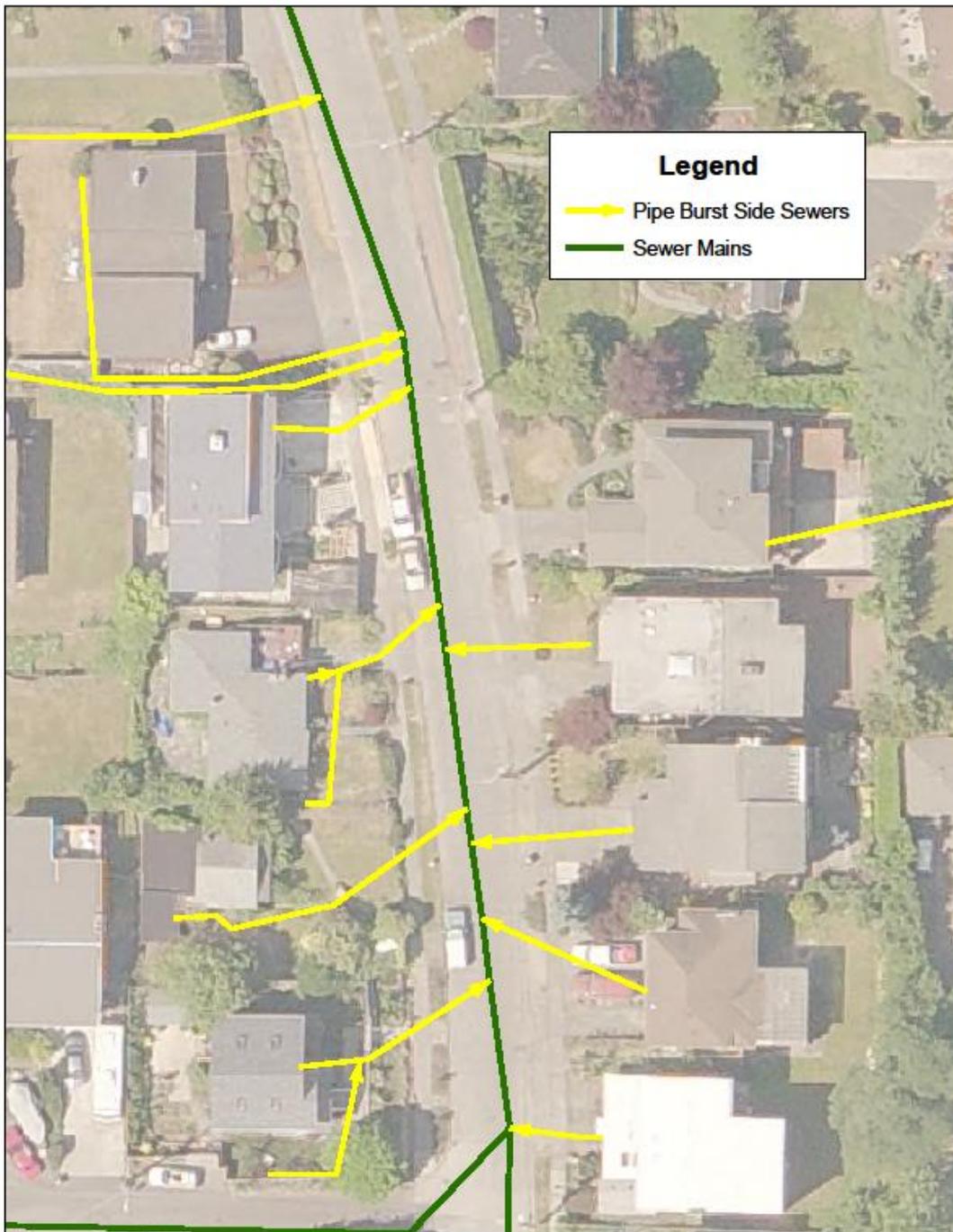
Cost Range: \$55 - \$117 million

# Where Does the Rain Get In?



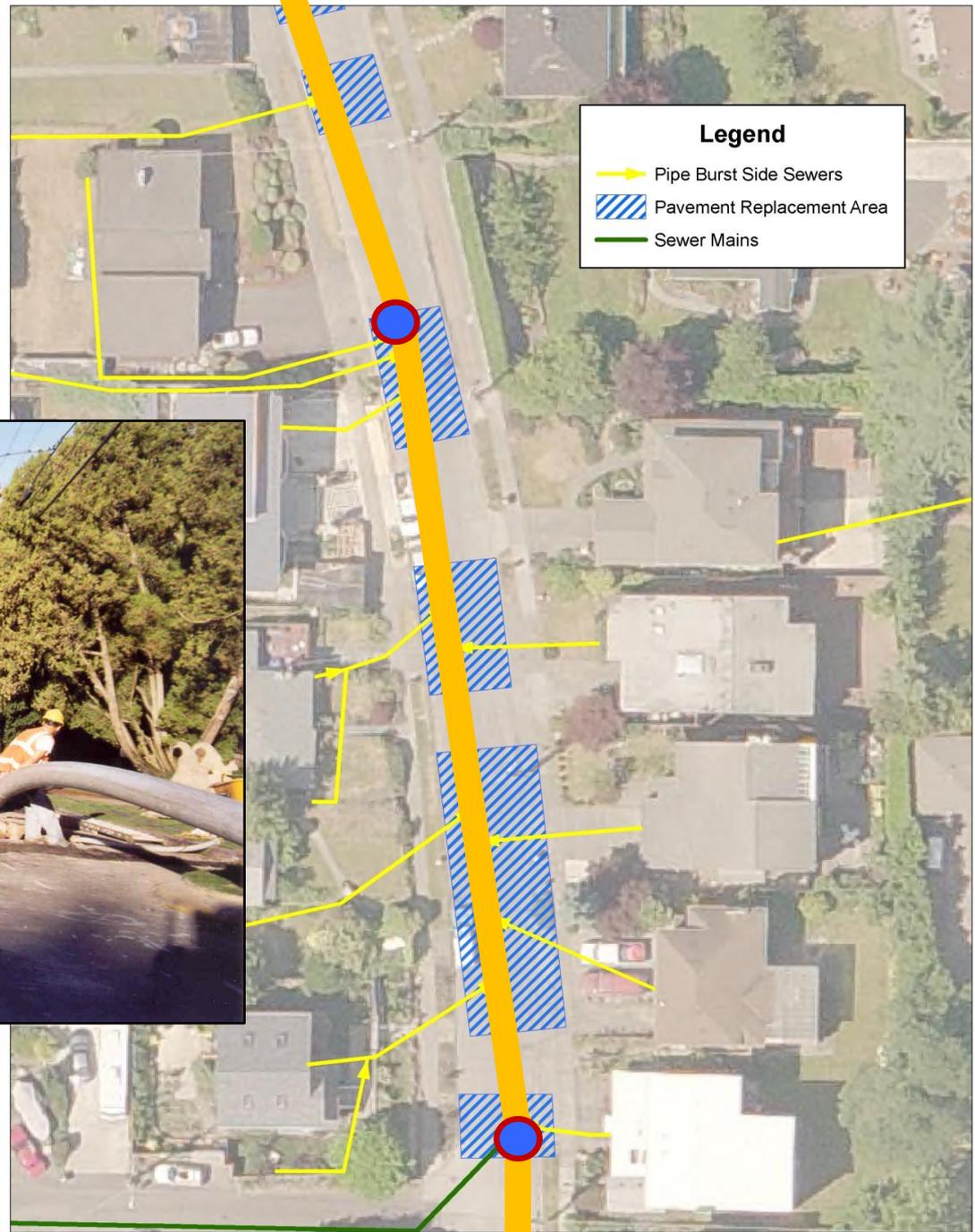
# Complete Separation

- 💧 Typical Block in Basin 44 with Sewer Main and Side Sewers



# Complete Separation

💧 Sewer main replacement



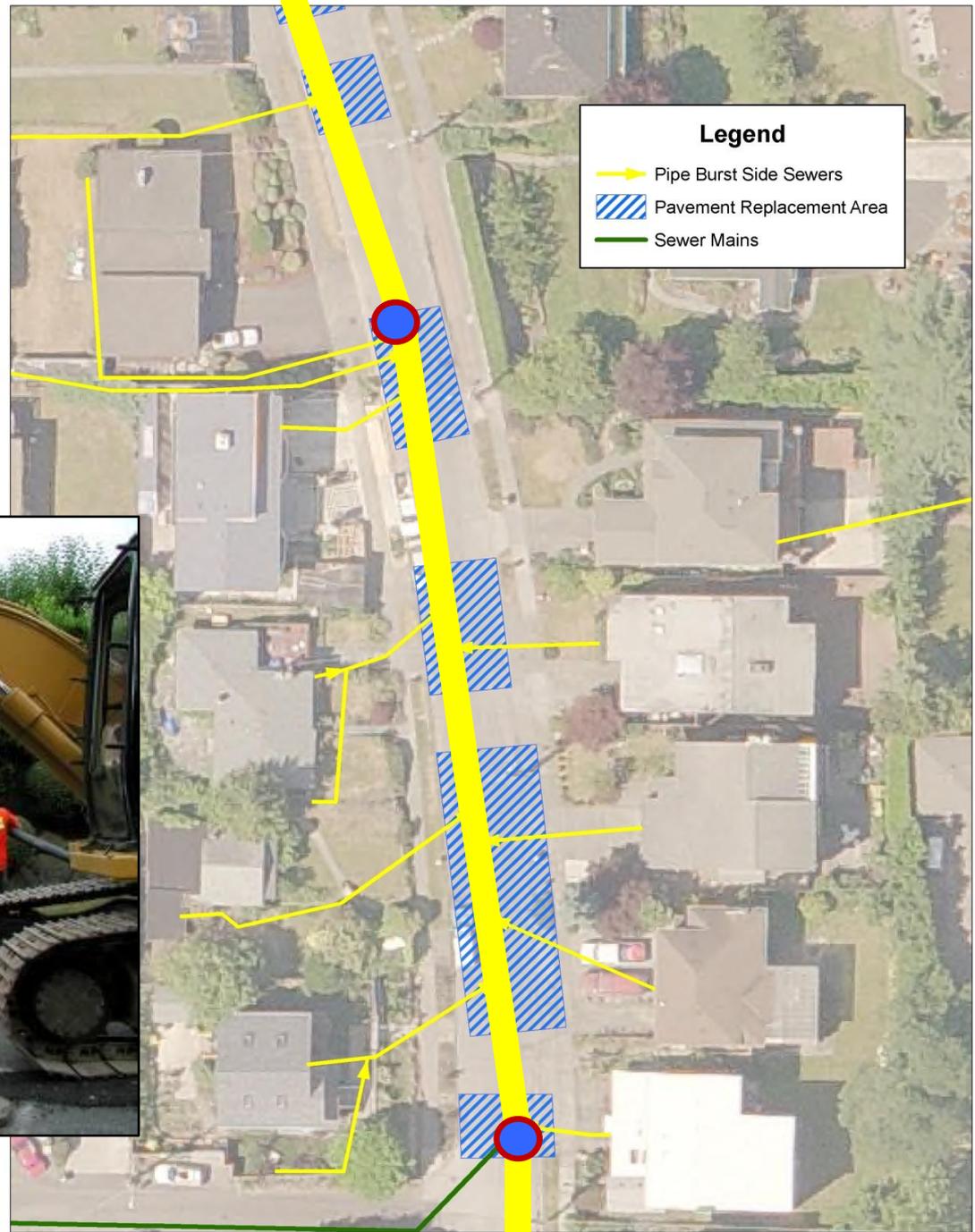
## Legend

- Pipe Burst Side Sewers
- ▨ Pavement Replacement Area
- Sewer Mains

# Complete Separation

☉ Sewer main replacement

💧 Side sewer replacement



# Complete Separation

👉 Sewer main replacement

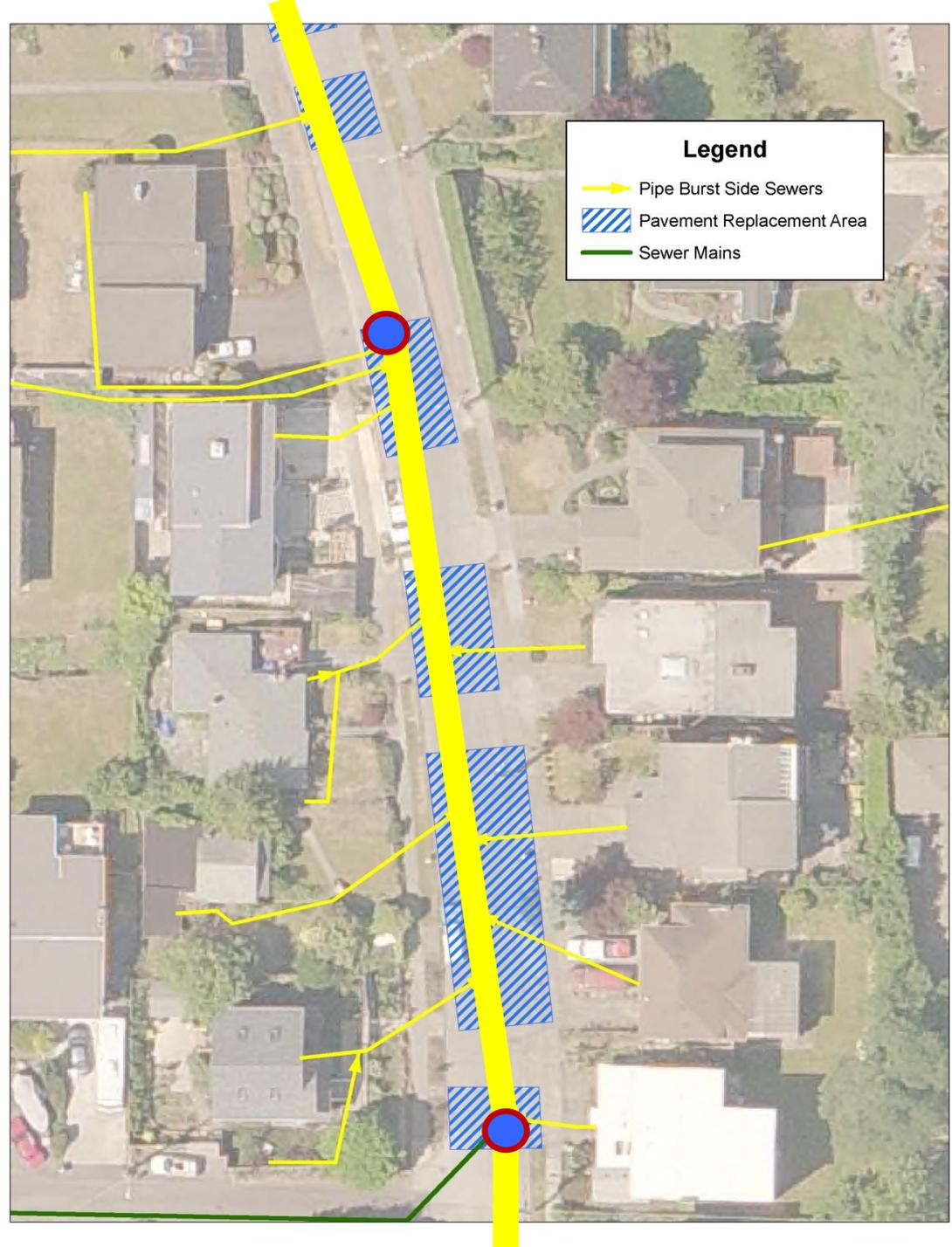
💧 **Side sewer replacement**



# Complete Separation

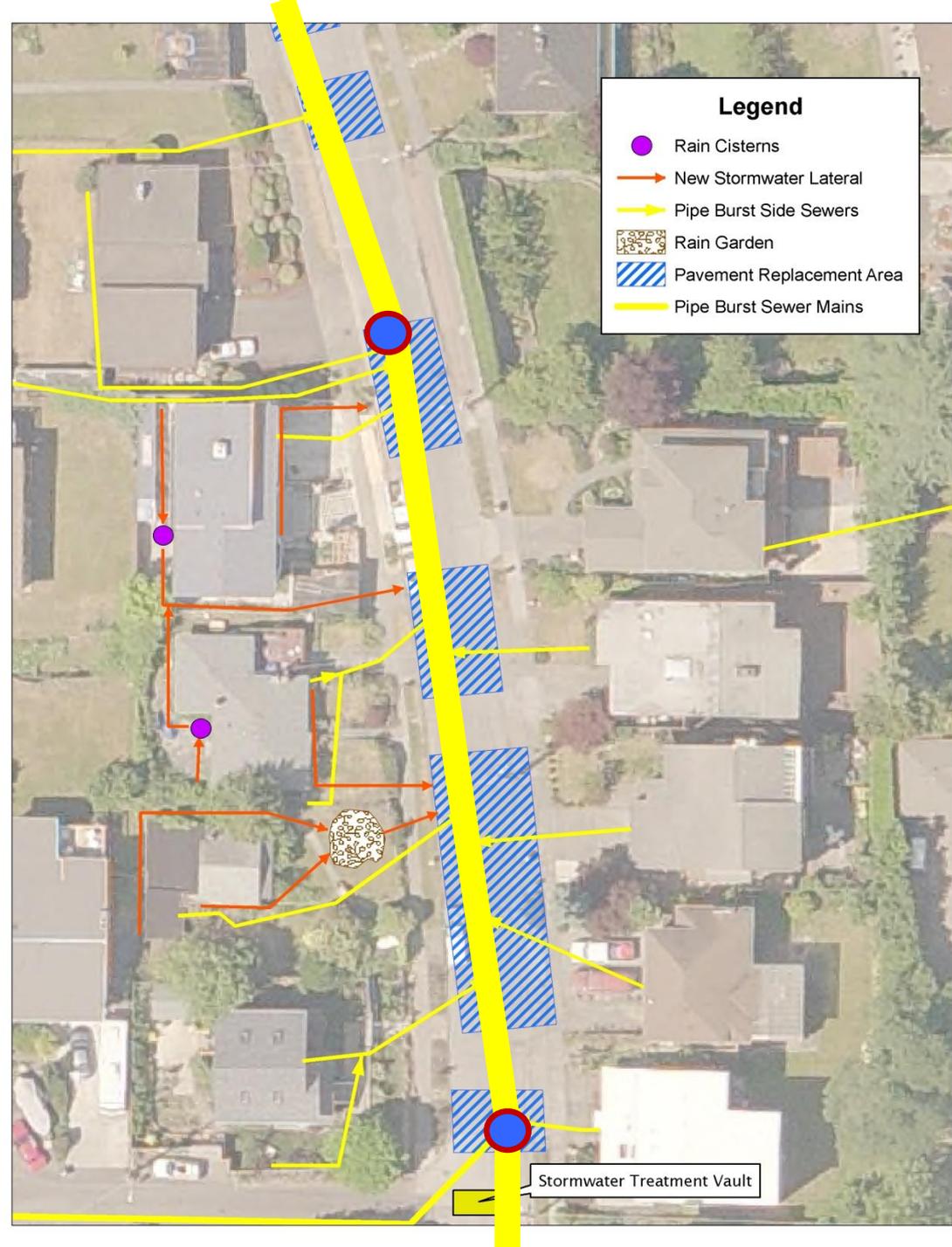
- 💧 Sewer main replacement
- 💧 Side sewer replacement

***Requires repaving the streets***



# Complete Separation

- 💧 Sewer main replacement
- 💧 Side sewer replacement
- 💧 **Roof leader disconnection**
- 💧 **New storm lateral, sump pump (if necessary), or raingarden (if feasible)**



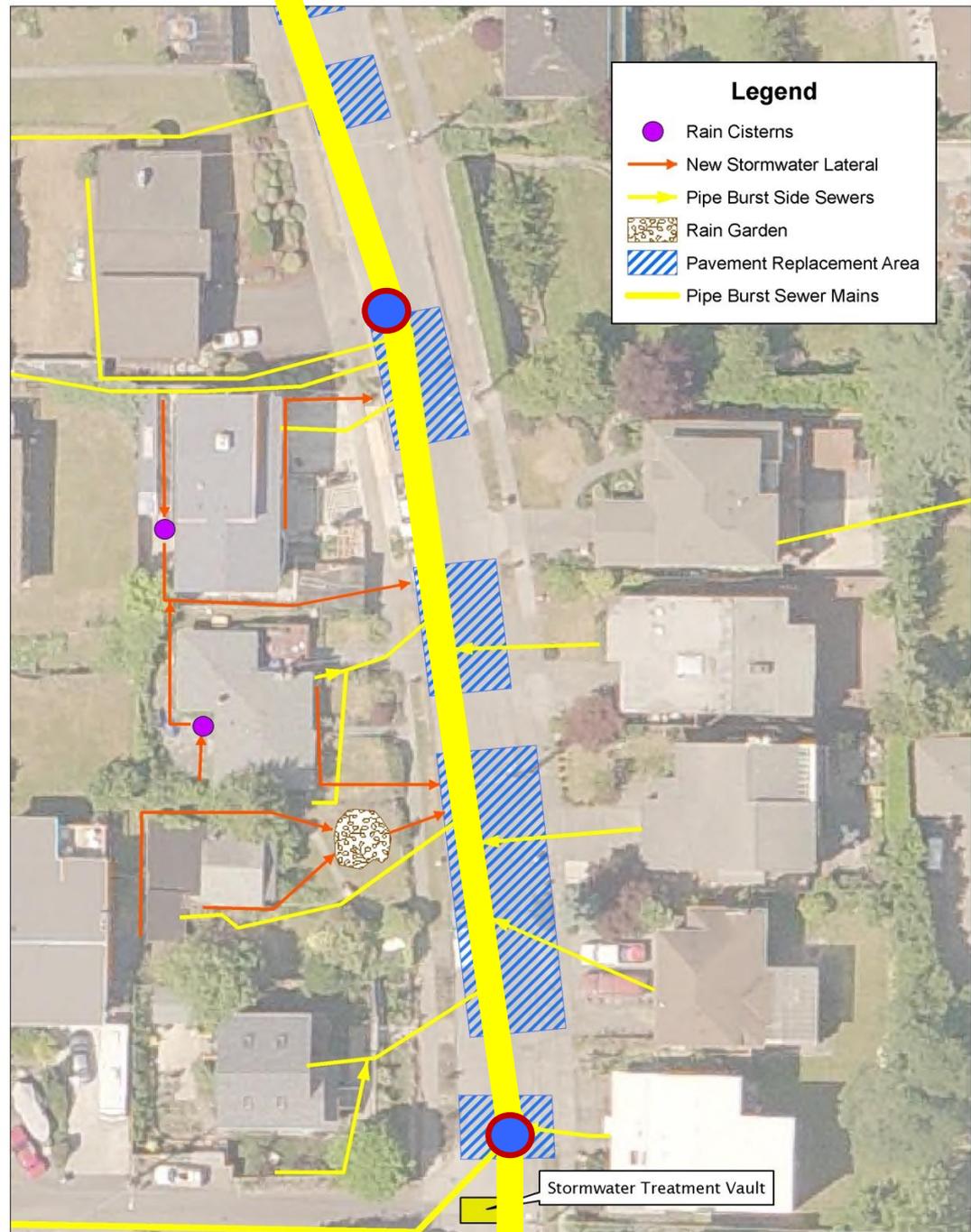
# Complete Separation

- 🔹 Sewer main replacement
- 🔹 Side sewer replacement
- 💧 **Roof leader disconnection**
- 💧 **New storm lateral, sump pump (if necessary), or raingarden (if feasible)**



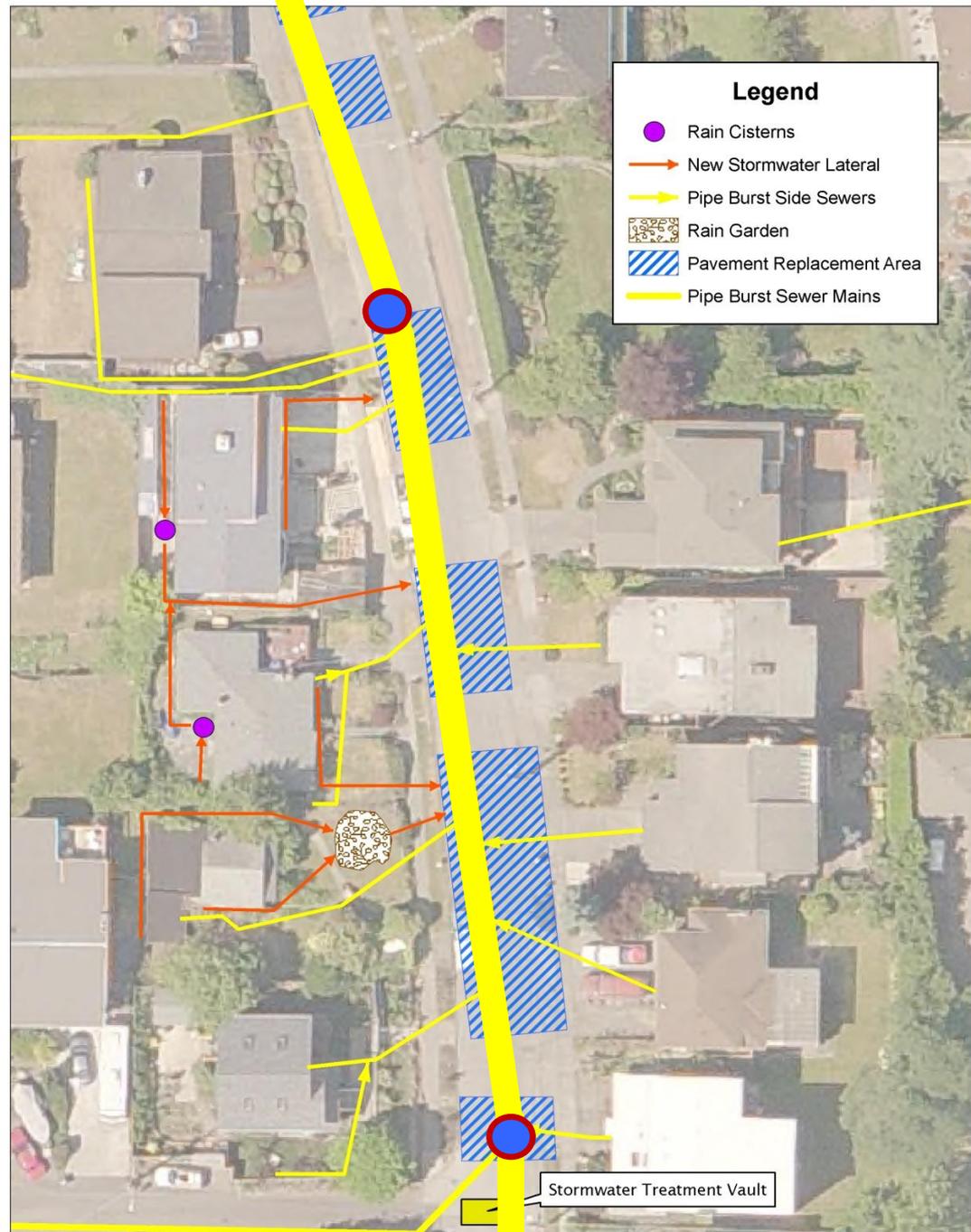
# Complete Separation

- 💧 Sewer main replacement
- 💧 Side sewer replacement
- 💧 Roof leader disconnection
- 💧 New storm lateral, sump pump (if necessary), or raingarden (if feasible)
- 💧 **Storm main extensions**



# Complete Separation

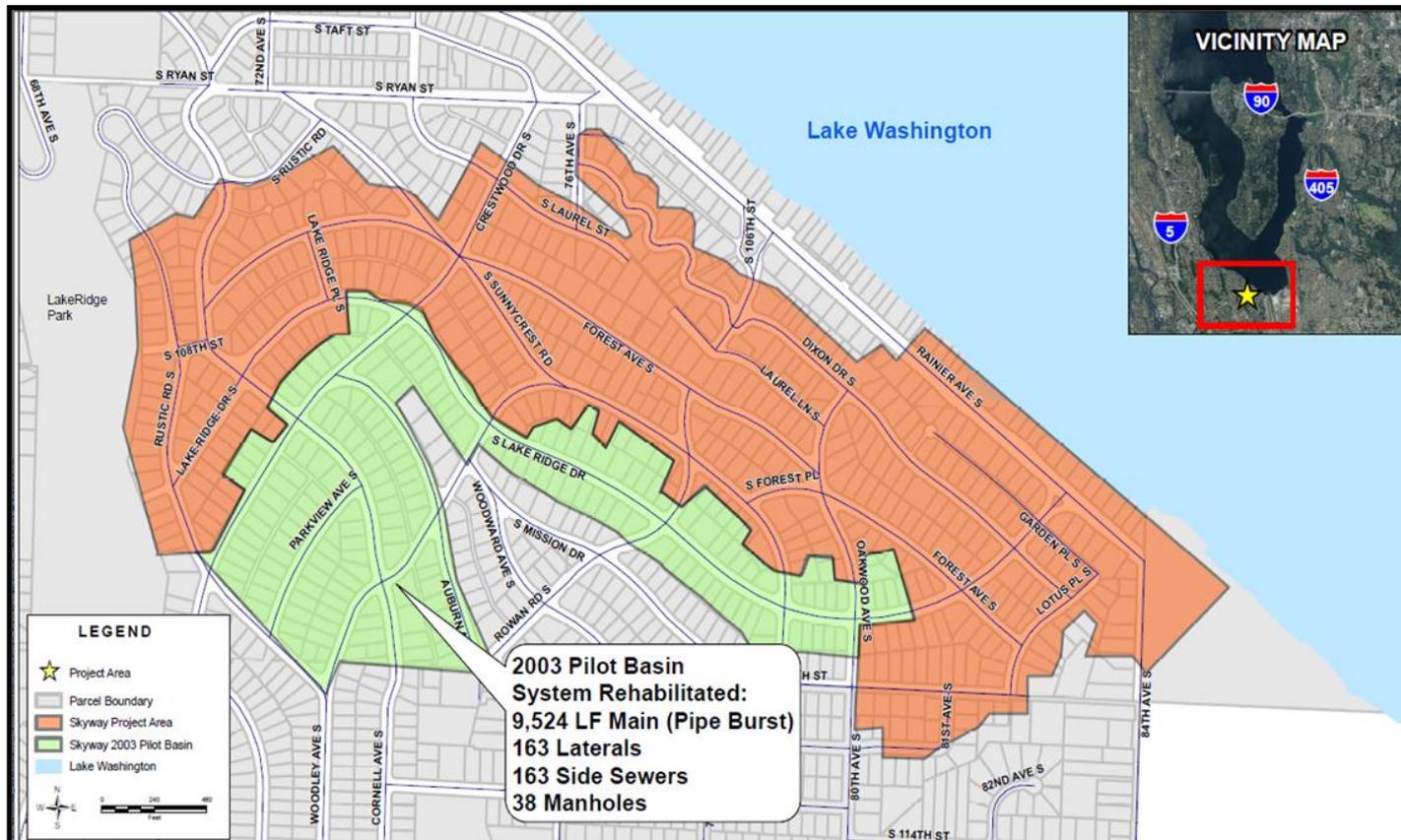
- 🔹 Sewer main replacement
- 🔹 Side sewer replacement
- 🔹 Roof leader disconnection
- 🔹 New storm lateral, sump pump (if necessary), or raingarden (if feasible)
- 🔹 Storm main extensions
- 💧 **Stormwater treatment (water quality vault and green stormwater infrastructure if feasible)**



# Where Has This Been Done?

## Partial Separation

- Bremerton – Roof Leader Disconnections
- Skyway - Mains and Side Sewers Only



# What Would Be Needed in North Henderson?

***Basin 44*** - Requires Complete Separation with 100% Participation

***Basin 45*** - Requires Complete Separation with Minimum 75% Participation

# Cost Ranges of Alternatives

| <b>Alternative</b>  | <b>Approx. Cost Range</b> |
|---------------------|---------------------------|
| Distributed Storage | \$35 - \$75 million       |
| Tunnel Storage      | \$45 - \$96 million       |
| Convey & Store      | \$43 - \$93 million       |
| Complete Separation | \$55 - \$117 million      |

# Questions?

