

Seattle Public Utilities Capital, Program & Policy Work Supporting the Reduction of I&I *- Part 2*

Presentation to MWPAAC, Engineering & Planning

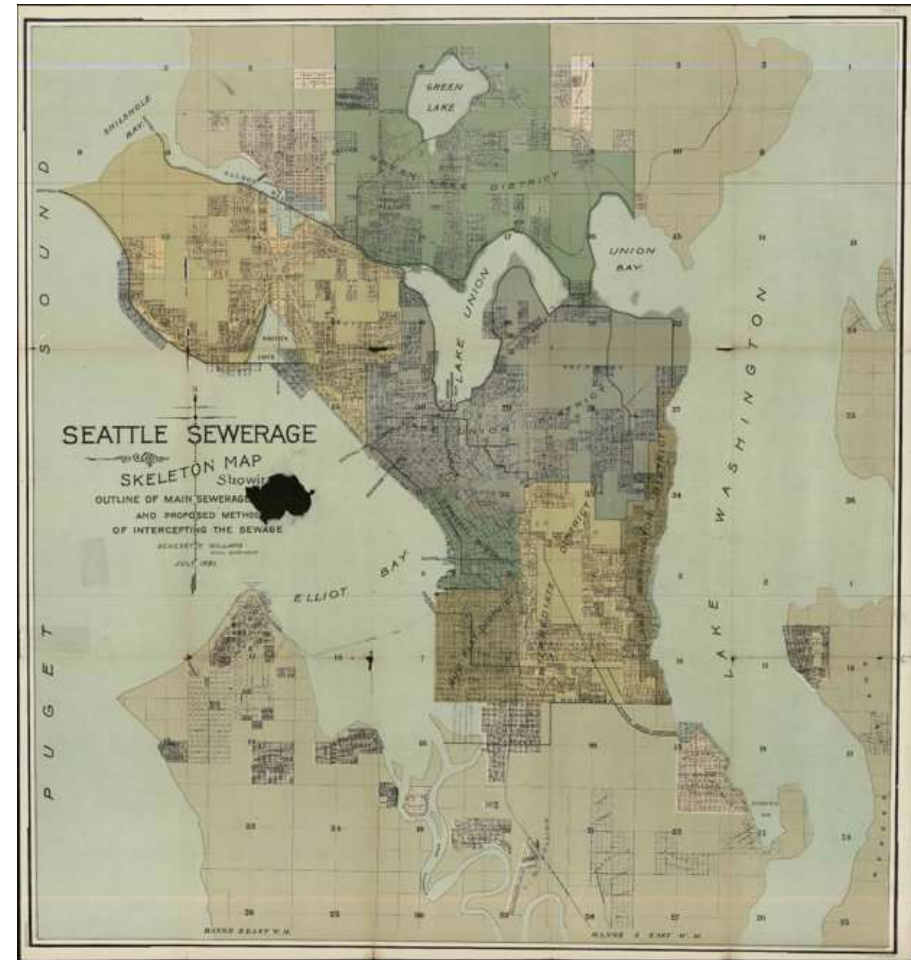
5/4/2023

Don Anderson



Today's discussion

- Context on Seattle's sewer system
- CMOM Program & Pipe Rehab Program
- Spotlight on a Couple Projects
- Policy & Program
- Questions/Discussion



Seattle's Wastewater System

Pipelines

1420+ miles of wastewater pipes

400+ miles of drainage pipes

Average age over 80 years

Pump Stations and Force mains

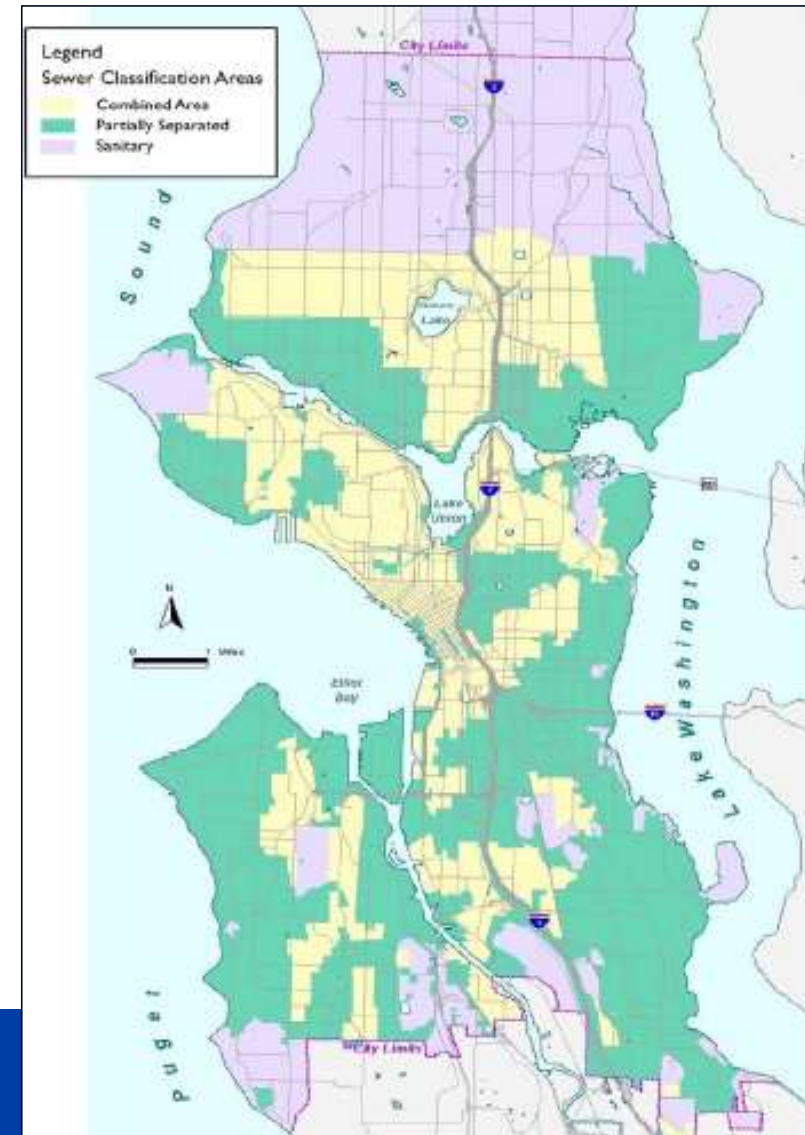
68 wastewater pump stations

68 force mains

Conveyance

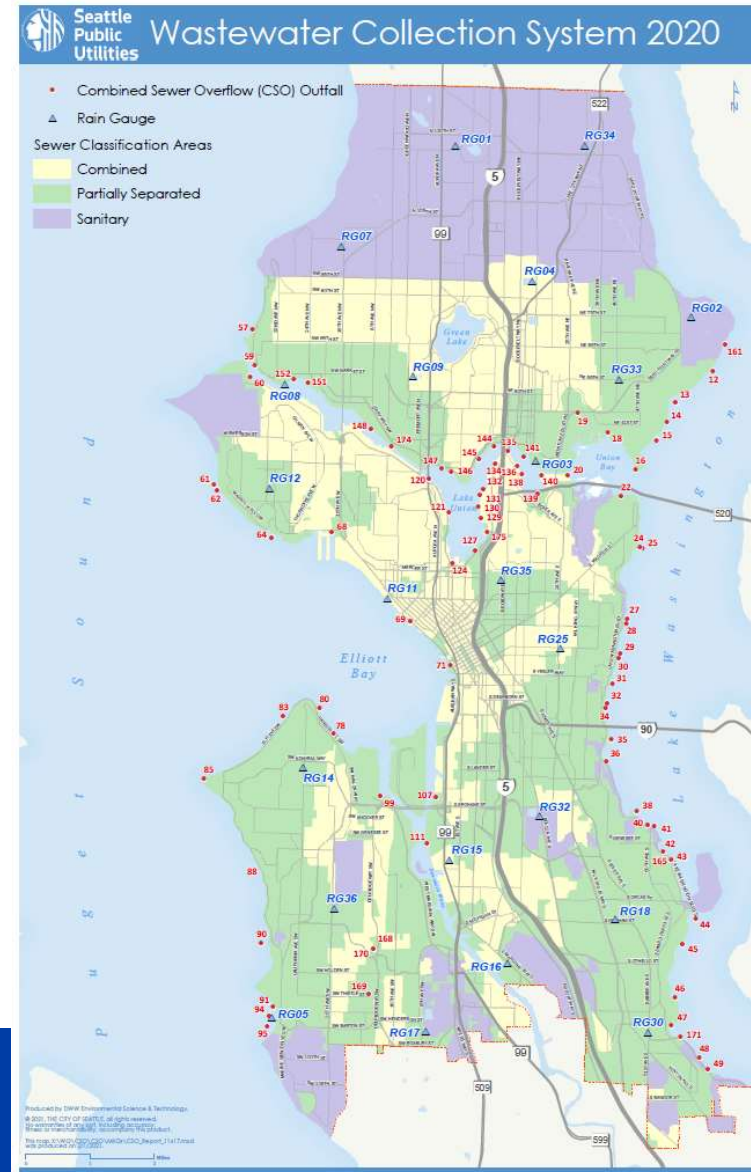
To King County Regional Collection System

~120 miles Regional Interceptor through Seattle



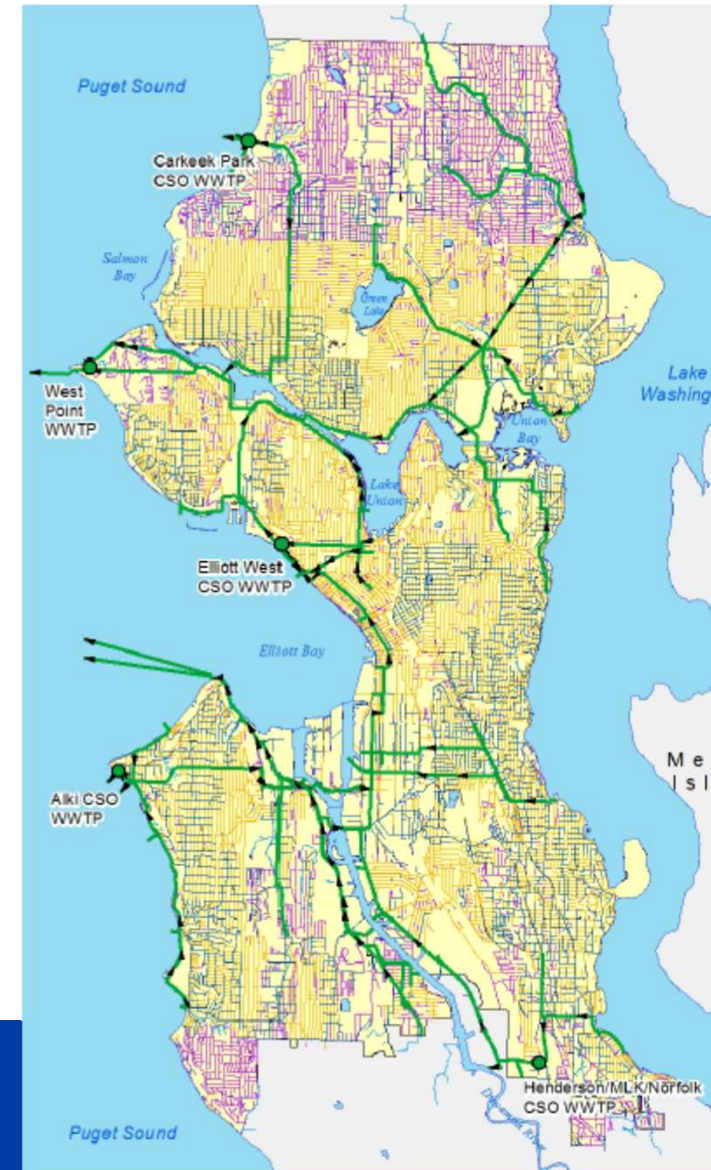
Seattle's Wastewater System Timeline

- 1880-1900 – First sewers built
 - Fully combined system, stormwater and wastewater in the same pipe
- 1950's-ish – Annexations of unincorporated areas, informal drainage
 - Separated system, only wastewater in wastewater pipe
- 1958 – Formation of METRO/King County regional wastewater treatment system
- Infrastructure serving basins larger than 1,000 acres owned and operated by King County
- 1960-1970s – “Forward Thrust” separation program
 - Partially separated, streets connected to separate stormwater system
 - Over time
 - Redevelopment connects to separate stormwater system
 - And redevelopment extends the separate stormwater system

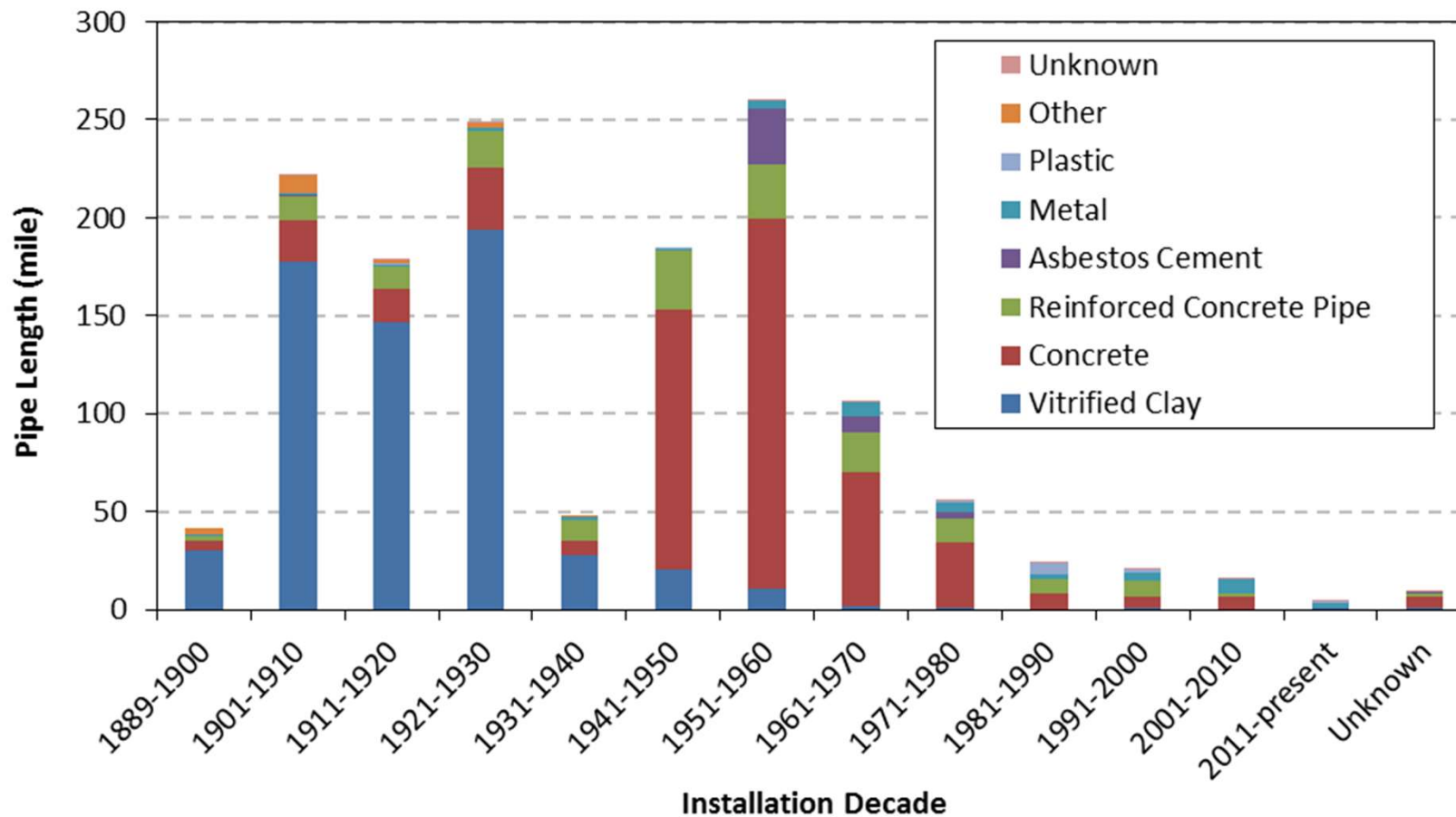


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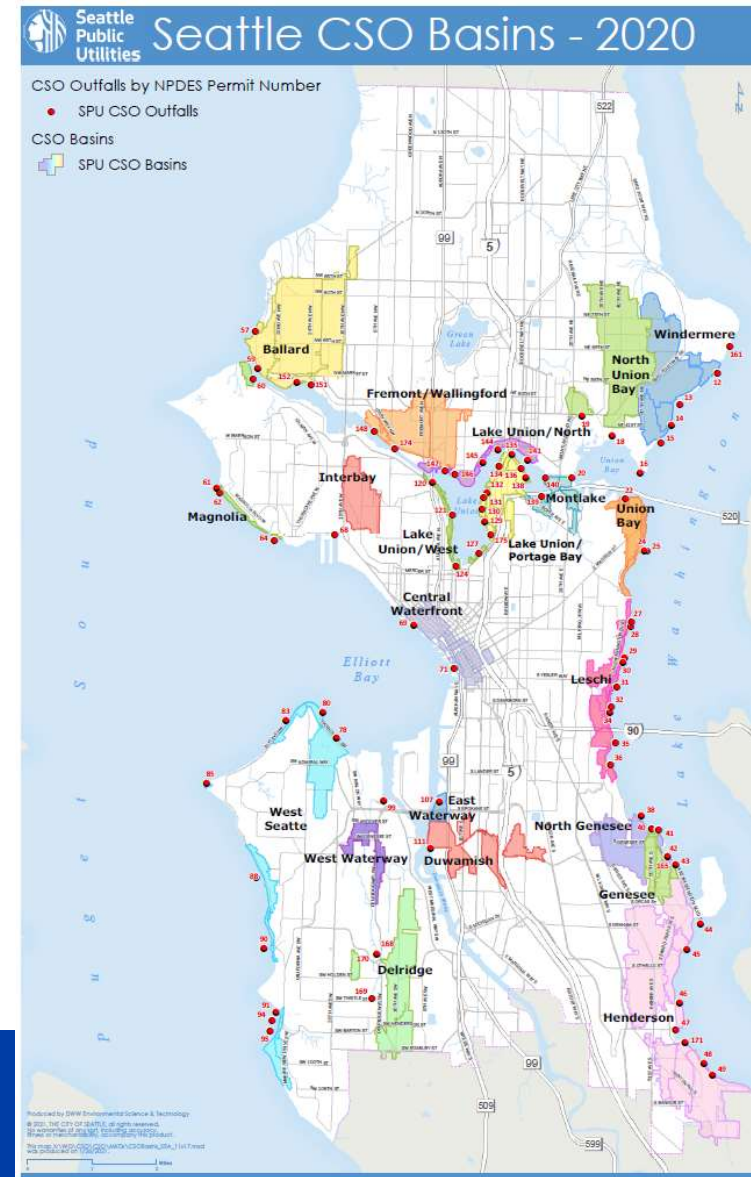


Wastewater Pipe Profile by Material & Installation Decade



Drivers for Program Work

- Consent Decree
 - 82 CSO outfalls, 51 controlled
 - 1 CSO per basin per year, on a 20-year average
- SSO requirements
 - 4 SSOs per mile of pipe per year on a 2-year average
- Asset Conditions > Asset Management approach



Condition Assessment Strategy & Pipe Rehab Program

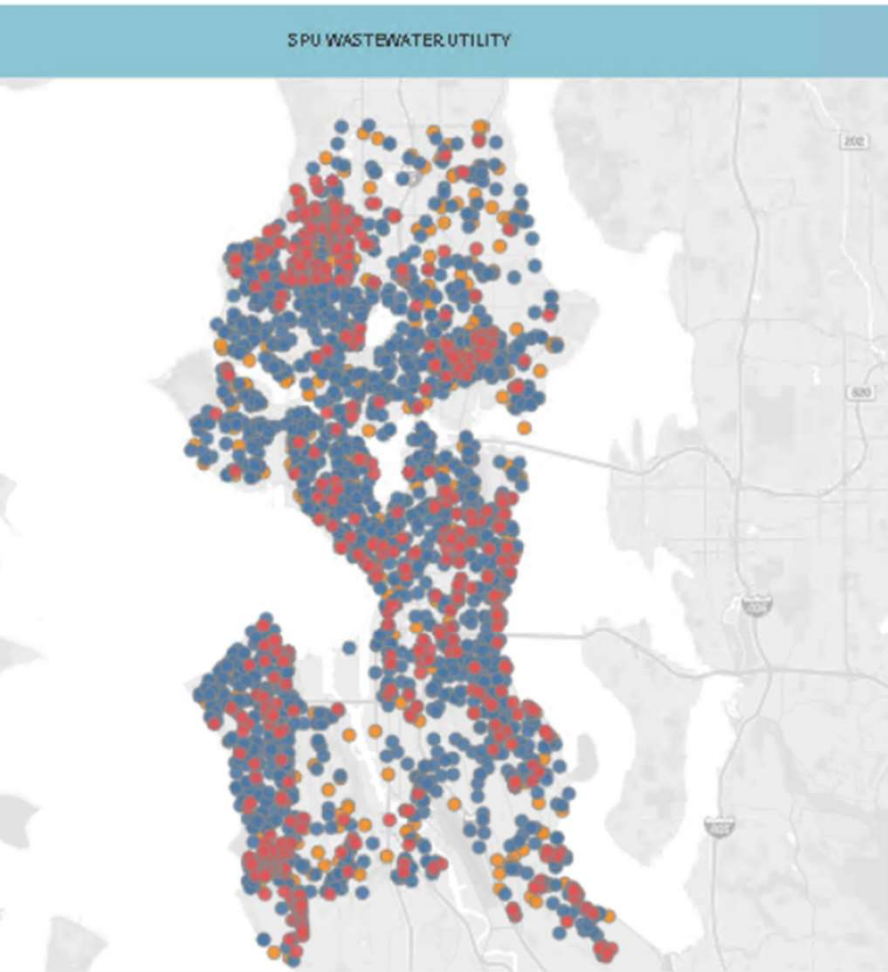
Knowing our System to Better our System

Seattle Public Utilities



City of Seattle

Performance Dashboard: Completed Map



WO Actual Finish Date
Last 10 years

Location Desc: Level 1
 (All)
 SPU DRAINAGE UTILITY
 SPU WASTEWATER UTILITY

Contractor Work Group
 (All)
 Contractor Work Group
 Not Contractor Work Group

Rehab Type
 Pipe Full Rehab
 Other Pipe Rehab
 Other Structure Rehab
 Other Other Rehab

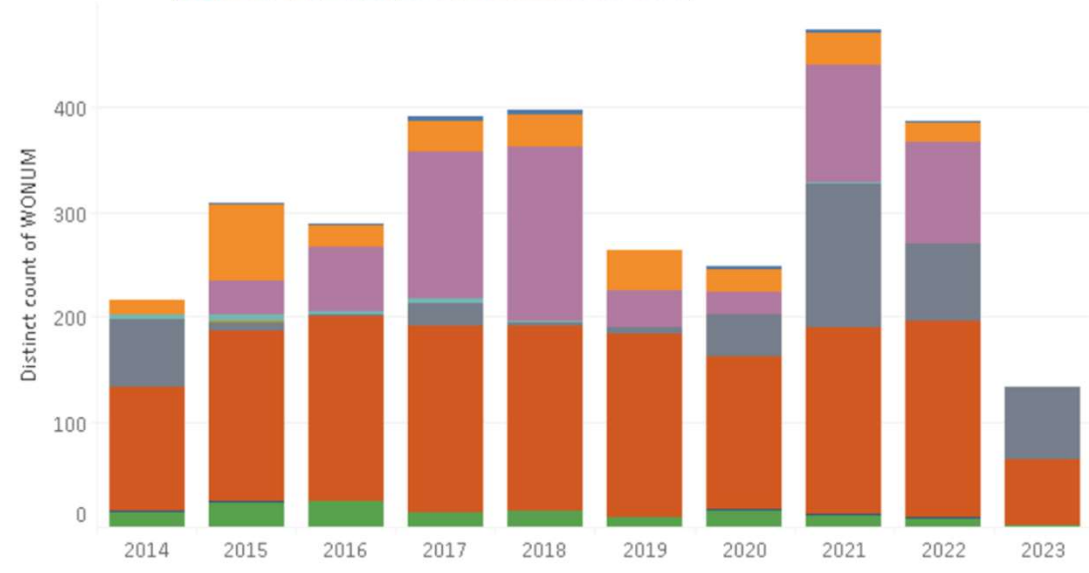


WO Actual Start Date
Last 10 years

WO Priority
(All)

WO Job Plan (group) Repair Categories

- CNTRCTR MAINLINE REHAB DIG FULL
- CNTRCTR MAINLINE REHAB DIG SPOT
- CNTRCTR MAINLINE REHAB LINER FULL
- CNTRCTR MAINLINE REHAB LINER SPOT
- MAINLINE REHAB PIPEBURST
- Other Repairs
- WW MAINLINE DIG SPOT
- WW MAINLINE REHAB DIG FULL
- WW MAINLINE REPAIR NO EXCAVATION



Spotlight on Projects

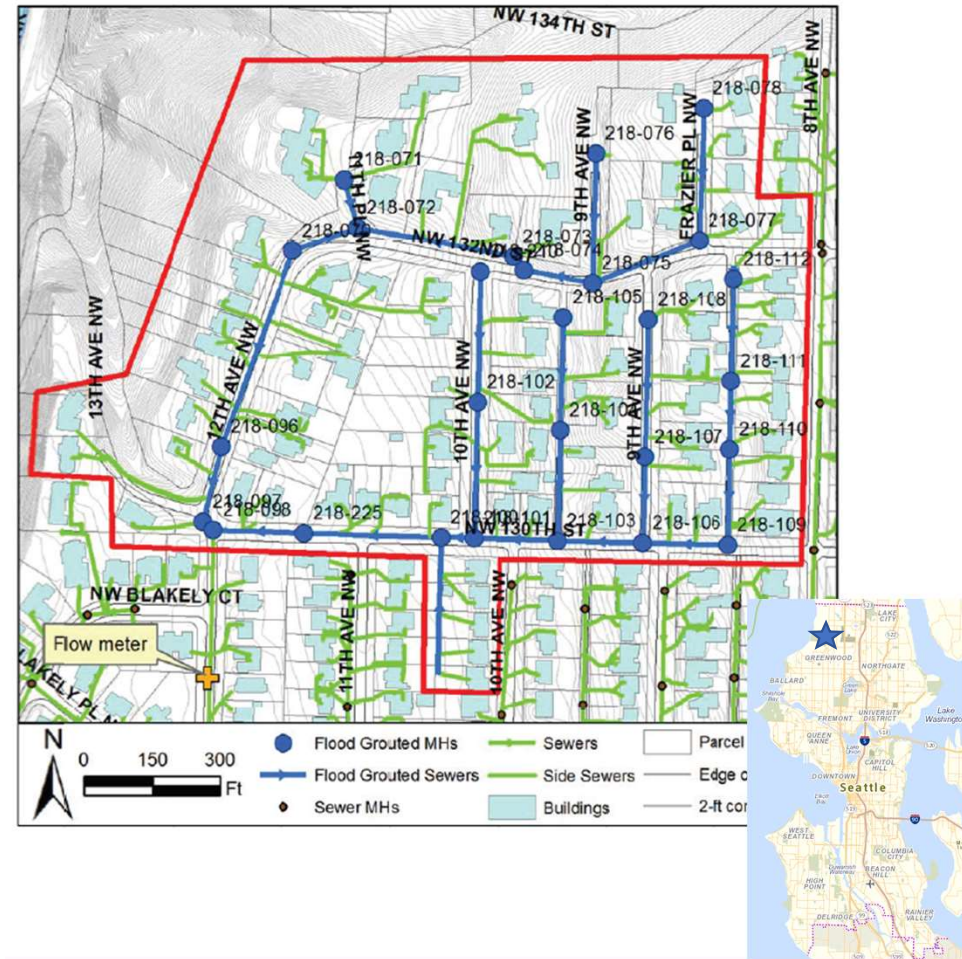
Past: Broadview Pilot Grouting

Present: PS 45 I&I Assessment, and
Longfellow Starts Here



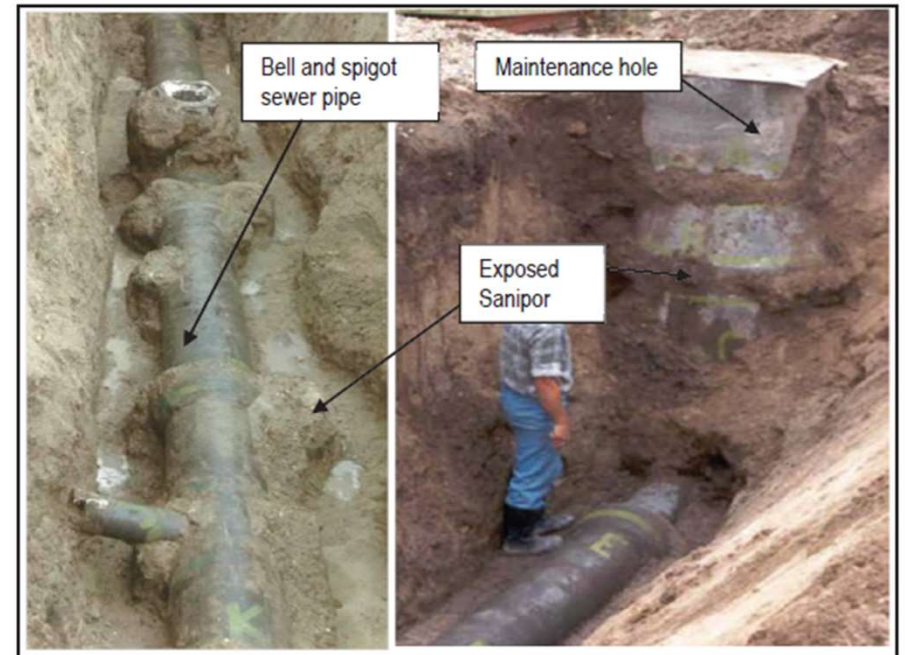
Broadview Flood Grouting

- 80% of peak flow during large storm events due to infiltration
- Pilot sub-basin: 30-acres, 5,880 LF of 6" and 8" diameter concrete mainline pipes, ~9,725LF of 4", 6" and 8" diameter side sewers (conc and PVC)
- Evaluated flood grouting, joint grouting, pipe bursting, CIPP lining. Business case identified flood grouting to have the greatest benefit cost ratio of the options



Broadview Flood Grouting

- Internally flooding an entire sewer segment and side sewers with a two-part liquid grout process
- Grout leaches, exfiltrates around pipe and MH cracks
- Completion of the chemical reaction hardens over 2-3 days



Broadview Flood Grouting

Site	Measured Leakage Rates (gpm)			Estimated Water Leakage Before Rehabilitation (gpm)		Estimated Water Leakage Reduction 10 Years After Rehabilitation	
	Before Rehabilitation	After Rehabilitation		Low End	High End	Low End	High End
	S1	S2	Water				
218-074	1.37	0	0.69	16	99	96%	99%
218-076	2.15	0	0.15	78	155	100%	100%
218-104	0.39	0	0.64	14	28	95%	98%
218-107	2.35	0.07	1.71	85	169	98%	99%
218-110	2.25	0	2.56	81	162	97%	98%
218-111	3.33	0	0.64	120	240	99%	100%
218-175	Unknown	0	2.82				
218-210	2.74	0	0.49	99	197	100%	100%
218-225	0.20	0	0.20	7	14	97%	99%

Broadview Flood Grouting

- MHs, mainlines and side sewers sealed
 - 30% of side sewers flood-grouted (challenges: side sewer branches, landscaping, elevation, homeowner approval and participation)
 - About 56% of the entire sewer basin was sealed through flood grouting
- 2011 costs: ~\$77 / lf.
- Construction Costs (2011) \$1,033,400
- Flow monitoring results peak hour flows reduced by 41%, and reduced storm volumes by 66%

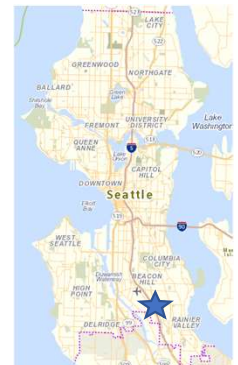
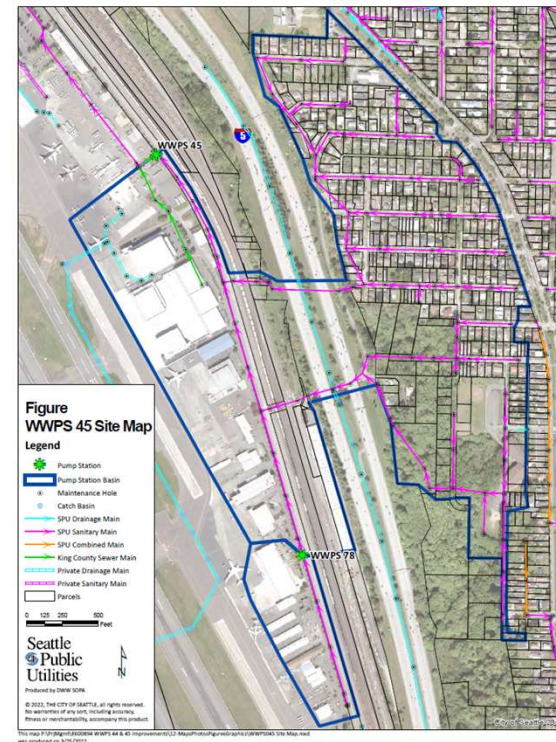
Takeaways

- *Successful in reducing infiltration – high performance over ten years after completion!*
- *Working on private side sewers challenging – maximize participation and branching side sewers*
- *When infiltration is controlled, groundwater migration needs to be addressed*
- *Hilly areas are very challenging (pressure on plugs)*



PS 45: I&I Assessment

- Problem: Increased and regular SSOs at PS 45 (where suspected cause is significant I&I)
 - All overflows are contrary to our mission
 - Overflows to adjacent private storm system, requiring costly cleanup
 - Counts against our regulatory limits



PS 45: I&I Assessment

- Two sub-basins: one mainly commercial, one mainly residential
- Smoke testing completed for commercial October 2022; upper basin to be completed weather-permitting, 2023 (June)
- Flow monitoring results also to be analyzed for I&I (suspected private pipe flow has high I&I)



Private Pipes & Regulatory Complexity

- Layers of regulation: Property owners versus renters: KC Airport and Tenants
- One Property/Facility was found to be a significant contributor of Inflow – investigations continue, future dye test



PS 45: I&I Assessment

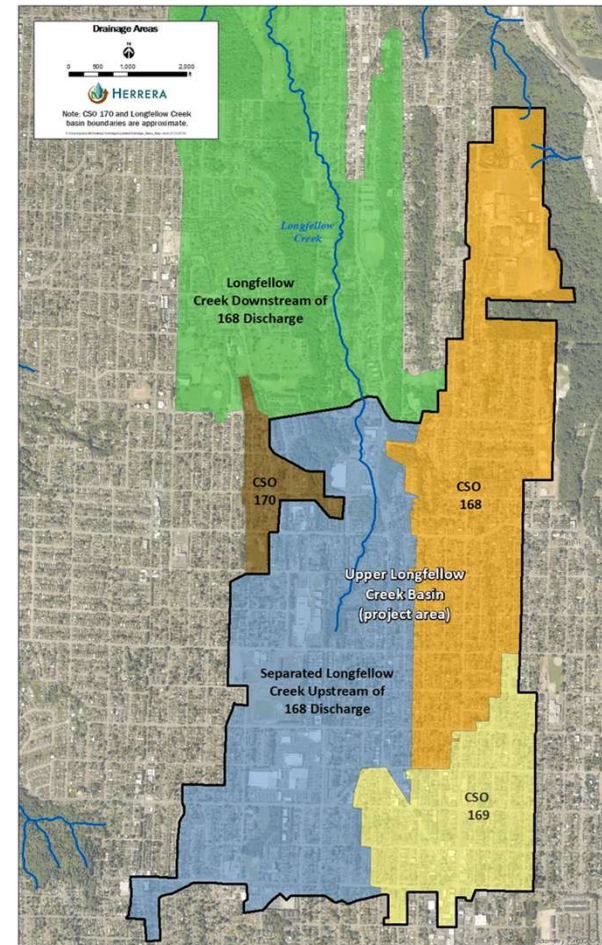


Next steps:

- Future phase smoke testing
- Completion of flow metering analysis
- Consultant tech memo: initial and final with recommendations
- Options Analysis (Pre-Design) work. Challenges:
 - area lacking storm infrastructure,
 - nature of current connections

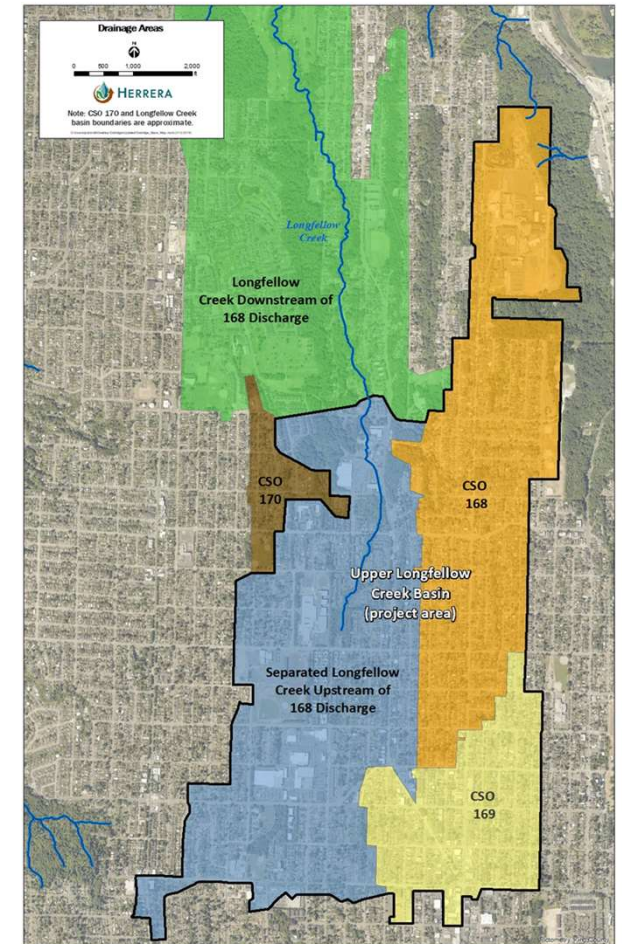
Longfellow Starts Here

- Consent decree drivers for CSO 168, 169 – improve water quality
- Mixture of combined and partially separated basins
- 2020 Report on I&I highlighted potential benefits of I&I reduction through:
 - *sewer main rehab (lining), MH rehab, side sewer rehab (trenchless and open cut), sump pump and roof drain disconnects*



Longfellow Starts Here

- Define two options for piloting that:
 - Remove significant water from the system
 - Can be implemented based on existing info
 - Relatively quickly



Program & Policy Work

Side Sewer Assistance Program

GSI Voluntary Beyond Code Partnership
Program

Seattle Public Utilities



City of Seattle

Side Sewer Assistance Program

Deferred Loan Program

- ✓ 0% interest deferred loans
- ✓ \$3,000 to \$45,000 per loan
- ✓ No monthly payments due
- ✓ Secured by lien against the property
- ✓ 10 year term
(with two options to renew, for a total possible term of 30 years)



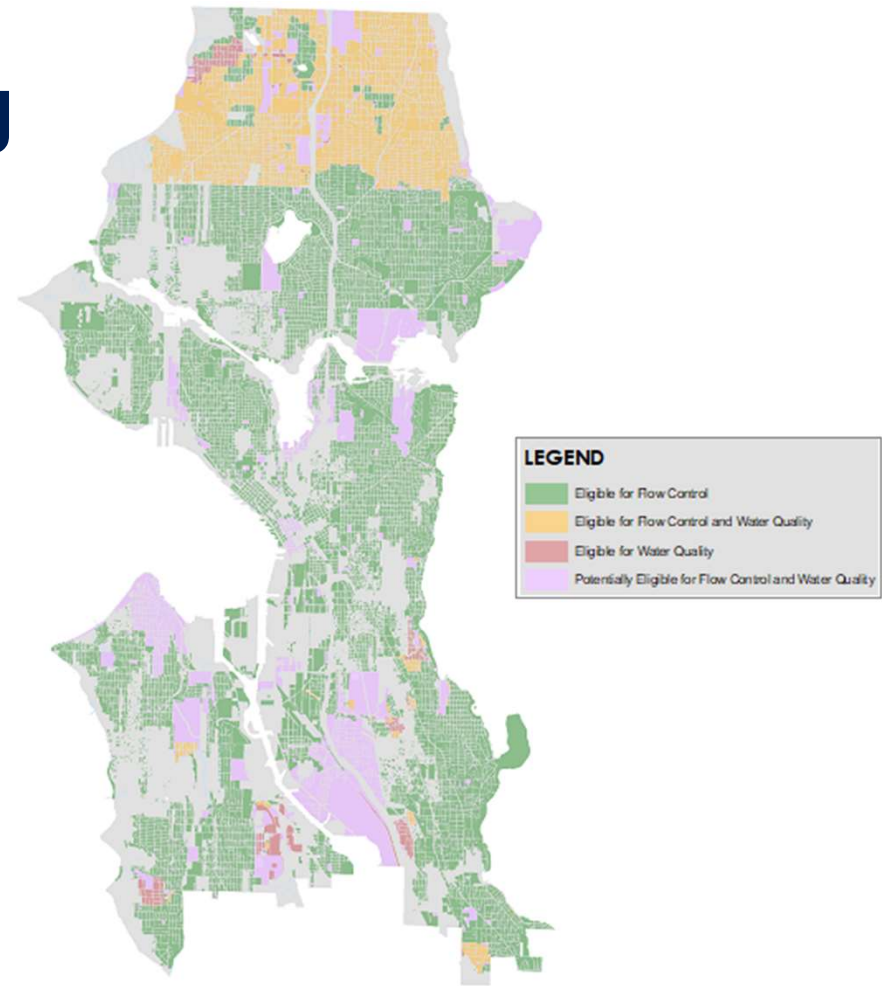
Loan Eligibility

- Owner-occupied single-family home
- In Seattle city limits
- Household combined gross income under 80% Area Median Income
- **Currently experiencing a side sewer emergency or urgent issue**
 - full/partial collapse or break in the line

- Financial assistance in the form of loans for income-eligible households in need of urgent side sewer repairs
- SPU funds support loans; program is administered by Office of Housing under its Home Repair Program

GSI Beyond-Code Partnering Program

- Identified unit cost benefit amounts (\$/SF Impervious Area Managed)
- Incentivizes private development to further remove Inflow
- SPU provides direct funding for additional flow control or WQ
- MOAs negotiated during development permitting



Northlake Commons (Latona)

TOP OF LATONA
AND RUN
DOWNHILL TO
SETTLING VAULT



JazzHouse



Queen Mary Rowhouses



Kubota Garden

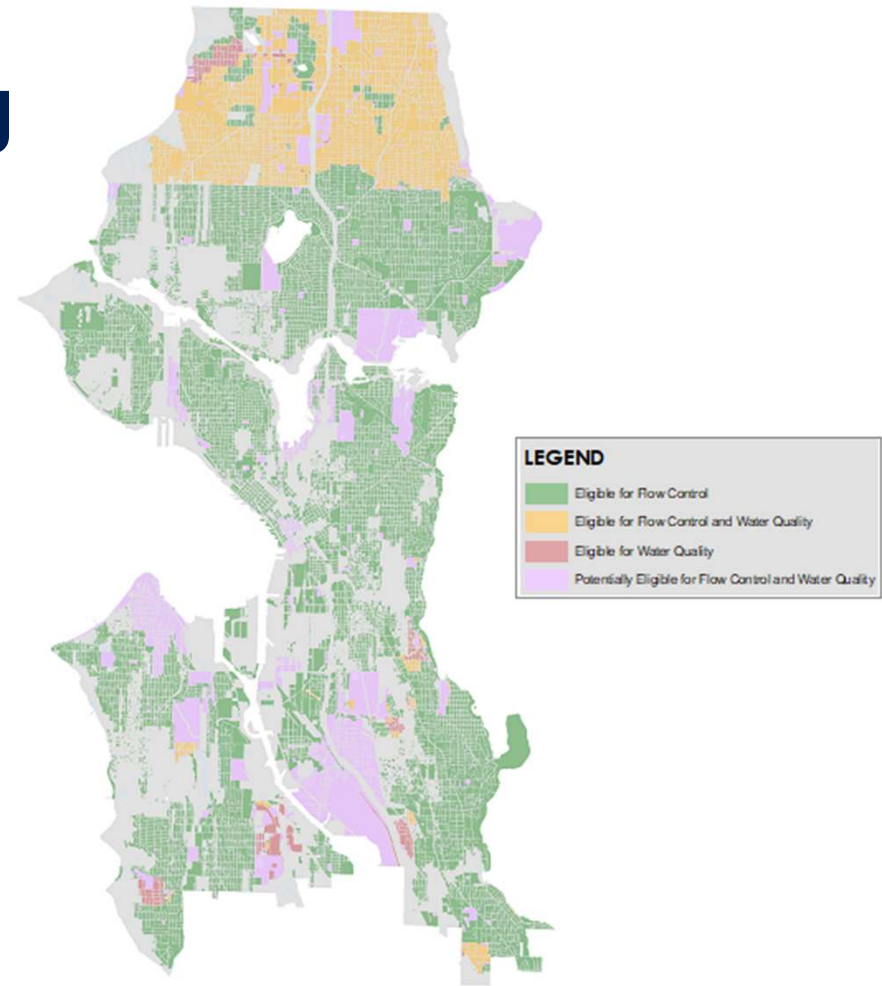


Beyond Code Projects in Development

- Northlake Commons (Latona Station) – Redevelopment of the Dunn Lumber site at 3800 Latona Ave NE; constructing a regional biofiltration swale on the parcel to treat nearly two acres of contributing area.
- JazzHouse – A mixed-use, 130-unit affordable housing development and performing arts hub supporting youth music education in Mt. Baker. The project will construct bioretention cells along 22nd Ave S and S Hill S to treat ~10K square feet of road runoff.
- Queen Mary Rowhouses – A 20-unit redevelopment in Crown Hill that is constructing bioretention and conveyance to manage ~17K square feet of road runoff from the upstream block, decreasing flood risks.
- Kubota Garden – Parks is redeveloping the main parking lot at Kubota Garden; SPU is partnering with Parks and SDOT to design bioretention both in the parking lot and along 55th Ave S to treat road runoff before it enters Mapes Creek and/or Lake Washington.

GSI Beyond-Code Partnering Program

- Current status: nascent stage – how can we grow?
- Considerations:
 - Developing a program option for further implementation
 - Outreach and engagement
 - Design deviations are inevitable
 - Permitting needs support
 - O&M perspective invaluable



In Closing

I&I reduction work driven and supported by:

- Layout and nature of Seattle's sewer system
- Asset management needs of infrastructure
- CMOM Program, Pipe Rehab Program build on asset management approaches
- Individual capital project work
- Side Sewer Assistance Program
- Code Incentives



Discussion

Seattle Public Utilities



City of Seattle