

Updated CSO Control Plans: Alternatives Screening and Affordability Analyses

January 22, 2025





zoom



Interpretation

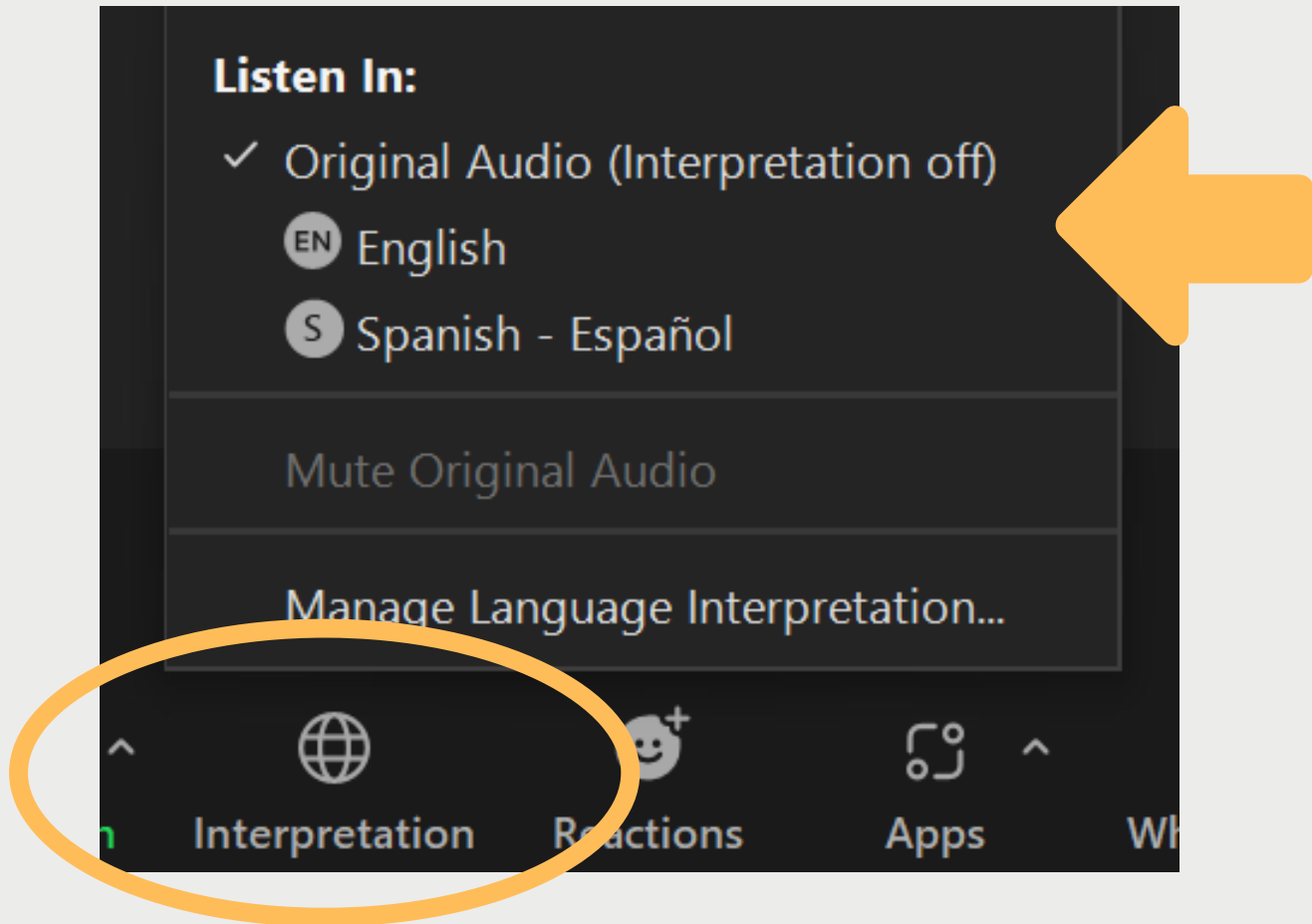


SOMER **VIVA**

OFFICE OF
IMMIGRANT
AFFAIRS

WE SPEAK YOUR LANGUAGE
HABLAMOS SU IDIOMA
FALAMOS A SUA LÍNGUA
NOU DALE LANG OU
हामी तपाईंको भाषा बोल्छौं ।
我们会说您的语言

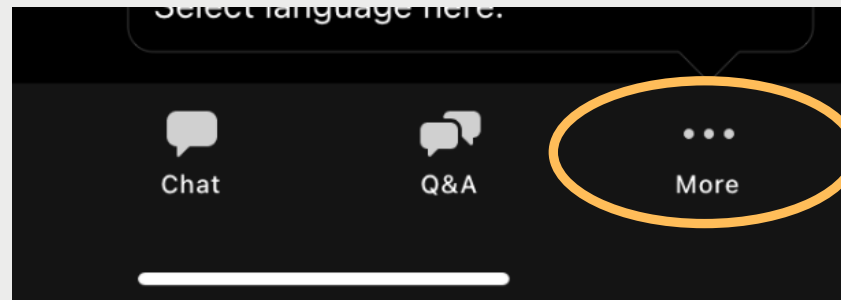
Interpretation on a computer



Click on the globe symbol in the bottom right corner of your screen.

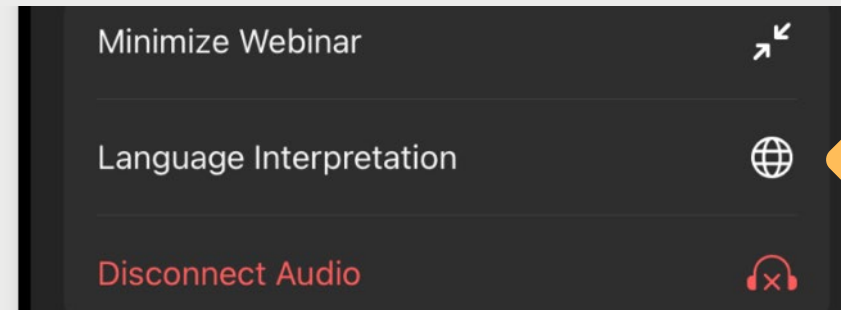
Select the option for the language you speak.

Interpretation on a smartphone

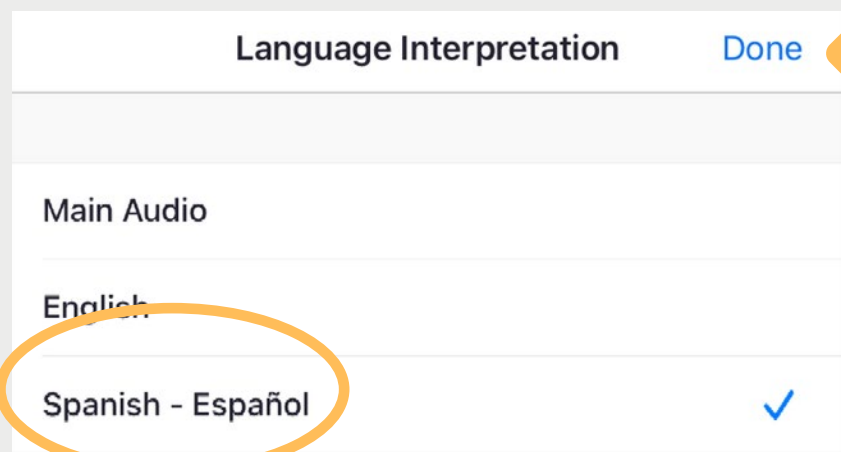


Click on the three dots in the bottom right corner of your screen.

Select the option with the globe symbol.



Select your language. Press "Done" in the top right corner.



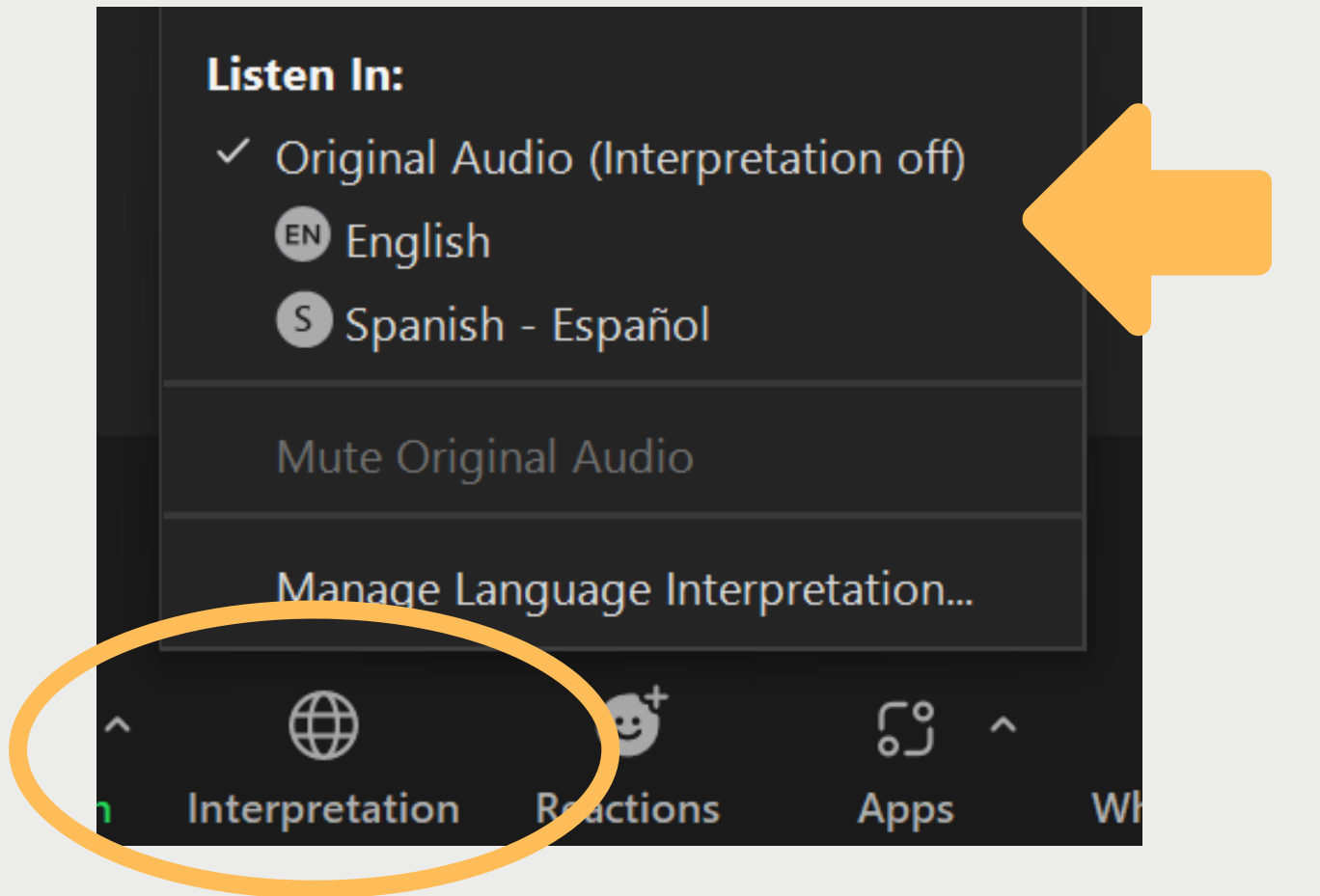


zoom



Interpretación

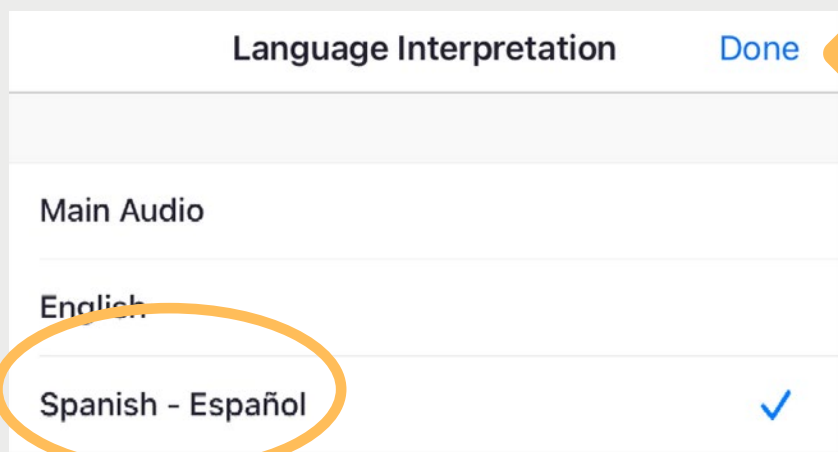
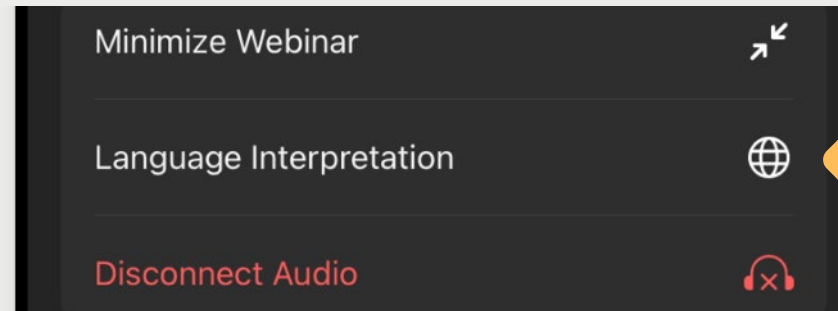
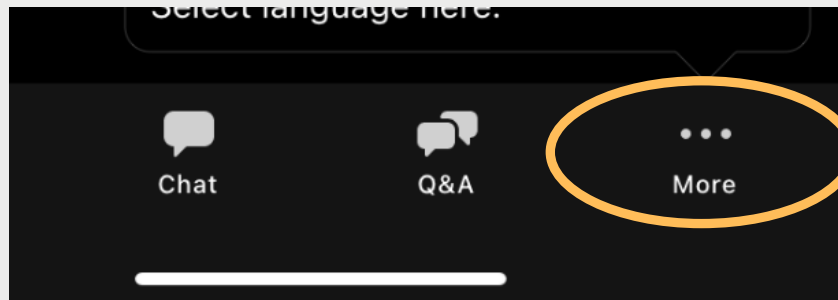
Interpretación en una computadora



Haga clic en el globo terráqueo ubicado en la esquina derecha abajo de su pantalla.

Seleccione la opción para el lenguaje que usted habla.

Interpretación en un teléfono inteligente



Haga clic en los tres puntos ubicados en la esquina derecha abajo de su pantalla.

Seleccione la opción con el símbolo de globo.

Seleccione su lenguaje. Presione "Done" arriba en la esquina derecha de su pantalla.



zoom

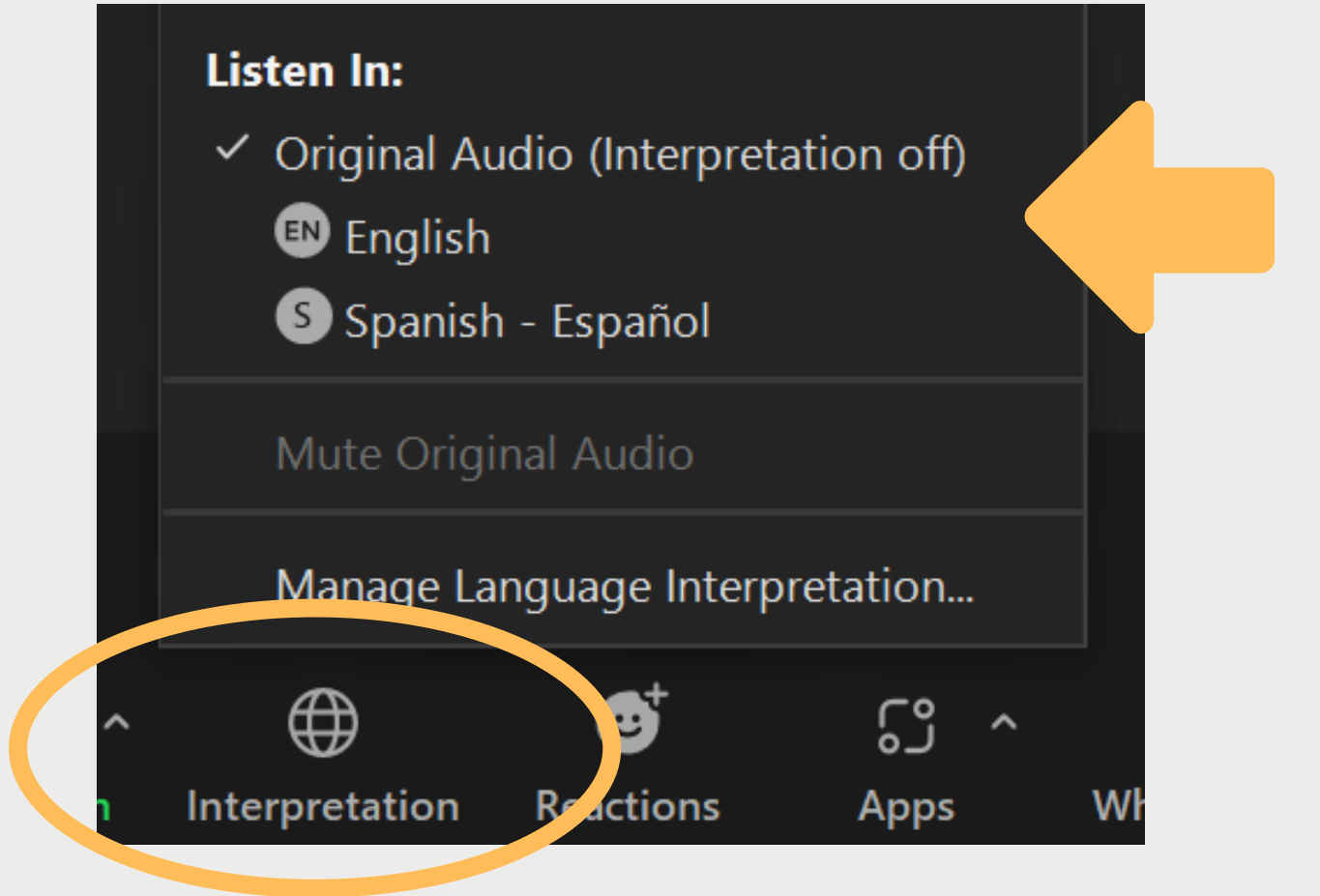


Interpretación

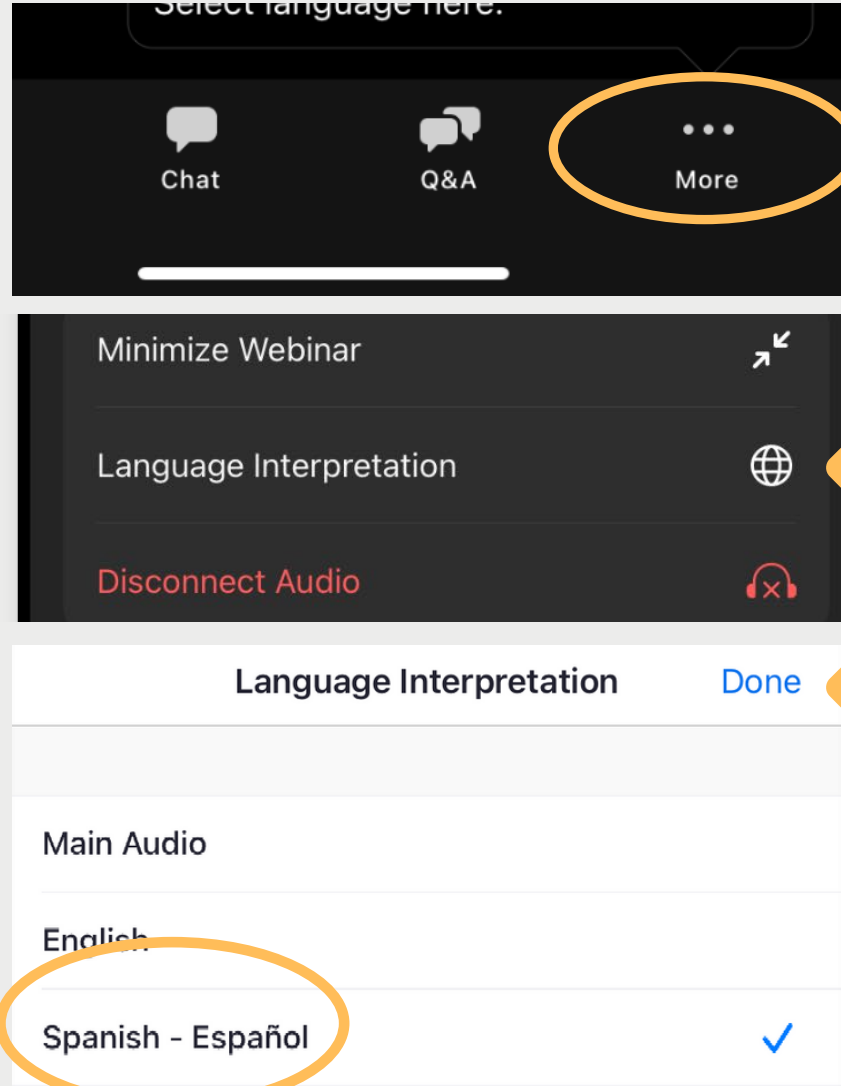
ترجمة عبر جهاز الكمبيوتر

إضغط على رمز الكرة الأرضية
في أسفل الجانب اليمين من
الشاشة.

حدد خيار اللغة التي
تحدثها.



ترجمة عبر الهاتف الذكي



حدد الخيار باستخدام رمز الكرة الأرضية.

حدد لغتك.
إضغط على "Done" (إنتهى) في أعلى
الجانب اليمين.



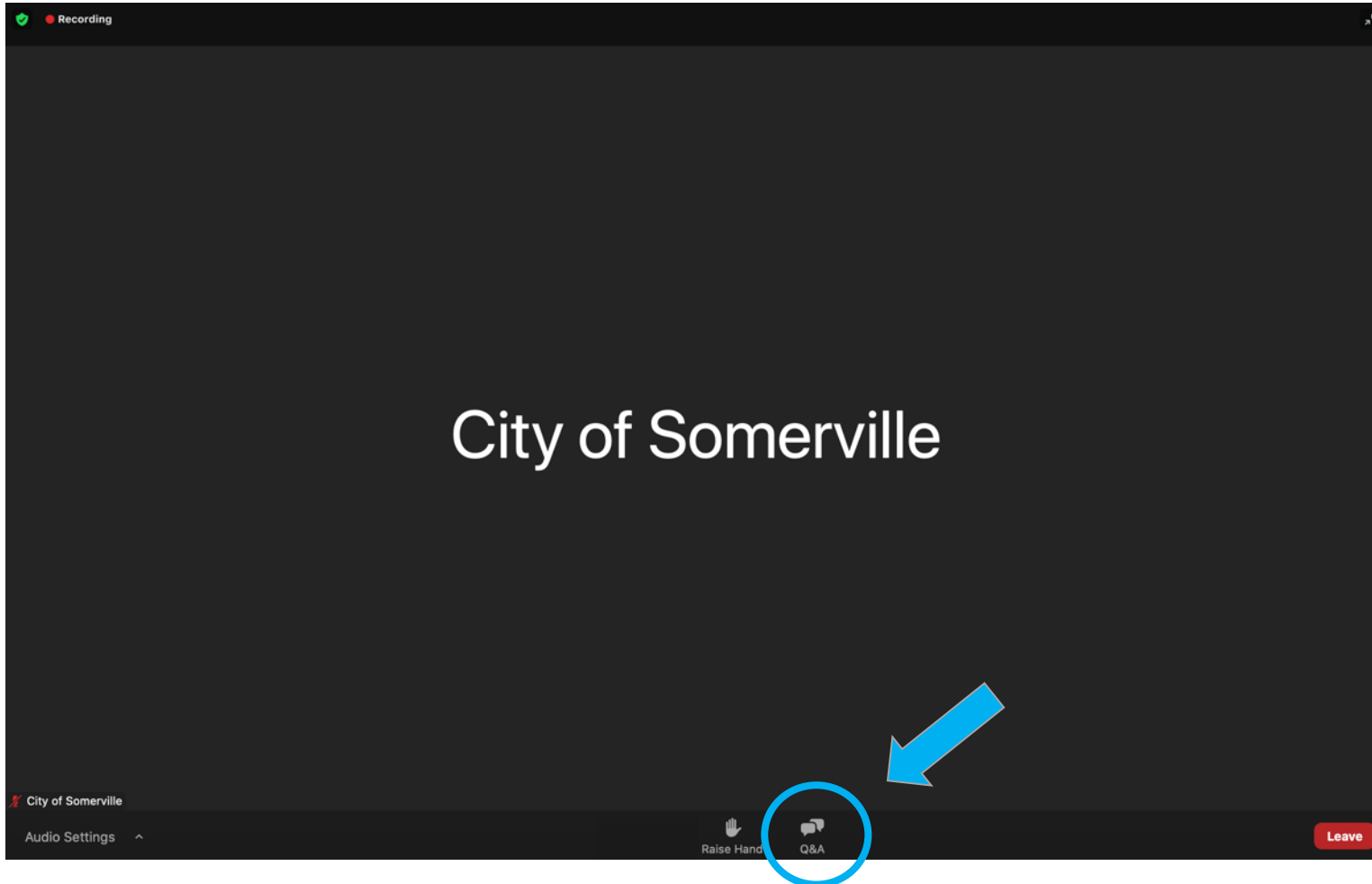
Interpretation will now begin

Meeting Guidelines

- The meeting is being **recorded**.
- We will have time for **questions & answers** (Q&A) following each presentation.
 - We will prioritize questions pertaining to the presentation topic.
 - We will do our best to answer as many questions as possible. We will likely not get to every question given the anticipated high number of participants.
- Post any technical issues in the Q&A.

Please pace your speech to allow our interpreters time to translate.

How to Use Zoom's Q&A Function



Type your question in the bottom of the Q&A window. Click "Send" to submit your question

Welcome to Q&A

Questions you ask will show up here. Only host and panelists will be able to see all questions.

How do I send a question using the Q&A function?

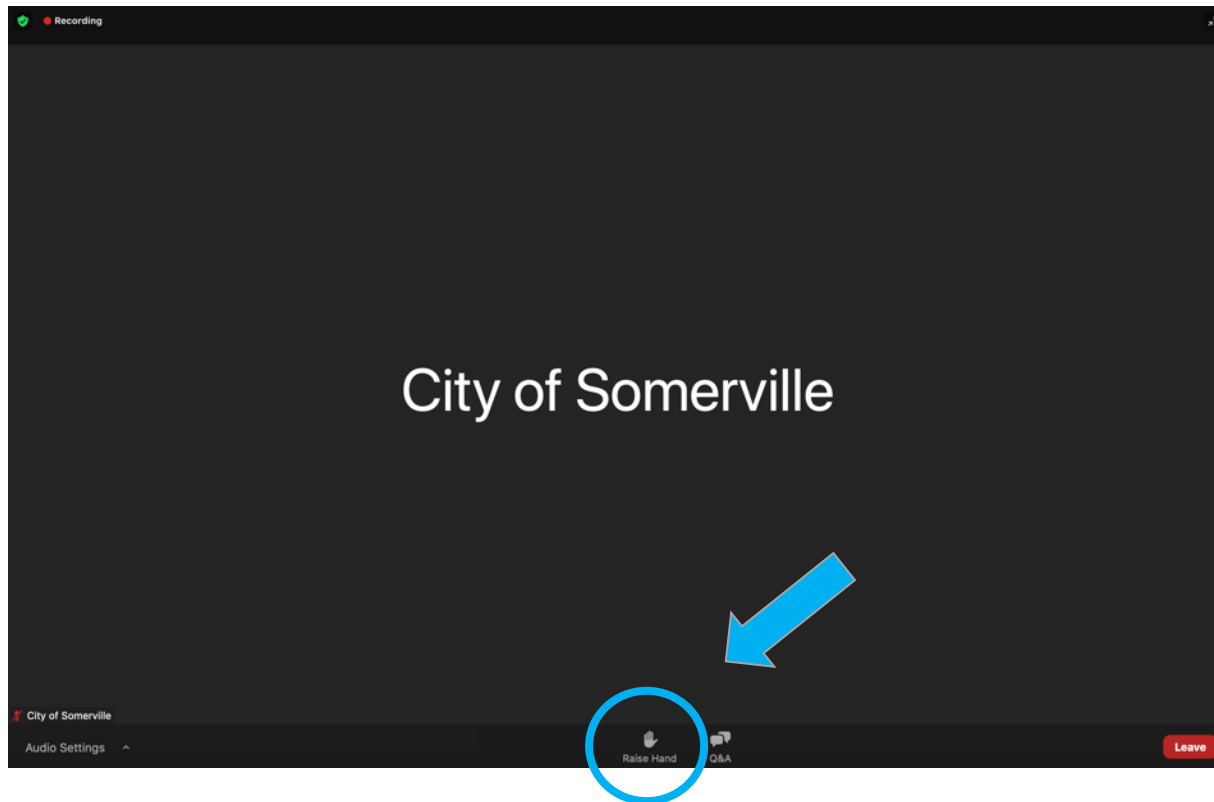
Send anonymously

Cancel Send

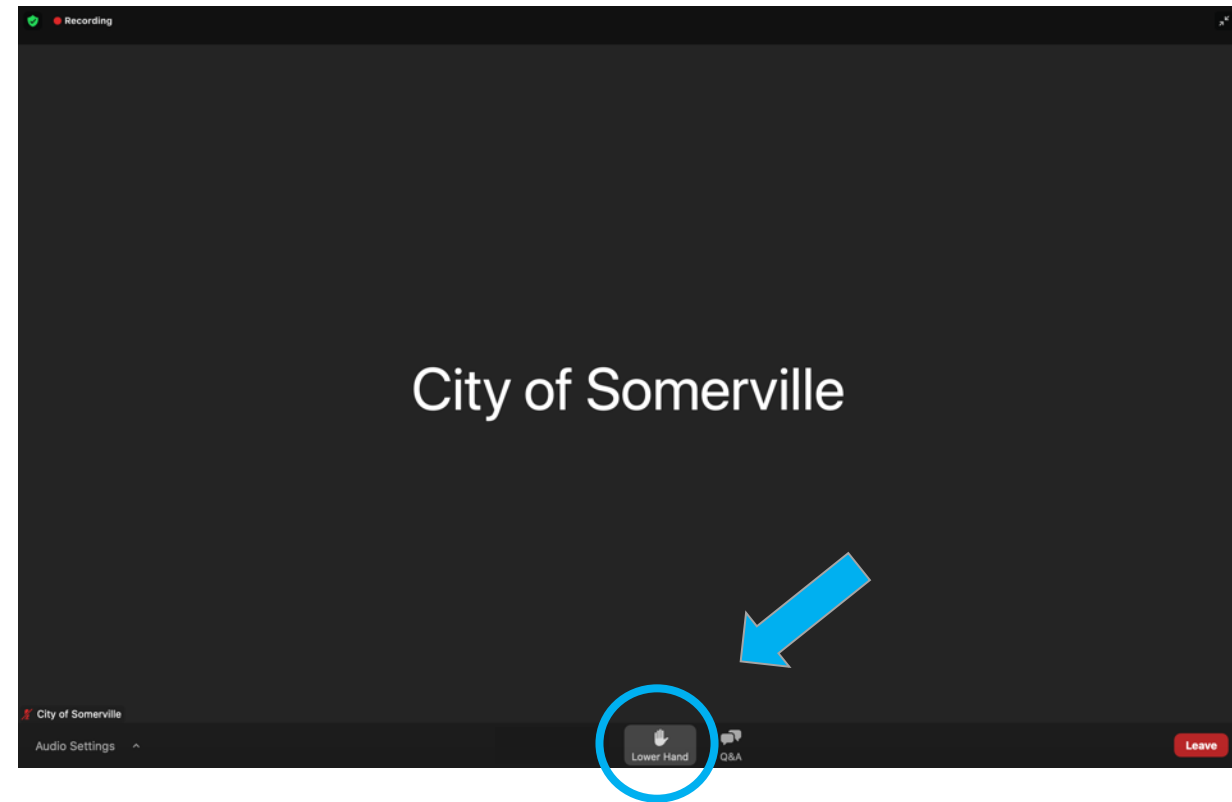
Click the "Q&A" button in the webinar controls bar

How to Raise Your Hand to Ask a Question

Click the “Raise Hand” button on the webinar controls toolbar



When your question has been answered, click “Lower Hand”



If you are calling in: Dial *9 to raise your hand
Dial *6 to unmute and mute

Updated CSO Control Plans: Alternatives Screening and Affordability Analyses

January 22, 2025



Project Partners



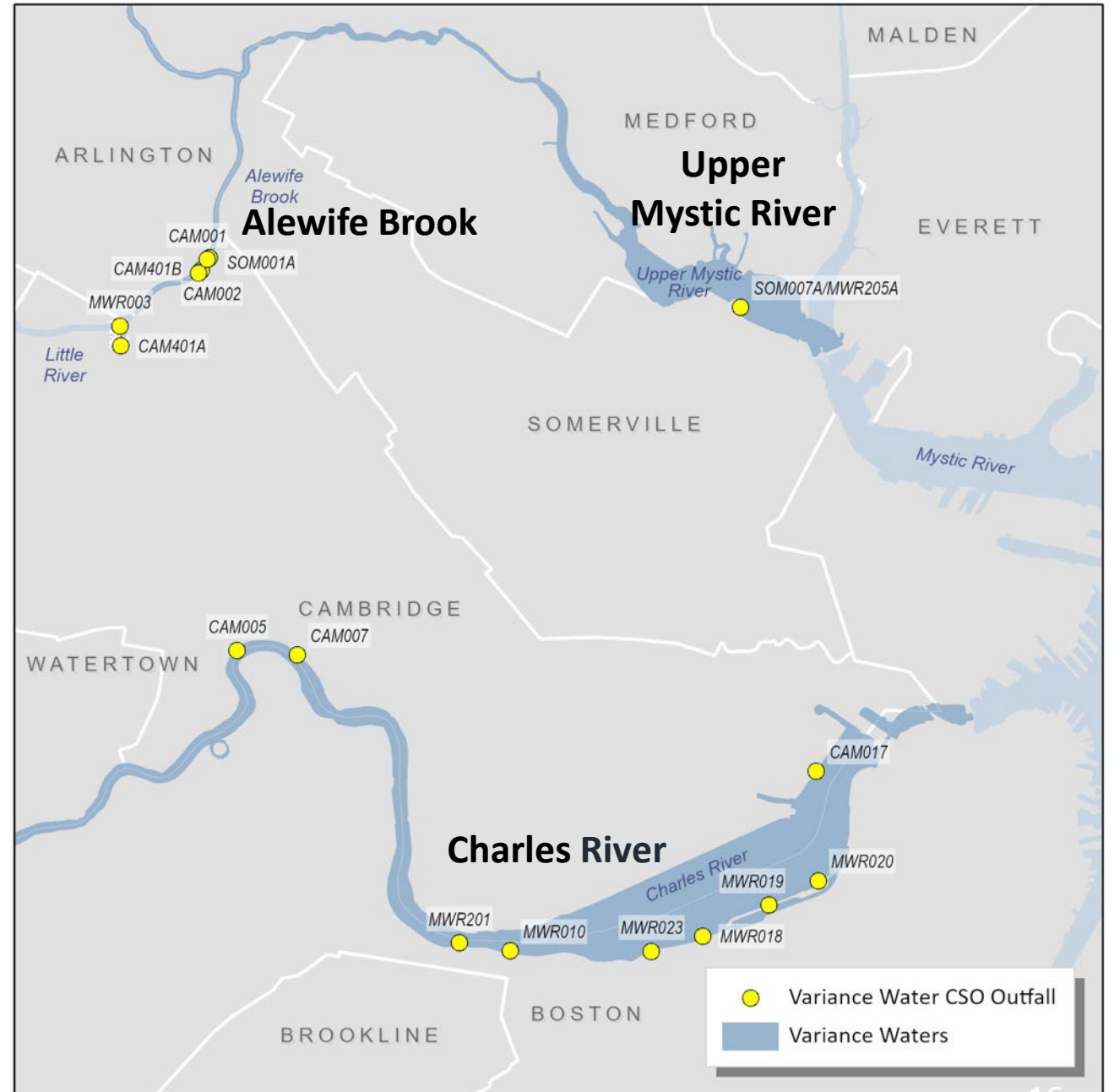
City of Somerville



City of Cambridge



**Massachusetts
Water Resources
Authority (MWRA)**





Tonight's Agenda

6:00 PM Welcome & Meeting Overview

6:10 Overview of the Updated Combined Sewer Overflow (CSO) Control Plans Process and Regional Effort

6:25 Alternatives Under Consideration to Reduce or Eliminate CSOs
What is the process to developing alternatives? What alternatives are under consideration? What are some key alternatives being considered?

7:10 Financial Capability Assessment Process
Where does the process come from? What is it? How is it calculated?

7:50 Next Steps & Wrap-up

8:00 Adjourn

Panelists



City of Cambridge

Catherine Woodbury
Diane Stokes
Jim Wilcox
Lucica Hiller
Stef Harrison (Stantec)
David VanHoven (Stantec)
Indrani Ghosh (Weston & Sampson)



City of Somerville

Rich Raiche
Gina Cortese
Magdalena Gomez
Brian Postlewaite
Miles Bateman (Dewberry)



**Massachusetts
Water Resources
Authority**

Brian Kubaska
Jeremy Hall
David Wu
Erika Casarano (AECOM)
Don Walker (AECOM)



Resources & Previous Public Meetings

Project Website: www.voice.somervillema.gov/joint-cso-planning

Public meeting 1

June 29, 2022

Agenda:

- Introduction and orientation to the planning process
- Discussion

Public meeting 2

Dec 15, 2022

Agenda:

- CSO planning background
- Goals and priorities
- Typical Year development
- Community feedback session

Public meeting 3

Nov 15, 2023

Agenda:

- CSO Control Plans process
- CSO Control Toolbox
- Goals and priorities – participant feedback



Instructions

Go to

www.menti.com

Enter the code

1985 8312



Or use QR code

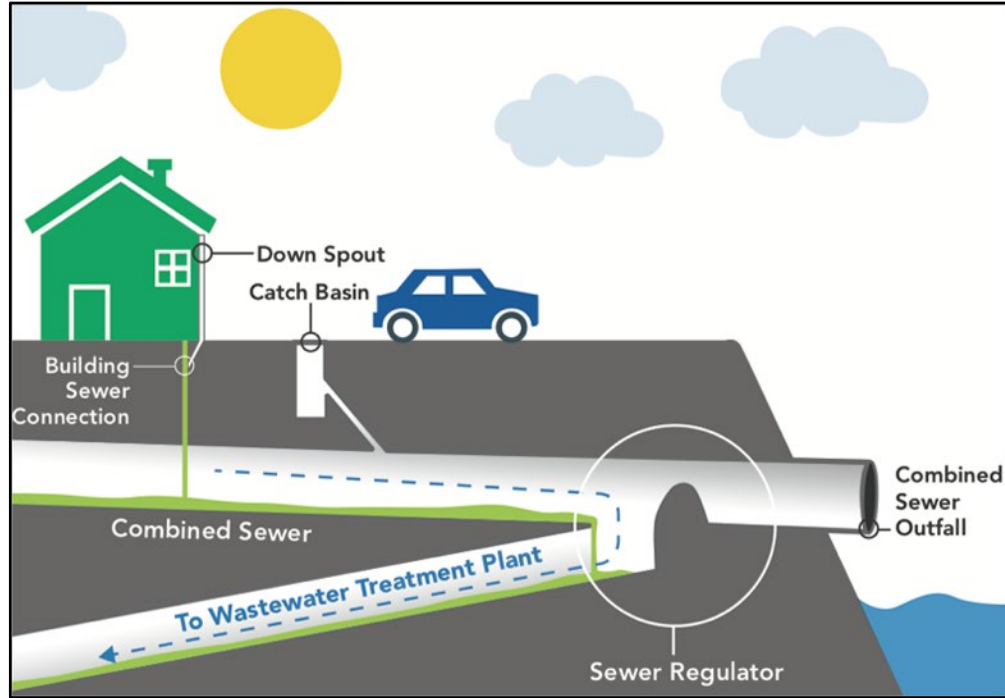


The background of the slide features a scenic view of a city skyline across a large body of water. In the foreground, the water is blue with gentle ripples. A marina with several sailboats is visible in the middle ground. The city skyline in the background includes various high-rise buildings under a blue sky with scattered white clouds. A small yellow speech bubble icon is located in the top-left corner.

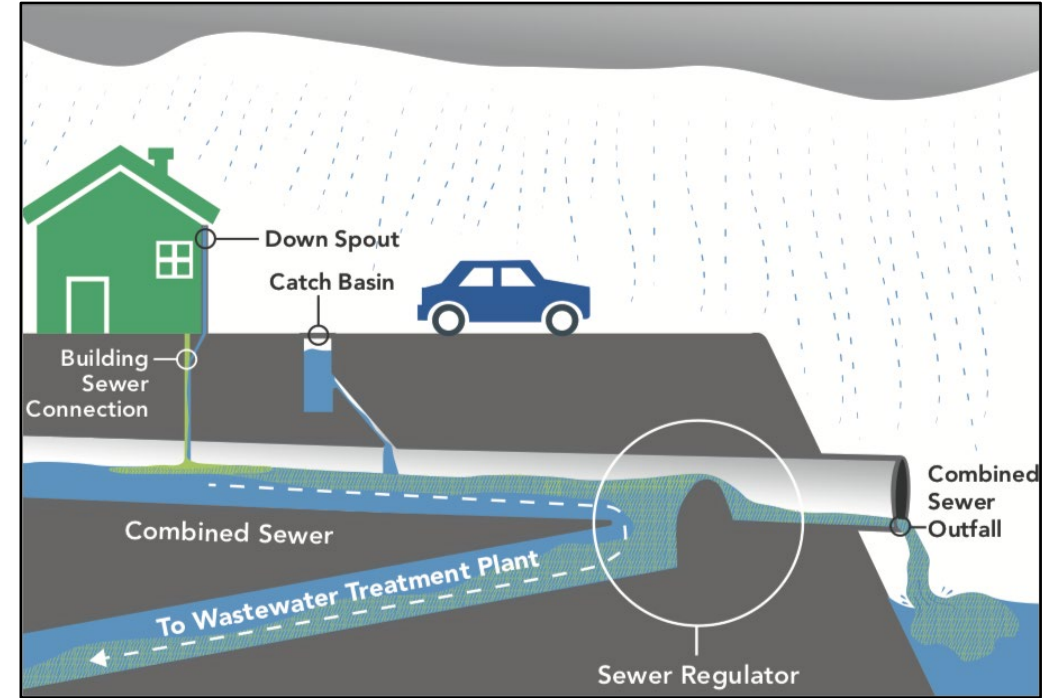
Overview of the Updated Combined Sewer Overflow Process and Regional Effort

What is a Combined Sewer Overflow (CSO)?

Combined System – No or Moderate Rain



Combined System – Heavy Rain



Sewage



Stormwater



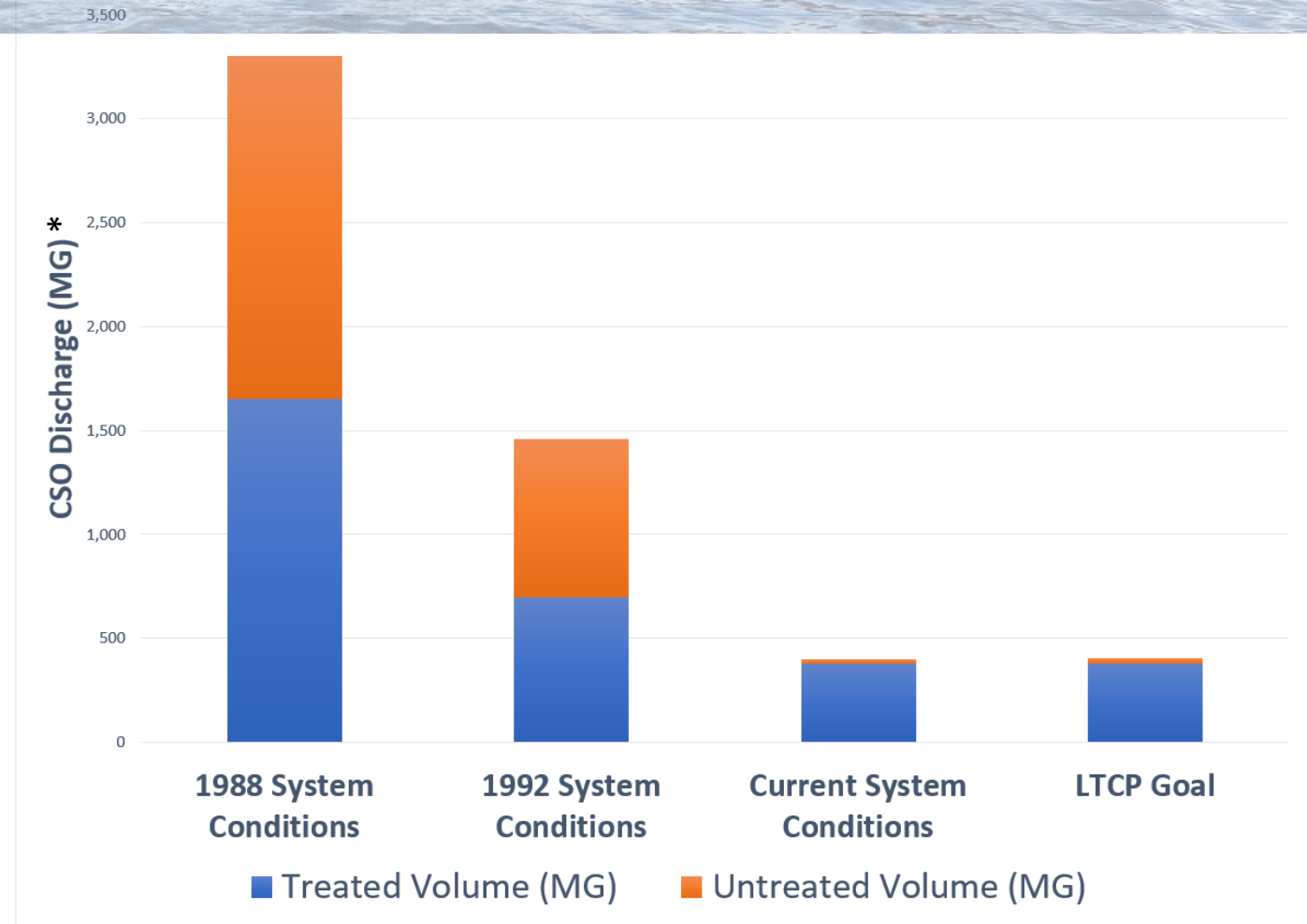
Combined Sewer Overflows



System Wide CSO Reduction Since the Start of the CSO Program in the 1980s

Prior Long Term Control Plan

- System wide improvements including the Charles, Alewife, Mystic resulted in significant reductions in CSO discharge since 1980s.

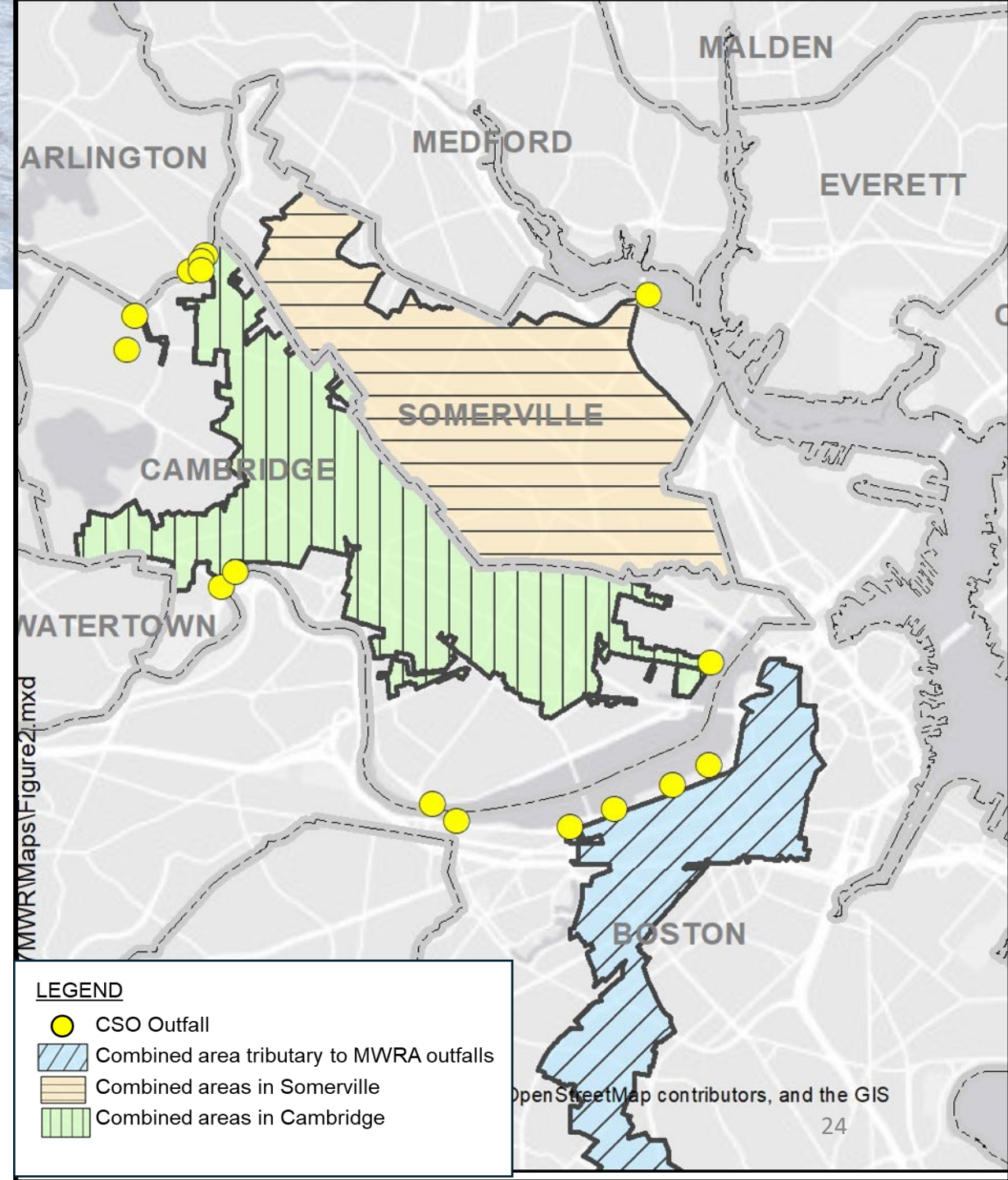


System Wide CSO Reduction Since the 1980s

**Annual discharge volume based on the prior Typical Year*

What Are We Doing **Now** About CSOs?

- Cambridge, Somerville, and MWRA are developing Updated CSO Control Plans with the overall goal to reduce or eliminate CSOs.
- The new plans focus on the Charles River, Alewife Brook, and Upper Mystic River (the variance waters).
- New plans incorporate the impacts of climate change.





Updated CSO Control Plan Steps:

- ✓ 1) 2050 Typical Year & 2050 Design Storms
- ✓ 2) Unify Hydrologic & Hydraulic models
- 3) **Create alternatives:**
 - a) Identify scenarios to evaluate CSOs
 - 2050 Typical Year
 - 2050 5-yr
 - 2050 25-yr
 - b) Combine CSO tools to develop various alternatives
 - c) Optimize regionally for each variance water



Step 3b Zoom In: CSO Reduction Tools



Sewer Separation



Green Stormwater Infrastructure



Inflow/infiltration reduction




Storage



Conveyance



Updated CSO Control Plan Steps:

 4) Develop conceptual layouts and preliminary cost estimates

5) Compare alternatives using weighted criteria

6) Assess Initially Preferred Alternative(s) for:

- Financial Capability Assessment
 - Impact to rate payers
 - Implementation schedule
- Compliance with Water Quality standards
 - What is the highest attainable use without a widespread economic or social impact?

7) Develop Draft Updated CSO Control Plan(s)

Step 5 Zoom In: Alternatives Evaluation Preliminary Criteria

Reduce/eliminate combined sewer overflows

Reduce flooding and flooding impacts

Reduce sanitary sewer overflows

Improve water quality

Rehabilitate old infrastructure (pipes, facilities)

Improve resilience of our infrastructure to future climate conditions

Improve service to low income and minority communities

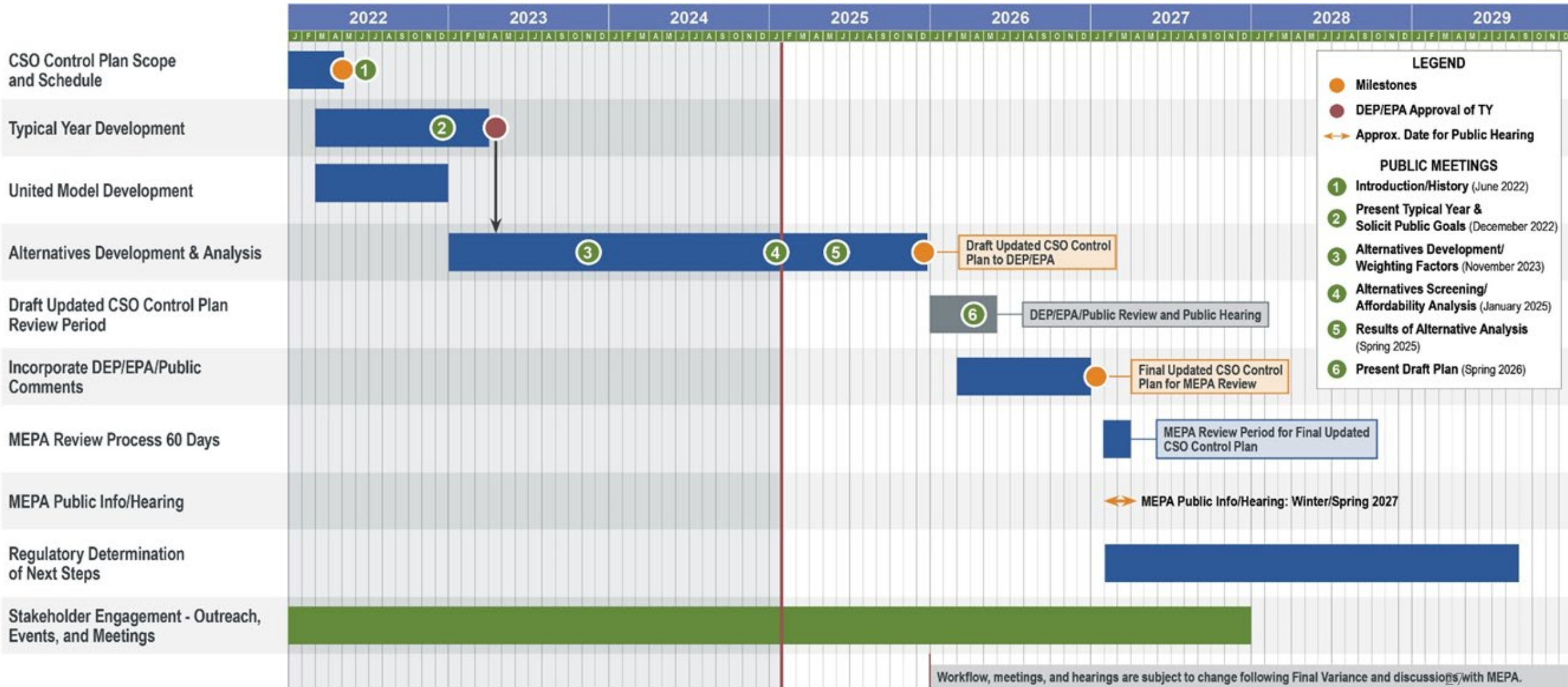
Offers community co-benefits
(e.g., green space, gathering space, heat reduction)

Minimize neighborhood disruption during construction

Minimize costs to ratepayers / taxpayers

Other criteria based on public feedback

Updated CSO Control Plan Schedule



Workflow, meetings, and hearings are subject to change following Final Variance and discussions with MEPA.



Alternatives Under Consideration to Reduce or Eliminate CSO

What is the process to developing alternatives?

What alternatives are under consideration?

What are some key alternatives being considered?



CSO Reduction Tools Included in Alternatives Development



CSO Reduction and Elimination Tools



Sewer Separation



Green Stormwater Infrastructure



Inflow/infiltration reduction



Storage



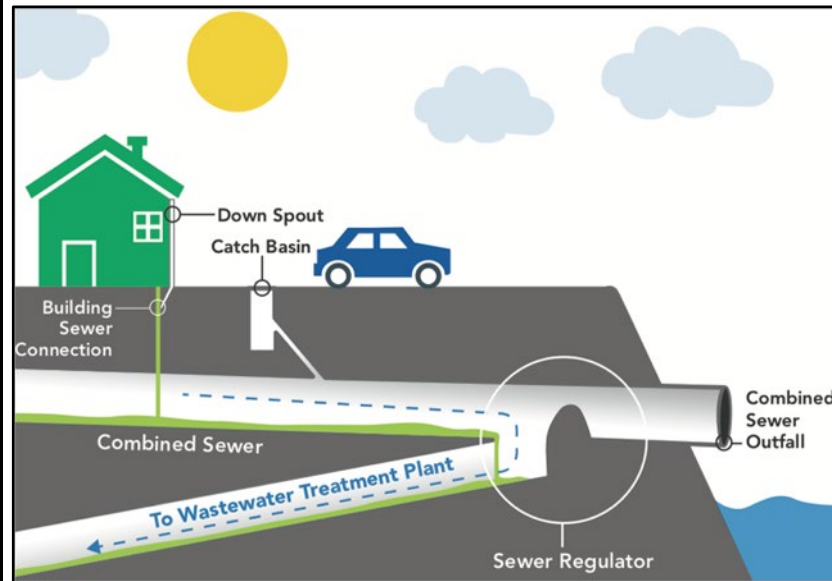
Conveyance

Reducing CSOs Tool: Sewer Separation

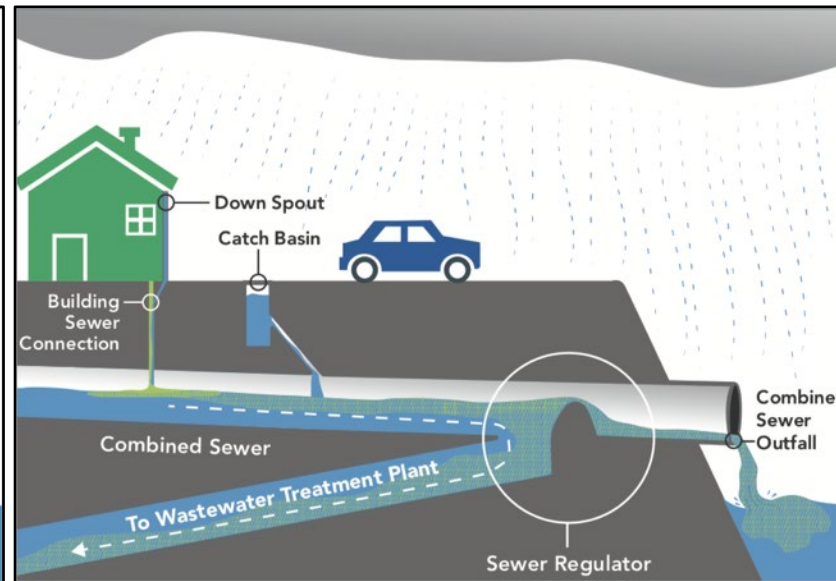


- Build separate/ parallel pipe networks
- Removes stormwater from combined system into a separate pipe
- All stormwater discharges directly to river untreated

Combined System

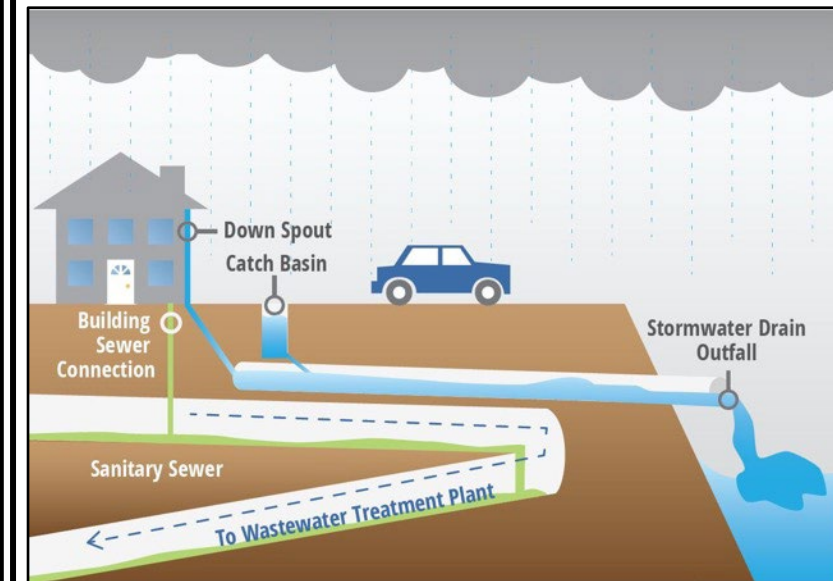


No or Moderate Rain



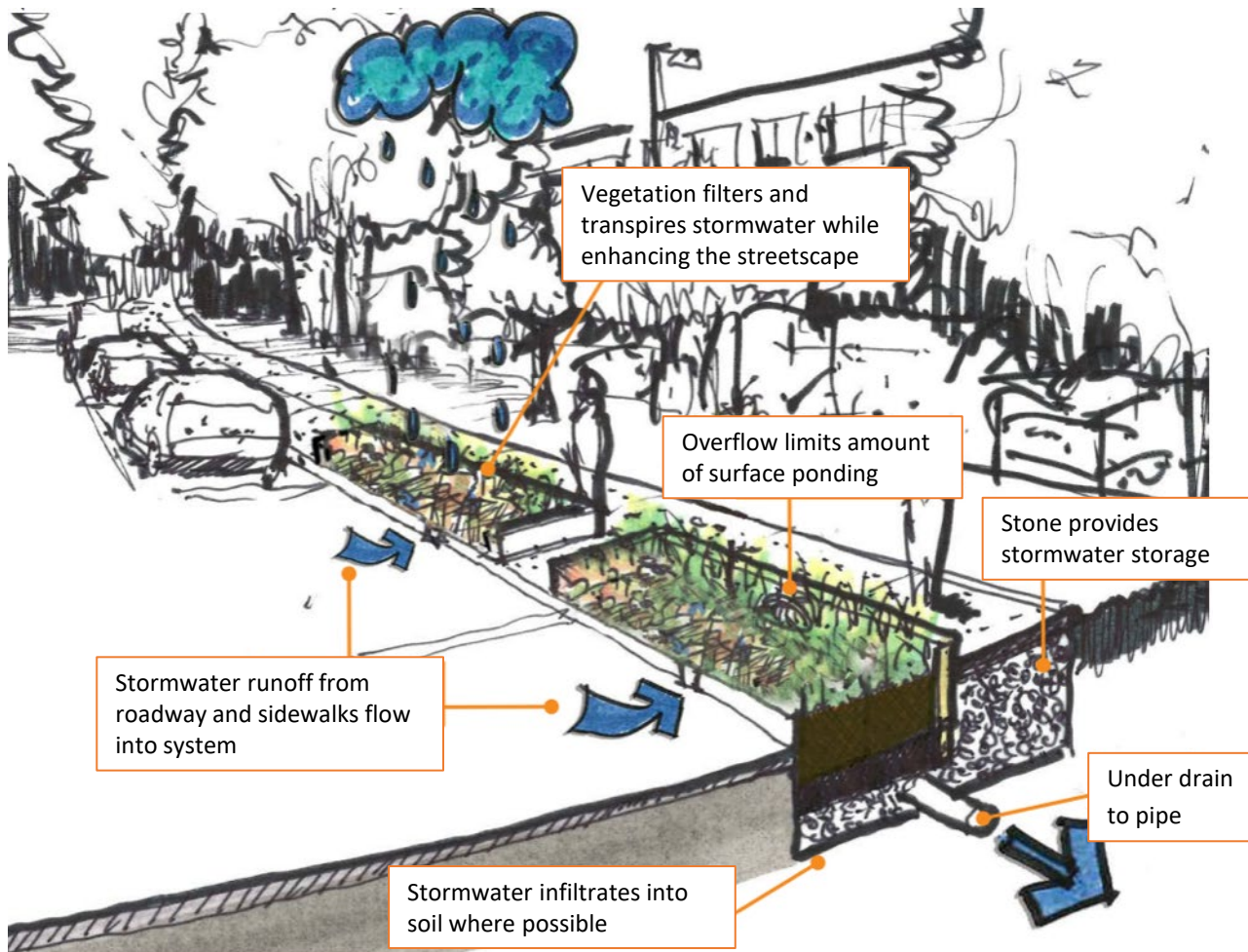
Heavy Rain

Separate System



Any Rain

Reducing CSOs Tool: Green Stormwater Infrastructure



- Captures/infiltrates some of the stormwater runoff before it enters the pipe network system
- Can treat stormwater to reduce pollutants





Reducing CSOs Tool: Infiltration/Inflow Reduction



Fix old pipes to reduce groundwater and stormwater entering the pipe network



Reducing CSOs Tool: CSO Storage



Hold combined sewer overflows until after the storm by:

- Increasing pipe size
- Building a new storage tank or tunnel

Release it back to the system for full treatment at Deer Island Wastewater Treatment Plant.



North Dorchester Bay Storage Tunnel



Union Park CSO Facility Storage Basins: Photo Credit: Simpson Gumpertz & Heger (SGH)
<https://www.sgh.com/project/union-park-detention-facility/>

Reducing CSOs Tool: Conveyance



Improve the flow through the pipes by:

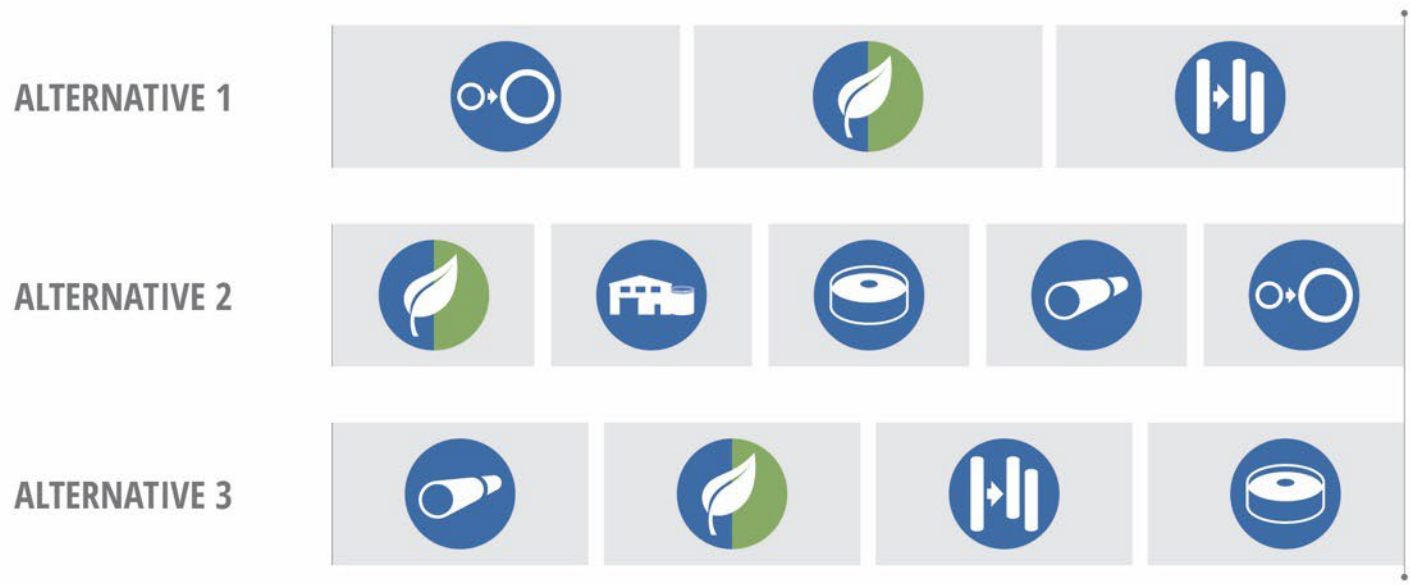
- Increasing pipe size
- Increasing size of pumps
- Improve pump station operations



Developing CSO Control Alternatives

What are CSO control alternatives?

A suite of CSO control tools that, in combination, meet a range of CSO reduction targets.



TOOLS ARE THE BUILDING BLOCKS FOR ALTERNATIVES.

 Sewer separation

 Green stormwater infrastructure

 Inflow / infiltration reduction

 Storage

 Conveyance

 Treatment



Alternatives Under Consideration & 3 Case Studies of Alternatives



Interim Progress: Alternatives Development Process

"TYPES" OF ALTERNATIVES

- **Integrated Alternative:**
Individual projects by CSO outfall
- **Tunnels**
- **Regional Sewer Separation/
Green Stormwater
Infrastructure (GSI)**
- **Hybrid:** Combination of the
above concepts

LEVELS OF CSO CONTROL

- **2050 Typical Year**
 - Rainfall Depth (largest storm) = 3.3"
- **2050 5-year 24-hour Storm
Event***
 - Rainfall Depth = 5.3"
- **2050 25-year 24-hour Storm
Event***
 - Rainfall Depth = 7.8"

*As previously shared, a variety of tools can be complementary in the Typical Year, while storage is foundational for CSO control in 5-year and 25-year storm events.

2050 Design Storm CSO Activations and Discharge Volumes by Receiving Water

2050 Typical Year

- A full year of rain data that best represents rain over time
- A representative "average" year for planning, as rain changes from year to year
- For the Updated CSO Control plan a new Typical Year was developed to reflect future climate conditions

Design Storms

- 2050 5-Year 24-hour and 25-year 24-hour design storms were developed to reflect future climate conditions

Receiving Water	Future Baseline Condition Model Results						
	Activation Frequency		CSO Discharge Volume (MG)				
	Prior Typical Year	2050 Typical Year	Prior Typical Year	2050 Typical Year	2050 Largest Storm in the Typical Year	2050 5-year Storm	2050 25-year Storm
Charles River	3	6	7.9	38.4	16.6	65.5	120.6
Alewife Brook	8	13	9.9	20.9	4.84	20.9	40.1
Mystic River	2	8	1.3	29.3	10.5	17.4	27.2

Interim Progress: Preliminary List of Potential Alternatives

Waterway	2050 Typical Year	2050 5-year Storm	2050 25-year Storm
Charles	<ul style="list-style-type: none"> • Integrated Alternative by Outfall • Tunnel • Tunnel + GSI • Regional Sewer Separation/GSI* • Hybrid 	<ul style="list-style-type: none"> • Tunnel • Tunnel + GSI • Hybrid 	<ul style="list-style-type: none"> • Tunnel • Tunnel + GSI • Hybrid
Alewife	<ul style="list-style-type: none"> • Integrated Alternative by Outfall • Tunnel • Tunnel + GSI • Regional Sewer Separation/GSI* • Hybrid 	<ul style="list-style-type: none"> • Tunnel • Tunnel + GSI • Hybrid 	<ul style="list-style-type: none"> • Tunnel • Tunnel + GSI • Hybrid
Mystic	<ul style="list-style-type: none"> • Integrated Alternative by Outfall • Storage • Storage + GSI • Regional Sewer Separation/GSI* • Hybrid 	<ul style="list-style-type: none"> • Storage • Storage + GSI • Hybrid 	<ul style="list-style-type: none"> • Storage • Storage + GSI • Hybrid

*Regional sewer separation/GSI is shown for TY control; simulating full separation of all combined areas, CSOs/SSOs occur in a 5-year event.

Interim Progress: Preliminary List of Potential Alternatives

Waterway	2050 Typical Year	2050 5-year Storm	2050 25-year Storm
Charles	Integrated Alternative by Outfall	Tunnel	Tunnel
	<ul style="list-style-type: none"> Tunnel Tunnel + GSI Regional Sewer Separation/GSI* Hybrid 	<ul style="list-style-type: none"> Tunnel + GSI Hybrid 	<ul style="list-style-type: none"> Tunnel + GSI Hybrid
Alewife	Integrated Alternative by Outfall	Tunnel	Tunnel
	<ul style="list-style-type: none"> Tunnel Tunnel + GSI 	<ul style="list-style-type: none"> Tunnel + GSI Hybrid 	<ul style="list-style-type: none"> Tunnel + GSI Hybrid
	<ul style="list-style-type: none"> Regional Sewer Separation/GSI* Hybrid 		
Mystic	Integrated Alternative by Outfall		
	<ul style="list-style-type: none"> Storage Storage + GSI 	<ul style="list-style-type: none"> Storage Storage + GSI Hybrid 	<ul style="list-style-type: none"> Storage Storage + GSI Hybrid
	<ul style="list-style-type: none"> Regional Sewer Separation/GSI* Hybrid 		

*Regional sewer separation/GSI is shown for TY control; simulating full separation of all combined areas, CSOs/SSOs occur in a 5-year event.

Case Study A: Potential Regional Sewer Separation/ Green Stormwater Infrastructure (GSI)

- **Step 1:** Identify tributary area that contributes to CSO discharge(s).
- **Step 2:** Develop project areas to separate the local sewers from the storm drains.
- **Step 3:** Identify project components (conveyance and flow attenuation) that need to be built to handle the additional flow from the separated sources.

Alewife Brook Sewer Separation

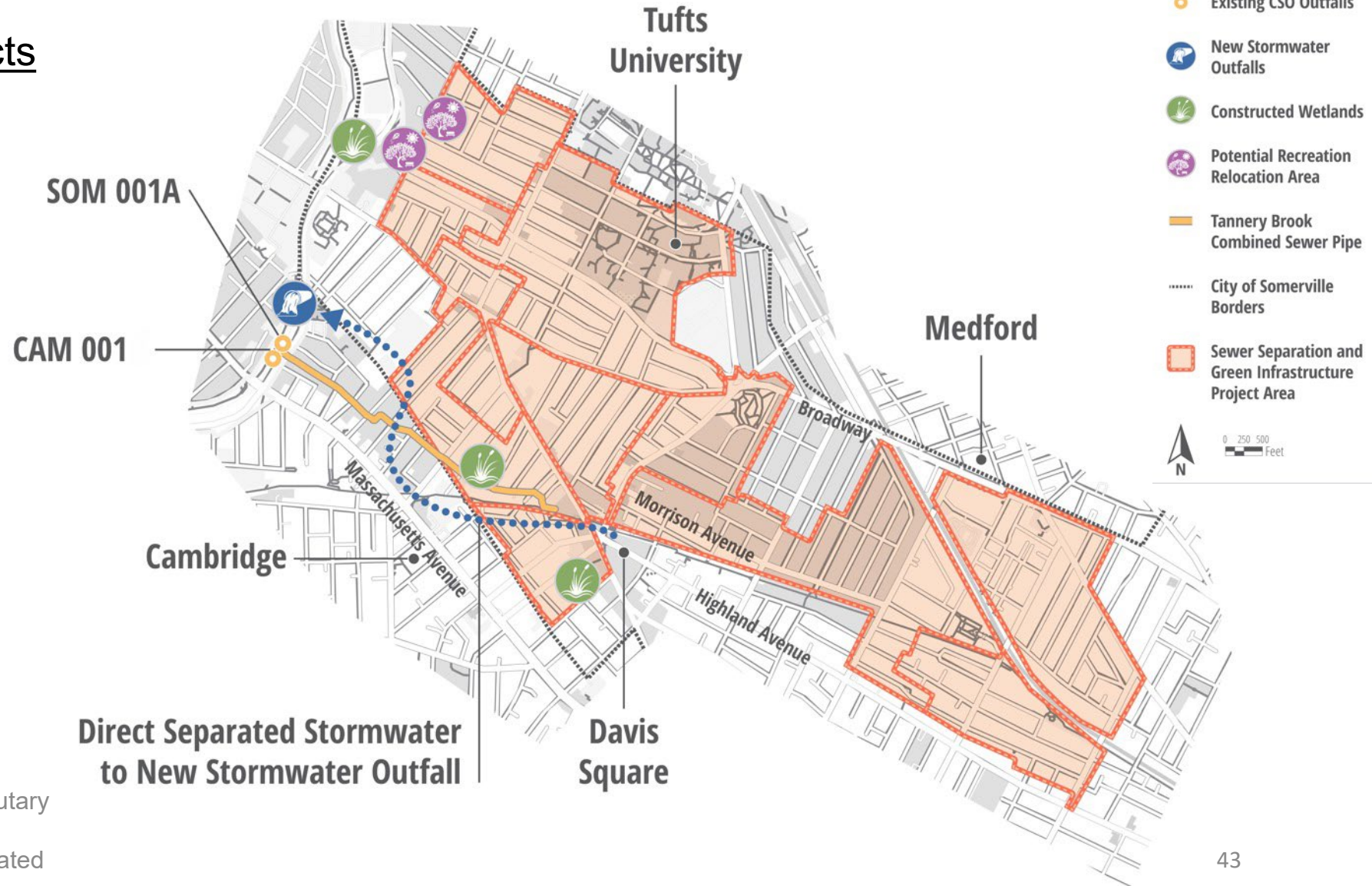
City of Somerville - 2050 Typical Year CSO Control

Potential Alewife Brook Projects

- Large trunk storm drain
- 560 acres of localized sewer separation
- New stormwater outfall on Alewife Brook
- 3 constructed wetlands and land acquisition

Prelim. Estimated Cost:
~\$850 million *

Prelim. Timeline: ~50 yrs



**Direct Separated Stormwater
to New Stormwater Outfall**

**Davis
Square**

*Costs include sewer separation of some areas tributary to both Alewife Brook and Mystic River. Costs estimated using 2024-dollar amounts and not escalated to construction period. Costs subject to refinement.

Mystic River Sewer Separation

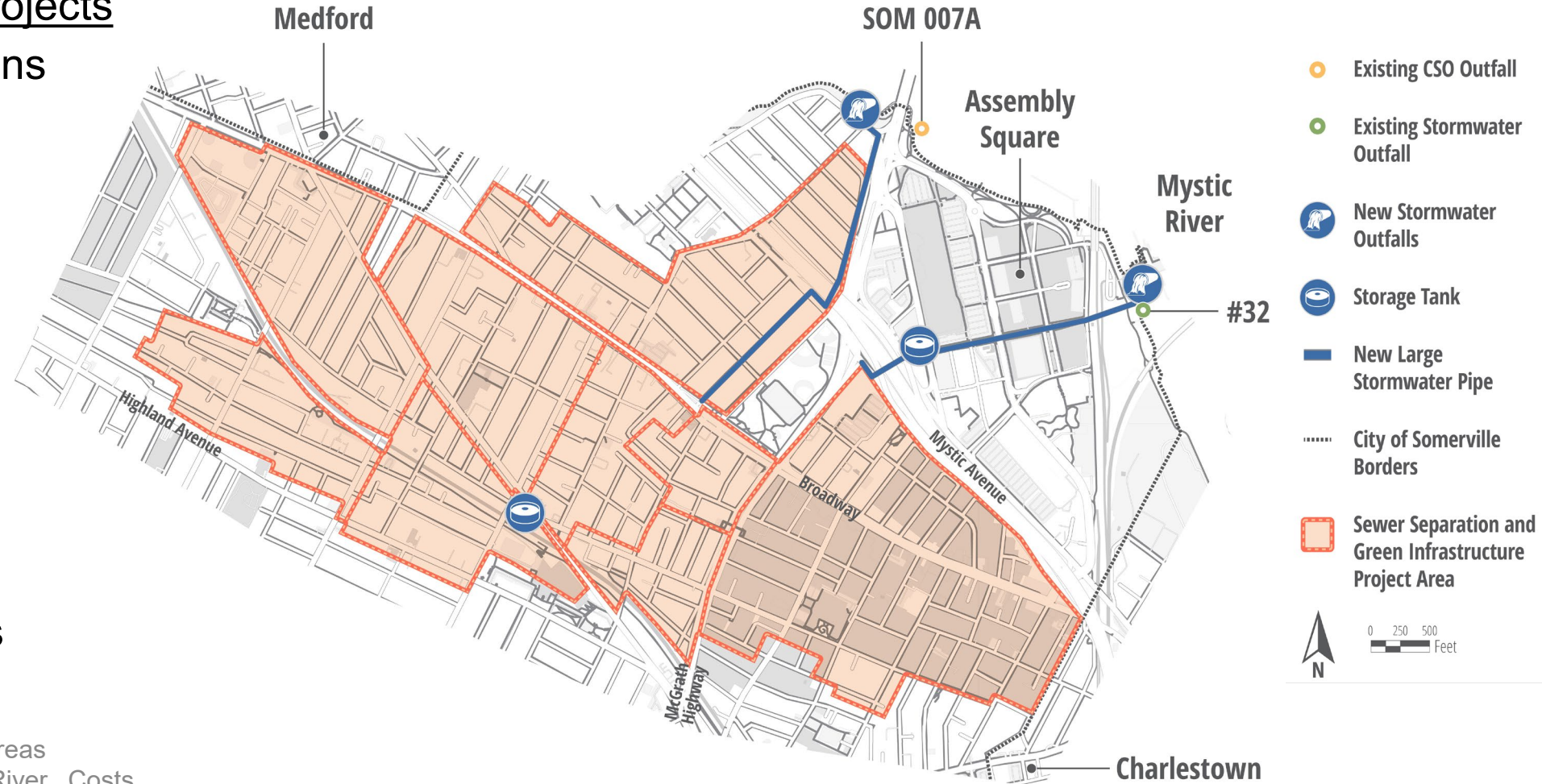
City of Somerville - 2050 Typical Year CSO Control

Potential Mystic River Projects

- Large trunk storm drains
- 5.5MG storage tank
- 0.5 MG storage tank
- 2 Storm drain outfalls
- 560 acres of localized sewer separation

Prelim. Estimated Cost:
~\$700 million *

Prelim. Timeline: ~40 yrs



*Costs include sewer separation of some areas tributary to both Alewife Brook and Mystic River. Costs estimated using 2024-dollar amounts and not escalated to construction period. Costs subject to refinement.

Case Study B: Potential CSO Storage Tunnel Alternatives

DRAFT

Potential Alewife Brook and Charles River Tunnel Alternatives:

- Identify outfalls with CSOs in the 2050 Typical Year, 2050 5-year, and 2050 25-year storms
- Develop potential CSO storage tunnels for each level of control

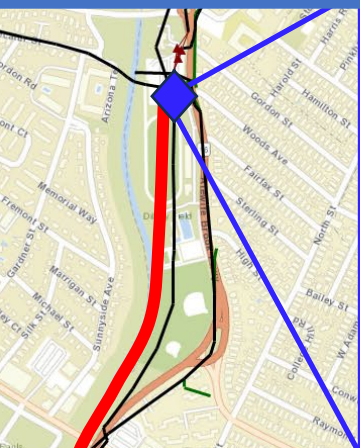


Storage Tunnel to Control CSO Outfalls Tributary to Alewife Brook

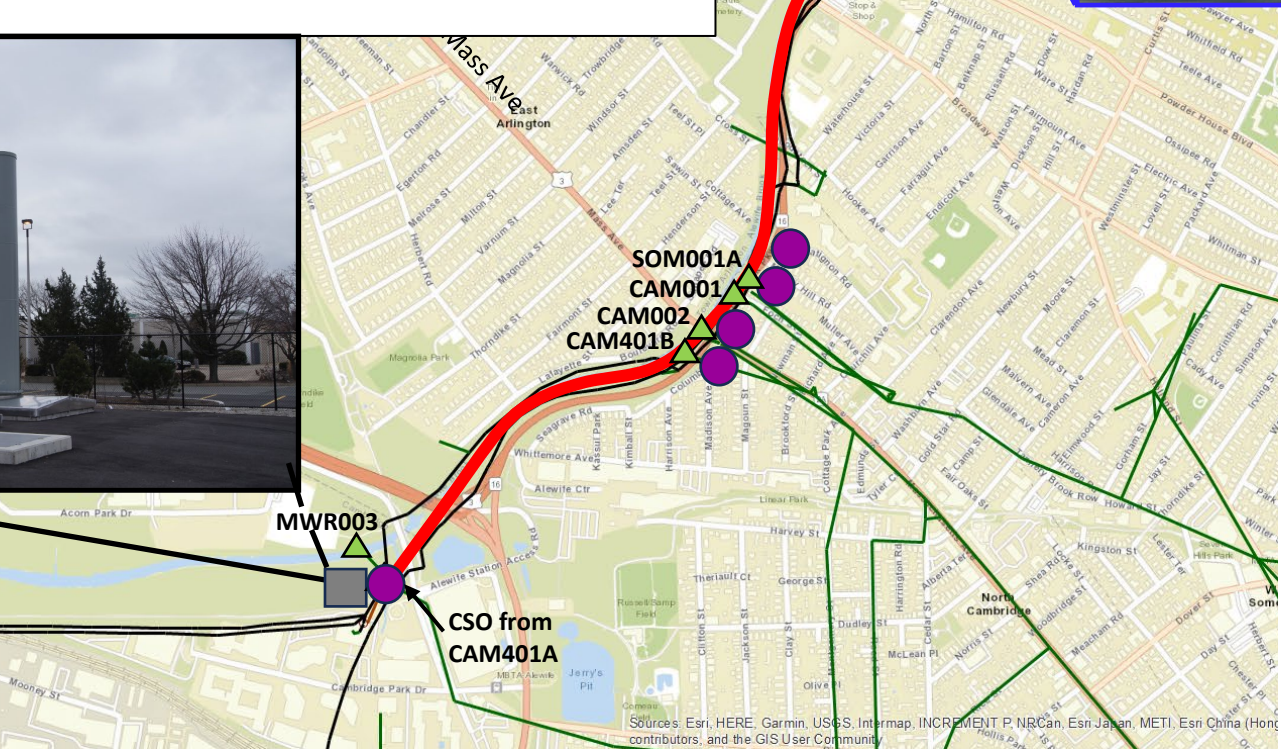
Legend:

- Potential Tunnel Alignment
- ▲ CSO Outfall
- Location where CSO drops into tunnel
- ◆ Pump station to pump stored flow to interceptor after storm
- Odor control/Ventilation Building
- Large Collection System Pipes

Note: Facility locations are approximate



North Dorchester Bay Odor Control/Ventilation Facility



North Dorchester Bay Dewatering Pump Station

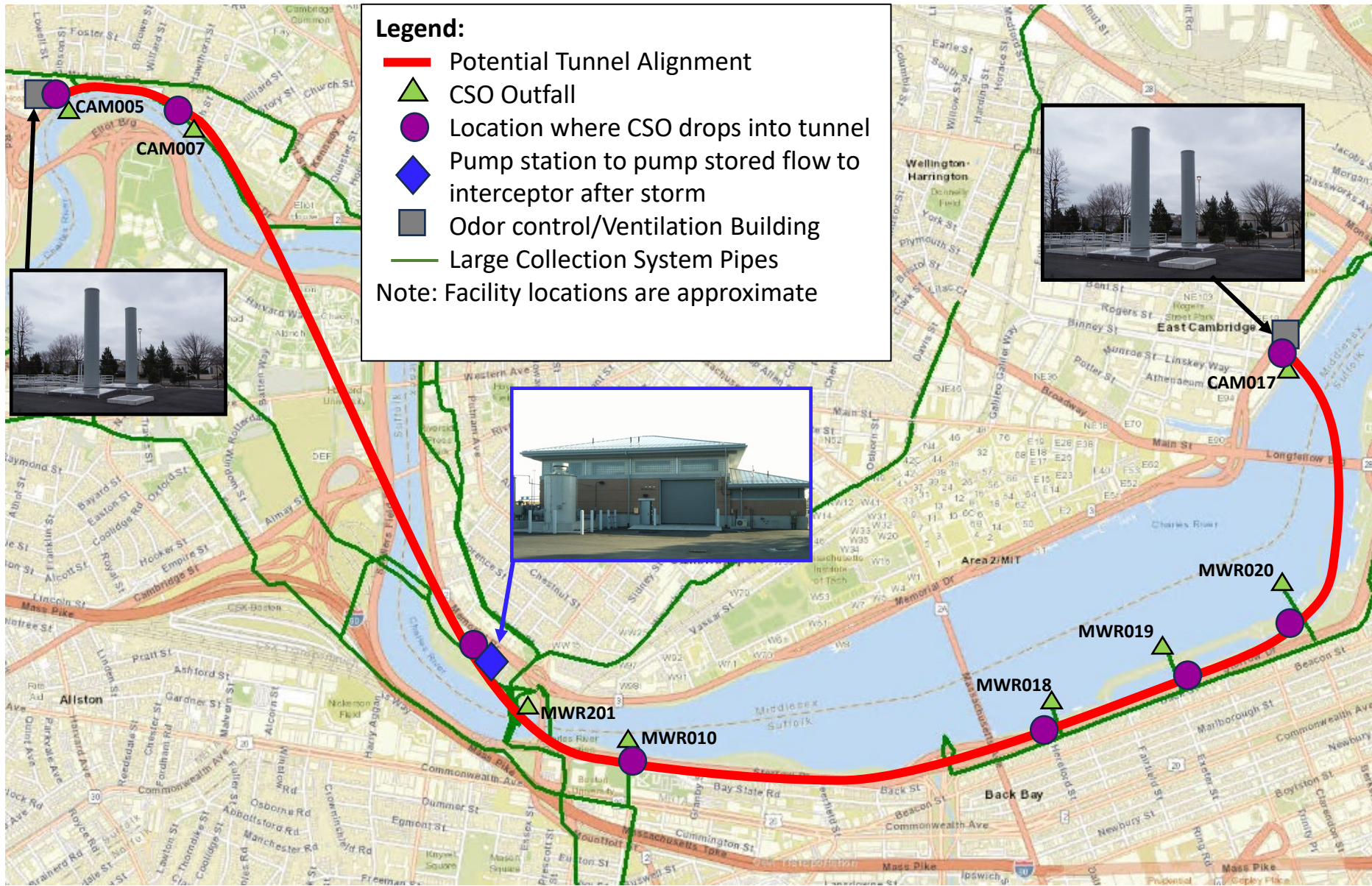
Alewife Brook Potential CSO Storage Tunnel Alternatives (Tunnel Length: 1.4 Miles)		
Level of CSO Control	Storage Volume (MG)	Diameter (feet)
2050 Typical Year	4.9	11
2050 5 Year	20.6	22
2050 25 Year	41.6	32

Preliminary Estimated Capital Costs Range from ~\$700M to ~\$1.7B*

*2024 dollars unescalated to construction period. Costs do not include land acquisition and may be further refined.

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Swire, DeLorme, NAVTEQ, and the GIS User Community

Storage Tunnel To Control CSO Outfalls MWR201 (Cottage Farm) /MWR010/MWR018/019/020/CAM005/CAM007/CAM017



Legend:

- Potential Tunnel Alignment
- ▲ CSO Outfall
- Location where CSO drops into tunnel
- ◆ Pump station to pump stored flow to interceptor after storm
- Odor control/Ventilation Building
- Large Collection System Pipes

Note: Facility locations are approximate

Charles River Potential CSO Alternatives (Tunnel Length: 4.5 Miles)		
Level of Control	Storage Volume (MG)	Diameter (feet)
2050 Typical Year	17.8	12
2050 5 Year	71.9	24
2050 25 Year	132.1	32

Preliminary Estimated Capital Costs Range from ~\$1.4B to ~\$2.3B*

*2024 dollars unescalated to construction period. Costs do not include land acquisition and may be further refined.



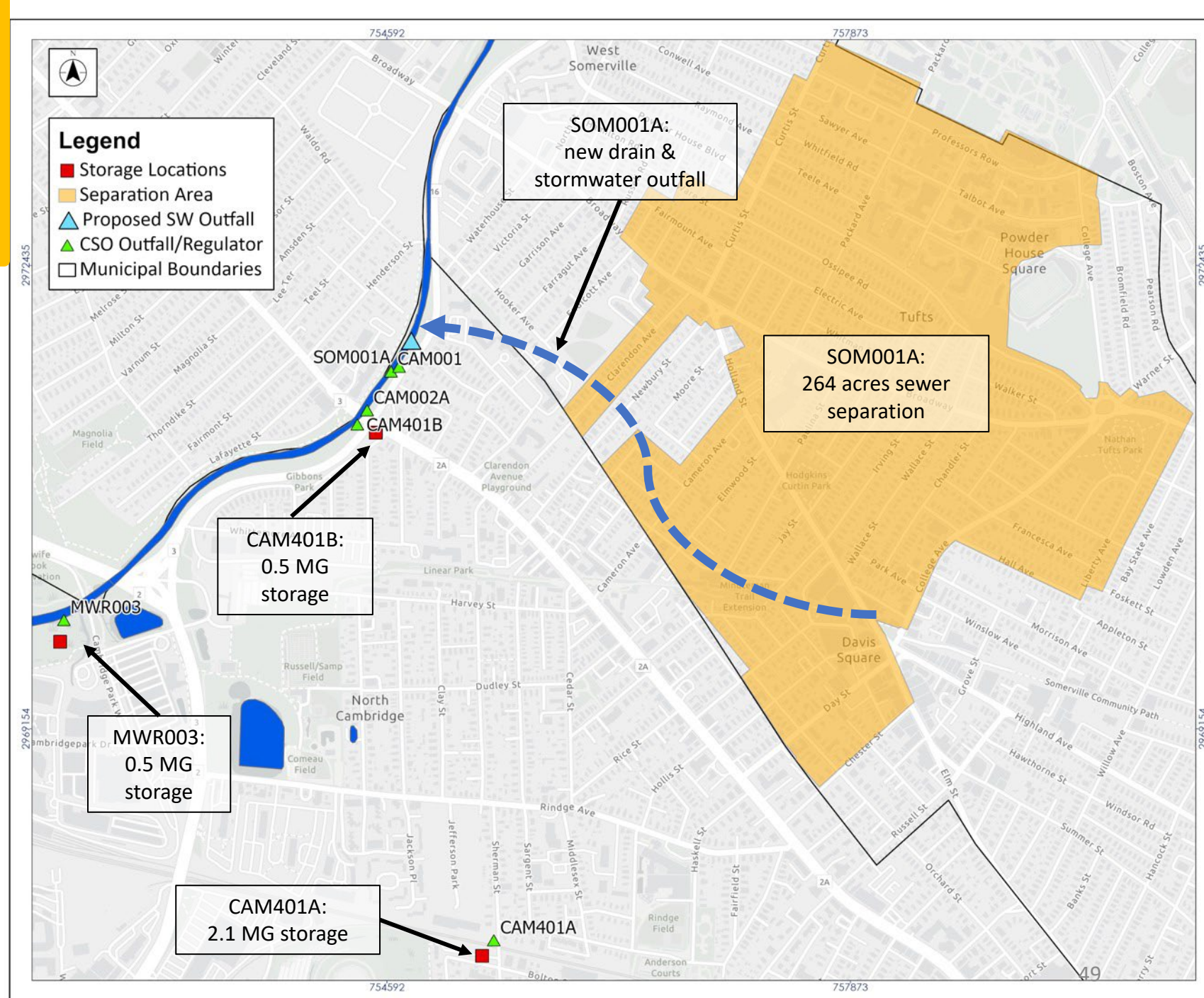
Case Study C: Potential Integrated Alternative

- **Step 1:** Identify outfalls with CSOs in the 2050 Typical Year.
- **Step 2:** Each permittee identifies projects sized to eliminate CSOs in 2050 TY at their outfalls.
- **Step 3:** Combine all projects in Unified Model to verify CSO performance.

Alewife Integrated Alternative: 2050 Typical Year CSO Control

- CAM401A: 2.1 MG storage
- CAM401B: 0.4 MG storage
- MWR003: 0.5 MG storage
- SOM001A: 264 acres separated + inline storage with throttles

Prelim. Estimated Cost: ~\$600 million

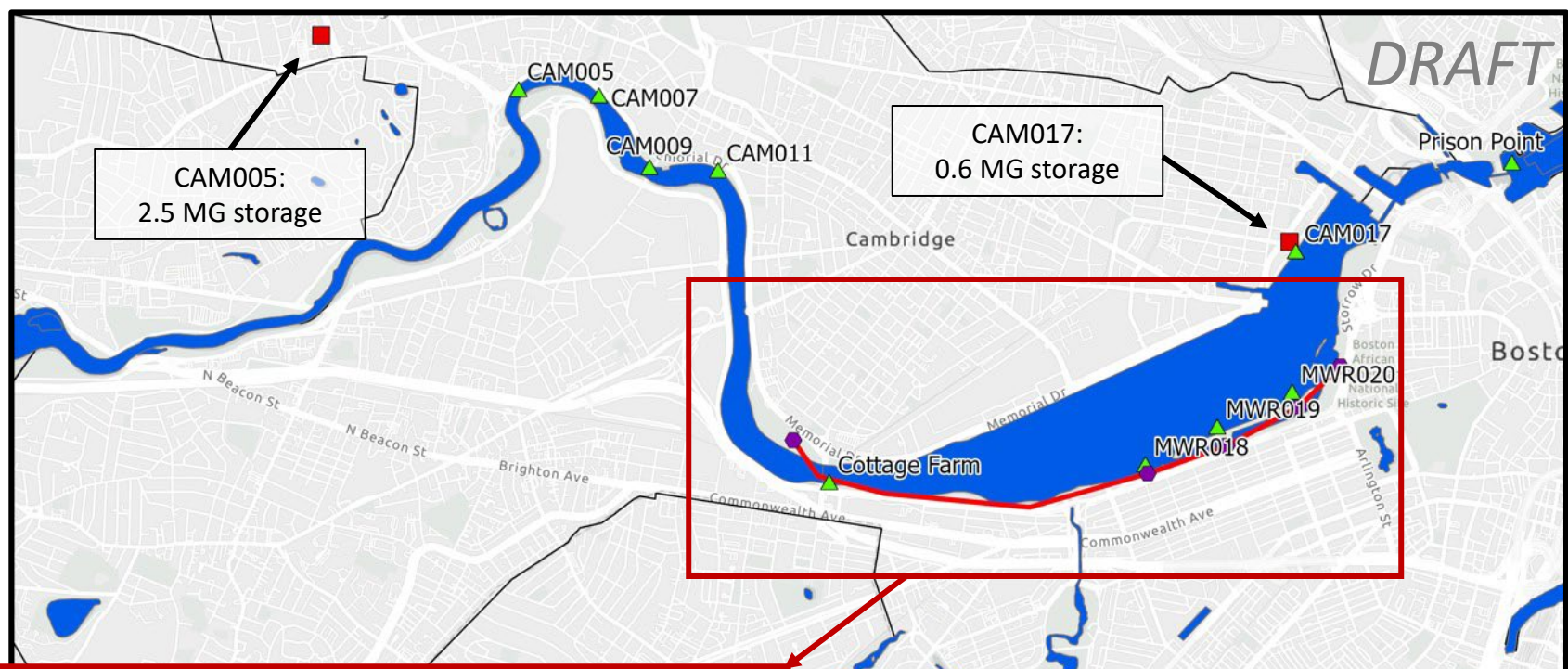


Charles Integrated Alternative: 2050 Typical Year CSO Control

- CAM005: 2.5 MG storage
- CAM017: 0.6 MG storage
- MWR201/MWR018/019/020: 17.2 MG tunnel
- MWR023: 0.3 MG storage

Prelim estimated Capital Costs: ~\$1 Billion*

*2024 dollars unescalated to construction period. Costs do not include land acquisition and may be further refined.



Potential Charles River CSO Storage Tunnel (2.2 Miles)

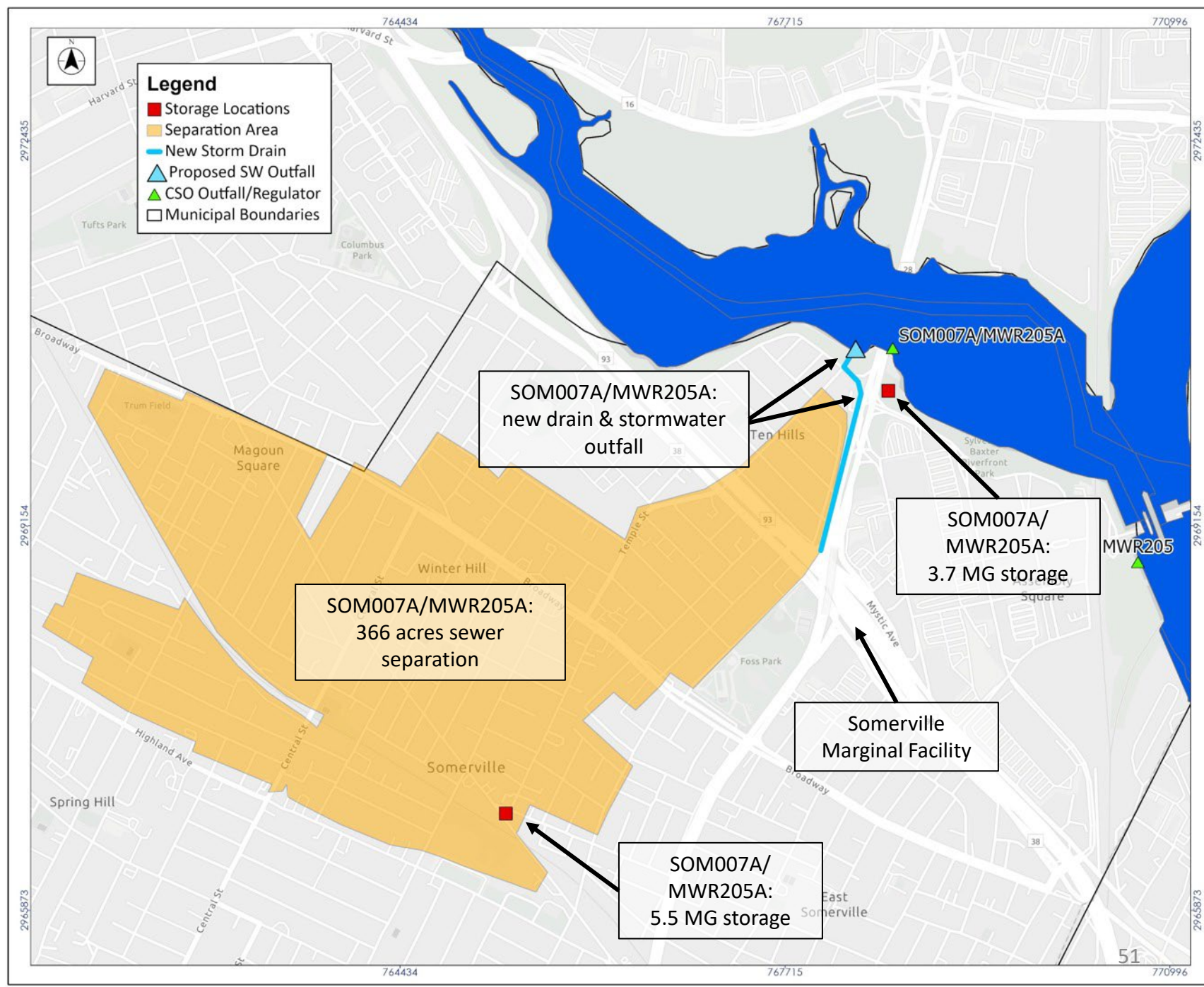


Mystic Integrated Alternative: 2050 Typical Year CSO Control

SOM007A/MWR205A:

- 366 acres sewer separation
- 5.5 MG stormwater storage
- 3.7 MG treated CSO storage

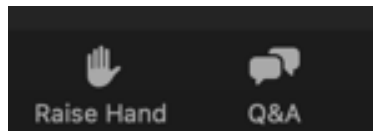
Prelim. Estimated Cost: ~\$550 million





Q&A Instructions

- We will prioritize questions pertaining to the presentation topic.
- We will do our best to answer as many questions as possible. We will likely not get to every question given the anticipated high number of participants.
- To ask a question, you can either:
 - A) Write your question in the Q&A, or
 - B) Raise your hand to share your question *verbally*. Please limit your question to *1 minute*.



Please pace your speech to allow our interpreters time to translate.



Financial Capability Assessment Process



What is and what is not a Financial Capability Assessment (FCA)?

- ✓ Helps communities understand their ability to implement CSO long-term control plans as mandated by the Clean Water Act (CWA)
- ✓ Helps in developing the schedule for implementing CSO control plans and economic impact analysis for water quality standards decisions
- ✓ Shows the financial impacts of CSO controls
- ✗ Does not evaluate affordability for individual customers
- ✗ Does not consider other financial needs or priorities



Financial Capability Assessment (FCA) Process

EPA guidance prescribes methods to measure financial impact (low, medium, and high) associated with current and future sewer services within community using critical metrics such as:

- **Residential Indicator**
- **Financial Capability Indicators**
- Lowest Quintile Poverty Indicator Score
- Financial and Rate Models

Evaluate the financial impact of alternative CSO controls and schedule



Residential Indicator

Defined as a community's average cost per household for wastewater treatment and Clean Water Act controls needed to meet the requirements of the Clean Water Act.

$$\text{Residential Indicator (\%)} = \frac{\text{Cost per household}}{\text{Median Household Income (MHI)}}$$

Residential Indicator	Financial Impact
< 1.0%	Low Impact
1.0% - 2.0%	Mid-Range Impact
> 2.0%	High Impact



Financial Capability Indicators

Debt Indicators

- Bond Rating
- Net Debt/Property Value

Socioeconomic Indicators

- Unemployment Rate
- Median Household Income

Financial Management Indicators

- Property Tax/Property Value
- Property Tax Collection Rate

Each indicator is given a ranking of

Strong

Mid-Range

Weak

compared to other communities.



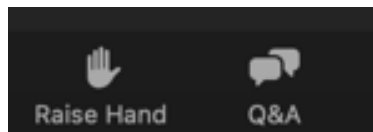
FCA Next steps

- Finalize baseline FCA – current conditions (ratepayers costs now)
- Evaluate different levels of CSO control, alternatives, and schedules for impacts to ratepayers, including lowest income households
- Present FCA results at the next public meeting
- Using ratepayer feedback, refine what alternatives, or partial alternatives, may be accomplished for CSO control in an affordable manner



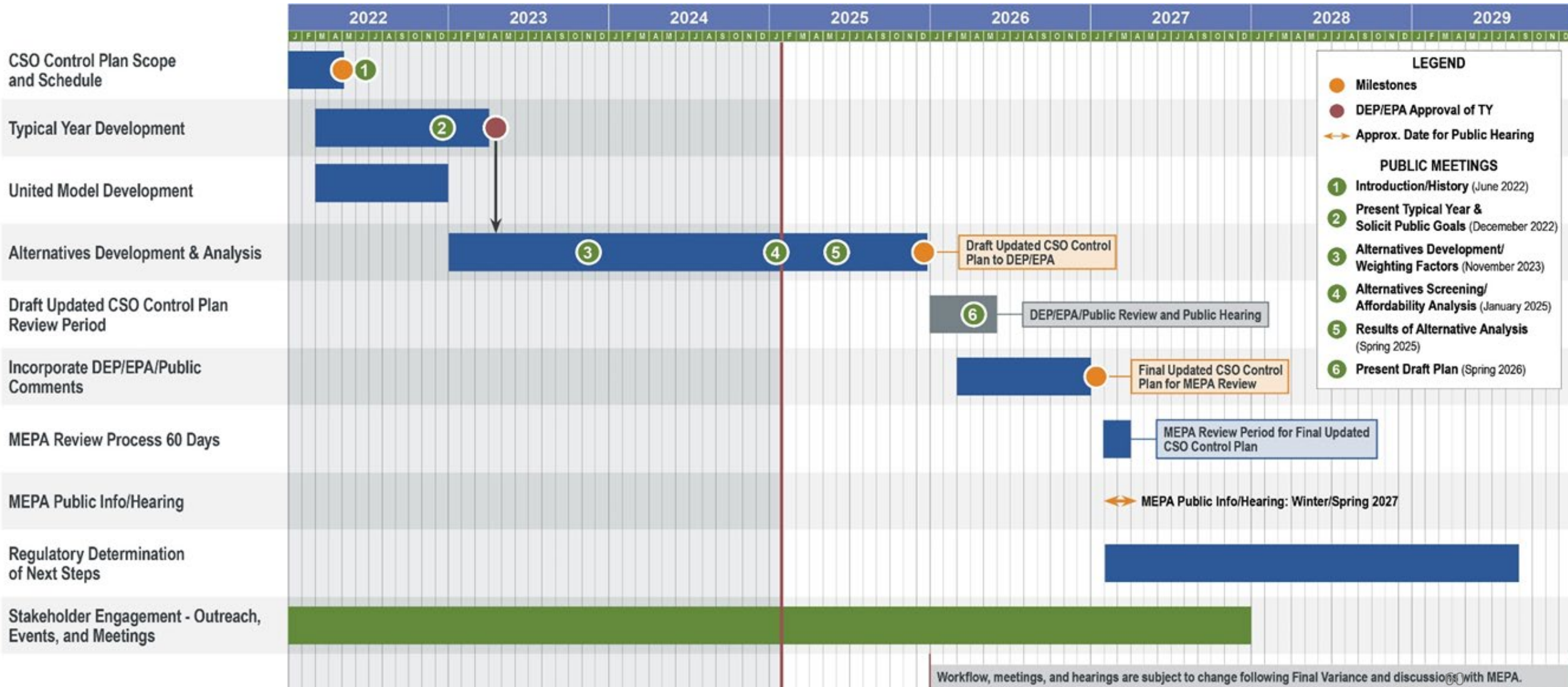
Q&A Instructions

- We will prioritize questions pertaining to the presentation topic.
- We will do our best to answer as many questions as possible. We will likely not get to every question given the anticipated high number of participants.
- To ask a question, you can either:
 - A) Write your question in the Q&A, or
 - B) Raise your hand to share your *question* verbally. Please limit your question to *1 minute*.



Please pace your speech to allow our interpreters time to translate.

Updated CSO Control Plan Schedule



Workflow, meetings, and hearings are subject to change following Final Variance and discussion with MEPA.



Project Info & Contacts

For additional information on the project, see the project website:

<https://voice.somervillema.gov/joint-cso-planning>

Or contact

Cambridge: Lucica Hiller - lhiller@cambridgema.gov

Somerville: Gina Cortese - gcortese@somervillema.gov

MWRA: Jeremy Hall - jeremy.hall@mwra.com





Interpretation will now begin.






La interpretación ahora comenzará.

A interpretação começará agora.

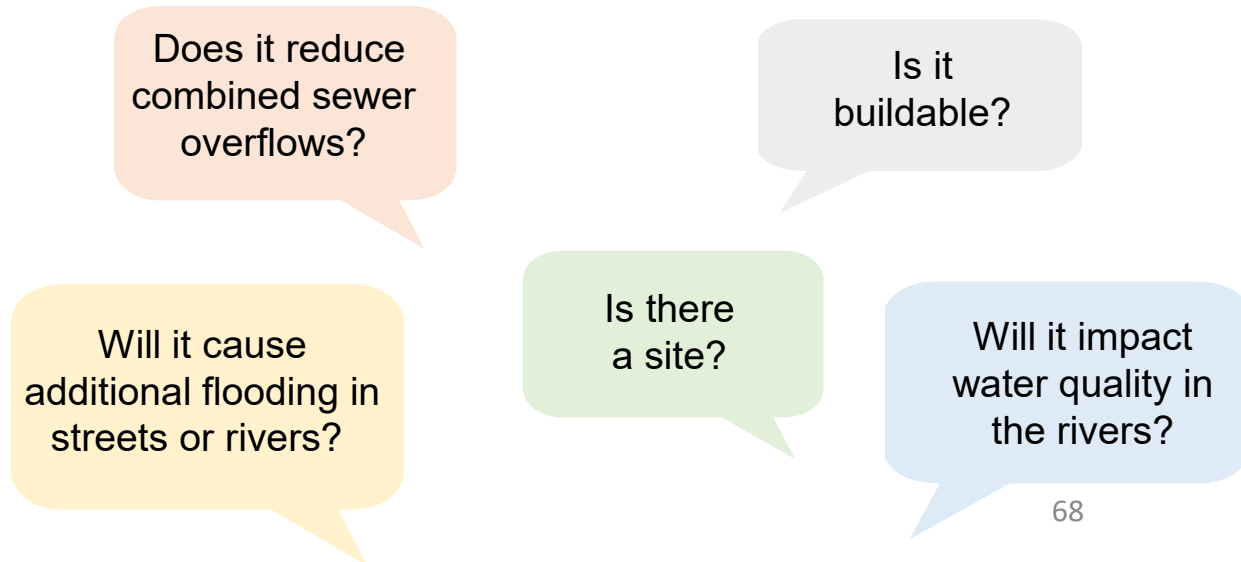
Updated CSO Control Plan Steps:

- 1) 2050 Typical Year & Design Storms ✓
- 2) Unify Hydrologic & Hydraulic models ✓
- 3) **Create alternatives:**
 - a) Identify CSO performance goals
 - 0 CSO in 2050 Typical Year
 - 0 CSO in 2050 5-yr and 25-yr event
 - b) Combine CSO tools to develop various alternatives
 - c) Optimize regionally for each variance water
- 4) Screen and develop scope for alternatives ✓

Step 3: CSO Reduction Tools

-  Sewer Separation
-  Green Stormwater Infrastructure
-  Inflow/infiltration reduction
-  Storage
-  Conveyance

Step 4: Screening / Scope Development



Updated CSO Control Plan Steps:

5) Compare alternatives using weighted criteria. Run analyses such as:

- H&H modeling
- Water Quality calculations
- Desktop concept development
- Cost estimates

6) Assess Recommended Alternative(s) for:

- Affordability
 - **Financial Capability Assessment**
- Implementation schedule
- UAA applicability

7) Develop Draft Updated CSO Control Plan(s)

Zoom in on Step 5: Alternatives Evaluation – Preliminary Criteria

- Reduce/eliminate combined sewer overflows
- Reduce flooding and flooding impacts
- Reduce sanitary sewer overflows
- Improve water quality
- Rehabilitate old infrastructure (pipes, facilities)
- Improve resilience of our infrastructure to future climate conditions
- Improve service to low income and minority communities
- Offers community co-benefits (e.g., green space, gathering space, heat reduction)
- Minimize neighborhood disruption during construction
- Minimize costs to ratepayers / taxpayers
- Other criteria based on public feedback