

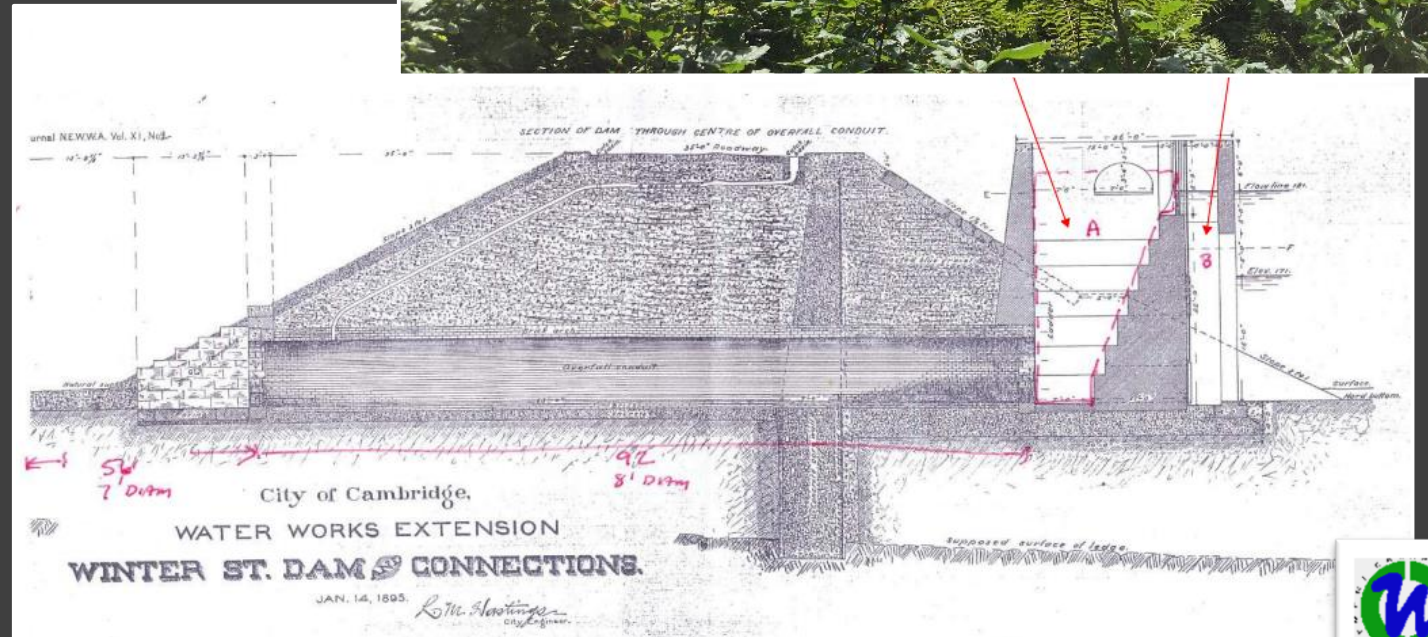


# Watershed Projects Overview

Cambridge Water Board, February 8, 2022

# Watershed Projects - Upcountry

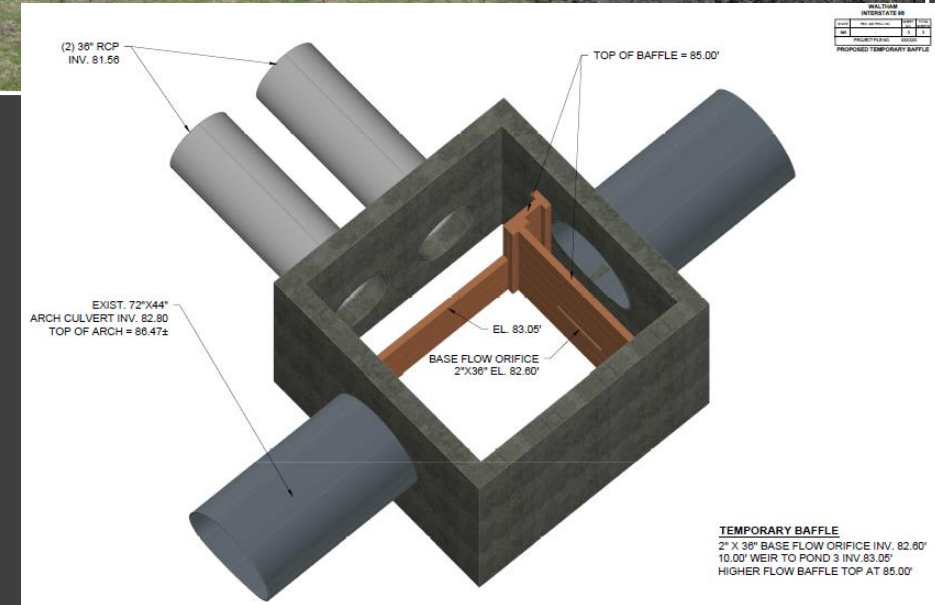
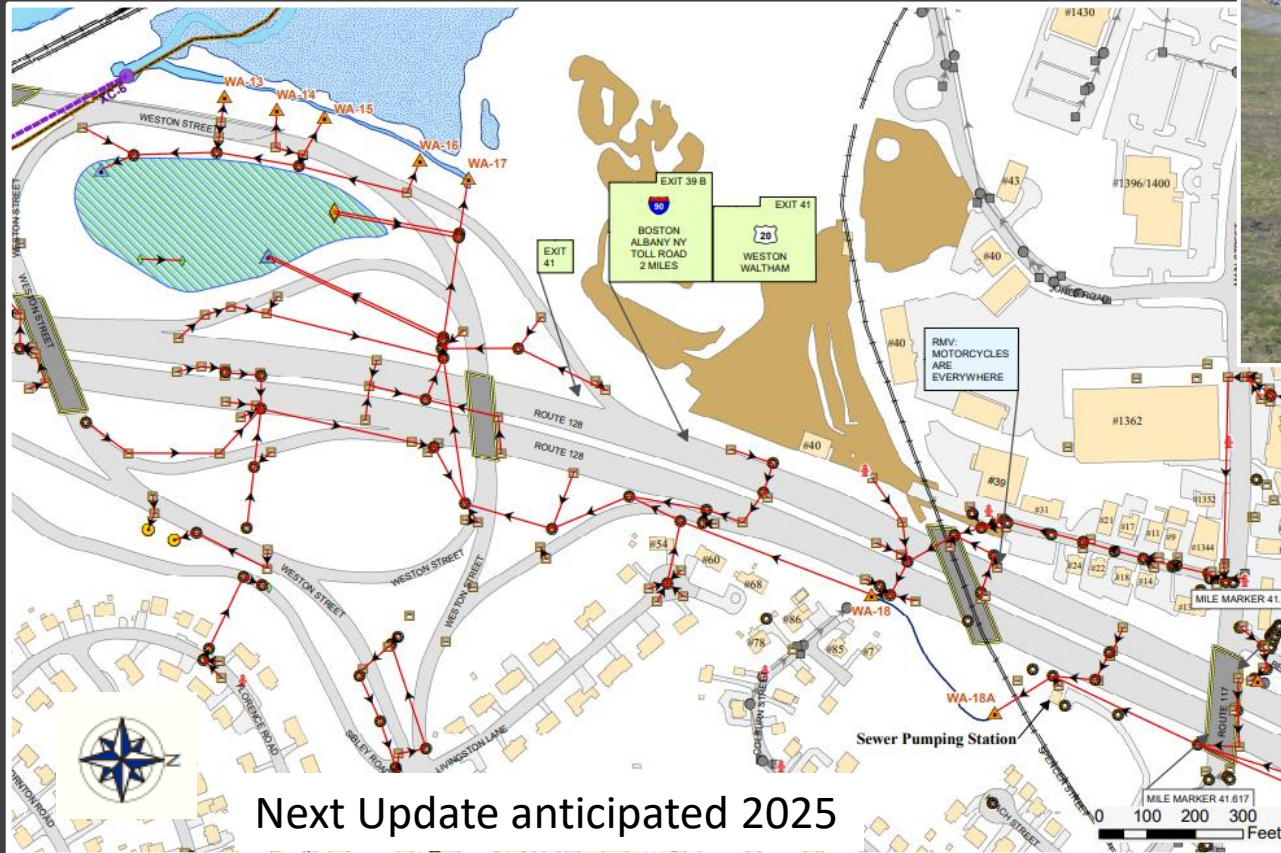
- Land Acquisition – Twin Pond Lane Lincoln
- Emergency Planning
  - Hazmat Atlas (2022 Updates)
  - 1265 Main Street Traffic Mitigation
- Construction/Maintenance
  - Dam Repairs
  - Hobbs Downstream Slope/Seepage
- Site Monitoring
  - Current Significant Construction
  - Site Monitoring Mobile Mapping Tool
- Water Quality Monitoring
  - Revisioning the EOY Water Quality Report
  - Demo



# Watershed Projects - Upcountry

## Emergency Planning

- Hazmat Atlas (2022 Updates)
- 1265 Main Street Traffic Mitigation



# Watershed Projects

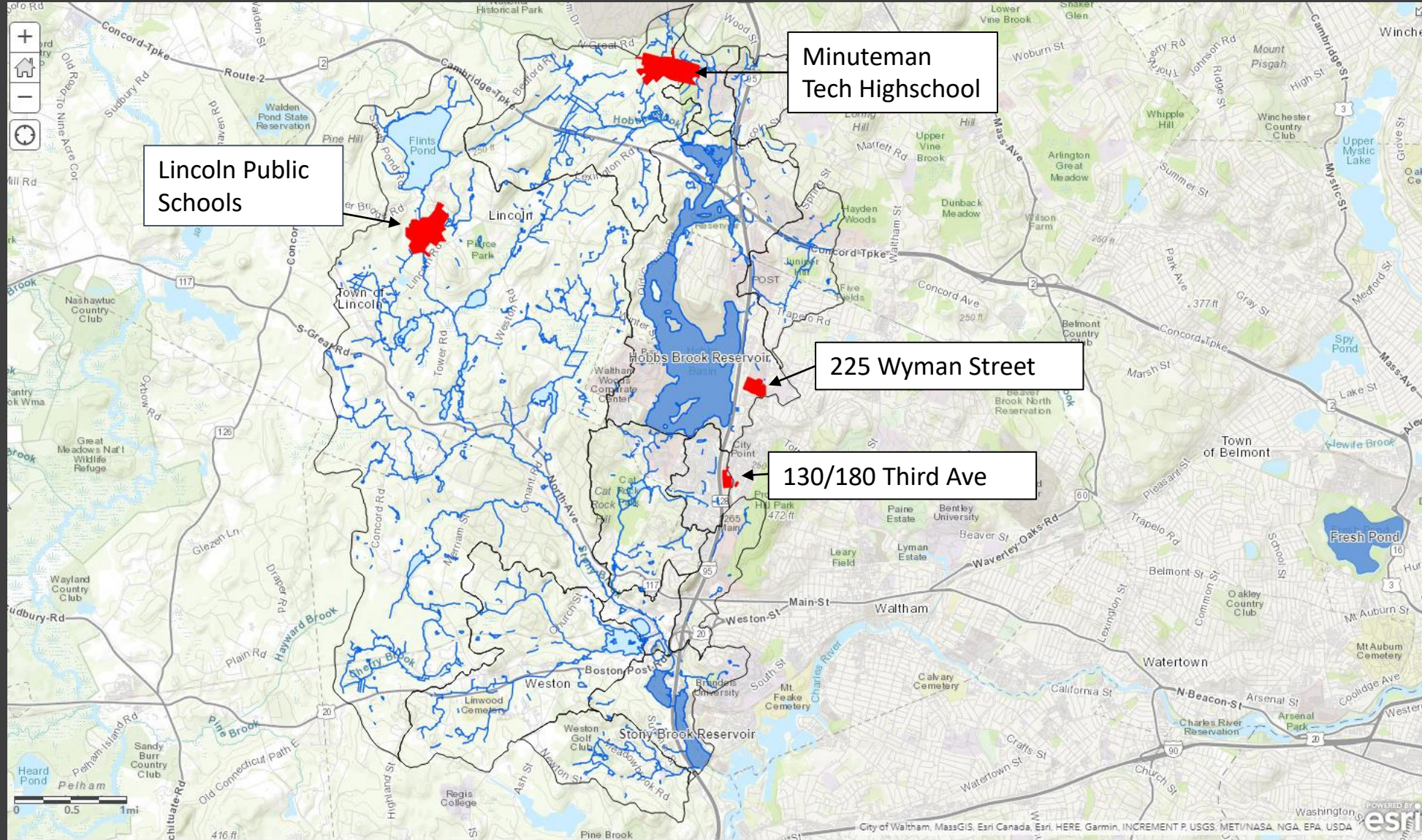
## Construction/Maintenance

- Dive Inspections 6/10/2021 (Hobbs), 6/14/2021 (Stony)
- Identified Priority Repairs @ Hobbs
  - Repoint granite blocks
  - Adjust sluice gates
  - Repair scour under outlet headwall, wingwalls
  - Spring 2022
- Slope Stability Evaluation
  - Subsurface Exploration
  - Groundwater monitoring
  - Develop Model
  - Recommendations and Cost Estimates
- Seepage Evaluation
  - Assess and Identify Likely Cause
  - Recommendations and Cost Estimates



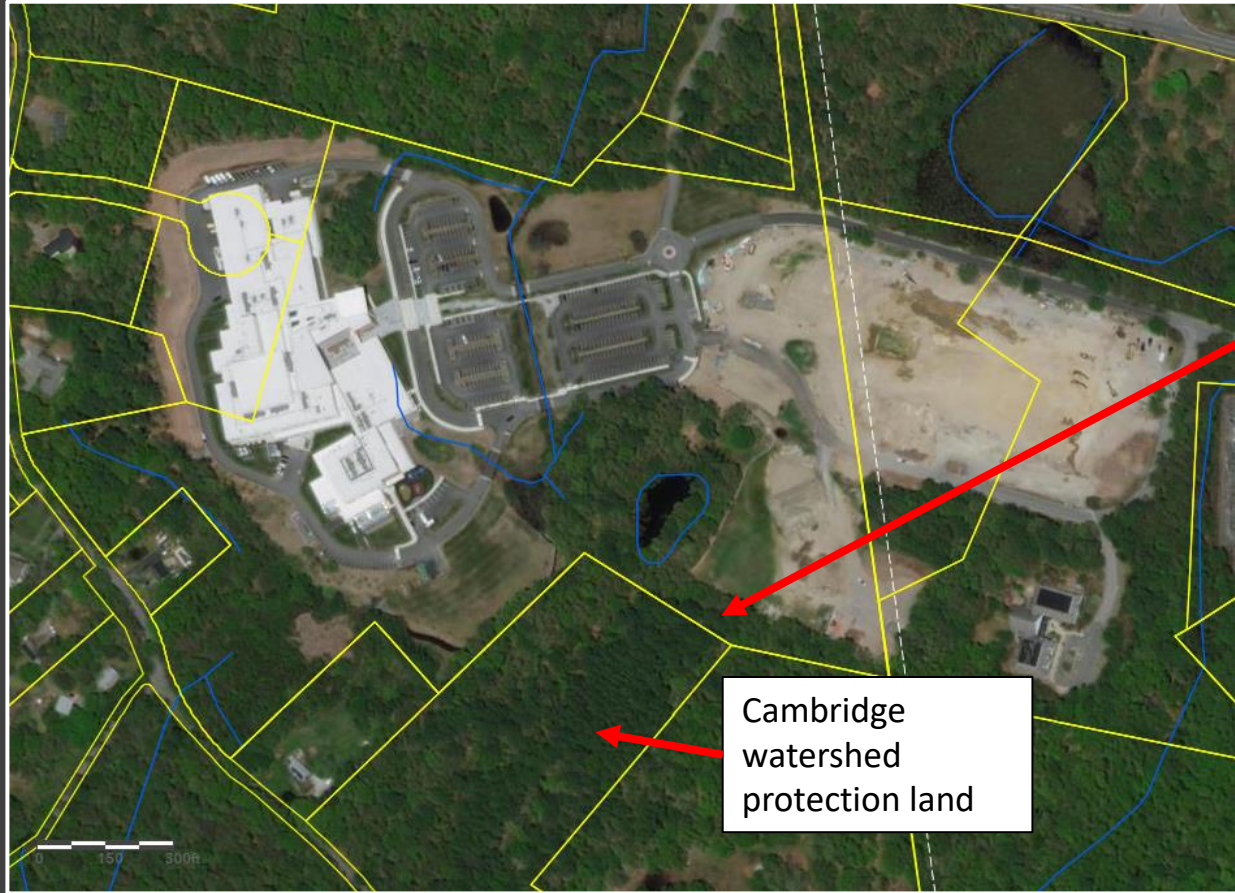
# Watershed Projects

Site Monitoring - Current Significant Construction (>300k sq. ft. estimated disturbance)



# Watershed Projects

## Site Monitoring – Inspection Example Minuteman Tech Highschool



Cambridge watershed protection land

Confirm that the property boundary and tree cutting lines are clearly marked



Boundary of project site buffer and watershed protection land



# Watershed Projects

## Site Monitoring – Inspection Example

### 130/180 Third Ave



2. Caused primarily by roadway shoulder erosion and missing CB protection outside the upstream project site



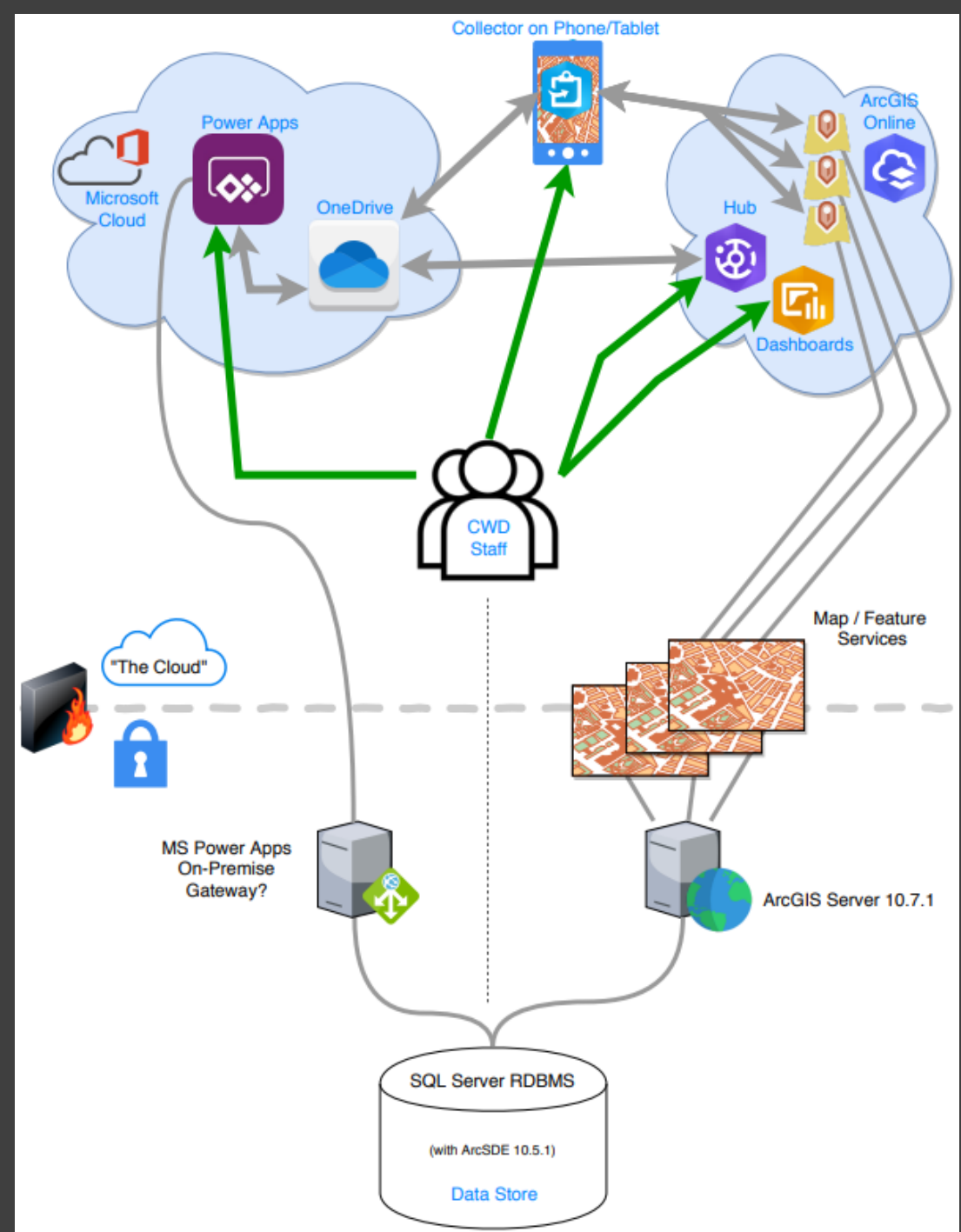
3. Fixed by adding jersey barriers with straw wattles to prevent erosion from trucks. Repaired CB protection. CWD staff observed clear water in the downstream outflow during the next storm.



# Watershed Projects

## Site Monitoring Mobile Data Management and Mapping Tool

- Goals
  - Centralize database/consolidate information
  - Create mobile access
  - Interact with and edit data in the field
  - Streamline site monitoring reports





# Watershed Projects

## Site Monitoring Mobile Data Management and Mapping Tool

### Cambridge Restrictions

Parcel ID (from Collector)  
1357

Date of Inspection

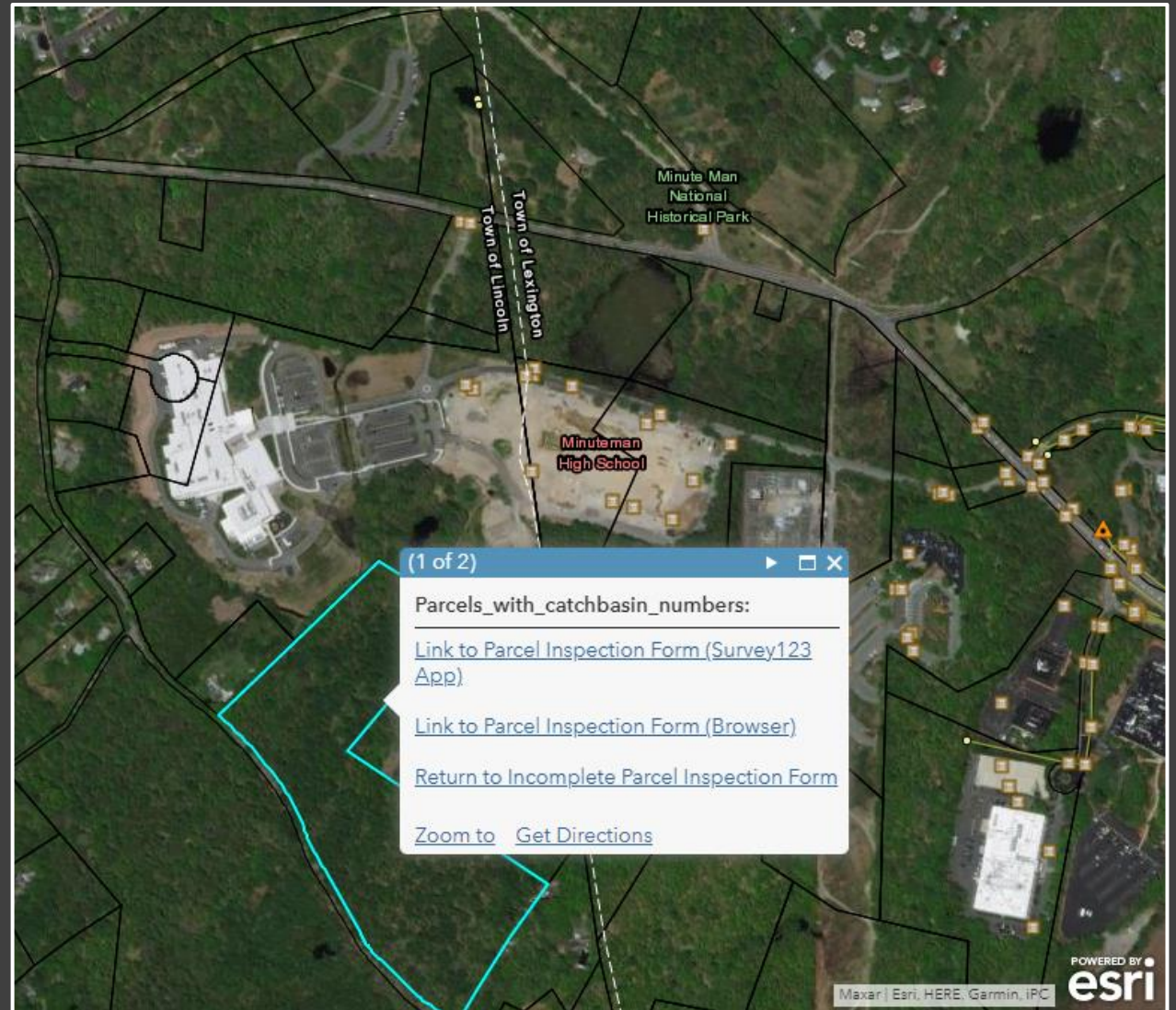
Weather  
 Wet - Rain within past 72 hours  
 Dry - No rain in past 72 hours

Inspectors Present

Inspection Status  
 Full  
 Partial  
 Incomplete

[Instructions on What to Check For](#)

General Inspection Notes



Interact with Parcel or Infrastructure

Conduct real-time field inspections

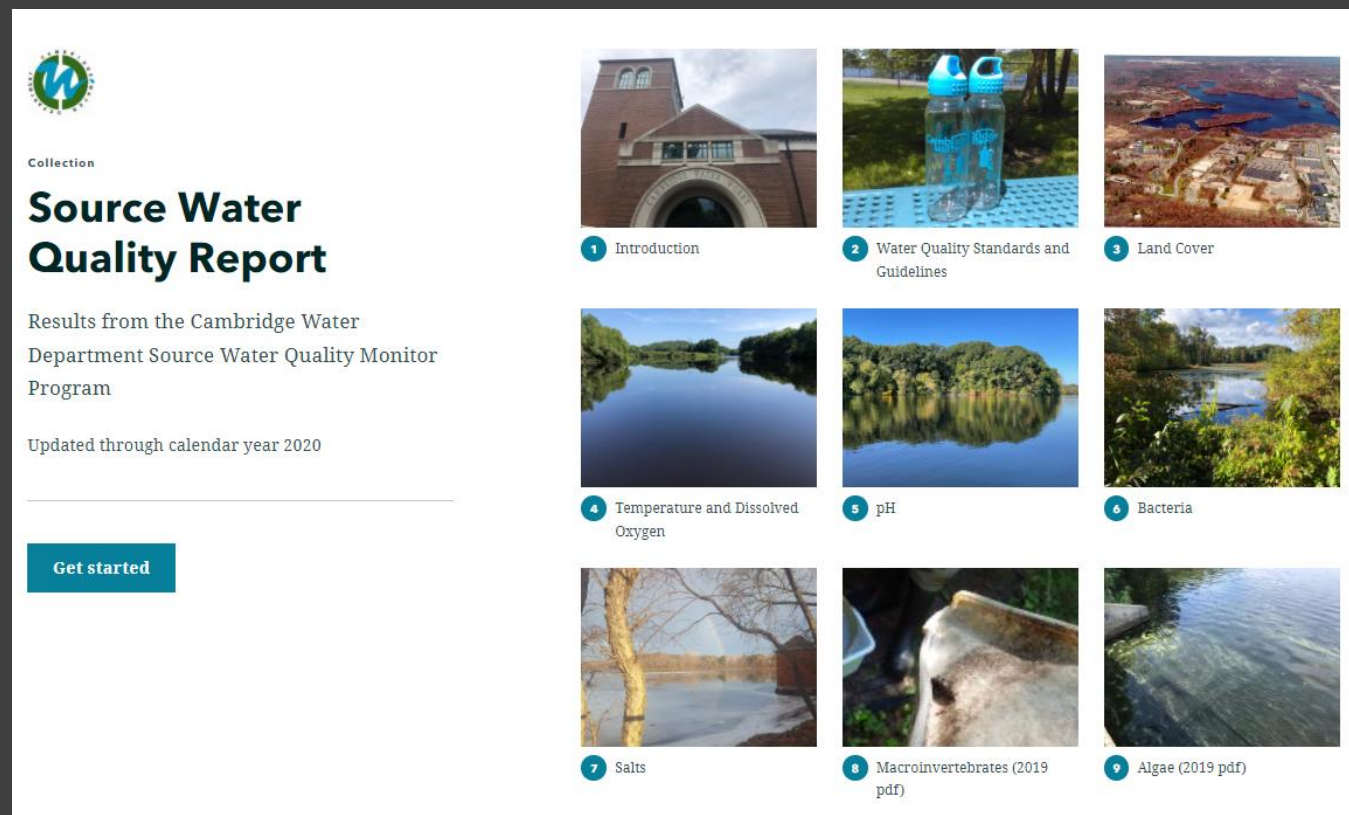


# Watershed Projects

## Water Quality Monitoring EOY Report

### Goals:

- Replace time-consuming, dense annual pdf report with an easy to update online reporting platform
- Create a visually engaging report accessible and appropriate for a wide range of public users (school kids -> general adult public -> research scientists)
- Allow users to "jump around" in the report and easily find information of interest to the user
- Allow user to interact with the data to compare sites, parameters, and trends over time
- Using pictures and interactive maps, allow users to "explore" the Cambridge watershed, learn about watershed protection, and understand the work of the CWD Watershed Division



The screenshot shows the homepage of the 'Source Water Quality Report'. At the top left is the logo of the Cambridge Watershed Division, featuring a stylized 'W' with a water drop and a leaf. Below the logo, the text reads 'Collection' and 'Source Water Quality Report'. Underneath, it states 'Results from the Cambridge Water Department Source Water Quality Monitor Program' and 'Updated through calendar year 2020'. A prominent blue button labeled 'Get started' is positioned below the text. To the right of the main content is a grid of nine thumbnail images, each with a numbered circle and a title: 1. Introduction (brick building), 2. Water Quality Standards and Guidelines (blue water bottles), 3. Land Cover (aerial view of a town), 4. Temperature and Dissolved Oxygen (calm lake), 5. pH (lake with trees), 6. Bacteria (lake with trees), 7. Salts (frozen lake), 8. Macroinvertebrates (2019 pdf) (stone with water), 9. Algae (2019 pdf) (green algae in water).



# Watershed Projects


## Water Quality EOY Report

- Project uses ESRI StoryMaps & AGOL platforms, R/shiny apps
- With support from Cambridge GIS and IT departments



# Watershed Projects

## StoryMap Collection Home Page - Select topic of interest












Collection

### Source Water Quality Report

Results from the Cambridge Water Department Source Water Quality Monitor Program

Updated through calendar year 2020

[Get started](#)

-  1 Introduction
-  2 Water Quality Standards and Guidelines
-  3 Land Cover
-  4 Temperature and Dissolved Oxygen
-  5 pH
-  6 Bacteria
-  7 Salts
-  8 Macroinvertebrates (2019 pdf)
-  9 Algae (2019 pdf)



# Watershed Projects

Within a StoryMap, users can navigate to subsections of interest. Users can also navigate to a different StoryMap or return to the collection home page.

The screenshot shows a web page for a 'Source Water Quality Report'. At the top, there is a navigation menu with several items: 'Introduction', 'Water Quality Standards and Guidelines', 'Land Cover', 'Temperature and Dissolved Oxygen', 'pH', 'Bacteria', 'Salts', 'Macroinvertebrates (2019 pdf)', and 'Algae (2019 pdf)'. The 'Salts' item is highlighted with a red box. Below this menu is another row of navigation items: 'Overview', 'Methods', 'Reservoir Sodium and Chloride', 'Tributary Sodium and Chloride', 'Loads and Yields', 'Appendix', and 'References'. The 'Overview' item is also highlighted with a red box. The main content area on the left is titled 'Overview' and contains text about the Cambridge Source Water Quality Monitoring Program (SWQMP) and its focus on salt ions. On the right, there is a large image of a snowy landscape with a calm body of water reflecting the sky and trees.

Source Water Quality Report

Introduction Water Quality Standards and Guidelines Land Cover Temperature and Dissolved Oxygen pH Bacteria **Salts** Macroinvertebrates (2019 pdf) Algae (2019 pdf)

Overview Methods Reservoir Sodium and Chloride Tributary Sodium and Chloride Loads and Yields Appendix References

## Overview

The Cambridge Source Water Quality Monitoring Program (SWQMP) measures a variety of salt ions: sodium (Na), chloride (Cl), calcium (Ca), magnesium (Mg), and sulfate (SO<sub>4</sub>). Calcium and magnesium cause water hardness. Chloride can exacerbate drinking water distribution pipe corrosion and inform corrosion control strategies employed by CWD. Elevated chloride concentrations can also result in salty tasting drinking water and harm aquatic life. Sodium has implications for consumers on salt-restricted diets, although drinking water typically contributes less than 10 percent of an individual's overall sodium intake (1). Currently, the City's water treatment facility cannot remove these ions so increasing concentrations could have real cost implications from a treatment standpoint. This section discusses two of the most common salt ions in the Cambridge watershed: sodium and chloride.

- Sodium and chloride are dissolved ions that are present naturally in the environment. However, concentrations of these ions can become elevated by anthropogenic sources, such as sodium chloride (NaCl) pollution from road salt. Through the



# Watershed Projects

\*\*Shiny apps embedded in StoryMap sidecars allow users to interact with the data

Source Water Quality Report

Introduction Water Quality Standards and Guidelines Land Cover Temperature and Dissolved Oxygen pH Bacteria Salts Macroinvertebrates (2019 pdf) Algae (2019 pdf)

Overview Methods Reservoir Sodium and Chloride Tributary Sodium and Chloride Loads and Yields Appendix References

## Annual Exceedances and Statistics - All Reservoir Sites

Sodium and chloride concentrations are typically elevated in the Hobbs Brook Reservoir lower basin and, in recent years, often surpass the EPA chronic toxicity criteria and drinking water SMCL. However, the upper and middle basins (HB @ Upper and HB @ Middle) tend to have lower sodium and chloride concentrations and chloride exceedance rates than the lower basin (HB @ DH and HB @ Intake). The differences between the basins appears to have become more pronounced in 2019 and 2020.

Select a year from the dropdown menu in the interactive application to view sodium and chloride concentrations at each reservoir site. Click the "Tables" tab to view tabular annual statistics.

Open Results Full Screen

The lower sodium and chloride concentrations in the middle and upper basins of Hobbs Brook Reservoir, especially HB @

### Reservoir Surface Sodium and Chloride Concentrations

Select Comparison Year: 2020

Plot Tables

Site Name	Cl (mg/L) Median	Cl (mg/L) IQR	Na (mg/L) Median	Na (mg/L) IQR
HB@Upper	165	150-215	110	95-125
HB@Middle	235	200-260	135	120-145
HB@DH	255	250-260	140	135-145
HB@Intake	245	240-260	140	135-145
SB@DH	245	240-255	125	120-130
SB@Intake	200	165-235	110	95-130
FP@DH	210	205-220	110	105-115

Basin Name

- Hobbs Brook
- Story Brook
- Fresh Pond

Standard

- ORS Guideline
- EPA Chronic Toxicity
- - - SMCL

# Watershed Projects

Interactive AGOL maps embedded in StoryMap sidecars provide another way for users to view data

Source Water Quality Report

Introduction Water Quality Standards and Guidelines Land Cover Temperature and Dissolved Oxygen pH Bacteria Salts Macroinvertebrates (2019 pdf) Algae (2019 pdf)

Overview Methods Reservoir Sodium and Chloride Tributary Sodium and Chloride Loads and Yields Appendix References

## Sodium and Chloride Concentrations and Catchment Land Cover

Explore how baseflow concentrations of sodium and chloride vary between catchments with differing percentages of roadways and impervious cover. Notice how more densely developed catchments (more impervious cover and roadways) tend to have the highest sodium and chloride concentrations.

*Click on a catchment in the map to view the percent impervious cover, percent roads, and tributary median sodium and chloride concentrations.\**

View catchments by annual median concentration\*:

Cl (mg/L)

Na (mg/L)

*\*Reported median concentrations are for the most recent year available. Land cover data is from 2016. Map shading represents*

CWD Site Name	HB @ Mill St
USGS ID	01104405
Area (sq. mi.)	2.15
% Roads	2.3
% Impervious	5.9
Cl Median (mg/L)	88.7
Na Median (mg/L)	51.5

City of Waltham, MassGIS, Esri, HERE, Garmin, USGS, EPA, NPS | The land cover dataset was created in raster format by the Coastal Change Analysis Program (C-CAP) of the National Oceanic and Atmospheric Administration. Powered by Esri