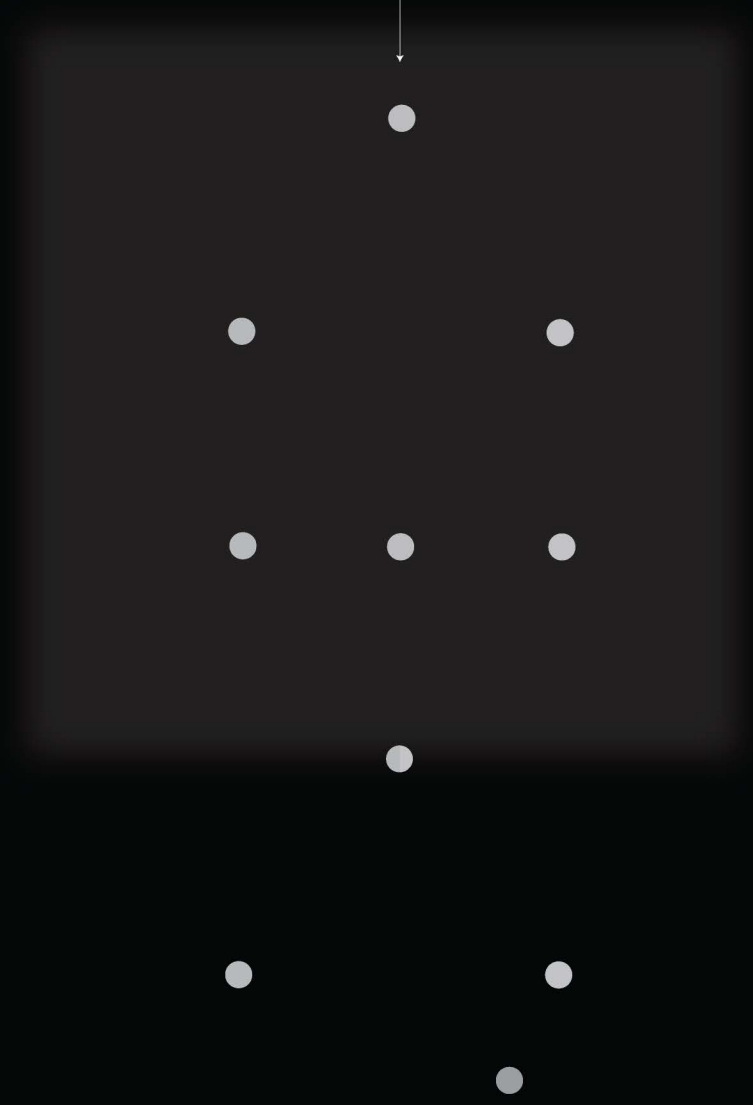
visualizing the waste system



BY CHLOE PROCK

visualizing the waste system

BY CHLOE PROCK

Statement

This project is a monograph study of the function of visualization as a tool for understanding the Massachusetts waste system.

This topic is incredibly broad, and there are many unknowns, so there is no way that it could all be convered within these 50 pages.

more here and here and here (this page of content not final)

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LANDFILL LIFECYCLE

what we know (and what we don't)

In this chapter, I propose a diagram of what we know is occuring in the waste disposal system, and then alter the same diagram to highlight the few elements of the system that we actually collect data on.

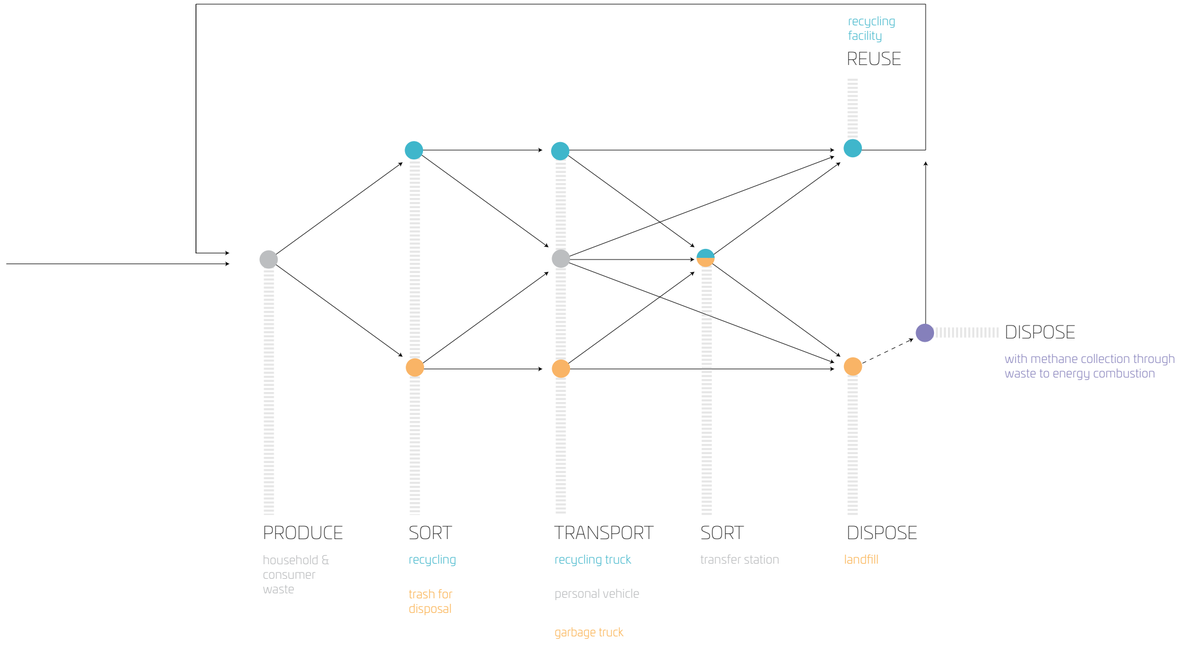
These diagrams are accompanied by visualizations of waste disposal data about the USA from 1960-2018, in order to make visible the process through which the diagrammatic proposal was formed.

When tasked with attempting to create a visual representation of where our waste goes, it became clear that the gaps in the system are so pervasive that the somewhat basic question "where does this soda can go when I throw it away" is virtually impossible to answer.

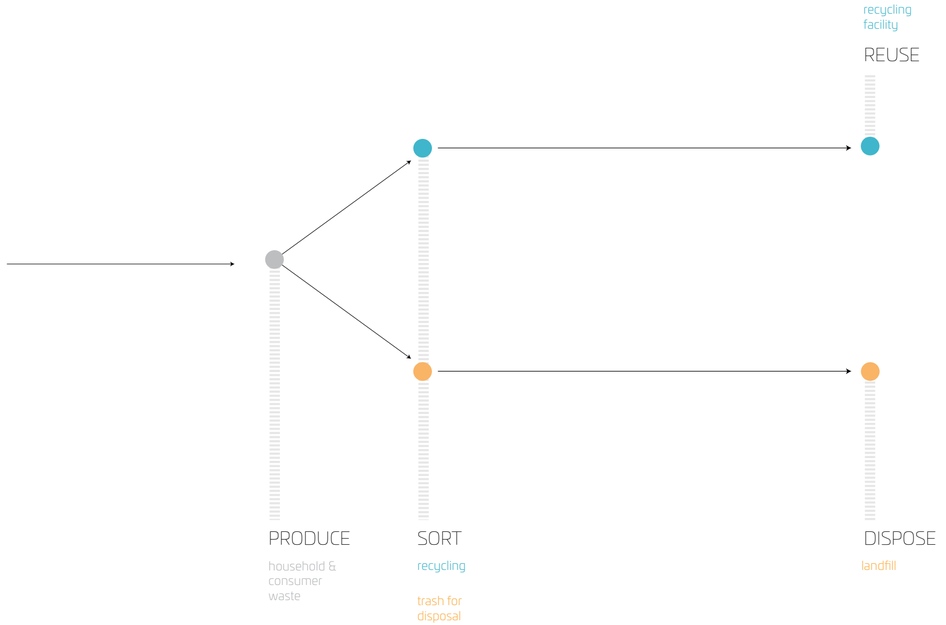
While it is difficult to create simple representations of such a complex system, identifying key processes and features that we know to be occuring, and cross referencing these processes against the data that is collected allows us to begin forming a picture not only of what we know about the system, but more importantly, what we don't.

THE WASTE SYSTEM

what we know is happening

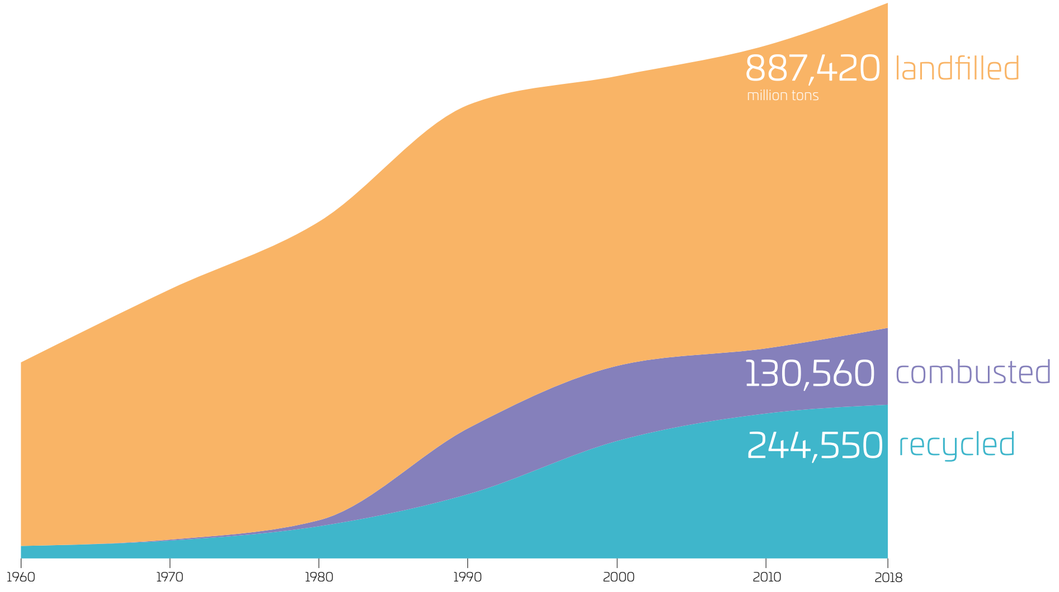


what we actually have data on



THE DATA

streamgraph of disposal of municipal solid waste (MSW) in the USA, 1960 - 2018



matrix plot of disposal of municipal solid waste (MSW) in the USA, 1960 - 2018

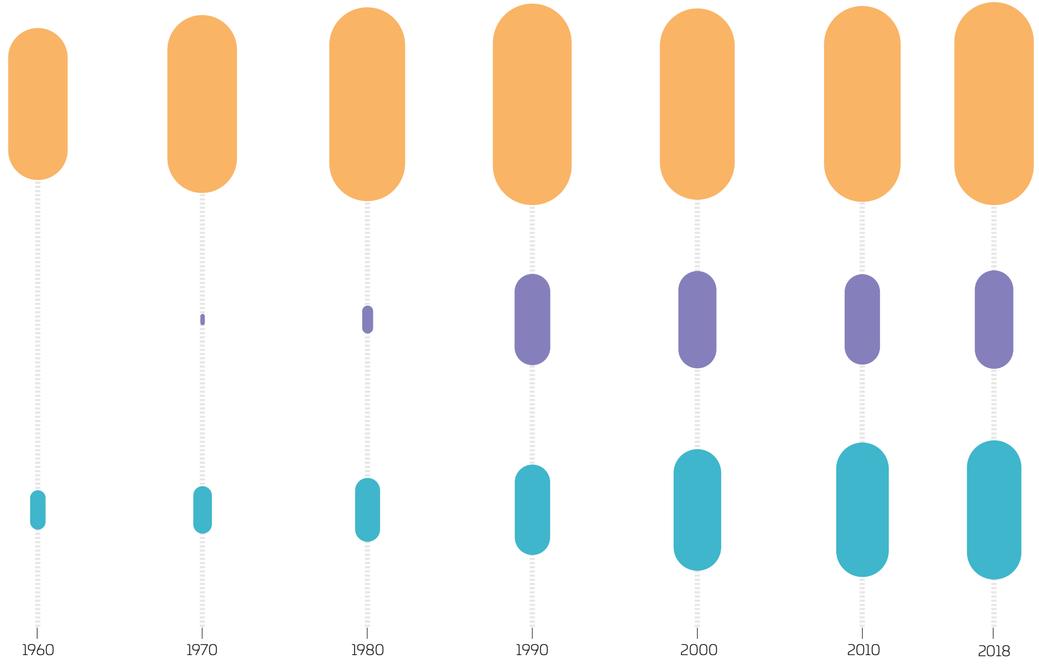
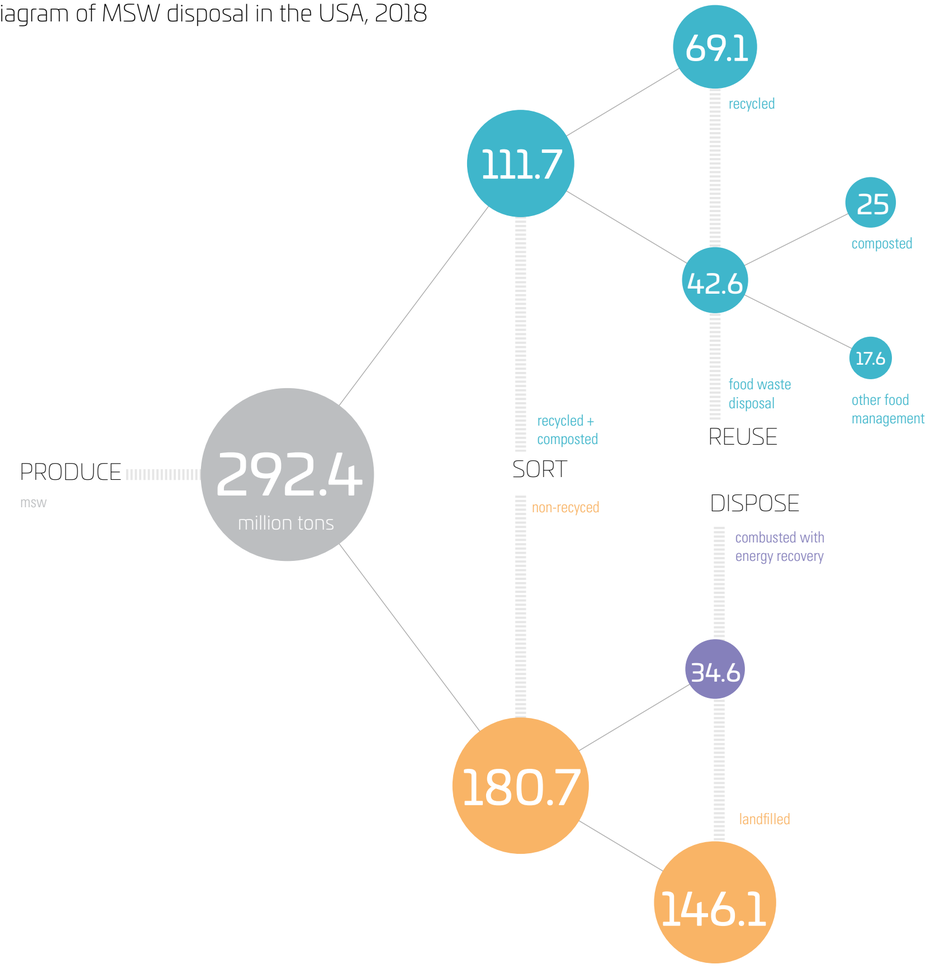
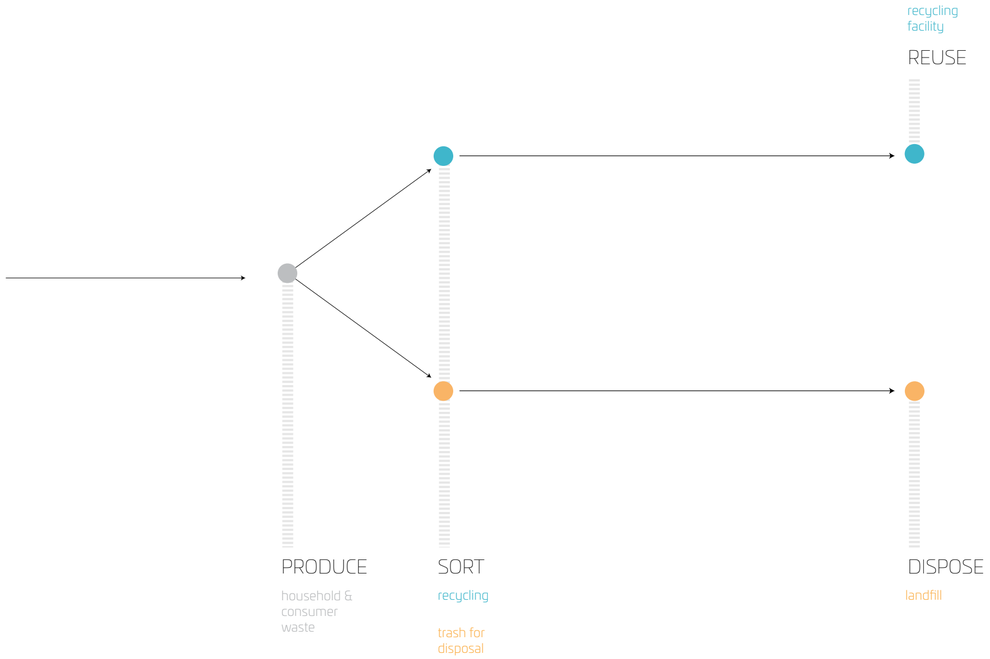


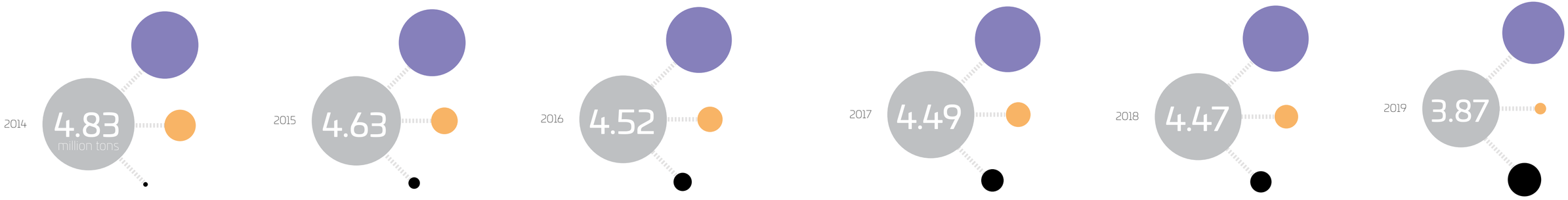
diagram of MSW disposal in the USA, 2018



The data on the left corresponds to the waste system diagram “what we actually have data on”



solid waste disposal in Massachusetts, 2014-2019



Millions of ons of MSW

- Produced
- Combusted
- Landfilled
- Net Exports

In recent years, net exports of waste in Massachusetts have increased, while the amount of waste landfilled in the state has decreased. Total amount of waste produced and combusted has remained somewhat steady. Data on recycling was not available.

Source: mass.gov

spatial understanding

Visualizing the geographic placement of active and legacy landfills is essential in understanding social and environmental impacts of waste disposal. Legacy landfills are defined as inactive and closed landfills. Legacy landfills often still pose environmental risks to the surrounding area, and are consequentially monitered for 30 years after closure.

The following chapter conducts an exploration of where landfills are in Massachusetts, specifically in relationship to Environmental justice populations. It also covers more in depth case studies of legacy landfills that are registered as federal superfund sites. This is done in order to begin to visualize some of the environmental impacts of these sites, and the ongoing risks posed even by legacy landfills.

SITE TYPES

Site types correspond to the variable of “activity status” in the mass.gov landfill data. The variable allows for differentiation between landfills by their status.

Type 1: Active

The active type indicates a landfill that is actively operating. In other words, it is currently open and accepting waste.

Type 2: Inactive

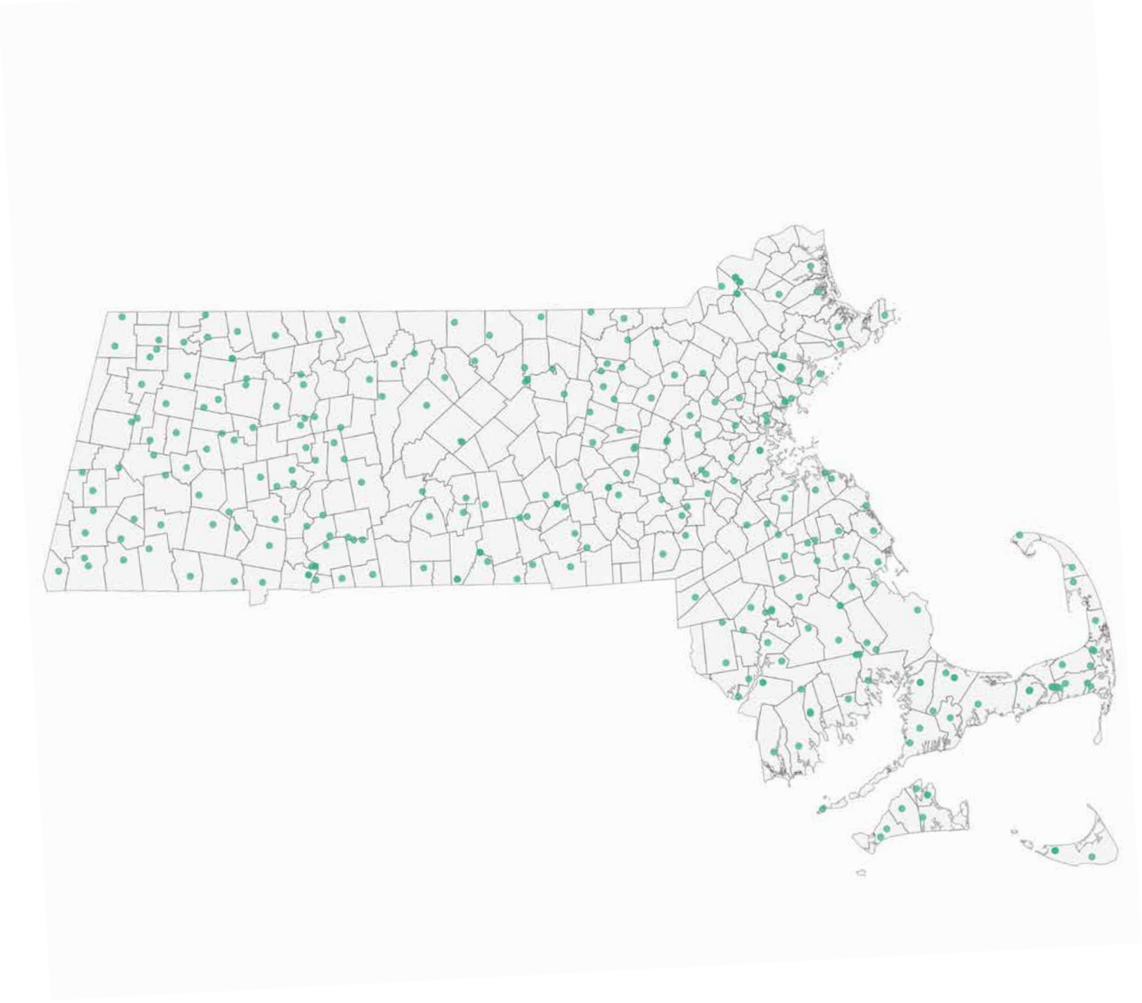
The inactive type indicates a landfill that is not actively operating, but also has not been officially closed. This means that the site is not accepting waste, but is still going through the process of closure.

Type 3: Closed

The closed type indiicates that a landfill is not accepting waste, and has gone through all of the necessary steps, such as capping*, to be officially considered a closed site.

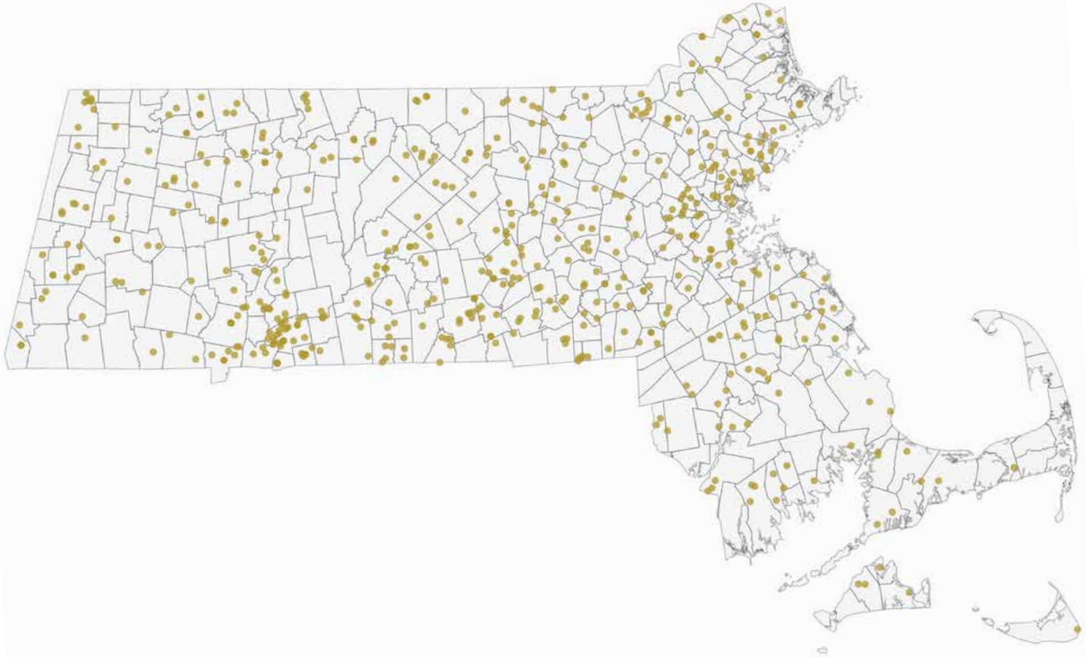
283 ACTIVE

solid waste facilities in Massachusetts



532 INACTIVE

landfills in Massachusetts

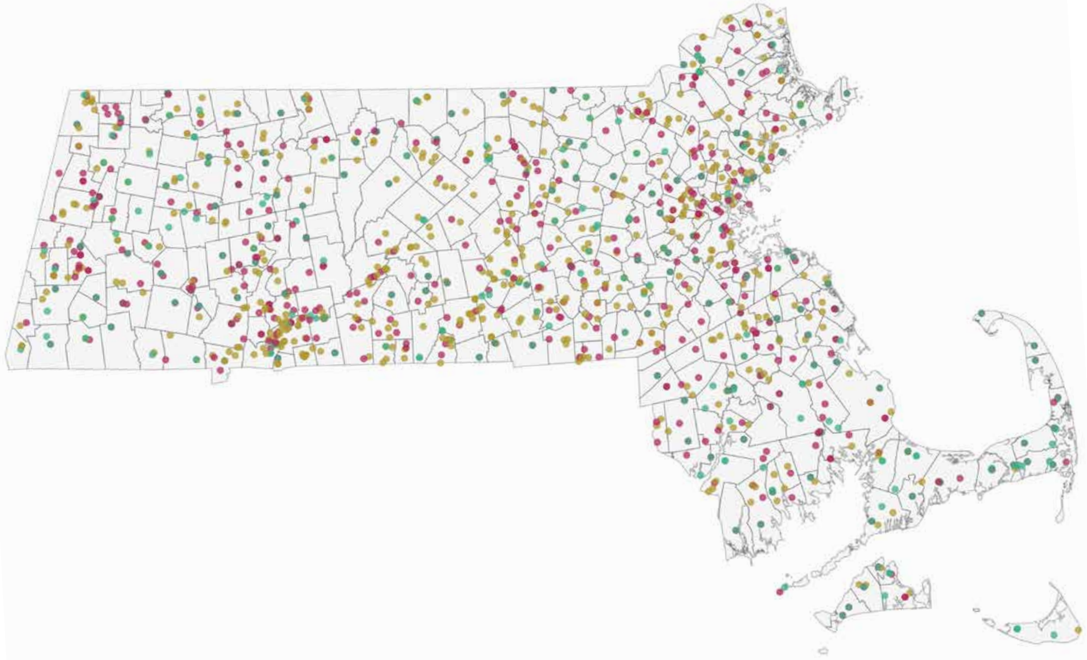


482 CLOSED

landfills in Massachusetts

1297 TOTAL

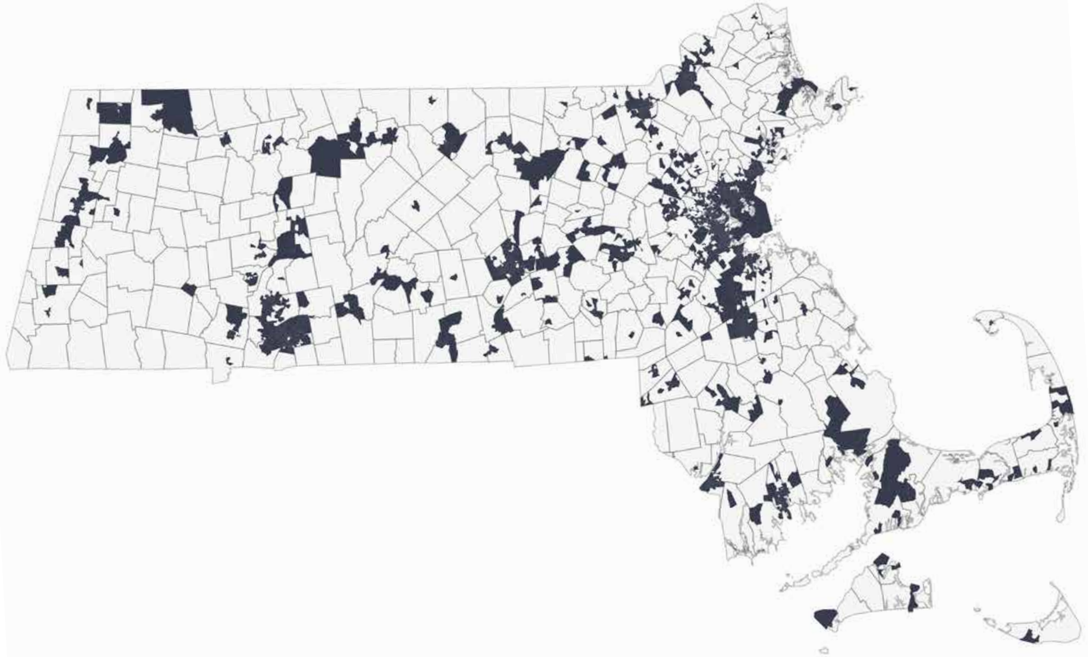
landfills in Massachusetts



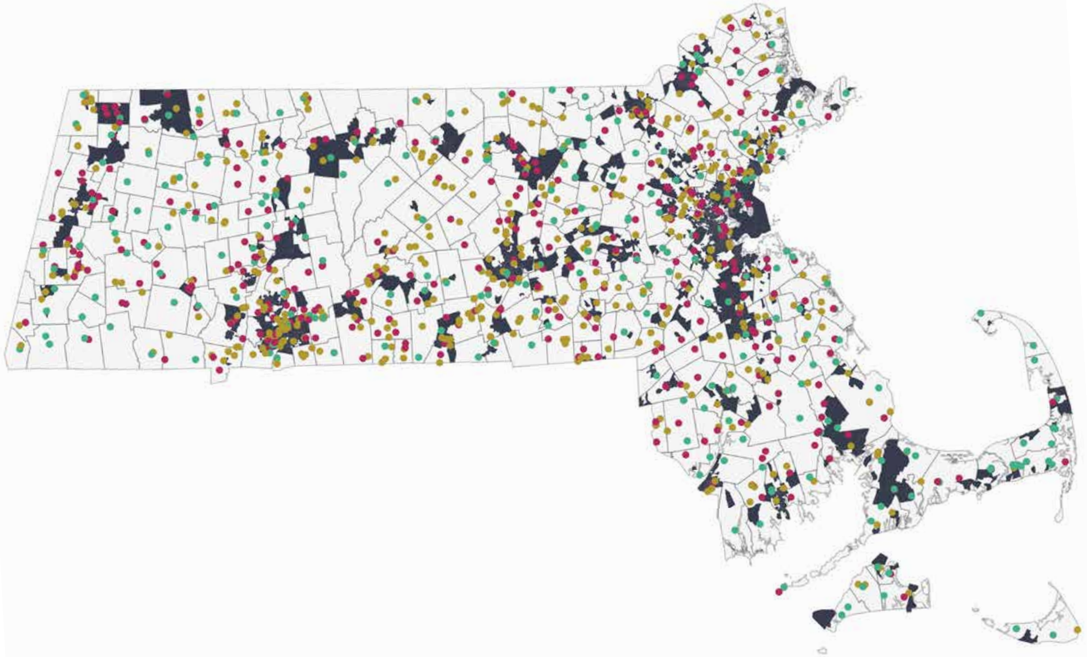
What are environmental justice populations?

"In Massachusetts, a neighborhood is defined as an Environmental Justice population if one or more of the following four criteria are true:
1. the annual median household income is not more than 65 percent of the statewide annual median household income;
2. minorities comprise 40 percent or more of the population;
3. 25 percent of more of households lack English language proficiency; or
4. minorities comprise 25 per cent or more of the population and the annual median household income of the municipality in which the neighborhood is located does not exceed 150 per cent of the statwide annual median household income."

(Source: mass.gov)



Where are landfills located in relation to environmental justice populations?



What is a Superfund Site?

"Thousands of contaminated sites exist nationally due to hazardous waste being dumped, left out in the open, or otherwise improperly managed. These sites include manufacturing facilities, processing plants, landfills and mining sites.

In the late 1970s, toxis waste dumps such as Love Canal and Valley of the Drums recieved national attention when the public learned about the risks to human health and the environment posed by contaminated sites.

In response, Congress established the Comprehensive Envrionmental Response, Compensation and Liability Act (CERLA) in 1980.

CERLA is informally called Superfund. It allows EPA to clean of contaminated sites. It also forces the parties responsible for the contamination to either perform cleanups or reimburse the government for EPA-led cleanup work. When there is no viable responsible party, Superfund gives the EPA the funds and authority to clean up contaminated sites.

Superfund's goals are to:
1.
Protect human health and the environment by cleaning up contaminated sites;
2.
Make responsible parties pay for cleanup work;
3.
Involve communities in the Superfund process;
4.
Return Superfund sites to productive use. "

(Source: epa.gov/superfund)

1950

Active year

1983

Inactive year

Waste category: MSW & Sludge

Class: Land Disposal

Location: Tynsborough, MA

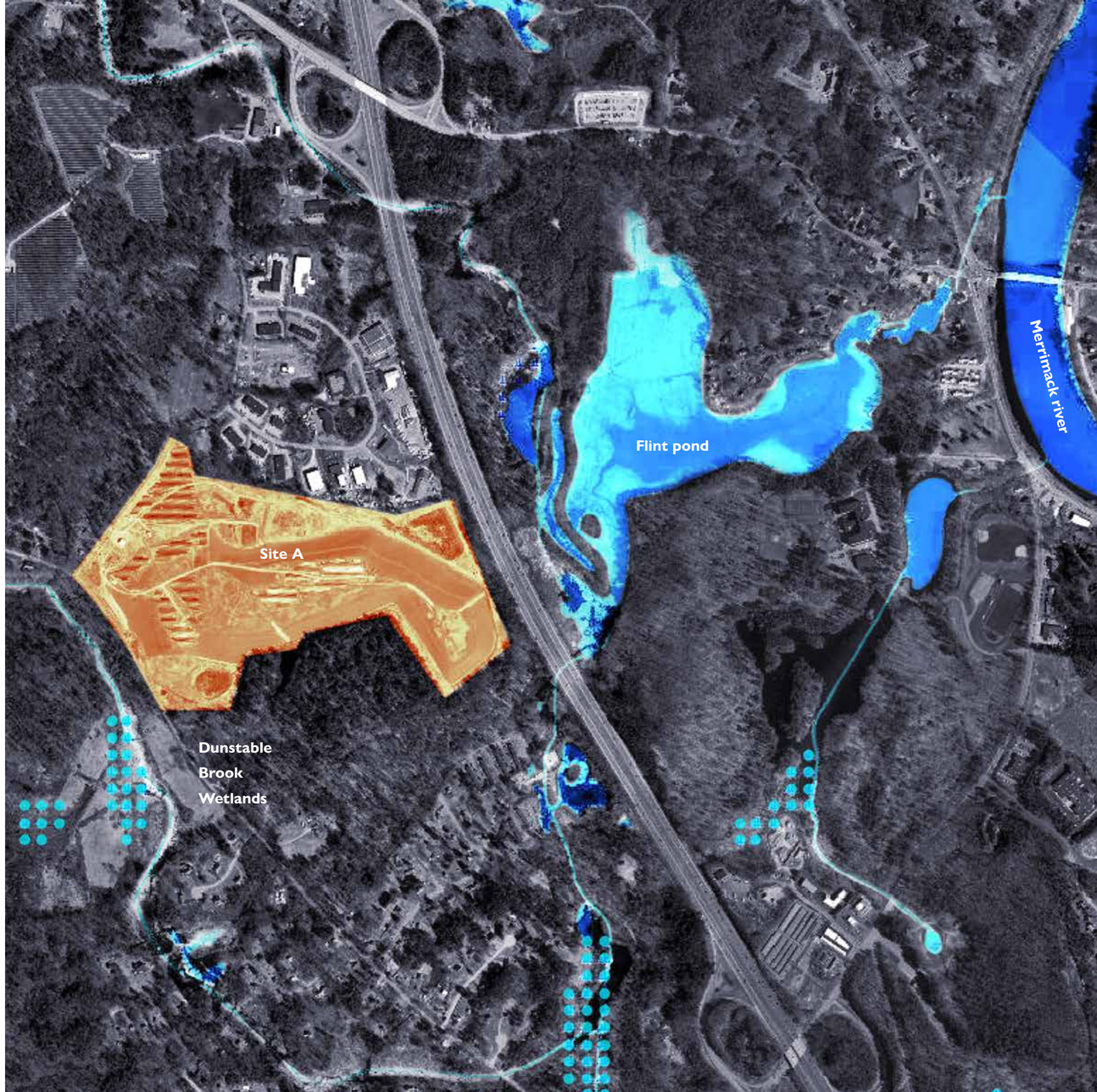
Charles George Reclamation Trust Landfill

Site Narrative

The 70-acre Charles George Reclamation Trust Landfill in Tyngsborough, Massachusetts, started off as a small municipal dump, then expanded to accept household and industrial wastes, chemicals containing volatile organic compounds and metal sludge. The state ordered the site closed in 1983. EPA provided a pipeline supplying residents effected by contaminated groundwater with a permanent alternative water supply. EPA has capped the landfill and is collecting leachate and contaminated groundwater to eliminate immediate potential risks.

The site has been addressed through federal actions. EPA has addressed site risks by extending the City of Lowell's water supply system to the Cannongate Condominium complex. In addition, 24 residential well water users along Dunstable Road to Cannongate Road, and along Cannongate Road, were included in the waterline extension. EPA also provided a cap for the site consisting of a synthetic membrane and soil cover, a surface water management system, a passive landfill gas venting system, and a leachate collection system.

Source: epa.gov



Sutton Brook Disposal Area

1957

Active year

1988

Inactive year

Waste category: MSW

Class: Land Disposal

Closure status: Incomplete

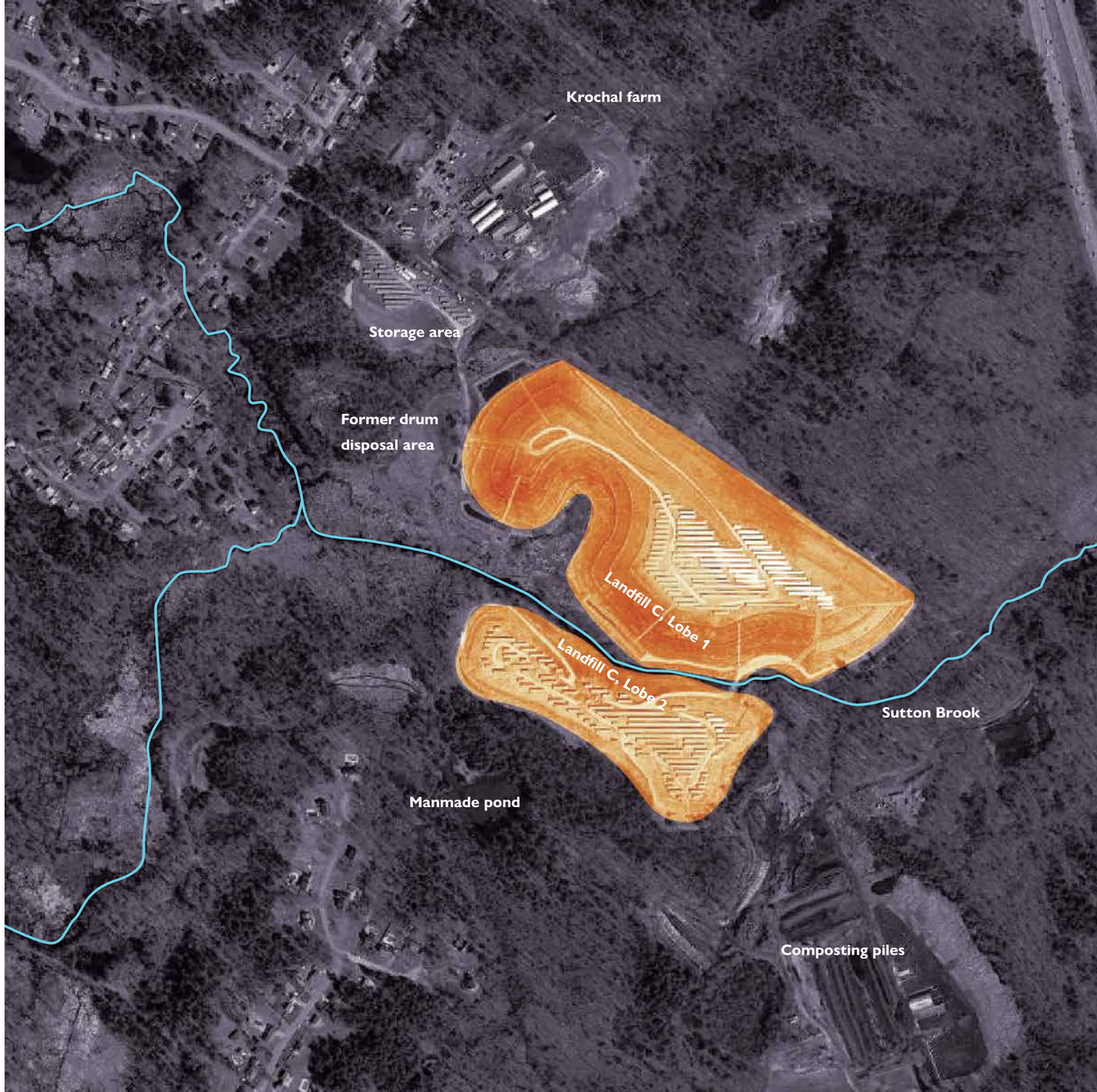
Location: South St, Tewksbury

Site Narrative

The 50-acre Sutton Brook Disposal Area site is located in Tewksbury, Massachusetts. A small part of the site also extends into the town of Wilmington. The site includes three source areas – a 50-acre landfill, an area of buried drums (excavated in 2000) and contaminated soils associated with the drum disposal area (excavated in 2000 and 2007).

Waste disposal activities can be traced back to at least 1957, when an area of the site was used as a "burning dump." The Tewksbury Board of Health originally used this area as a temporary disposal area (landfill). In 1961, the temporary assignment was modified to require that the landfill on the site be operated as a sanitary landfill, accepting municipal refuse generated only in Tewksbury. The assignment was not complied with; the landfill accepted municipal, commercial and industrial wastes from both inside and outside Tewksbury. The owners of the landfill received numerous citations from state and local officials for violating Massachusetts Sanitary Landfill Regulations.

In 1966, the Commonwealth of Massachusetts Commissioner of Public Health ordered the Town of Tewksbury to operate the landfill using the sanitary landfill method. However, after 1966, there were documented occurrences of landfill burning, uncovered waste areas, the filling in of on-site wetlands, and wastes disposed of below the water table and landfill slopes that exceeded operation plans. Due to these violations, the Commonwealth ordered the closure of the landfill in 1979. At the time of its closure, the landfill was accepting in



excess of 250 tons of waste per day. Despite the closure order, landfill operations continued until 1982, when official landfill operations were suspended, yet waste acceptance continued through 1988.

In 1983, a loam screening business began operation on the property. On August 11, 1983, during an inspection by the Massachusetts Department of Environmental Quality Engineering (MADEQE, now MassDEP), underground burning was observed through fissures in the ground in the southern landfill lobe. During a subsequent inspection by MADEQE personnel in August 1983, flames and smoke were no longer visible after heavy machinery had covered the fissures with soil. Subsequent investigations by Tewksbury Health Inspectors and MADEQE documented piles of demolition debris and soil on areas of the property, in some cases adjacent to and/or encroaching upon on-site wetland areas.

The site was placed on the National Priorities List (NPL) in June 2001.

Source: epa.gov

1938

Active year

1996

Inactive year

Waste category: MSW & Sludge

Class: Land Disposal

Closure status: Incomplete

Location: Old Groveland Rd, Haverhill

Haverhill Municipal Landfill

Site Narrative

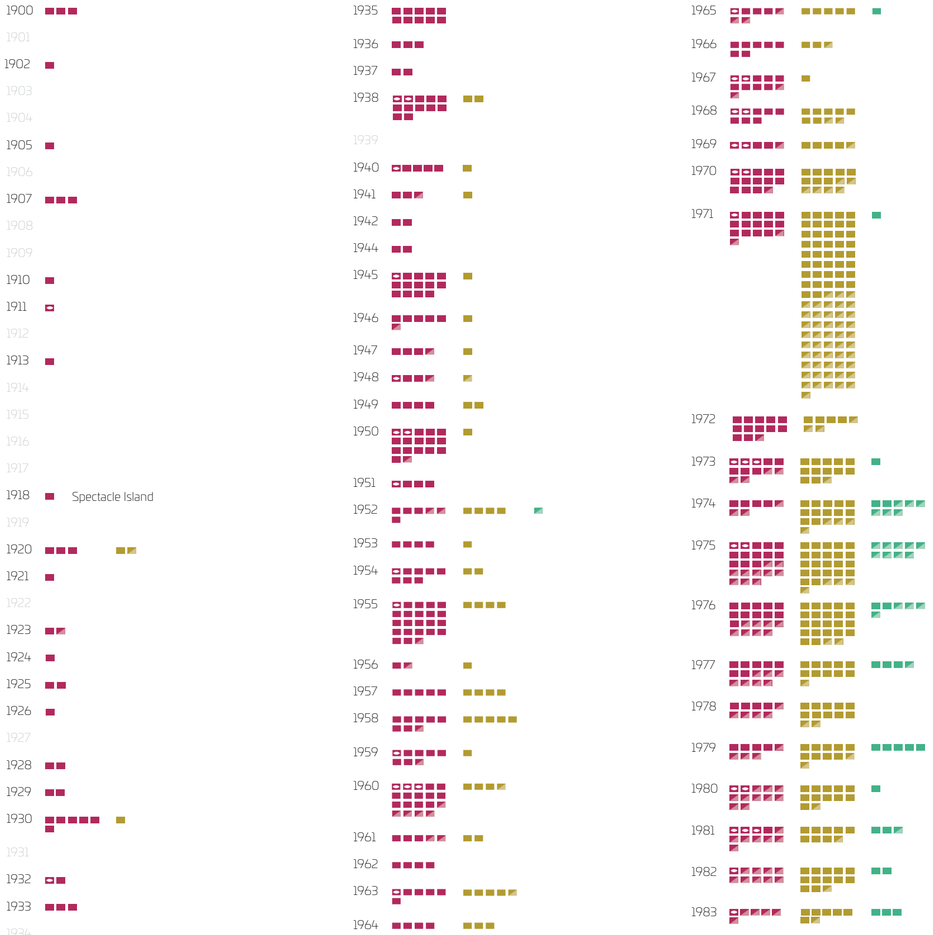
The Haverhill Municipal Landfill is located adjacent to the Merrimack River in the City of Haverhill, Essex County, Massachusetts. The landfill consists of three tracts of land covering a total of about 73 acres. Prior to June 1981, two of the three tracts were reportedly used for disposal of municipal and commercial refuse, while the other reportedly received liquid wastes and sludges. In August 1981, the city contracted for a ground water study, and evaluation of the landfill's impact on the local environment, and development of closure and monitoring plans. The results of that study indicate that ground water in the vicinity of the landfill is contaminated with volatile organic chemicals such as benzene, toluene, and xylenes.

Two municipal wells, which had supplied drinking water to approximately 6,000 people until they were closed in 1979 due to volatile organic contamination, lie within 1 mile of the site. These wells are being investigated as part of work at the Groveland Wells Site, which was placed on the NPL in September 1983.

Source: epa.gov

LANDFILLS OPENING AND CLOSING OVER TIME (1900-2020)

CONTEXT

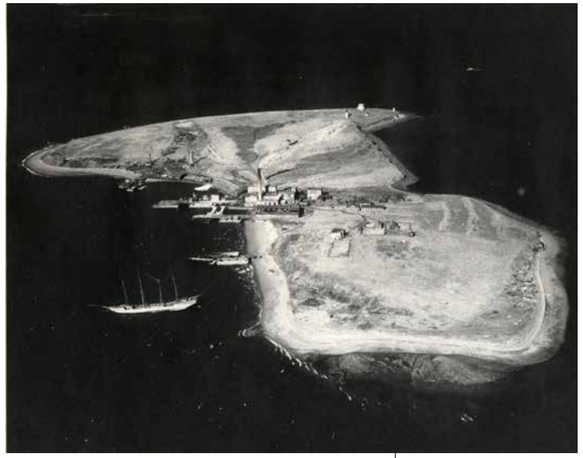


Spectacle Island

1918

Active year

Source: US National Archives



North View, circa 1939 - 1947

1959

Inactive year

Source: Land Use Database

Soil from the big dig (1990s) was used for capping.

2006

Closed year

Spectacle Island post-restoration. More than 2,400 trees and 26,00 shrubs were planted over the course of 15 years.

Waste category: MSW

Class: Land Disposal

Closure status: Capped

Location: Boston Harbour

Current use: Public park

Source: National Park Service