



The Unique History of Charleston Water System's Sewer Collection and Treatment Facilities

May 11-13, 2022
Kin Hill, P.E., CEO
Charleston Water System

Welcome to Charleston!

- Voted by CONDÉ NAST TRAVELER Magazine as the #1 tourist destination 10 years in a row
 - Great Food
 - Great Scenery
 - Great Beaches
 - Great History



Will focus on the history of CWS, and especially the history of our wastewater system

- ❖ How we morphed from a water only utility to a water and wastewater utility
- ❖ Show some unique aspects
- ❖ Give you some data on our compliance track record, etc.



Figure 49: The 78' x 70' three-dimensional wall mural depicts the Charleston Tunnel Sewer System, and is hung in the lobby of the Plum Island Plant Administrative Building. The mosaic was executed in ceramic by the internationally famous artist Gabriel Loire (1904-December 25, 1996) in Chartres, France.

How it all started:

1903



The Charleston Light & Water Co. builds the Goose Creek Reservoir and a pumping station to provide water to the naval ship yard.

1917

The City of Charleston purchases the Goose Creek Reservoir and Hanahan pumping station for \$1.3 million, and forms the Commissioners of Public Works to operate the City's water system.

1928



Construction begins on the 23-mile Edisto Tunnel to supply the Hanahan Plant with raw water from the Edisto River. The tunnel was completed in 1937.

- ❖ 1917 Charleston Commissioners of Public Works formed; later name changed to Charleston Water System. (CWS)
 - Assumed assets of the Charleston Water & Light Company
 - Operated a surface water treatment plant and water distribution system for over 40 years
- ❖ 1961 City of Charleston transferred ownership, operations, maintenance and control of City's wastewater collection system to Charleston CPW. (No WWTP in existence; just a collection system)

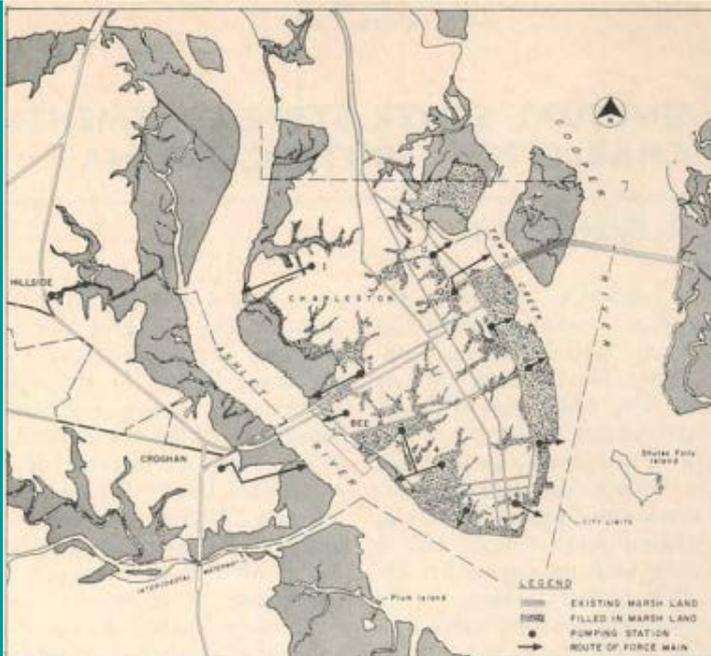
Pumping Station at Hanahan, 1905

Collection System “Evolution”

- ❖ Between 1865 – 1896 City Council's Health and Drainage Committee recommended the construction of separate sanitary sewers and removal of wastes from the storm drain system by means of a TIDAL Drain System.
- ❖ TIDAL Gate Keepers operated slide gates in sync with tidal cycles to flush out the storm drains.
- ❖ This system was kept operational until early 1960's.
(Both systems discharged to the Ashley and/or Cooper Rivers)

What wastewater assets did CWS assume in 1961?

- Original wastewater collection lines installed in early 1800's
- All pipes flowed to Ashley or Cooper Rivers (untreated)
- By 1840 such system was deemed “defective and offensive.”
- By 1854 City public health reports stated: **“The evil was radical, and the remedy must be radically administered, or the large number of causes of disease and death will continue to increase with the augmenting population”.**



Location of existing wastewater pumping stations - 1965



Original Sewer Pump Station – Market Street
(note background)

October 1961 – City Transfers Ownership to CWS (What happened next?)

- 1963 – Legislative Action by SC, “Charleston Harbor Pollution Law” (1970 Treatment Target)
- 1965 – Charleston Harbor declared “dead” by SC Pollution Control Authority, the predecessor of SC DHEC
- Fish Kills and zero dissolved oxygen events prevalent in Charleston Harbor
- June 1965 – Plans announced for a \$9.2 million wastewater treatment plant project on 14 acres at Plum Island, the former site of historic quarantine “pest houses” in Charleston

1961 CPW assumes operation of the City's sewer system.

1963 The SC legislature passes the “Charleston harbor pollution law,” requiring municipalities to begin treating wastewater by 1970.

1968



CPW begins construction of the Plum Island Pollution Control Plant and a deep sewer tunnel system. The plant went on-line in 1970.



1968 – CWS begins construction of Plum Island WWTP

Associated with Plum Island WWTP was 7 miles of deep collection system tunnels (11 miles ultimately)

- 90 – 130 feet deep for gravity conveyance in the cooper marl formation

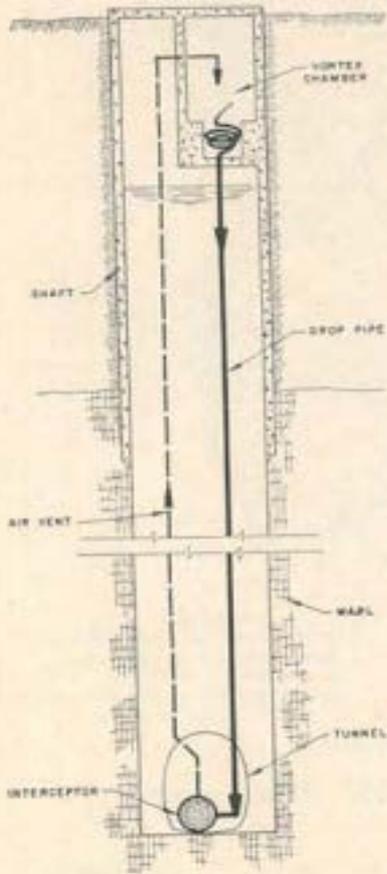
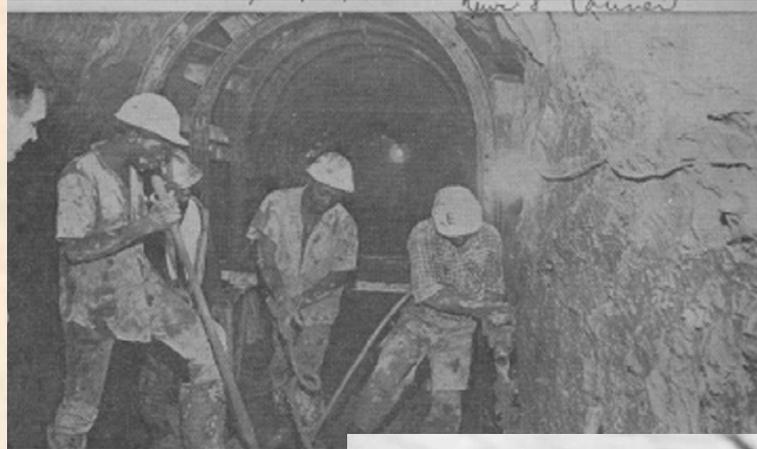
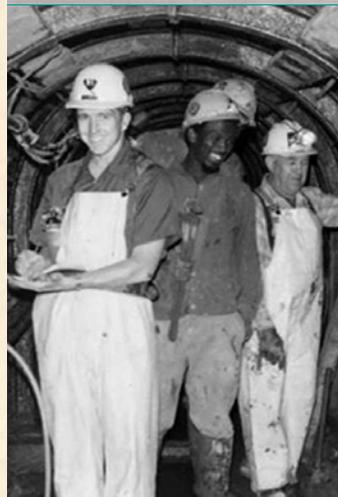


FIGURE 3.—Typical tunnel shaft and drop pipe.



SEWER TUNNEL TAKES SHAPE IN



'MARL SPECIAL'
Edward Wilsie (behind), equipment superintendent, takes Jack Fitzgerald, the subway's operator, for a ride. (Staff Photo by Swain)

Many Will Never Ride
City's 1st Subway System

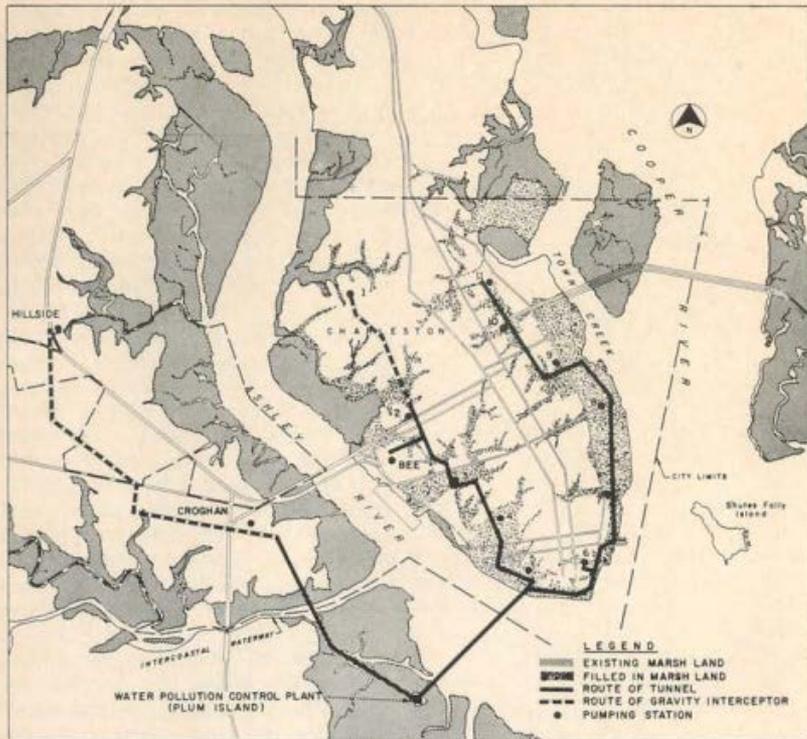
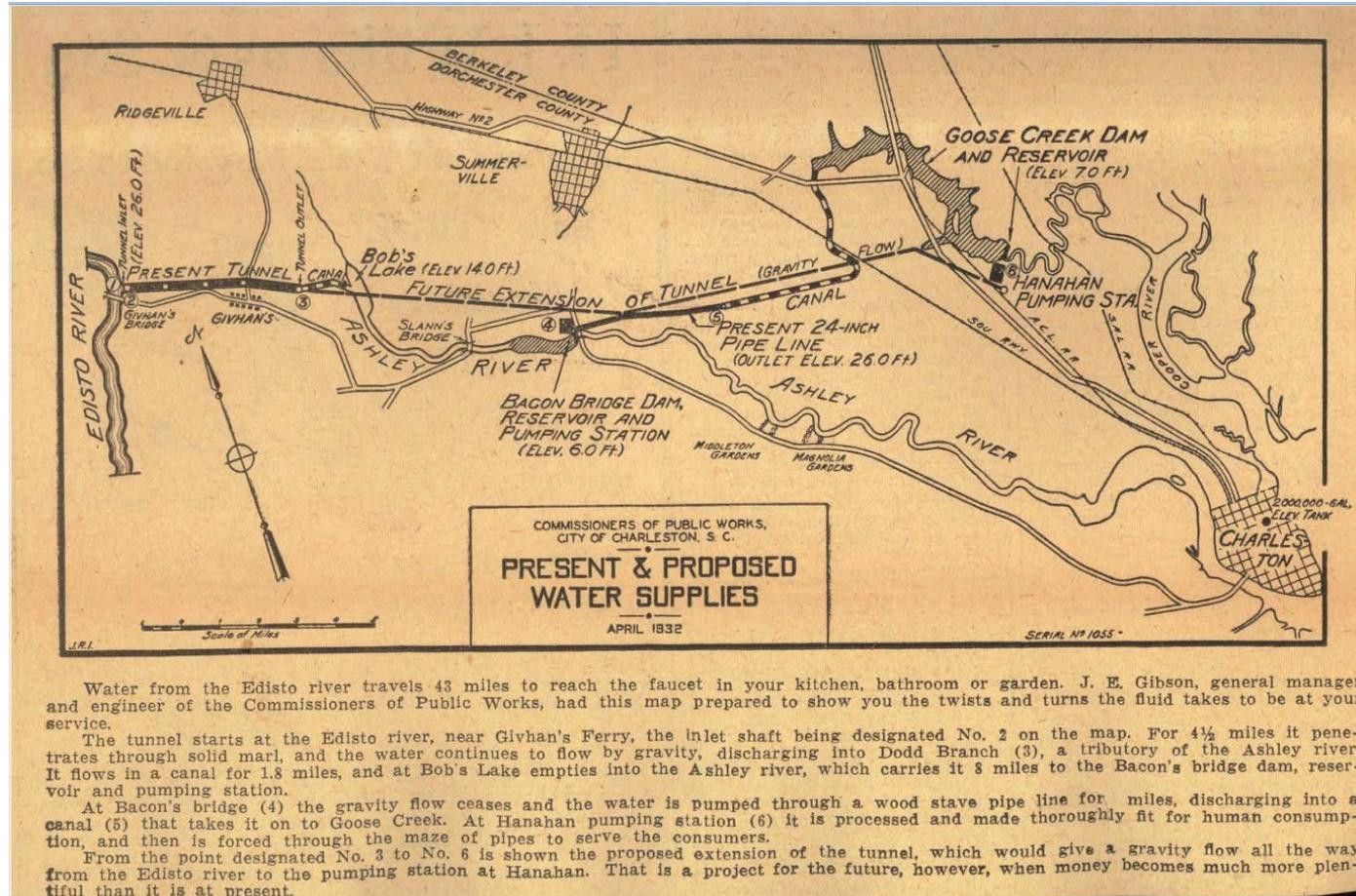


FIGURE 2.—Arrangement of interceptor tunnel system.



Why a gravity tunnel for conveyance?

3 Reasons



1. Least disruption to historical areas of Charleston

2. Great Geology for Tunnelling (Cooper Marl)

3. Past Experience (Water Tunnel)

Charleston's "underground," delight to tunnel digger and water works alike

There is an "underground" in Charleston, South Carolina. Not a group of latter day radicals, but one that's been there for millions of years...just waiting to benefit this colorful, historic Southern City.

That "underground" is a geological rarity called Cooper marl. Soft enough that tunnels can be cut through it easily. Dense enough that those tunnels can be used to transport water..."

Mueller Record, Spring, 1978.

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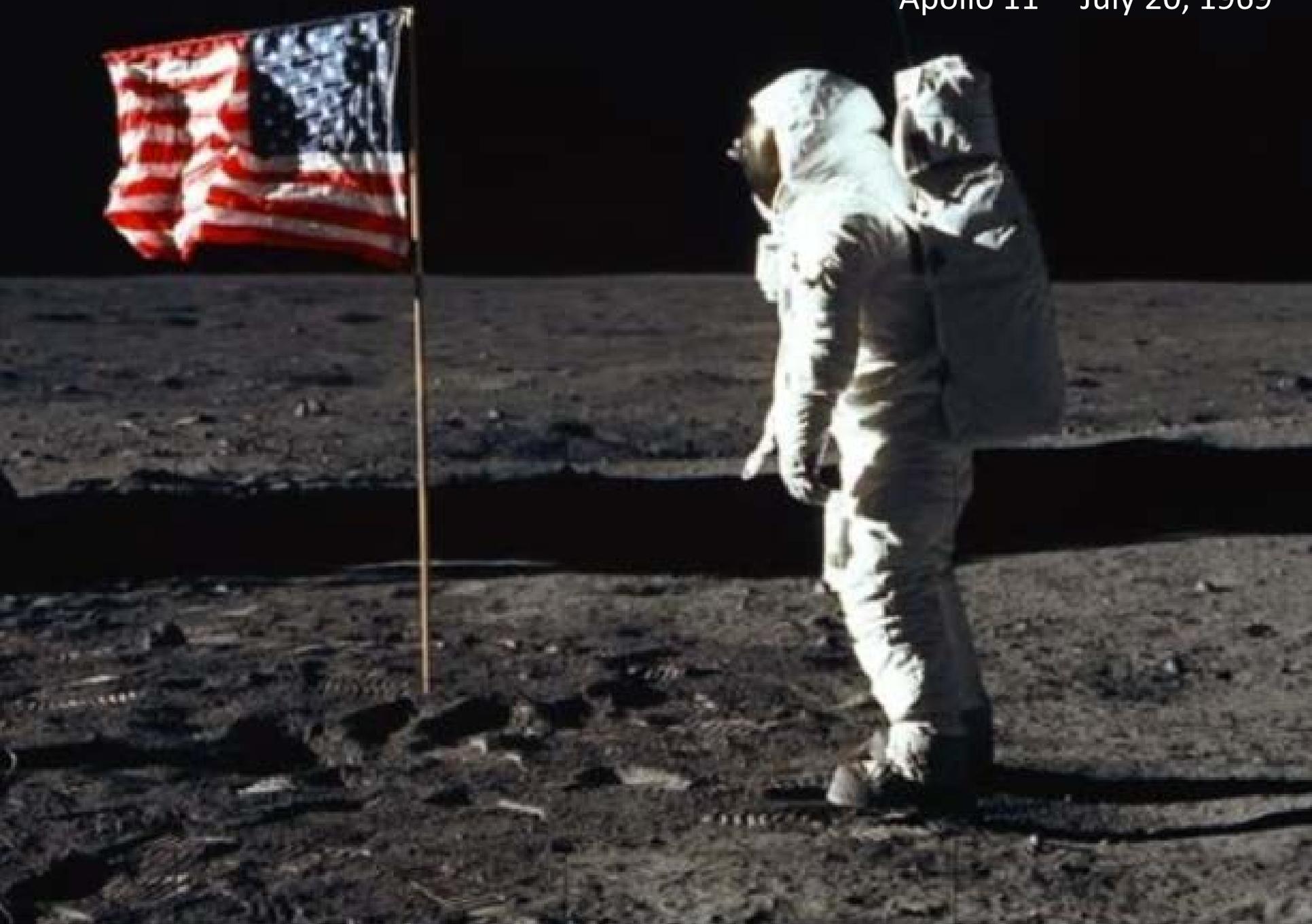
That "underground" is a geological rarity called Cooper marl. Soft enough that tunnels can be cut through it easily. Dense enough that those tunnels can be used to transport water. And that's what the City of Charleston has been doing since 1928. Using such tunnels . . . Now it is completing another.

"The geological formation of this region is a rarity . . . an engineer's delight and a boon to water departments," wrote reporter Gardner Miller in the *Charleston News* last year. Cooper marl is fossilized limestone, ideal for tunneling. Tunnels through Cooper marl rarely need supports since, once exposed to air, the stone sets almost like concrete and is impervious to water. That is why a hole through it makes a good water pipe.



Figure 48: *Mueller Record*, 1978.

Apollo 11 July 20, 1969



Plum Island WWTP goes online for the first time, November 1971

- Primary Treatment Only
- Later upgraded to secondary treatment in 1984 at a cost of \$13 million



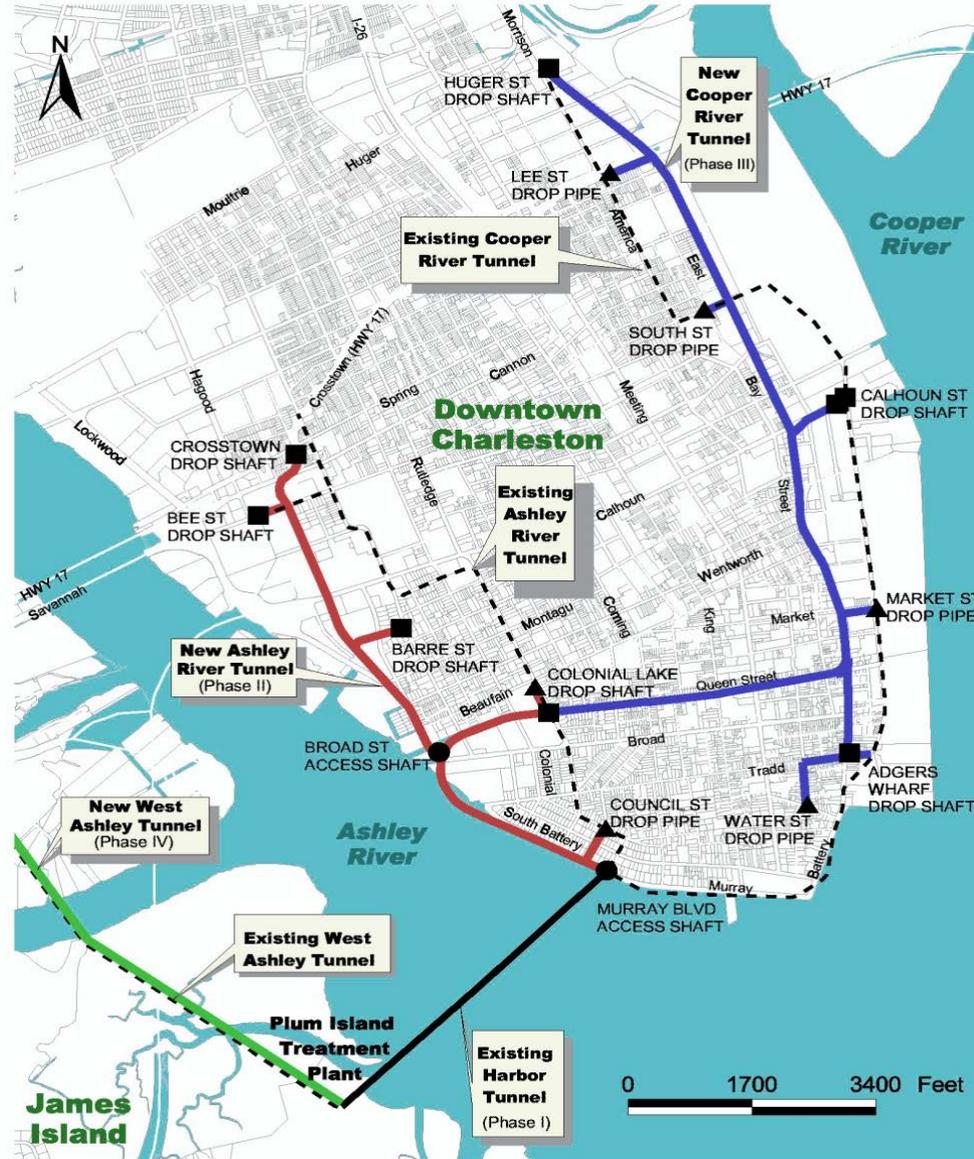
Plum Island, circa
1972

Plum Island Today, 2022



36 MGD Conventional Activated Sludge Treatment Plant

New Tunnel System Today, 2022



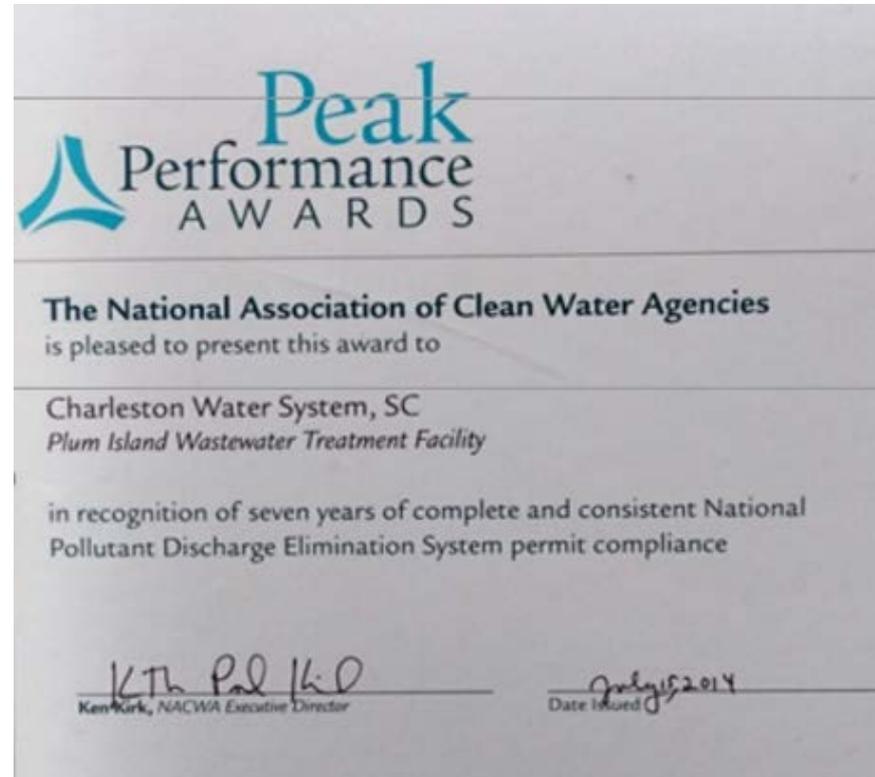
So How Has Plum Island Performed Since 1971 (50 Years)?

Answer: PHENOMINALLY!



25 times!

including numerous individual
WEF Awards for CWS Staff!



Peak Performance Platinum - 2015, 2014, 2013, 2012, 2003

Peak Performance Gold Award – 2020, 2019, 2018, 2017, 2016, 2011, 2010, 2007, 2001, 2000, 1999, 1998, 1996

Peak Performance Silver Award – 2015, 2006, 2005, 2004, 1997, 1995, 1994

Charleston Harbor Today



• Fishable

• Swimmable

• Loveable!

*Kathleen Wilson, CWS Commissioner (Long Distance Swimmer)

