Dewberry

Wastewater Treatment Facility Resilience and Climate Change Vulnerability Assessment

City of Newburyport, Massachusetts

NEWEA Spring Conference 2021

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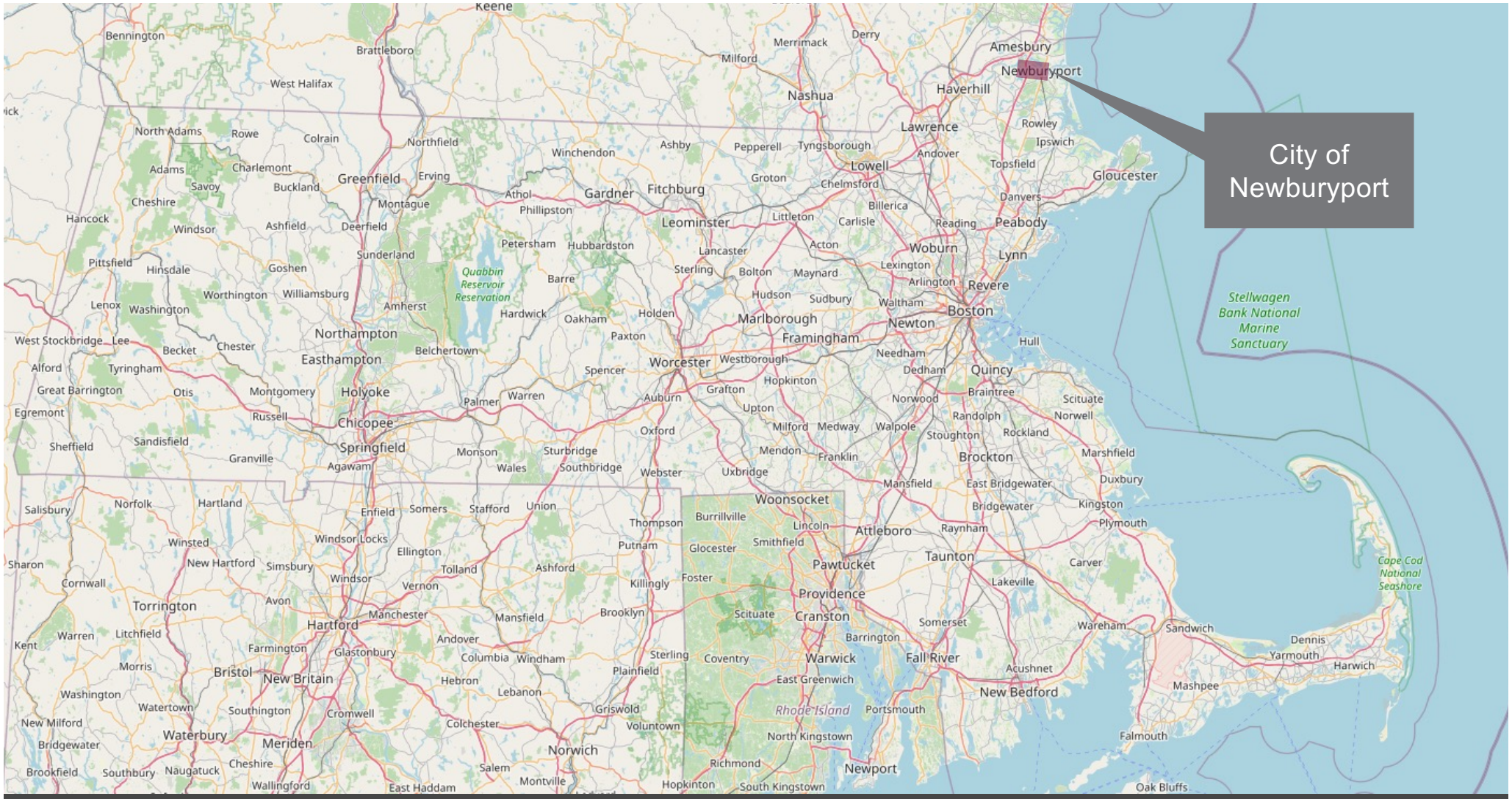
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Newburyport
Amesbury
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Nashua
Merrimack
Derry
Milford
Keene
Bennington
Brattleboro
West Halifax
North Adams
Rowe
Colrain
Northfield
Winchendon
Ashby
Pepperell
Tyngsborough
Andover
Lowell
Chelmsford
Groton
Fitchburg
Gardner
Greenfield
Erving
Athol
Montague
Phillipston
Leominster
Littleton
Carlisle
Billerica
Reading
Peabody
Danvers
Topsfield
Gloucester
Rowley
Ipswich
Adams
Charlemont
Savoy
Buckland
Cheshire
Hancock
Windsor
Ashfield
Deerfield
Sunderland
Petersham
Hubbardston
Lancaster
Sterling
Bolton
Maynard
Acton
Woburn
Lexington
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Revere
Lynn
Boston
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Newton
Hudson
Sudbury
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Holden
Paxton
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West Stockbridge
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Becket
Chester
Northampton
Easthampton
Belchertown
Worcester
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Kingston
Plymouth
Salisbury
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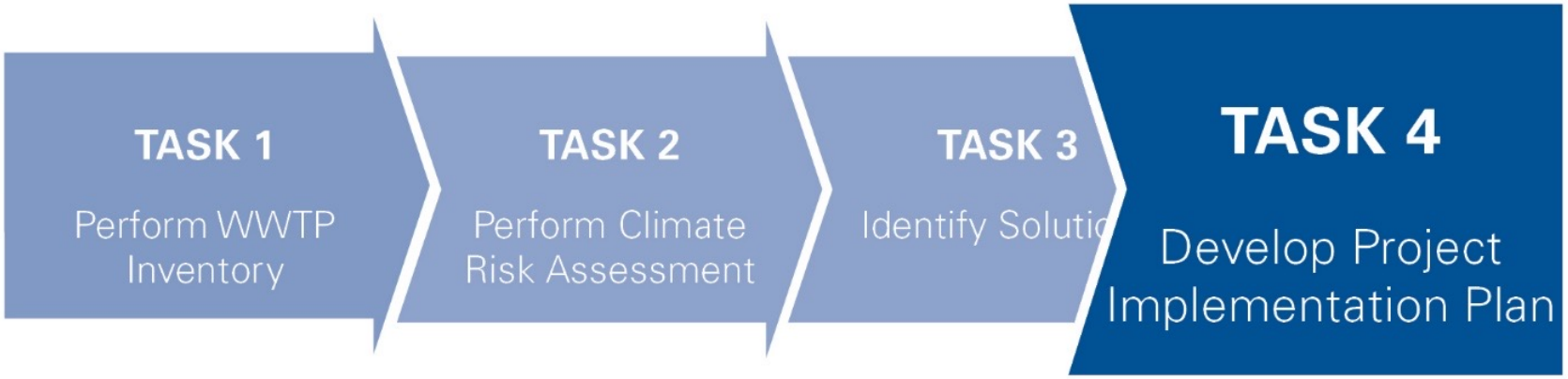
Somers
Stafford
Union
Woonsocket
Burrillville
Thompson
Lincoln
Attleboro
Raynham
Taunton
Winsted
Windsor Locks
Ellington
Putnam
Glocester
Smithfield
Pawtucket
Sharon
New Hartford
Simsbury
Windsor
Tolland
Ashford
Foster
Killingly
Carver
Lakeville
Cape Cod National Seashore
Cornwall
Torrington
Avon
Vernon
Providence
Cranston
Scituate
Somerset
Wareham
Sandwich
Dennis
Yarmouth
Harwich
Manchester
Mansfield
Brooklyn
Hartford
Andover
Barrington
Kent
Warren
Litchfield
Farmington
Glastonbury
Columbia
Windham
Sterling
Coventry
Warwick
Fall River
Acushnet
Morris
Bristol
New Britain
Hebron
Plainfield
East Greenwich
Mashpee
Lebanon
Washington
Watertown
Southington
Cromwell
Griswold
Rhode Island
Portsmouth
New Bedford
New Milford
Colchester
Voluntown
Waterbury
Meriden
Norwich
North Kingstown
Falmouth
Bridgewater
Cheshire
Salem
Richmond
Newport
Brookfield
Southbury
Naugatuck
Wallingford
Montville
East Haddam
Hopkinton
South Kingstown
Oak Bluffs
Stellwagen Bank National Marine Sanctuary


Waste Water Treatment Plant Location
NEWBURYPORT
Maudslay State Park
Carr Island Sanctuary
Stevens Conservation Area
Salisbury Beach State Reservation
Plum Island State Reservation
Lower Artichoke Reservoir
Upper Artichoke Reservoir
North Pasture Water Supply Land
Wet Meadows Conservation Area
Ordway Reservation CR
Martin H. Burns WMA
Spencer-Pierce-Little Farm
Graf Reservation
Rolfe
Plum Island-Newburyport Airport
Newburyport Harbor Range Light Front Range
Newburyport Harbor Range Light Rear Range
Main Street
Low Street
High Street
Merrimac Street
Water Street
Pond Street
Parker Street
State Street
Rolfes Lane
Hanover Street
Scotland Road
Indian Hill Street
Garden Street
Northern Boulevard
Plum Island Turnpike
High Road
Bridge Road
Route 1
Newburyport Turnpike
Little River
Town Creek
Allen Creek
Plum Island Creek
Little Pine Island Creek
500 m
1000 ft
N

Project Overview

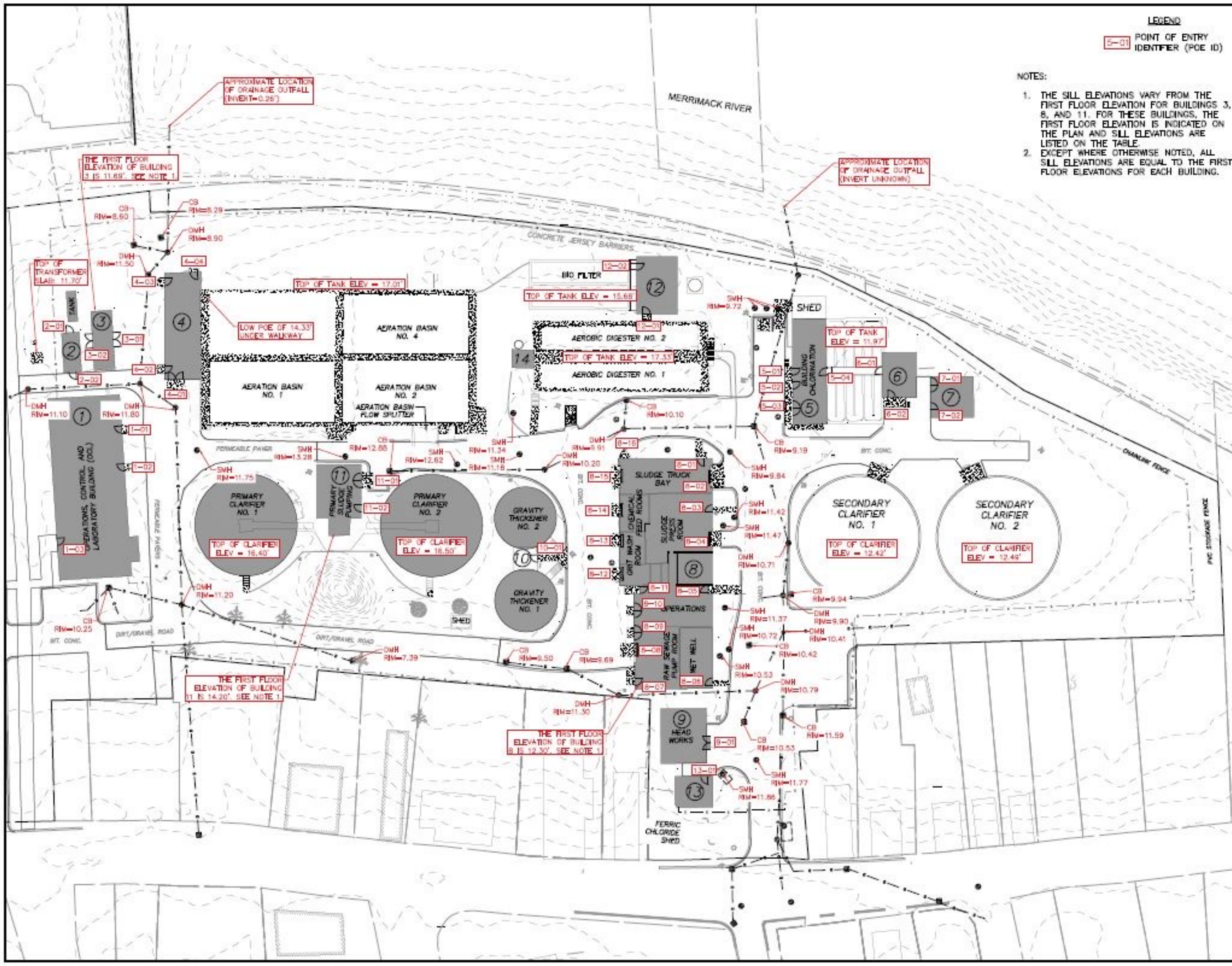
- FY 18 EEA Municipal Vulnerability Preparedness (MVP) Program Action Grant
  - Massachusetts Office of Coastal Zone Management (CZM)
- Goal to assess and Identify potential improvements to the resilience of the Wastewater Treatment Plant (WWTP)
  - Identify Risks
    - Assess Near Term and Long Term Risks
    - Comply with 2014 FEMA Flood Levels
- Improve WWTP Resilience to Climate Change

Project Tasks



Task 1: Perform WWTF Inventory

- Determine existing conditions
- Identify Critical Infrastructure/Assets
- Identify at-risk assets



POE ID	POE TYPE	SILL ELEV. (NAVD88 FT)
1-01	DOOR	12.46
1-02	DOOR	12.46
1-03	DOOR	12.46
2-01	DOOR	12.90
2-02	DOOR	12.90
3-01	DOOR	12.69
3-02	DOOR	12.69
4-01	DOOR	12.41
4-02	DOOR	12.41
4-03	DOOR	12.41
5-01	DOOR	12.83
5-02	DOOR	12.83
5-03	DOOR	12.83
5-04	DOOR	12.83
6-01	DOOR	12.84
6-02	DOOR	12.84
7-01	DOOR	10.98
7-02	DOOR	10.98
8-01	DOOR	12.00
8-02	OVERHEAD DOOR	11.97
8-03	DOOR	12.50
8-04	OVERHEAD DOOR	12.50
8-05	DOOR	12.50
8-06	DOOR	12.50
8-07	DOOR	12.50
8-08	OVERHEAD DOOR	12.50
8-09	DOOR	12.50
8-10	DOOR	12.50
8-11	DOOR	12.50
8-12	OVERHEAD DOOR	12.50
8-13	OVERHEAD DOOR	12.50
8-14	OVERHEAD DOOR	12.00
8-15	OVERHEAD DOOR	12.00
8-16	DOOR	12.00
9-01	DOOR	12.46
10-01	DOOR	12.50
11-01	DOOR	14.16
11-02	DOOR	14.16
12-01	DOOR	12.50
12-02	DOOR	12.50
13-01	DOOR	12.44

FIGURE 1-4

TITLE POINTS OF ENTRY (POE)

DATE OCT. 2018

SCALE 1" = 60'

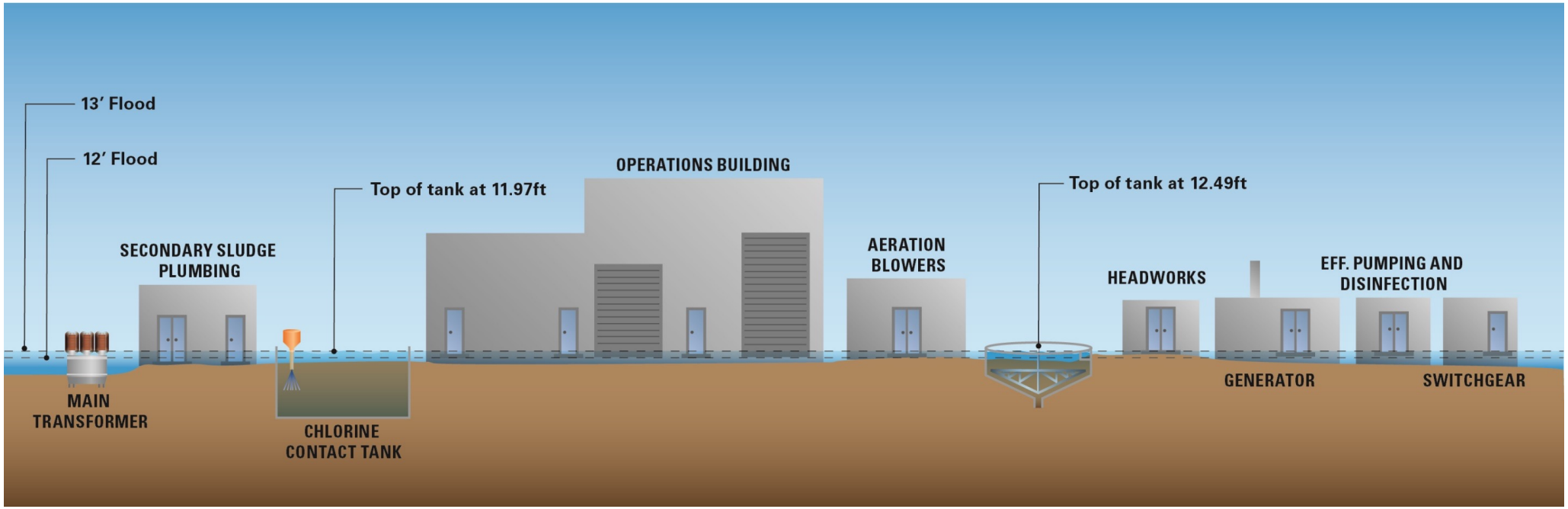
Dewberry
280 SUMMER ST.
10TH FLOOR
BOSTON, MA 02210
(617) 695-3400
(617) 695-3310

Existing Topography

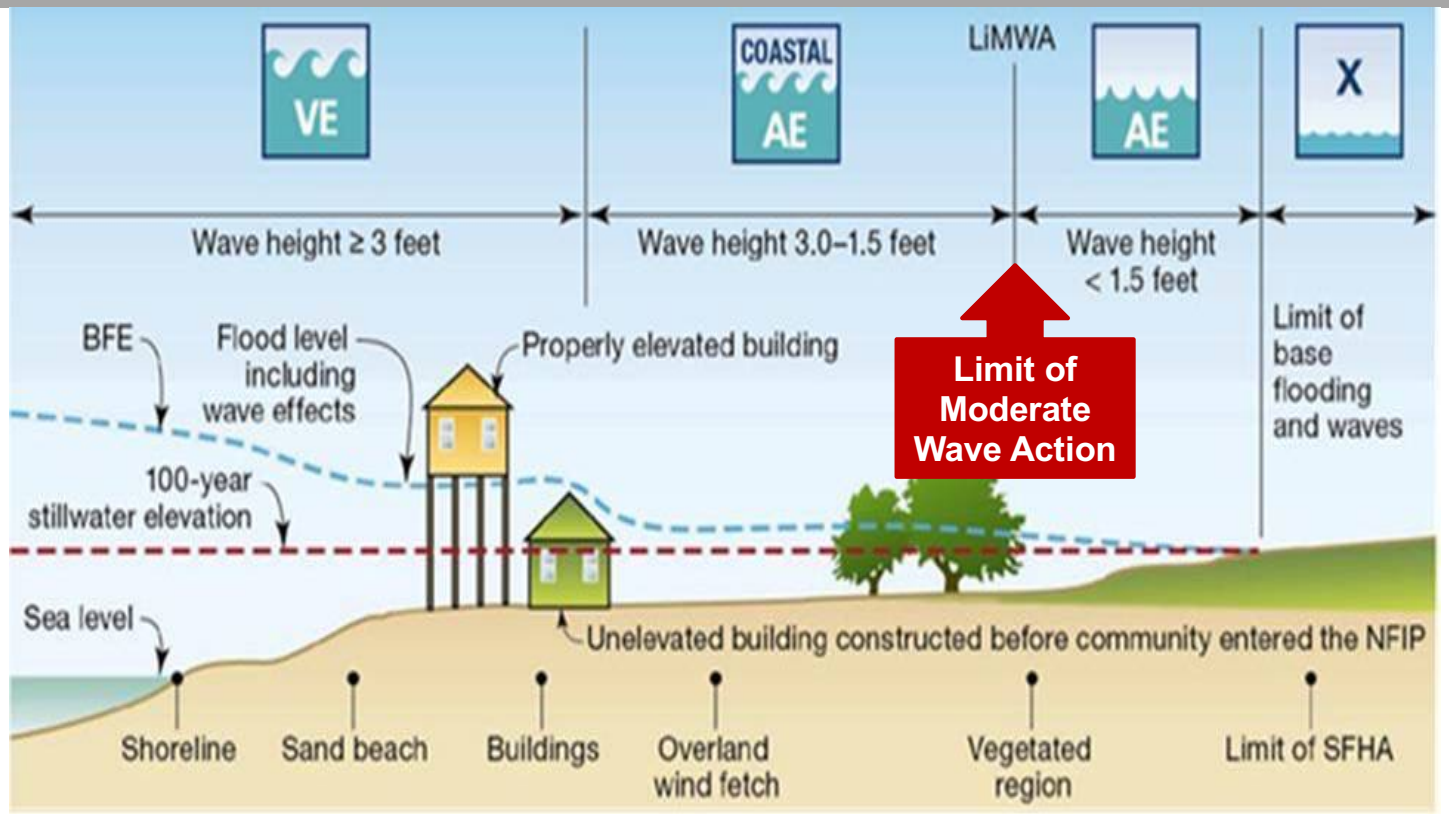
Mean High Water Level = 4.2 ft El.

***All elevations are in NAVD88**

Profile View – 10 Critical Assets



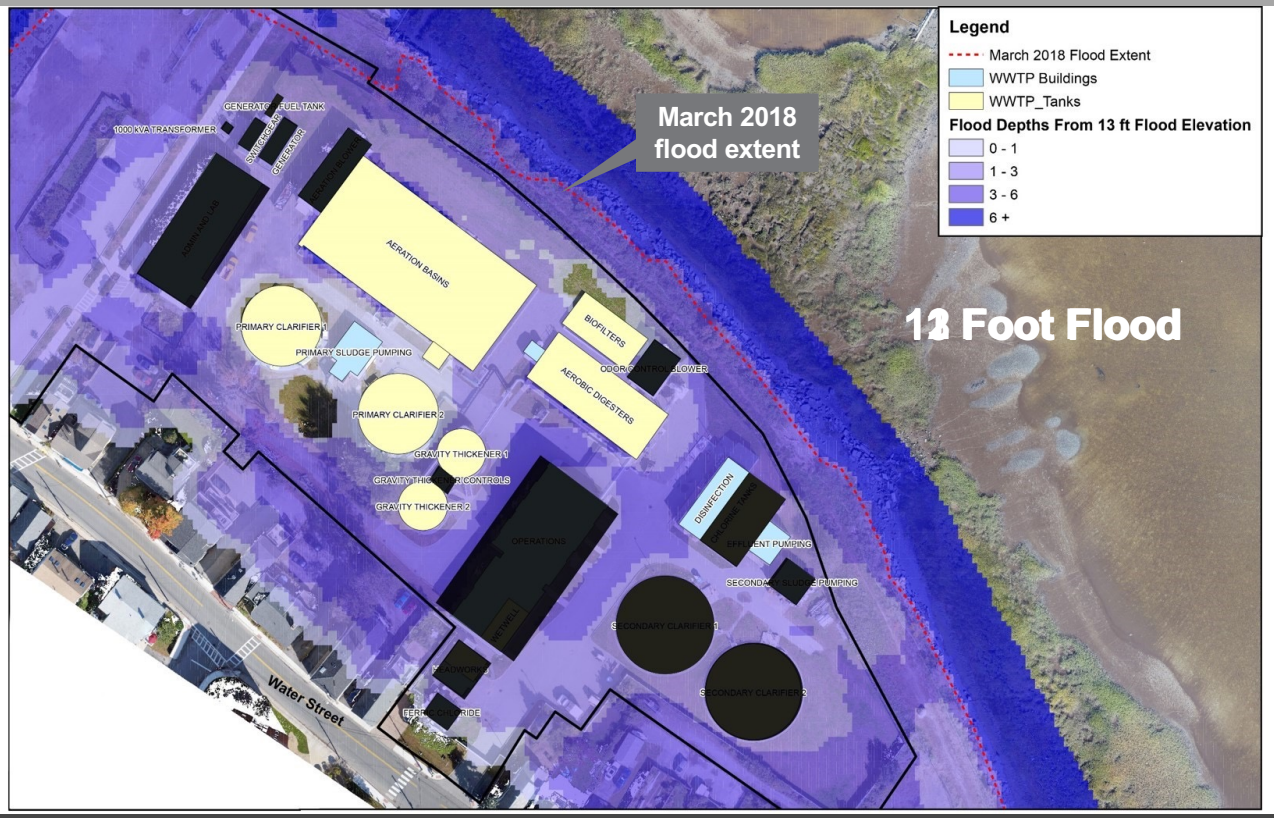
FEMA Flood Guidance - Explained



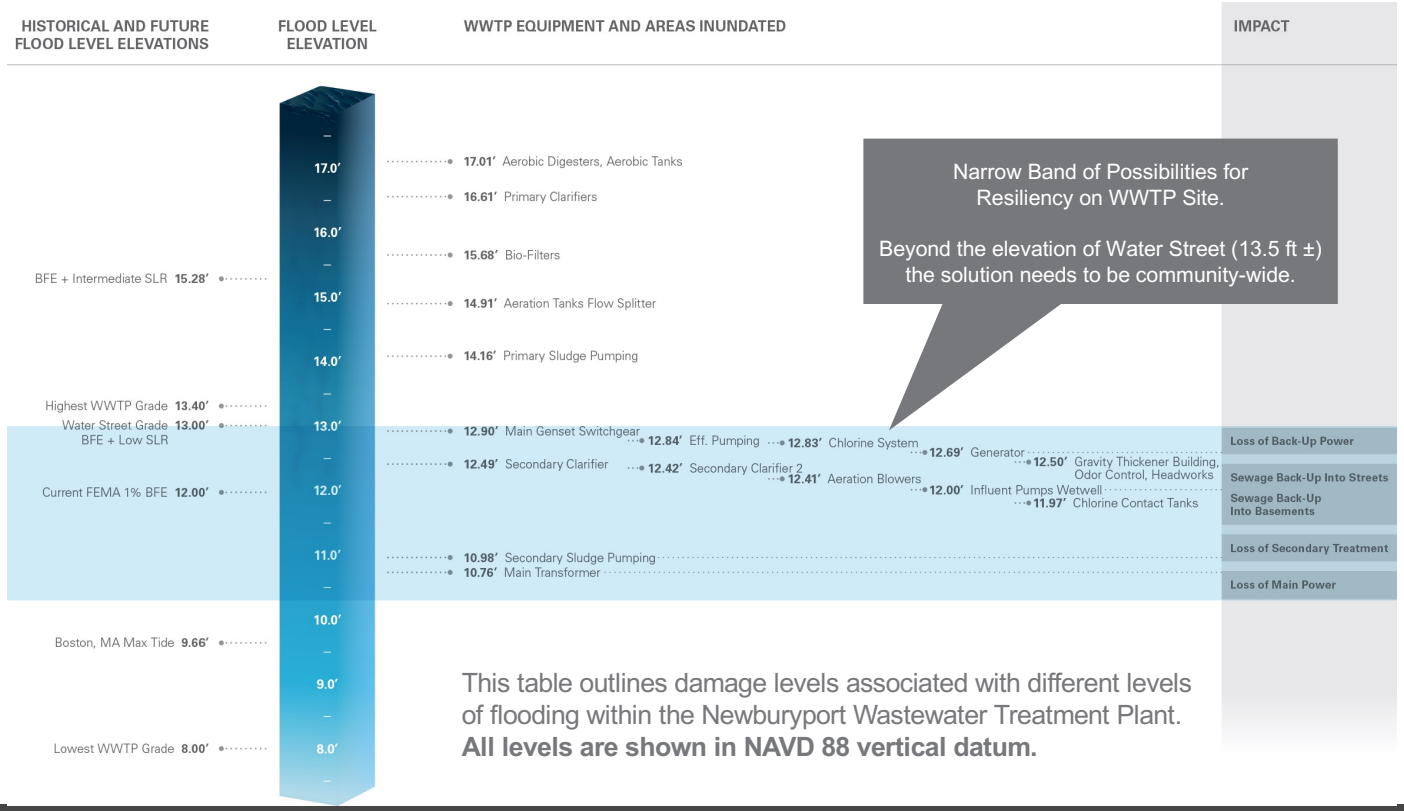
FEMA 1% Annual Chance Floodplain – Base Flood Elev. (BFE)

Operations Building Flood Levels

Asset Impacts from Various Flood Levels



Flood Level Guidance

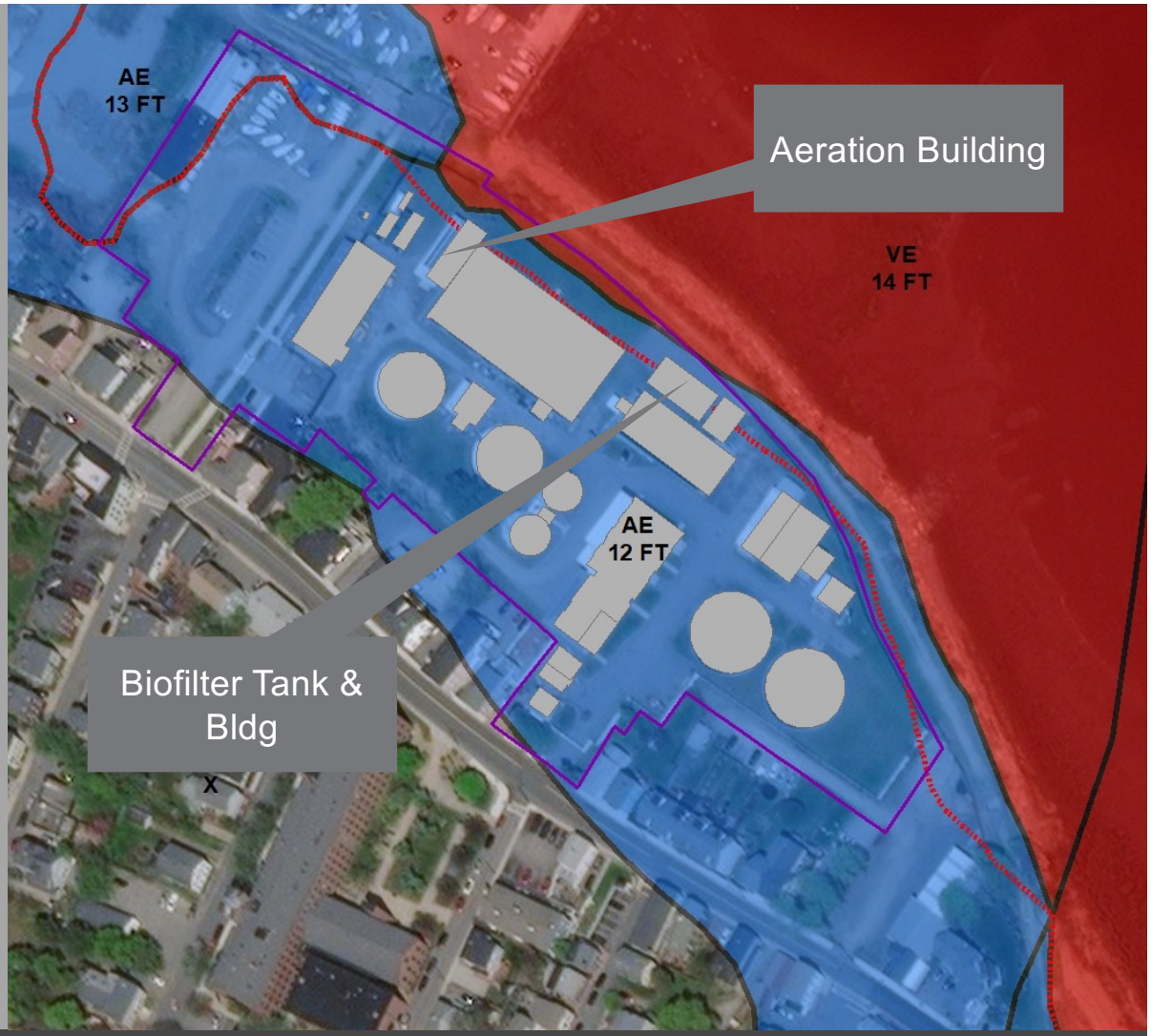


This table outlines damage levels associated with different levels of flooding within the Newburyport Wastewater Treatment Plant. **All levels are shown in NAVD 88 vertical datum.**

Challenges

Wave Action

- Within Limit of Moderate Wave Action (LiMWA), wave heights of 1.5-3 ft possible
  - Impacts multiple buildings and tanks along coastal boundary
  - Aeration Building in danger of direct wave impact
  - Biofilter Tanks in danger of undermining due to scouring



Challenges

Electrical System

- Main power and backup power on coastal boundary close to LimWA and the 14 ft BFE level
- Main transformer at El. 10.76 ft.
- Emergency Generator at El. 12.69 ft.
  - Very close to wave action zone

Challenges

Secondary Sludge Building Vulnerability

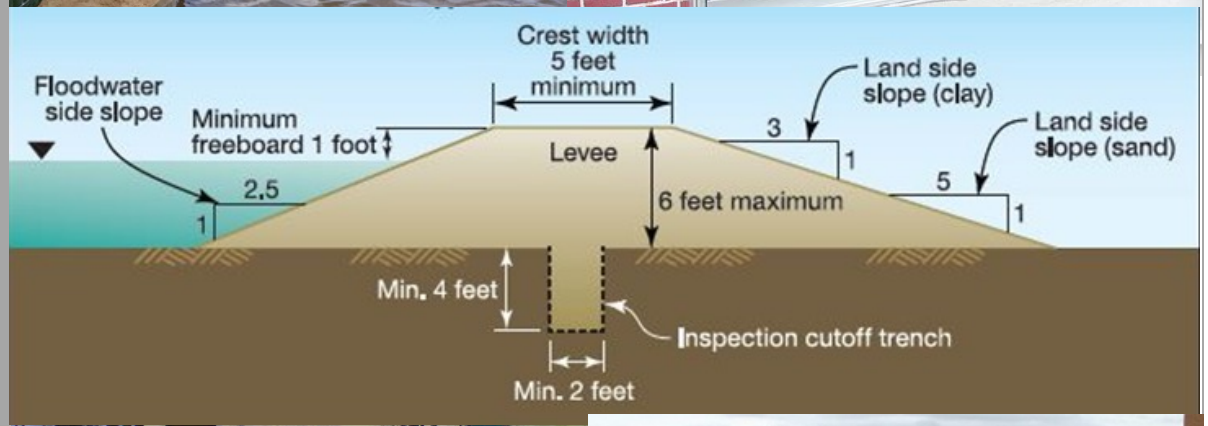
- LiMWA very close
- Secondary Sludge Building entrance at 10.98 ft.
- Waste Activated Sludge and Return Activated Sludge pumps in basement; not rated for submersion

Challenges

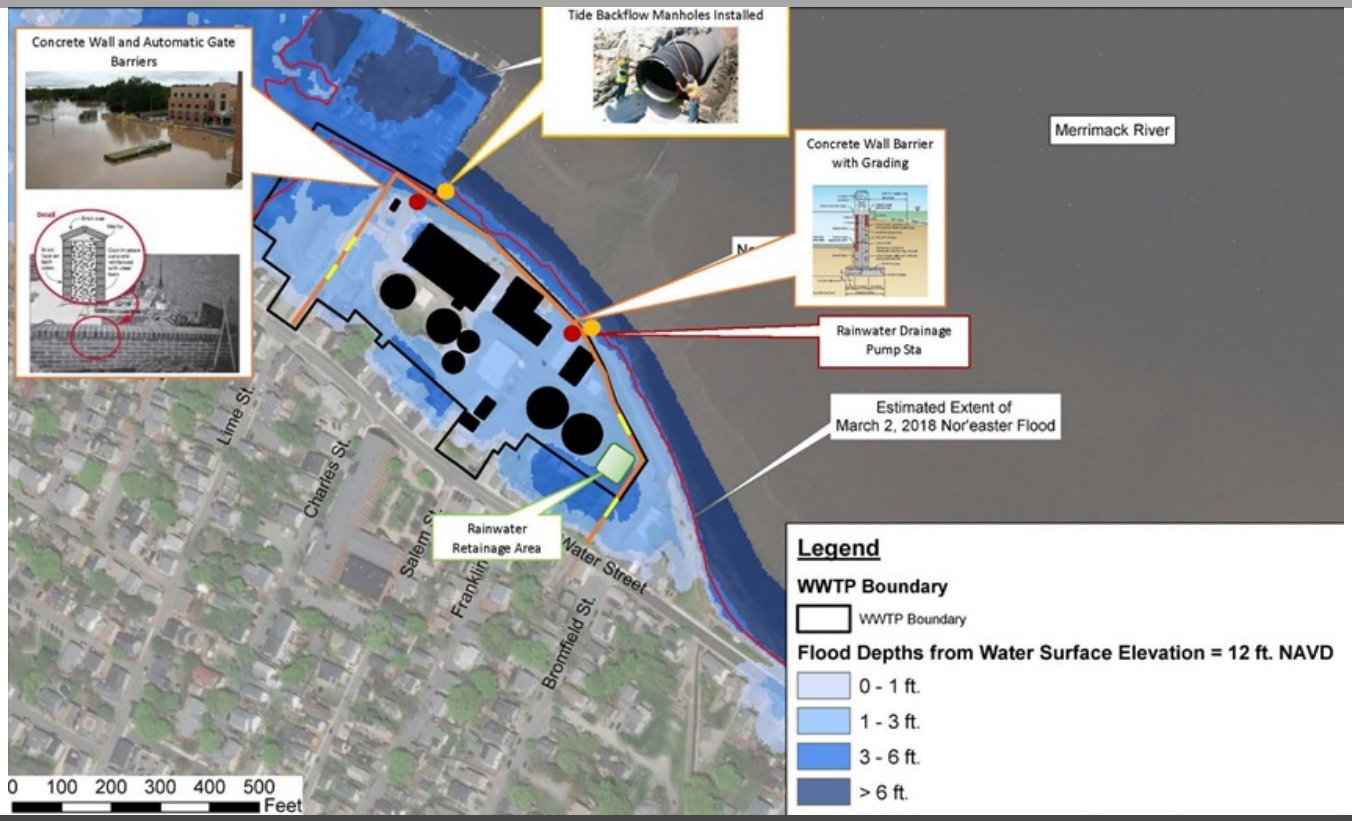

Community-Wide Flooding
14 ft Flood
Water Street
Legend
March 2018 Flood Extent
WWTP Buildings
Flood Depths From 14 ft Flood Elevation
0 - 1
1 - 3
3 - 6
6 +
0 50 100 200 300
Feet
N

Resilience Solutions/ Scenarios

- **Scenario 1:** Temporary Short term Solutions
  - Feasible to protect up to 10 ft El. F.L.
- **Scenario 2:** Coastal Berm within WWTP Site
  - Feasible to protect up to 12 ft El. F.L
- **Scenario 3:** Flood Wall along 3 sides of plant
  - Feasible to protect up to 13 ft. El. F.L.
- **Scenario 4:** Community-wide Resiliency Solution



Scenario #3 WWTP Flood Wall Solutions



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Climate Change Impacts

Sea Level Rise (SLR) and Stronger Storms

- NOAA intermediate prediction: 3.28 ft. Sea Level Rise by 2100
- Current BFE on WWTP site of 12 ft. + 3.28 ft. SLR = Future BFE of Elev. 15.28 ft.

Wind and Heat

- Wind and Heat will impact the equipment and building on the WWTP however slowly
- In most cases the rise in wind and heat requirements will be slow enough that the increased demands will be upgraded during the regular life span of each piece of equipment

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Questions?