



**US Army Corps
of Engineers®**
New York District

Integrated Hurricane Sandy General Reevaluation Report and Environmental Impact Statement

Atlantic Coast of New York

**East Rockaway Inlet to
Rockaway Inlet and Jamaica Bay**

Sub Appendix A2-A: HFFRRF Phase 1 Projects and Project Maps

US Army Corps of Engineers



A. SUB-APPENDIX A2-A: HFFRRF PHASE 1 PROJECTS AND PROJECT MAPS

The table below list all Phase 1 projects and some key characteristics. Subsequent pages display plan view maps of each of the Phase 1 projects.

Table A-1: Phase 1 Project Descriptions

ID	Project Name (Borough or County)	Notes	NNBF Type*	Length [ft]
1	Hammels (Queens)	This project consists of a series of floodwalls and is set back from the coastline to minimize conflicts with existing waterfront facilities. A total of six (6) vehicular gates are included to maintain access to the waterfront. ⁹		3,100
2	Arverne (Queens)	Project follows the coastline of the Arverne peninsula and includes a total of 11 HFFRRF segments to suit the changing conditions in landscape and land use along the proposed project. Four (4) vehicular gates are included to maintain access to the waterfront industrial sites and marina. ¹⁰		12,300
102	Arverne with NNBF	The Arverne project is enhanced with NNBFs at three locations. 1) The north-west corner of the peninsula (Brant Point). Existing habitat include mud flats, high marsh and invasive marsh (<i>Phragmites</i>). The proposed NNBF would employ the installation of rock sills off the existing, eroding shoreline to protect the toe of the slope and dampen incoming waves so the existing shoreline could be regraded and potentially extended seaward. The proposed NNBF also includes the removal of the <i>Phragmites</i> and expansion/restoration of the intertidal wetland habitat and high marsh. The existing upland maritime forest between the	2A	12,300

⁹ This was a conservative estimate and in Phase 2 all but one vehicular gate were switched to road ramps.

¹⁰ This was a conservative estimate and in Phase 2 all but one vehicular gate were switched to road ramps.



ID	Project Name (Borough or County)	Notes	NNBF Type*	Length [ft]
		berm feature and the wetlands are to remain undisturbed.		
		2) At the north-east corner of the peninsula where there is currently a narrow beach (DuBois Point), between Beach 69 th and just east of Beach 65 th Street a NNBF is proposed that includes the construction of rock sills to create an intertidal flat. Further upslope and to the east intertidal marsh can be restored. The existing upland maritime forest is to remain undisturbed.	1A	
		3) To the east of Marina 59, much of the existing marsh along the shoreline is dominated by <i>Phragmites</i> . The proposed NNBF includes restoration of an intertidal flat, supported by rock sills, and excavation of the <i>Phragmites</i> such that intertidal and high marsh can be restored.	2B	
3	Edgemere (Queens)	Project consists out of two approx. 3,000 foot segments, i.e. a medium floodwall for the west side and a high berm on the east side of the peninsula. One vehicular gate is included to maintain access to the waterfront.		6,300
103	Edgemere with NNBF	On the east side of the Edgemere neighborhood the proposed NNBF would restore and further enhance existing wetland habitat. A large area of wetland habitat is proposed to be restored and created between the HFFRRF high berm and the newly constructed rock sill, just off of the existing coastline. The proposed NNBF includes the removal of the <i>Phragmites</i> and restoration of the intertidal habitat and high marsh such that both type 2A and type 2B are implemented.	2A/2B	6,300
4	Norton Basin (Queens)	Project follows the coastal edge of Norton Drive and consist of approximately 2,400 foot segment of floodwall.		2,400
104	Norton Basin with NNBF	At Norton Basin the proposed NNBF includes creation/restoration of the intertidal habitat and high marsh adjacent to Norton Drive. The wetland habitat and appropriate grades along the extended shoreline would be supported by the construction of a rock sill in the water side and construction of a medium floodwall on the landward side.	1A/2A	2,400



ID	Project Name (Borough or County)	Notes	NNBF Type*	Length [ft]
5	Bayswater Park (Queens)	This project consists of an approximately 1,400 foot long berm that follows the coastal edge.		1,500
105	Bayswater Park With NNBF	Although currently healthy upland maritime forest exists at this location, there is an opportunity to enhance the HFFRRF with the creation of additional wetland habitat. The proposed NNBF includes the removal of <i>Phragmites</i> and restoration of the intertidal marsh. A rock sill would be constructed to support an extension of the existing shoreline. The existing upland maritime forest is to remain undisturbed.	1A/1B	1,500
6	Motts Basin S (Queens)	Project follows the southern perimeter of Motts Basin residential neighborhood as well as the low lying coastline of the Long Island Power Authority substation and the Inwood material terminal.		3,800
106	Motts Basin S With NNBF	For Motts Basin South an opportunity exists to enhance wetland habitat between Dickens Street and Pinson Street on the water side of the proposed HFFRRF. In the horizontal direction there are few constraints at this location, and the proposed NNBF includes extension of the shoreline and restoration of the intertidal and high marsh.	2A	3,800
7	Motts Basin N (Nassau County)	Project follows a short section of roadway (Waterfront Blvd.) in Nassau County set back from the northern perimeter of Motts Basin. Construction of a low floodwall would reduce the risk of coastal flooding of residential and commercial parcels on the north side of Motts Basin		700
107	Motts Basin N With NNBF	Similarly as with Motts Basin South, good conditions exist to enhance the HFFRR-Feature with NNBFs and habitat restoration. The proposed NNBF includes extension of the shoreline and restoration of the intertidal and high marsh.	1A /2A	700
8	Inwood Marina (Nassau County)	This project provides flood risk reduction to the residential neighborhood to the east of the Inwood Marina. Two (2) vehicular gates are included to maintain waterfront access.		2,700



ID	Project Name (Borough or County)	Notes	NNBF Type*	Length [ft]
9	Head of Bay Gate (Queens / Nassau County)	Equal to the alternative as proposed in Appendix A2 of the GRR, a storm surge barrier at this location would provide flood risk reduction for low lying coastal areas at the far eastern extent of Jamaica Bay and along adjoining waterbodies in Nassau County. A barrier at this single location could reduce risk for the extensive area for eastern end of Jamaica Bay. (If this barrier is deemed not viable, additional smaller projects provide options for isolated areas, as included in project 12 through 16 below.)		3,000
10	Old Howard Beach (Queens)	Similar to the alternative as proposed in Appendix A2 of the GRR, storm surge barriers at both Shell Bank Creek and Hawtree Basin and connecting HFFRRF to tie the alignment in to higher ground would provide flood risk reduction for the Howard Beach area.		3,700
11	Canarsie (Brooklyn)	This project includes flood risk reduction features along Fresh Creek such that the lowest portions of the shoreline would be elevated. Revetments would be placed where revetments currently exist. A floodwall is proposed to be constructed along a portion of E 108 th Street.		2,700
12	Cedarhurst-Lawrence (Nassau County)	This project follows a section of the Nassau Expressway with a low floodwall for approximately 1,100 feet. ¹¹ The project also includes two sections of bulkhead on either side of the canal next to the Lawrence High School. A short section of floodwall connects the bulkhead on the west side to high ground.		1,800
13	Meadowmere (Queens)	The Meadowmere alignment consists of a 3,700 foot length of bulkhead around the northern end of the Meadowmere Park Island. A low berm on the west side and a floodwall on the east side connect the bulkhead to a 1,000 foot long revetment on the southern end of the island.		6,700

¹¹ This section was later removed as an unrelated road raising project will provide a flood barrier in this area.



ID	Project Name (Borough or County)	Notes	NNBF Type*	Length [ft]
14	Meadowmere N (Queens)	This project provides flood risk reduction to the residential neighborhoods along Bayview Avenue and Broad Street in the Meadowmere area.		4,800
15	Meadowmere E (Queens)	This project consists of a 1,600 foot bulkhead around the peninsula parallel with 1 st and 3 rd Streets off of Rockaway Boulevard.		1,600
16	Rosedale (Queens)	The Rosedale project is a 1,900 floodwall that connects Brookville Boulevard in the south and high ground further north.		1,900
17	Broad Channel (Queens)	This project consists of urban bulkheads and road raisings on the west side of the island and berms and road raisings on the east side. There are also berms around two parks, at the northern and southern ends of the island. The project also has a 1,600 foot breakwater off of the west side of the island.		28,700

*NNBF Types are as follows per description in section 4.12.1

NNBF Type 1A – Shoreline Extension with Intertidal Marsh

NNBF Type 1B – Shoreline Extension with Intertidal and High Marsh

NNBF Type 2A – Shoreline Excavation for *Phragmites* Removal with Intertidal Marsh

NNBF Type 2B – Shoreline Excavation for *Phragmites* Removal with Intertidal and High Marsh





Legend

HFFRR-Feature

Low Floodwall

Revetment

20% AEP (5yr RP) Flood Extents
(2068)

0 30 60 120 180 240 Feet





Legend

HFFRR-Feature

- Low Floodwall
- 20% AEP (5yr RP) Flood Extents (2068)

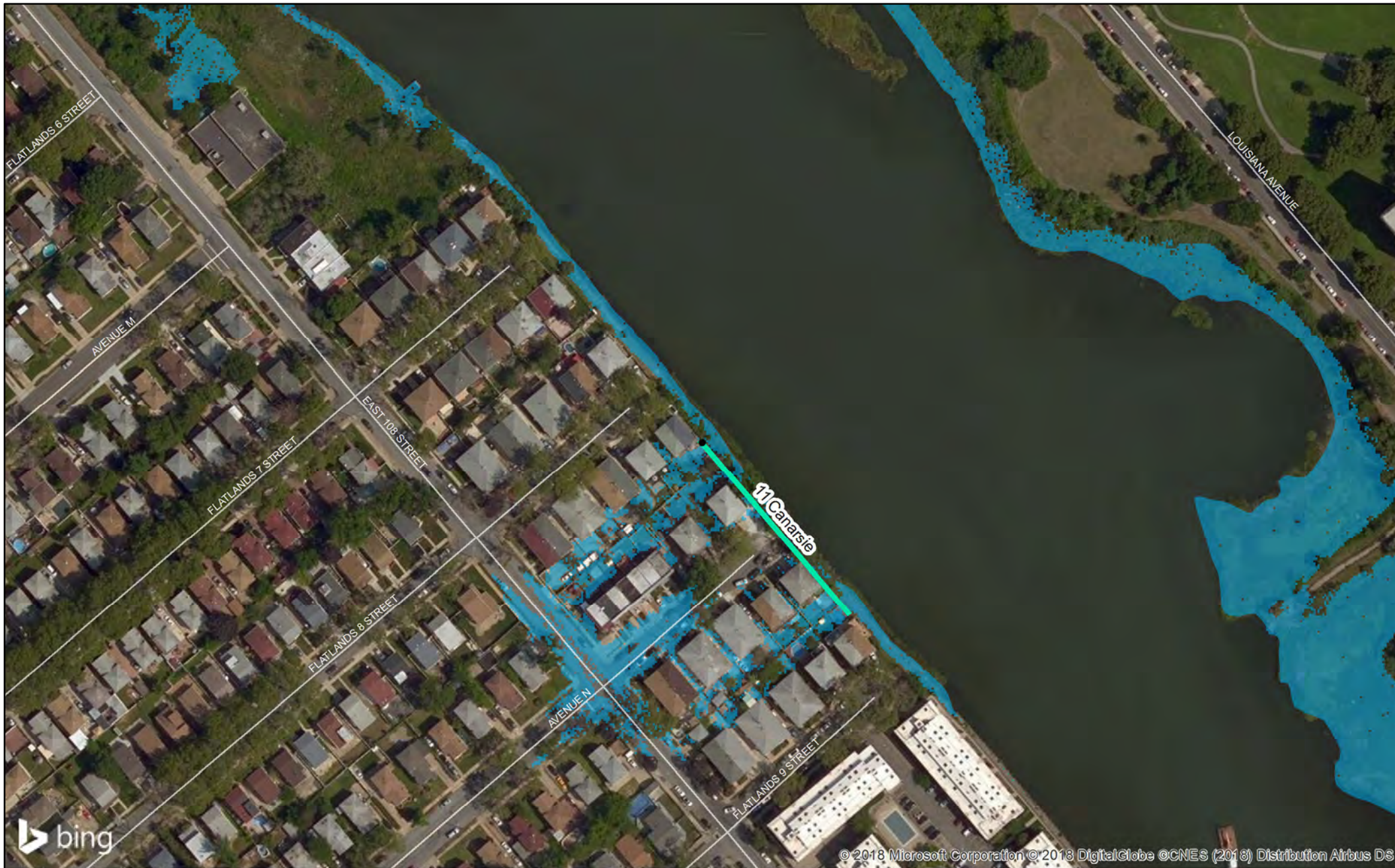




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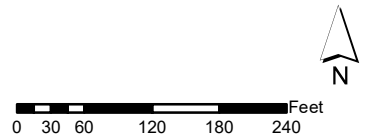
HFFRR-Feature

- Revetment
- 20% AEP (5yr RP) Flood Extents (2068)



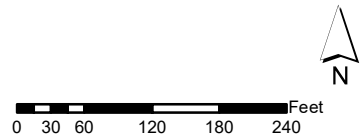


- Legend**
- HFFRR-Feature**
- Medium Floodwall
 - Low Berm
 - In Water Gate
 - 20% AEP (5yr RP) Flood Extents (2068)





- Legend**
- HFFRR-Feature**
- Medium Floodwall
 - Low Berm
 - In Water Gate
 - 20% AEP (5yr RP) Flood Extents (2068)





Legend

HFFRR-Feature

- Medium Floodwall
- 20% AEP (5yr RP) Flood Extents (2068)





Legend

HFFRR-Feature

- Medium Floodwall
- 20% AEP (5yr RP) Flood Extents (2068)





Legend

HFFRR-Feature

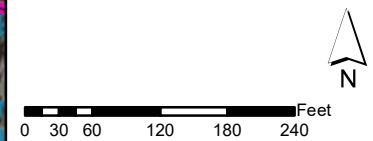
● Low Berm

● High Berm

● Deep Bulkhead

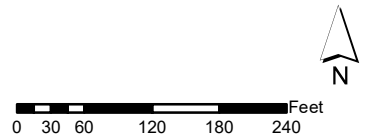
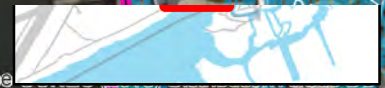
20% AEP (5yr RP) Flood Extents
(2068)

Nassau County Streets





- Legend**
- HFFRR-Feature**
- High Berm
 - Deep Bulkhead
- 20% AEP (5yr RP) Flood Extents (2068)
- Nassau County Streets





Legend

HFFRR-Feature

Deep Bulkhead

20% AEP (5yr RP) Flood Extents
(2068)

Nassau County Streets





Legend

HFFRR-Feature

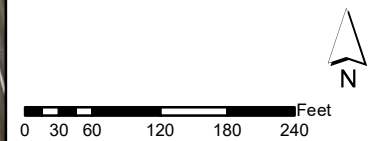
Medium Floodwall

Low Berm

Deep Bulkhead

20% AEP (5yr RP) Flood Extents
(2068)

Nassau County Streets





Legend

HFFRR-Feature

- Medium Floodwall
- Low Berm
- Revetment
- 20% AEP (5yr RP) Flood Extents (2068)
- Nassau County Streets



Legend

HFFRR-Feature

Low Berm

Deep Bulkhead

20% AEP (5yr RP) Flood Extents
(2068)

Nassau County Streets





Legend

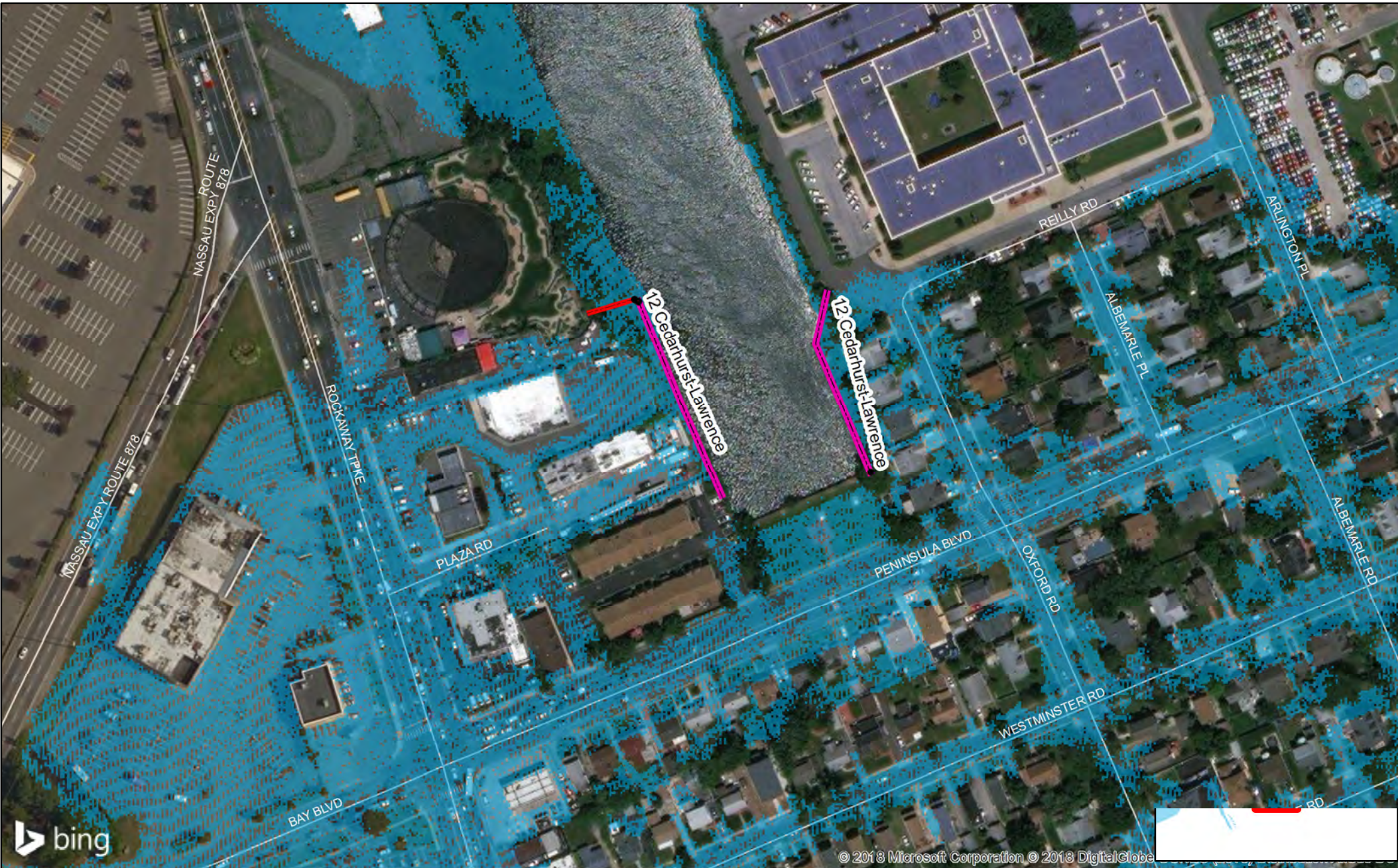
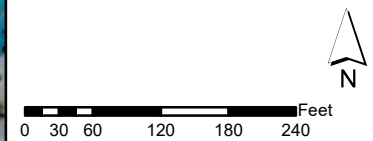
HFFRR-Feature

Medium Floodwall

Deep Bulkhead

20% AEP (5yr RP) Flood Extents
(2068)

Nassau County Streets





Legend

HFFRR-Feature

- Low Floodwall
- 20% AEP (5yr RP) Flood Extents (2068)
- Nassau County Streets



0 30 60 120 180 240 Feet



Legend

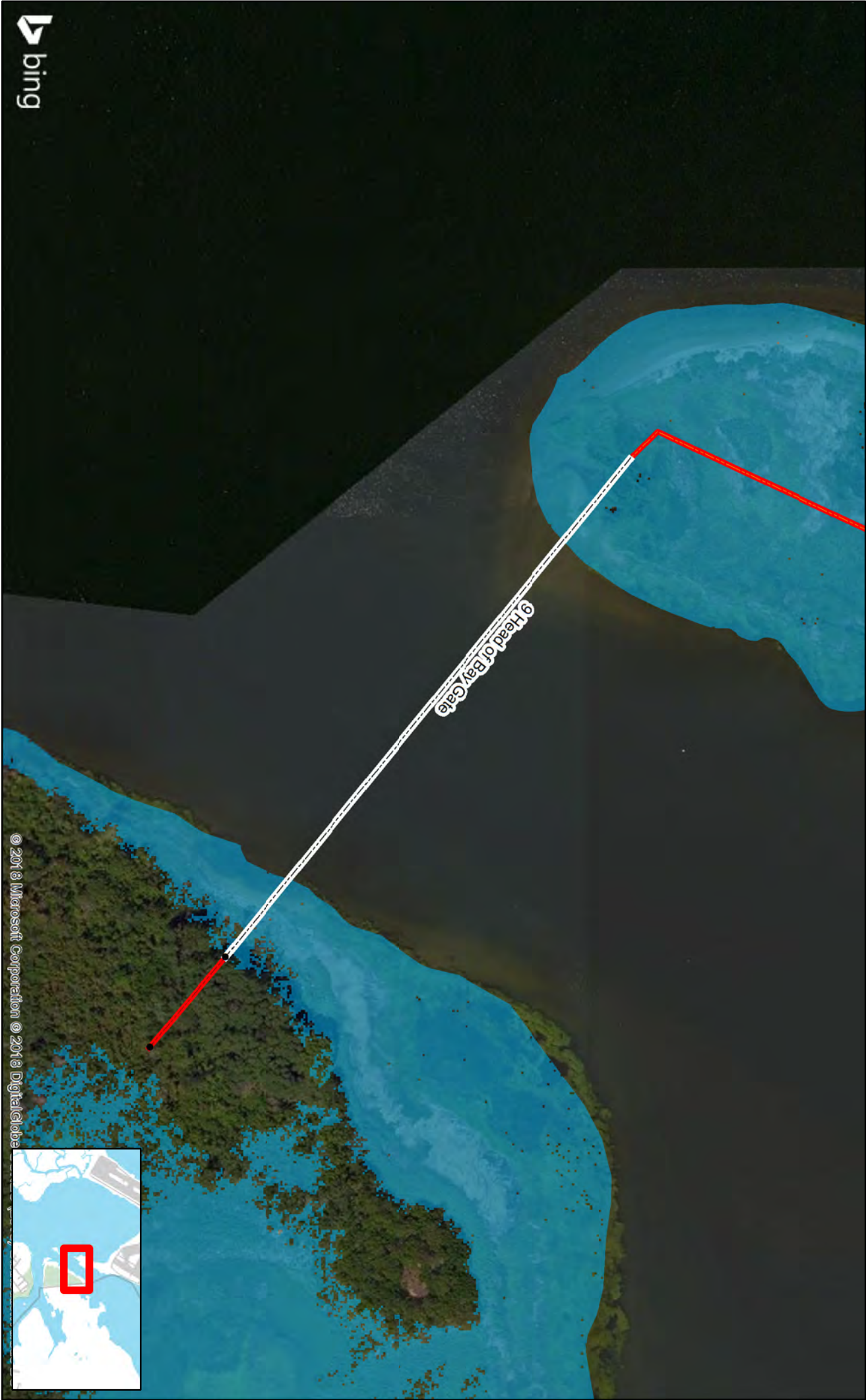
HFFRR-Feature

- High Floodwall
- 20% AEP (5yr RP) Flood Extents (2068)





Head of Bay Gate



Legend

- HFFRR-Feature**
- Medium Floodwall
- High Floodwall
- In Water Gate
- 20% AEP (5yr RP) Flood Extents (2068)

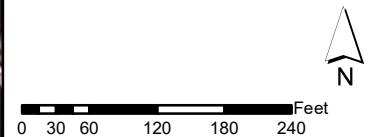




Legend


HFFRR-Feature

- High Berm
- 20% AEP (5yr RP) Flood Extents (2068)








Legend


 Vehicular Gates


HFFRR-Feature

 Medium Floodwall

 Low Berm

 Shallow Bulkhead

 20% AEP (5yr RP) Flood Extents (2068)






 Nassau County Streets





Legend

HFFRR-Feature

-  Low Floodwall
-  NNBF
-  NNBF
-  20% AEP (5yr RP) Flood Extents (2068)
-  Nassau County Streets





Motts Basin S





- Legend**
- HFFRR-Feature**
- Medium Floodwall
 - Shallow Bulkhead
 - NNBF
 - NNBF
 - 20% AEP (5yr RP) Flood Extents (2068)





Legend

HFFRR-Feature

● Low Berm

— NNBf

▨ NNBf

20% AEP (5yr RP) Flood Extents
(2068)





Legend

HFFRR-Feature

Medium Floodwall

NNBF

NNBF

20% AEP (5yr RP) Flood Extents
(2068)





Legend

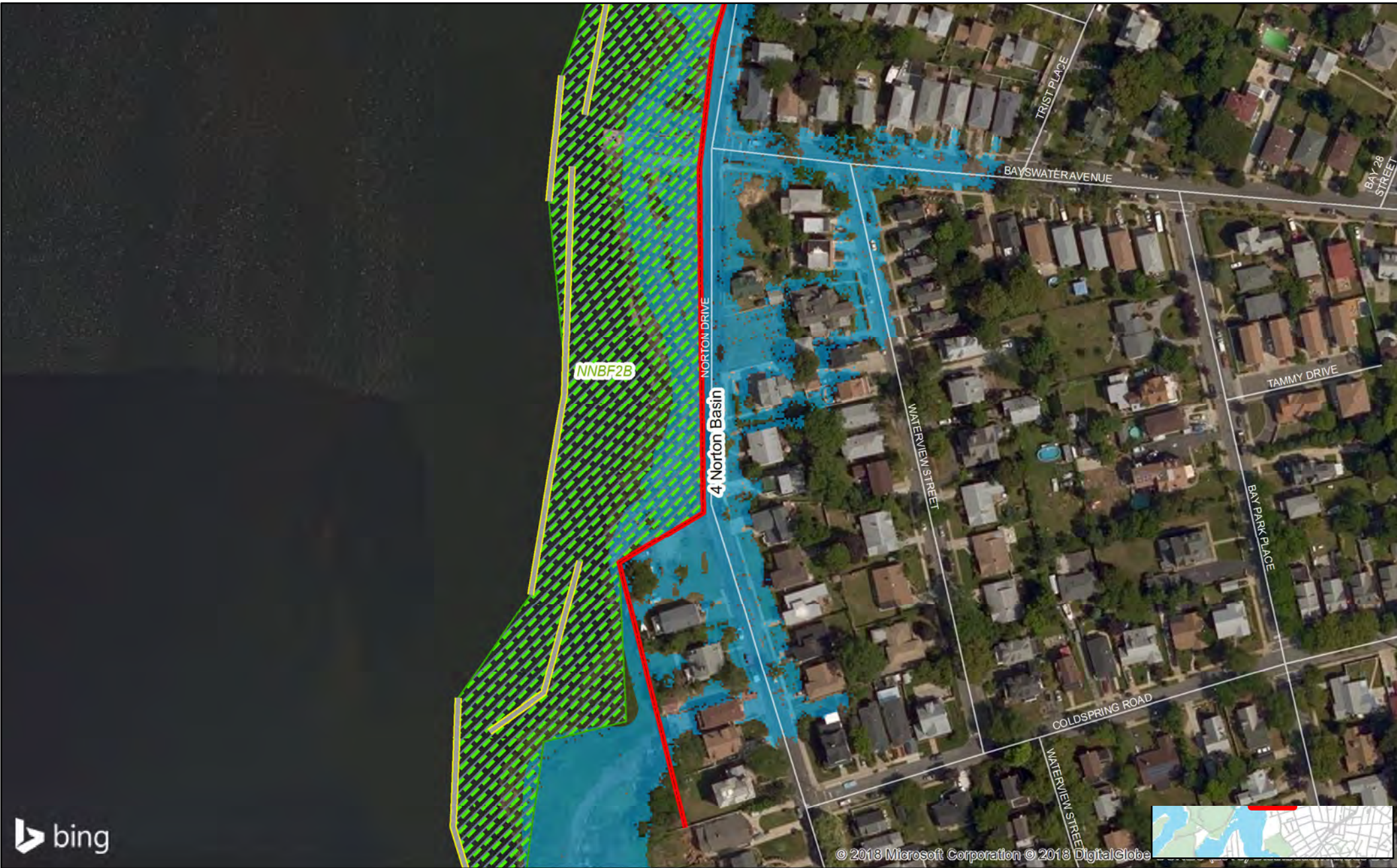
HFFRR-Feature

Medium Floodwall

NNBF

NNBF

20% AEP (5yr RP) Flood Extents (2068)





Legend

HFFRR-Feature

High Berm

NNBF

NNBF

20% AEP (5yr RP) Flood Extents
(2068)





Legend

HFFRR-Feature

Medium Floodwall

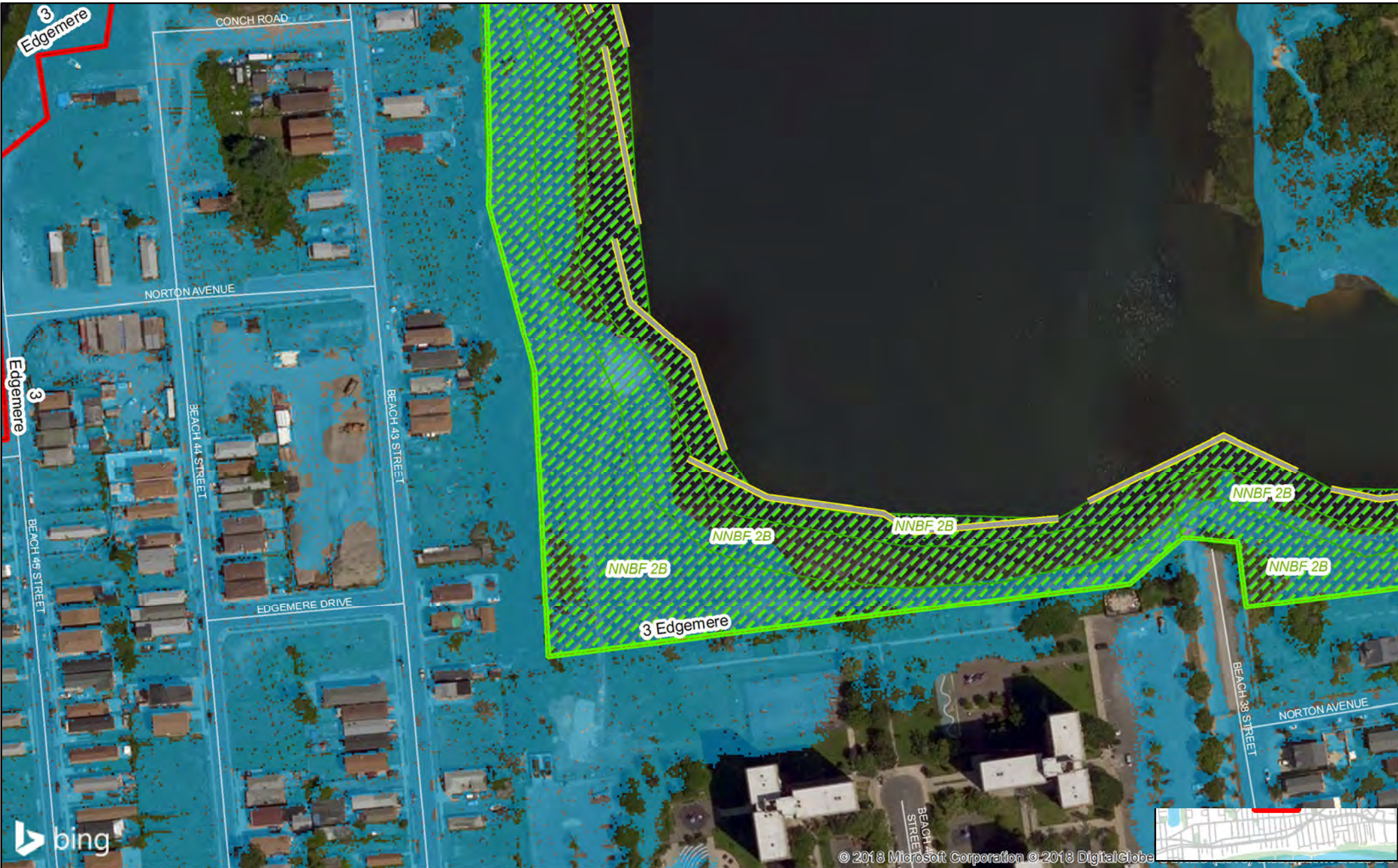
High Berm

NNBF

NNBF


20% AEP (5yr RP) Flood Extents
(2068)

0 30 60 120 180 240 Feet








Legend

 Vehicular Gates

HFFRR-Feature

 Medium Floodwall

 High Berm

 Shallow Bulkhead

 NNBF

 NNBF

 20% AEP (5yr RP) Flood Extents (2068)





Legend

HFFRR-Feature

Medium Floodwall

20% AEP (5yr RP) Flood Extents
(2068)





Legend


HFFRR-Feature

- Low Berm
- Deep Bulkhead
- NNBF
- NNBF
- 20% AEP (5yr RP) Flood Extents (2068)







Legend

 Vehicular Gates

HFFRR-Feature


 Low Floodwall

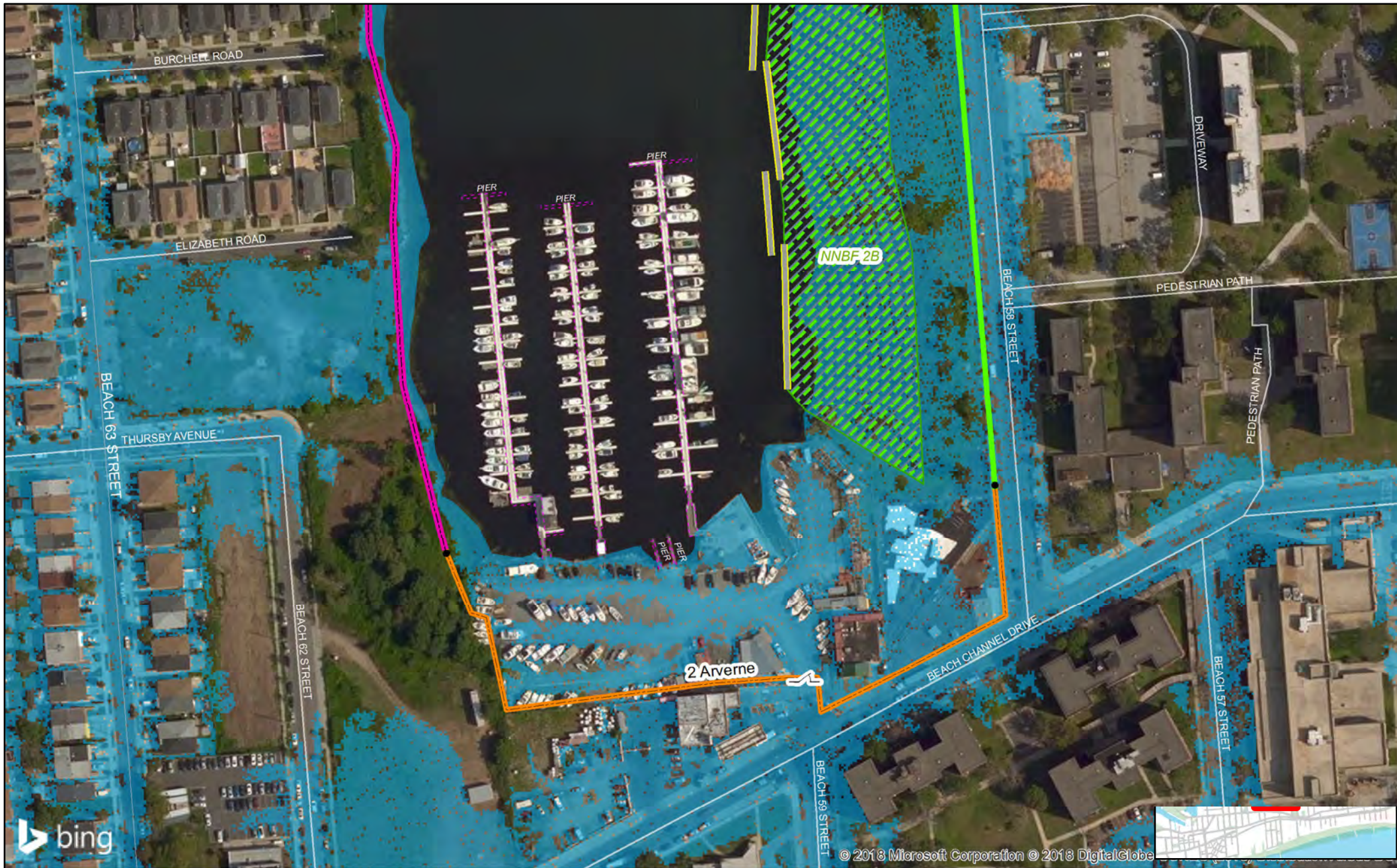
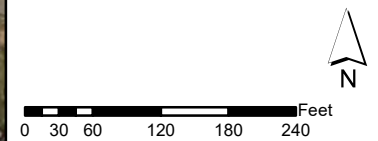
 Low Berm

 Deep Bulkhead

 NNBF

 NNBF

 20% AEP (5yr RP) Flood Extents (2068)



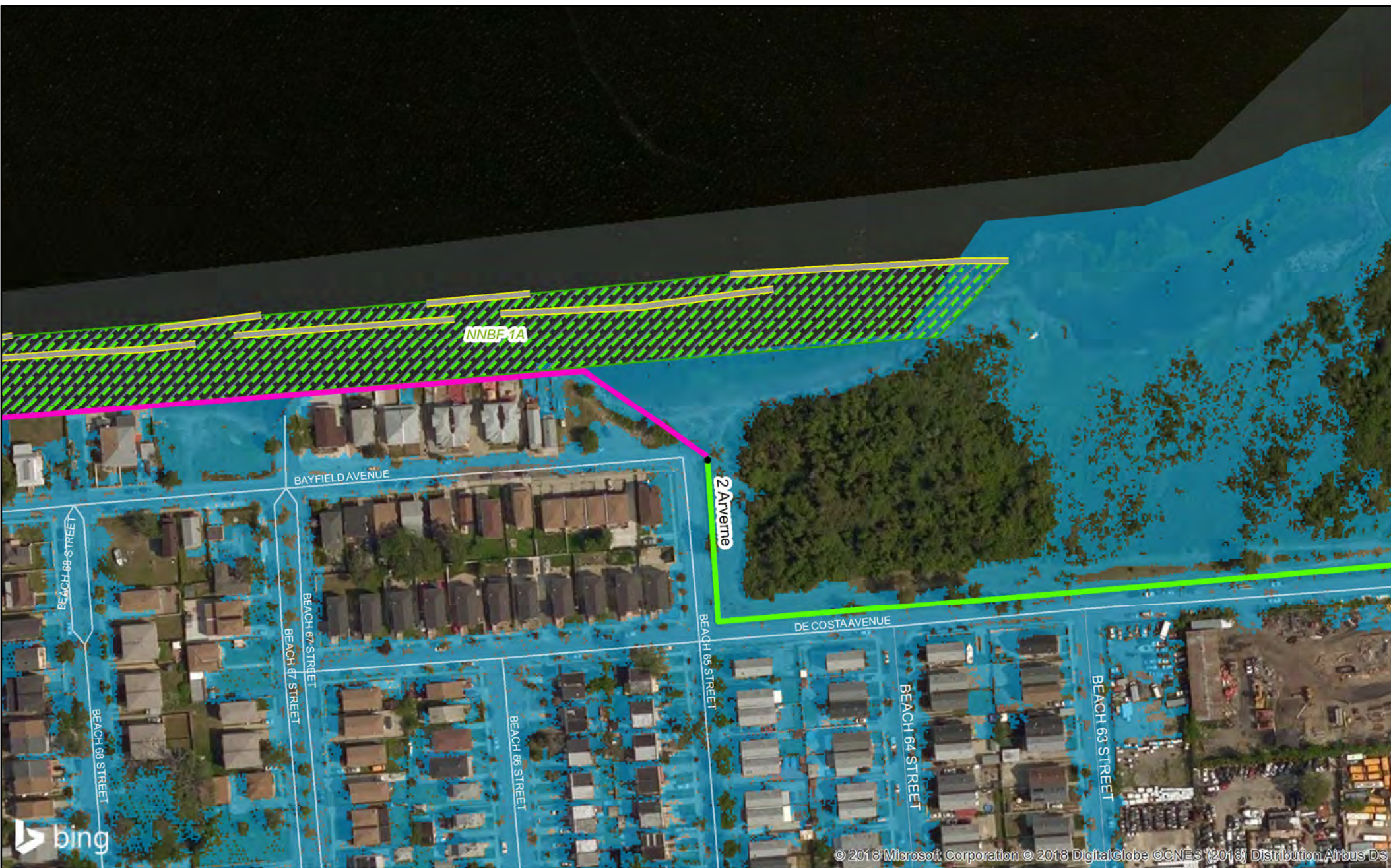


Legend

HFFRR-Feature

- Low Berm
- Shallow Bulkhead
- NNBF
- NNBF
- 20% AEP (5yr RP) Flood Extents (2068)

0 30 60 120 180 240 Feet

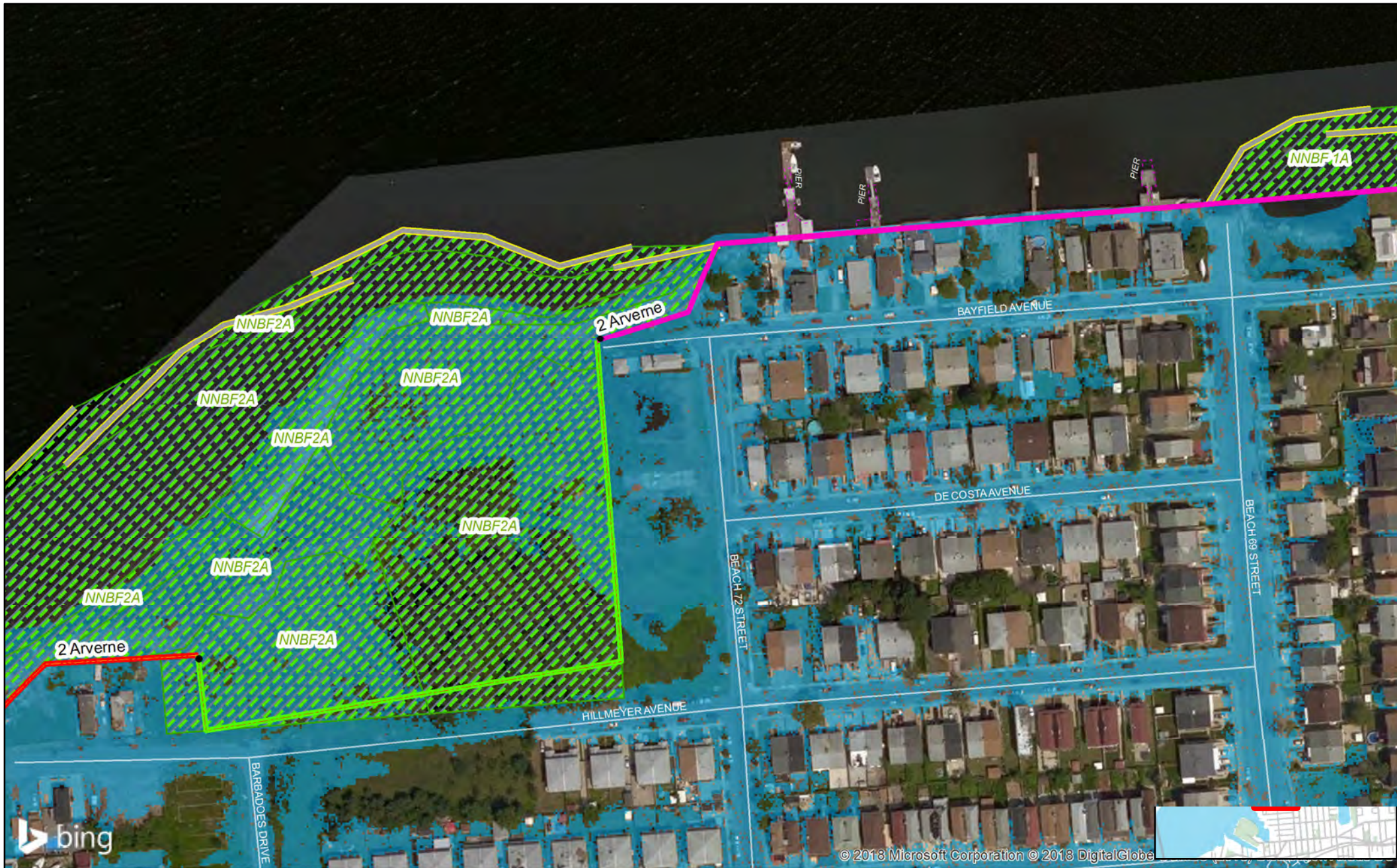




Legend

HFFRR-Feature

- High Floodwall
- High Berm
- Shallow Bulkhead
- NNBF
- NNBF
- 20% AEP (5yr RP) Flood Extents (2068)





Legend

HFFRR-Feature

- Low Floodwall
- High Floodwall
- High Berm
- Deep Bulkhead
- NNBF
- NNBF


20% AEP (5yr RP) Flood Extents (2068)

0 35 70 140 210 280 Feet







Legend

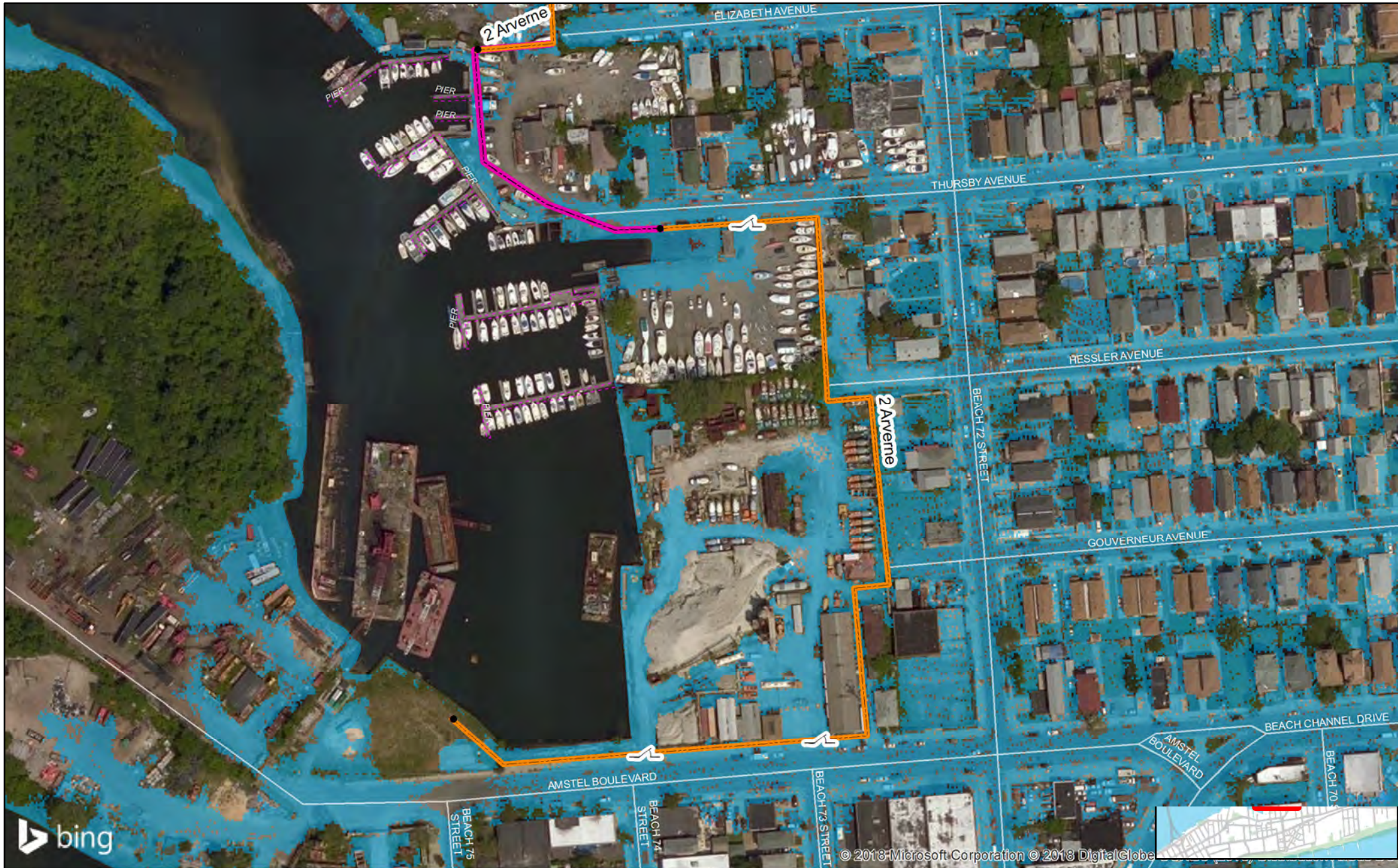
 Vehicular Gates

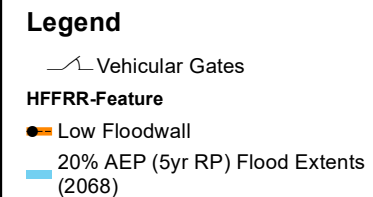
HFFRR-Feature

 Low Floodwall

 Deep Bulkhead


 20% AEP (5yr RP) Flood Extents (2068)









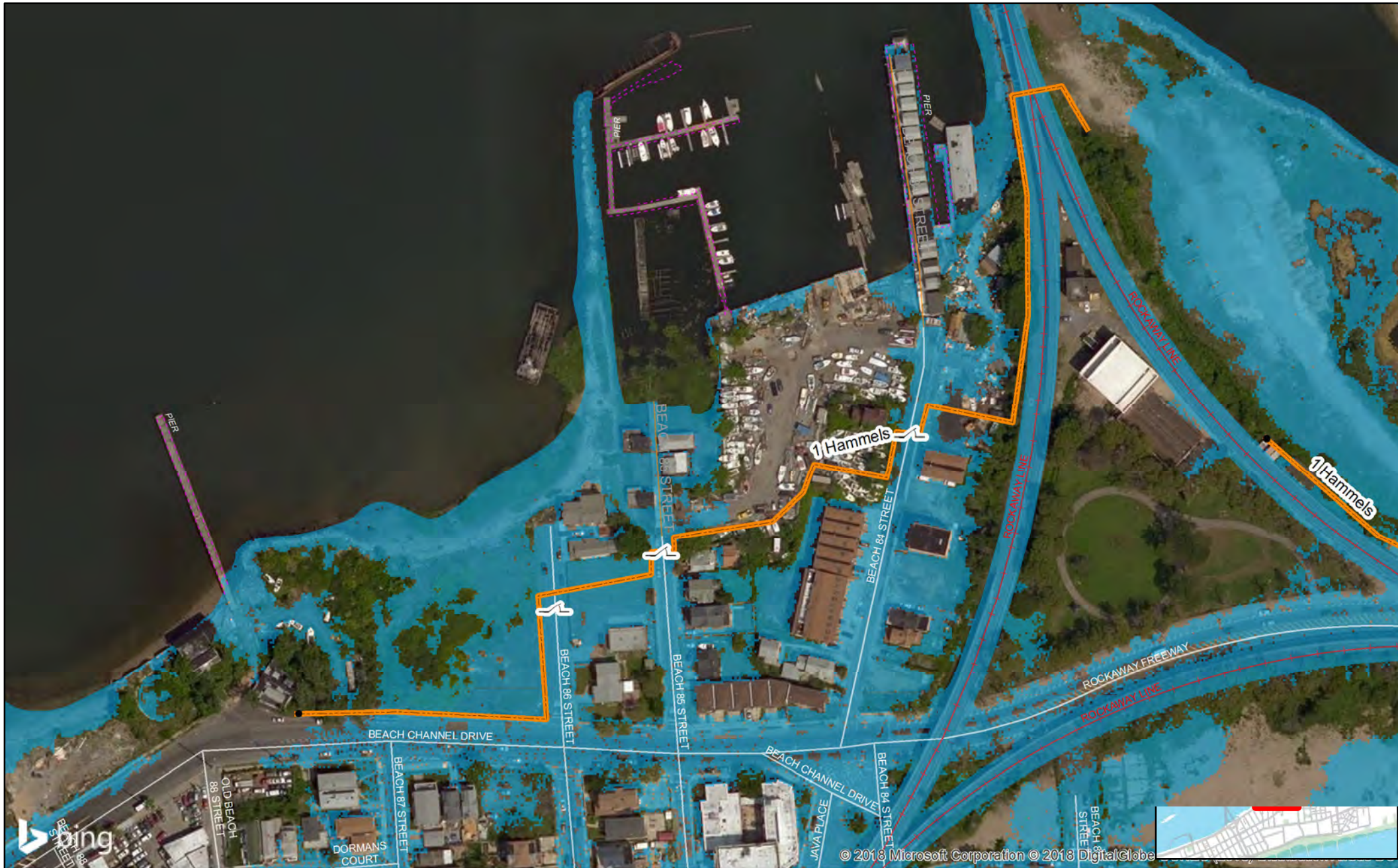
Legend

 Vehicular Gates

HFFRR-Feature

 Low Floodwall

 20% AEP (5yr RP) Flood Extents (2068)





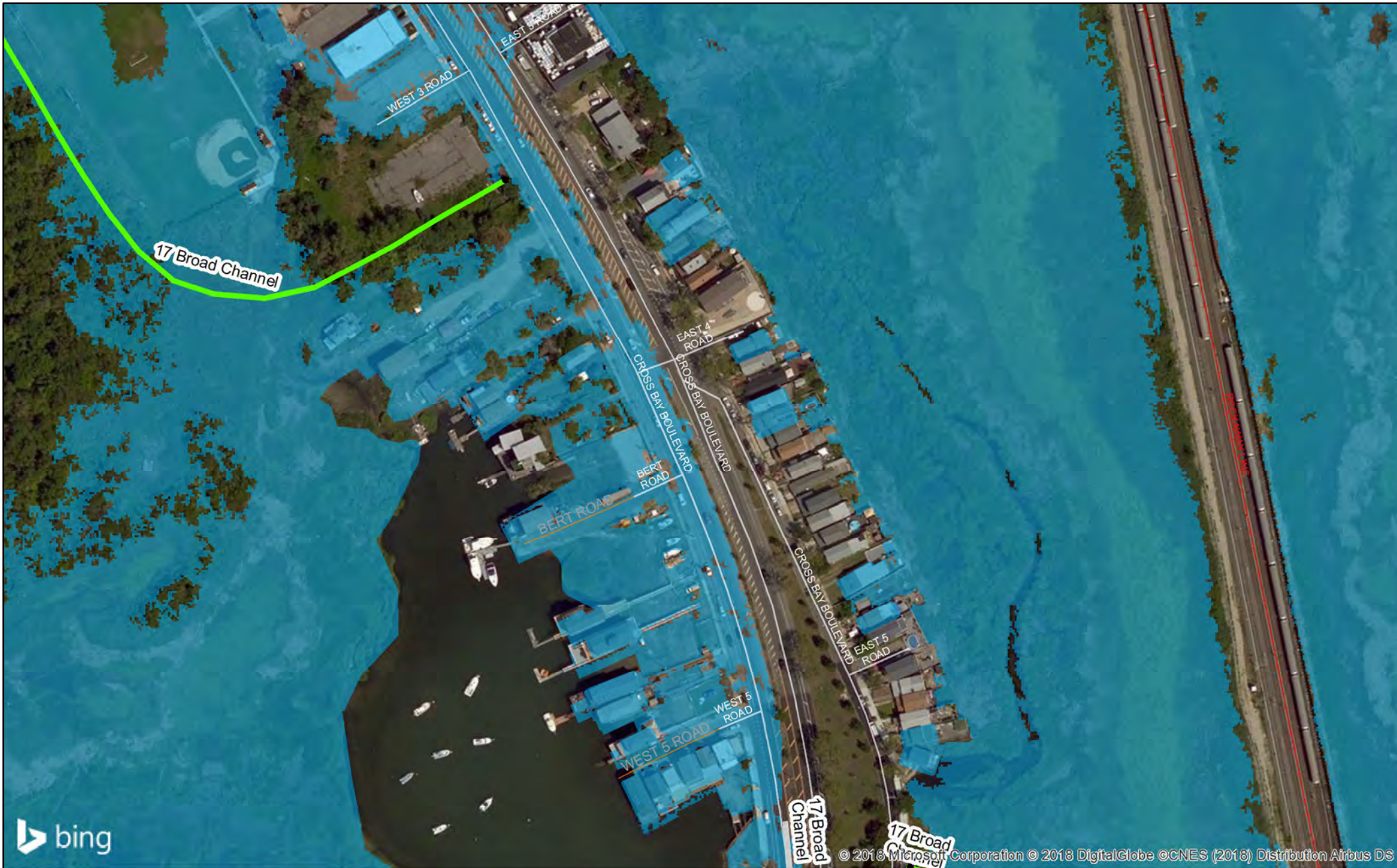
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- HFFRR-Feature
- Low Berm





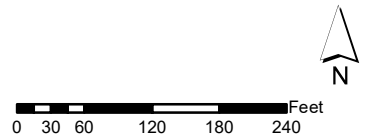
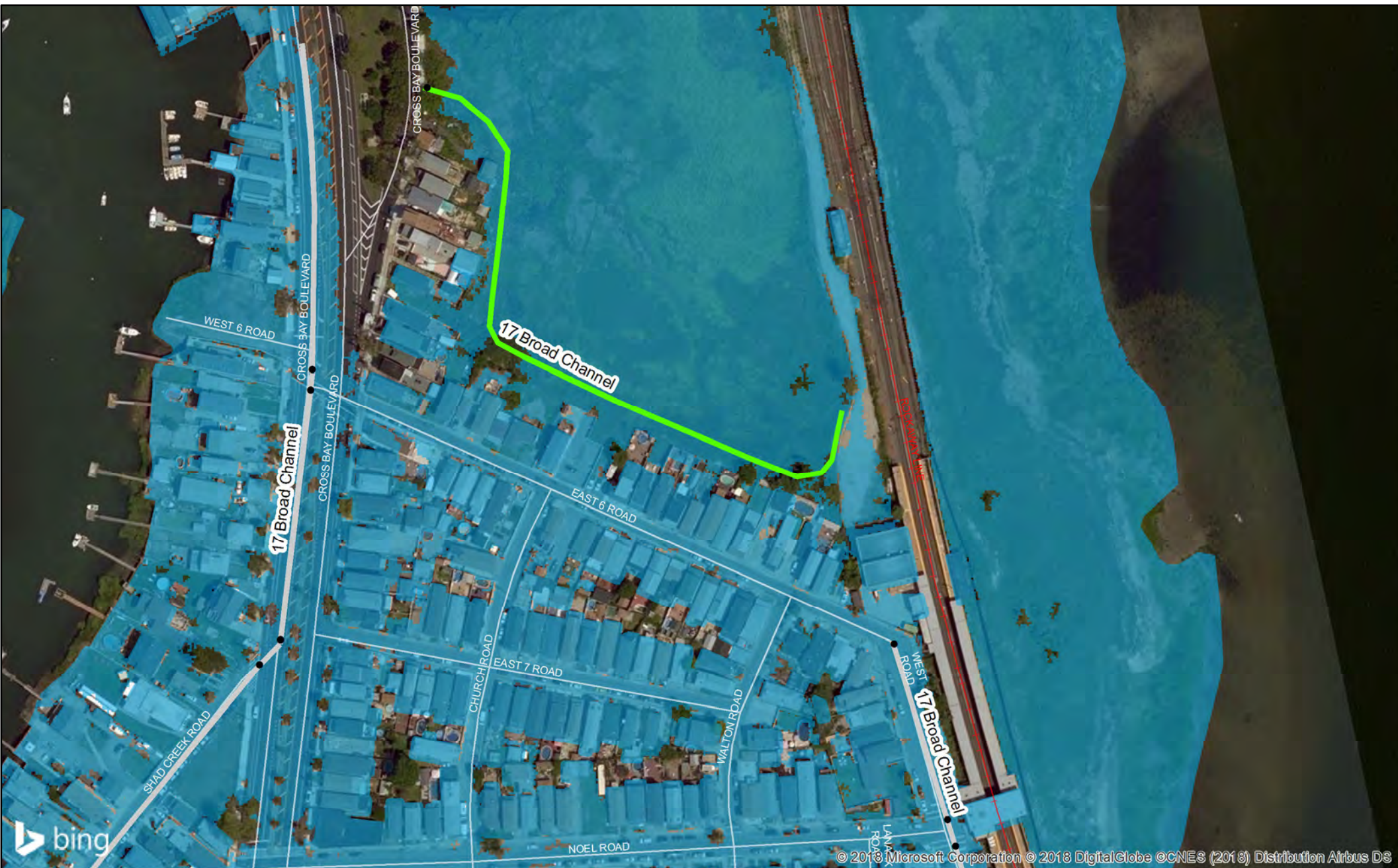
Legend

- HFFRR-Feature
- Low Berm
 - Road Raising





- Legend**
- HFFRR-Feature
- Low Berm
 - Road Raising

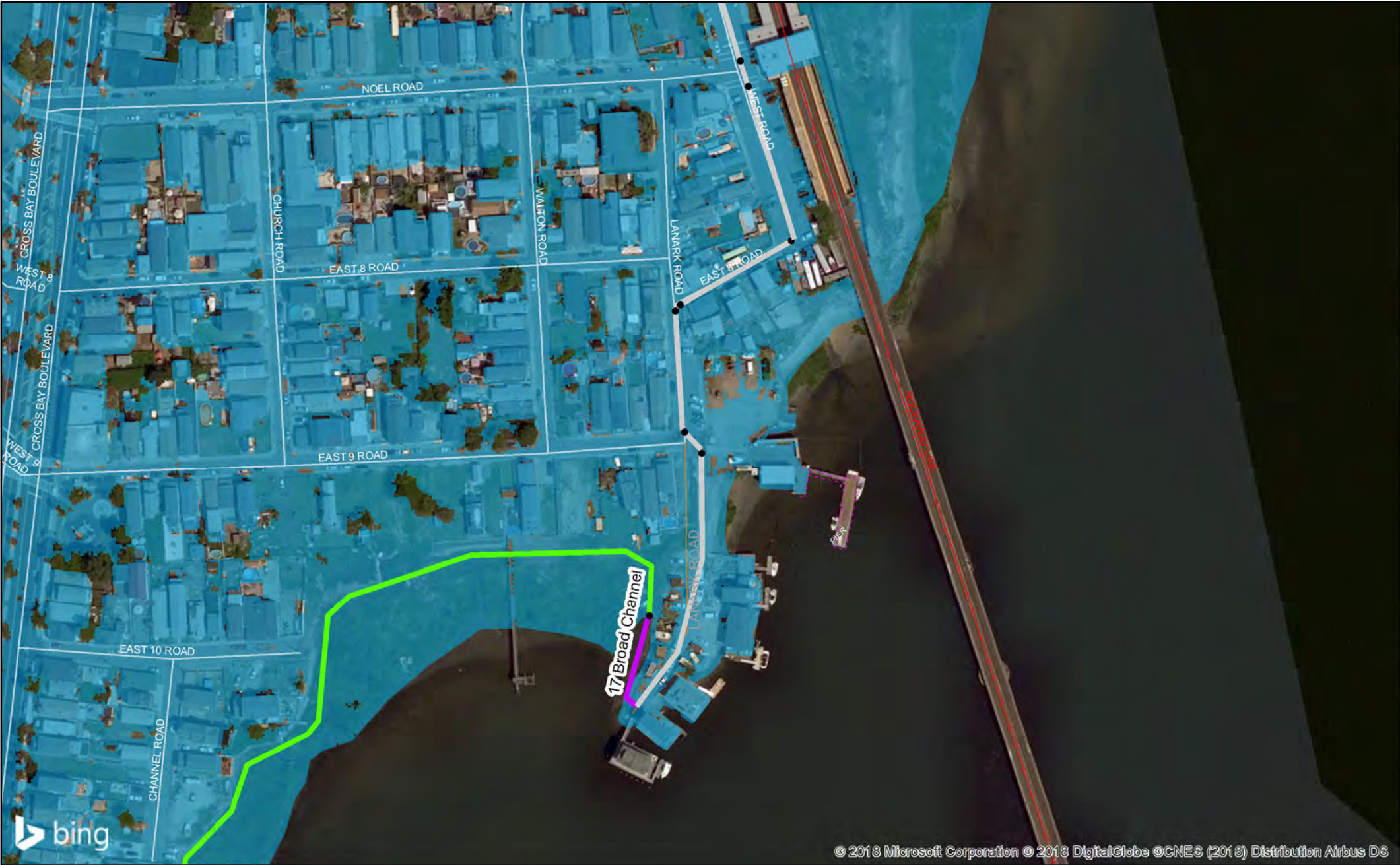




Legend

HFFRR-Feature

- Low Berm
- Shallow Bulkhead - Urban
- Road Raising

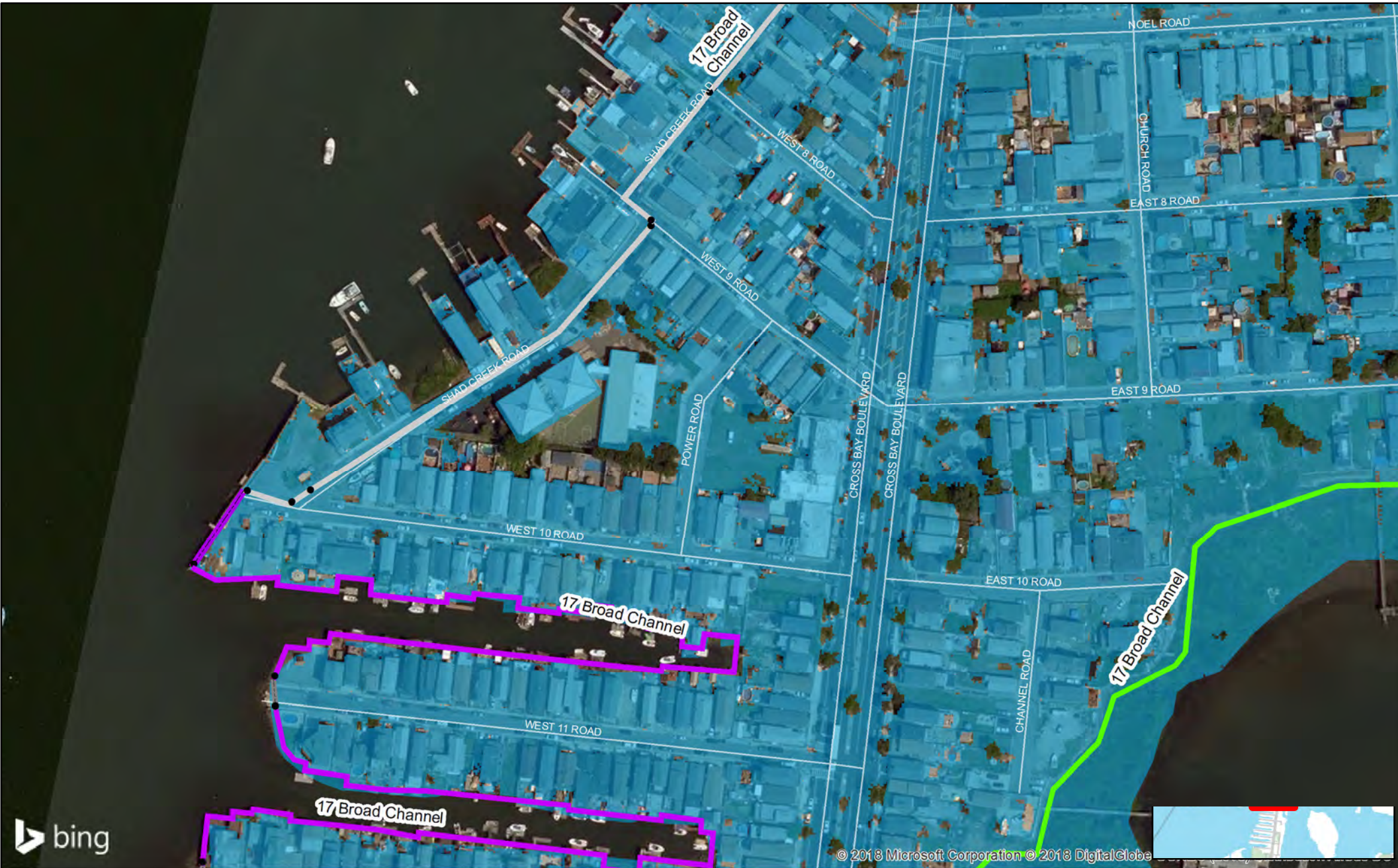




Legend

HFFRR-Feature

- Low Berm
- Deep Bulkhead - Urban
- Shallow Bulkhead - Urban
- Road Raising
- Street End Bulkhead

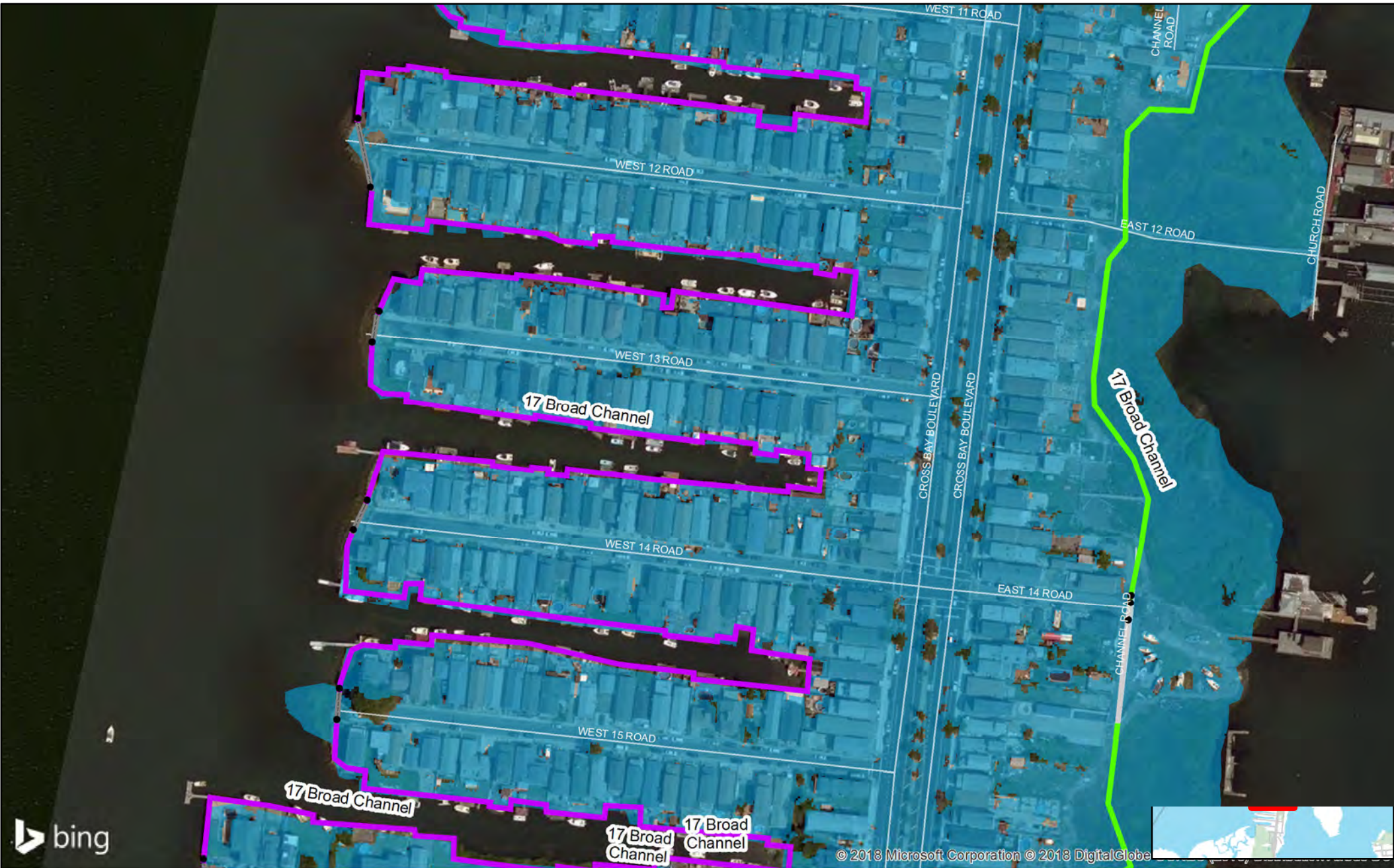




Legend

HFFRR-Feature

- Low Berm
- Shallow Bulkhead -
- Road Raising
- Street End Bulkhead

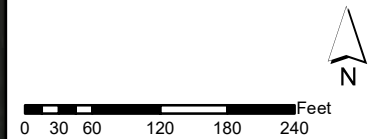




Legend

HFFRR-Feature

- Low Berm
- High Berm
- Deep Bulkhead - Urban
- Shallow Bulkhead - Urban
- Road Raising
- Street End Bulkhead

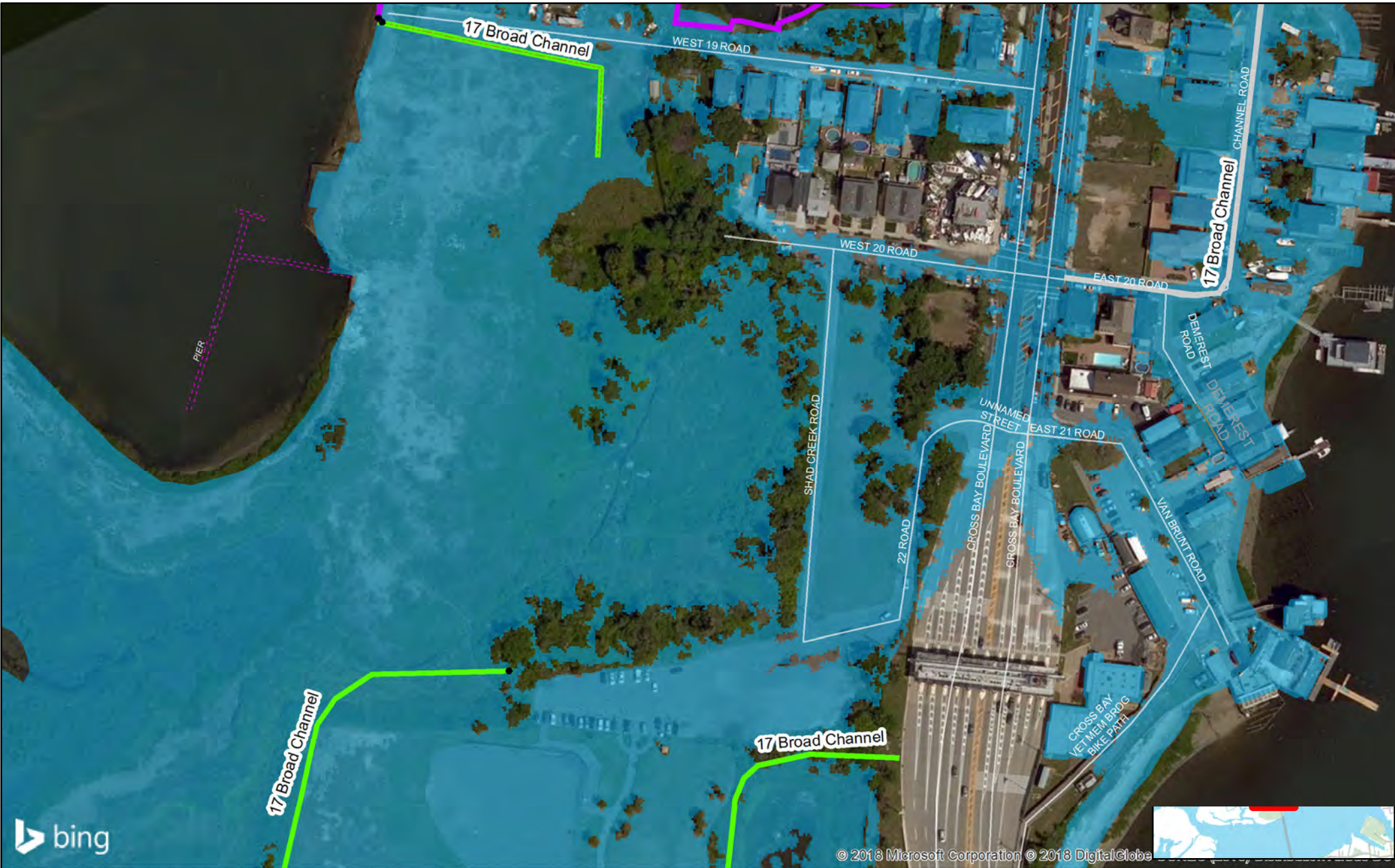




Legend

HFFRR-Feature

- Low Berm
- High Berm
- Shallow Bulkhead -
- Road Raising









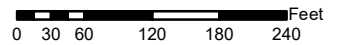
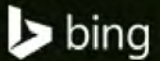
- Legend**
- HFFRR-Feature
- Low Berm





HFFRR-Feature

-  Deep Bulkhead - Urban
-  Shallow Bulkhead - Urban
-  Street End Bulkhead
-  Breakwater





Legend

HFFRR-Feature

- Shallow Bulkhead - Urban
- Street End Bulkhead
- Breakwater

