Hatch Mott MacDonald

Hatch Mott MacDonald
833 Rt 9 North
PO Box 373
Cape May Court House, NJ 08210
T 609.465.9377 www.hatchmott.com

April 28, 2014
Via e-mail & 1st Class Mail

Mr. Timothy P. Crowley
Director, Mitigation Division
FEMA Region II
290 Broadway, 29th Floor
New York, NY 10278

RE: FEMA Flood Map Revisions
Bay Side V-Zones
Borough of Mantoloking, Ocean County

Dear Mr. Crowley:

Hatch Mott MacDonald (HMM) is submitting this letter on behalf of the Borough of Mantoloking in response to FEMA's letter dated March 28, 2014, in which FEMA invited comments on the Preliminary FIRM and FIS report. Our comments include: follow-up of previously submitted comments regarding probability and wind direction and wave height analysis (addressed in FEMA's February 24, 2014 letter); responses to requests for additional information contained in FEMA's February 24, 2014 letter; elevation information obtained by a Professional Land Surveyor along the bayside transects and recommendations on using this supplemental information to delineate more accurate flood zones; and additional concerns prepared following a detailed review of the Preliminary FIRM and FIS.

We would note that the comments contained herein related to the probability and wind direction items are simply a general restatement of our earlier comments (contained in our December 7, 2012 and April 29, 2013 correspondence) since FEMA's answer to our concerns on this matter did not include a point-by-point response. Furthermore, we have repeatedly requested starting wave data from FEMA that was used in the back bay wave analysis, and we were repeatedly promised by more than one FEMA or RAMPP Team staff member that we would be provided with the Technical Support Data Notebook (TSDN) with this data in response to our requests at the time of the release of the Preliminary FIRM, but we are now told that this data will not be available to us until the formal appeal period. Our understanding of FEMA's position on both the probability issues and the wave height analysis would be significantly improved if we had access to this document; and the internal costs to the Borough of Mantoloking would be significantly less if we did not need to generate this existing data to complete our alternative wave modeling.

1.0 Probability and Wind Direction

In our April 29, 2013 letter to Mr. Robert J. Schaefer, we provided our opinion that the FEMA guidelines (*Atlantic Ocean and Gulf of Mexico Coastal Guidelines Update*, also known as Appendix D.2) on developing FEMA flood maps require that only those wind and wave conditions most likely to accompany the 1% annual chance storm surge should be used to determine V-Zones. In support of this opinion, we cited nine (9) separate sections of that document. However, rather than addressing these items individually, your response, in

essence, simply restated your opinion that "a wave that can physically exist at the time of the peak 1-percent-annual-chance surge occurs will be used for starting-wave conditions". We once again request a point-by-point response to the items we raised relative to the requirements of the guidelines. We also look forward to reviewing the technical basis for FEMA's position once the TSDN is made available to us as promised.

2.0 Wave Height Analysis

The following comments are provided in response to FEMA's February 24, 2014 letter:

FEMA Comment (a)

Our review revealed that the average water depth calculations appear incorrect. For example, at Transect 4510 the submitted water depth is 6.24 ft. NAVD 88, but the 1% SWEL is roughly 7.5ft. Seeing as the clipped fetch array is confined to water/bathy areas it would follow that the average depth has to be greater than the SWEL (7.5). Please update the average water depth, or provide justification for the proposed calculations.

Response:

The ACES input average water depth was calculated by using the still water elevation and ground elevation datasets provided by URS. The average water depth represents the water depth averaged over the fetch length. The fetch array for Transect 4510 shown on Page 2 of FEMA's letter corresponds to the adjusted fetch case which actually has an average water depth of 8.3 ft (see Table 2 in HMM's letter). Table 5, from our December 17, 2013 letter is corrected below to include adjusted average water depths for Transects 4480 and 4510:

Revised Table 5: Fetch Characteristics for ACES Analysis

Transect	Weighted Fetch (miles)	Average Water Depth (ft)
4450	1.34	7.2
4460	1.31	7.5
4470	1.24	6.82
4480	1.17	7.4
4490	0.58	7.98
4500	2.04	8.92
4510	1.84	8.3

It is noted that the fetch and average water depth were not estimated with the geometry of the bay as the limiting boundary, but taking into consideration the inland inundation. There is significant inundation close to the shoreline on the mainland; therefore, the fetch extends beyond the bay shoreline (e.g. Transects 4450 to 4480). Consequently, the average water depth is not necessarily greater in magnitude than the 1% SWEL.

Hatch Mott MacDonald

FEMA Comment (b)

Please use a larger fetch array or provide justification for why the fetch array is limited to a 20 degree sector. It's typical to use a much larger sector (as large as 170 degrees).

Response:

The 20° fetch sector was deemed appropriate, based on the WHAFIS underlying assumption that the wind blows from the same direction as the transect orientation. Nonetheless, a wider fetch array was considered in ACES to test the sensitivity of the results to this assumption. Figure 1 shows a 160° fetch array for Transect 4460 and Table 1 shows the original and new results.

Table 1: ACES-predicted waves for Transect 4460

Case	Weighted Fetch (mi)	H_s (ft)	H_c (ft)	T_p (s)
Original Fetch Array	1.31	1.89	3.02	2.51
Expanded Fetch Array	2.0	2.08	3.33	2.7

H_s – Specific Wave Height H_c – Controlling Wave Height T_p – Peak Wave Period

The results for the expanded fetch array show a slight increase in the ACES-calculated weighted fetch length and in the predicted height and period of the waves. The relatively small increase is likely because the wind direction specified in ACES is aligned with the transect orientation, consistent with the WHAFIS framework. Therefore, the amplification of the fetch array does not have a significant impact on the predicted wave height.

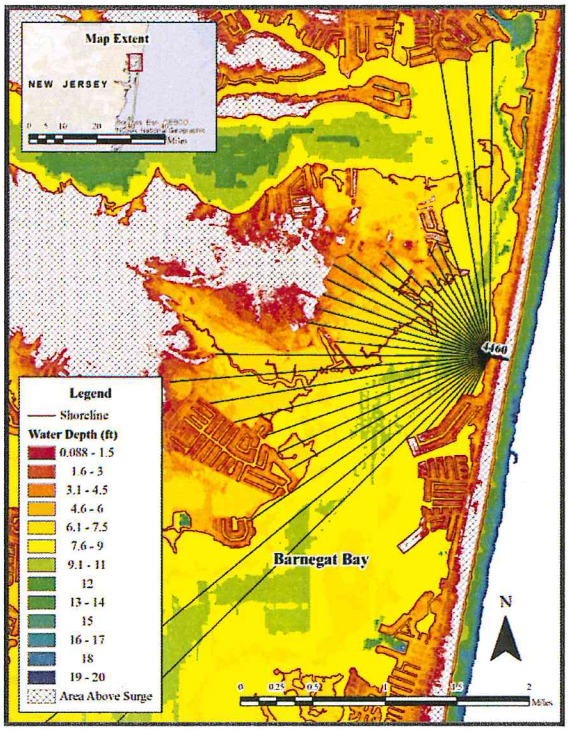


Figure 1 Expanded fetch array for Transect 4460

FEMA Comment (c)

Please provide more details regarding the determination that the shallow restricted fetch analysis in ACES was appropriate. Checking a wave period/water depth combination, revealed that the shallow criteria was not met. According to the Coastal Engineering Manual, deep water assumptions should be used in a restricted fetch analysis unless the predicted wave period exceeds:

$$T_p \cong 9.78\left(\frac{d}{g}\right)^{\frac{1}{2}}$$

Where T_p is the peak wave period, d is the water depth estimated using the average depth across the dominant fetch direction, and g is gravitational acceleration.

Response to Comment (c)

Following the recommendations in CEM, ACES was used for all wave prediction calculations. Since we do not have access to ACES internal calculations it is not possible for us to determine whether or not the program performs the predicted wave period check also recommended in the CEM and referenced in FEMA's comment.

Nonetheless, we tested the sensitivity of the results by selecting the deep water wave growth equations in ACES for the calculations on Transect 4460. As shown in Table 2, the predicted waves are actually smaller than those predicted with the shallow water equations for both the original and expanded fetch arrays.

Table 2: ACES-predicted waves for Transect 4460 (deep water restricted option)

Case	Weighted Fetch (mi)	H_s (ft)	H_c (ft)	T_p (s)
Original Fetch Array	1.31	1.74	2.78	2.43
Expanded Fetch Array	2.0	1.87	2.99	2.55

H_s – Specific Wave Height H_c – Controlling Wave Height T_p – Peak Wave Period

3.0 Supplemental Transect Elevations

HMM has obtained additional elevations along the seven (7) bay side transects that were used by FEMA in the WHAFIS analysis to determine the V-Zones along the bay side shoreline. We expect that this additional information should result in a reduction of the encroachment of the V-Zones depicted on the Preliminary FIRM, since in several cases the presence of a bulkhead or elevated landform results in attenuation of the wave that apparently was not accounted for in FEMA's analysis. It is our expectation that the reduced wave size resulting from a corrected WHAFIS model will require the re-analysis of the V-Zone line connecting these transects, and we anticipate that any reduction in the V-Zone limits may result in the relocation of the LiMWA line and relative locations of the inland A-Zone limits.

The following table contains the additional information, obtained by a NJ-licensed Professional Land Surveyor:

Transect No.	Northing (NAD83)	Easting (NAD83)	Elevation (NAVD88)	Description	Distance from Origin (feet)	Corresponding FEMA Elevation (feet)*	Increase in Elevation (feet)
4450	435,490.70	616,678.80	3.53	Top of BH	15	1.84	1.69
4460	436,876.40	617,050.40	4.23	Top of BH	10	2.42	1.81
	436,875.10	617,055.80	3.46	Ground	15	2.88	0.58
4470	437,825.20	617,301.00	2.79	Top of BH	20	2.21	0.58
4480	439,258.90	617,161.70	2.33	Top of BH	10	2.14	0.19
4490	441,220.40	617,989.40	5.01	Top of BH	17	2.83	2.18
4500	442,812.80	618,199.10	3.51	Ground	7	1.11	2.40
	442,804.10	618,232.80	2.42	Ground	42	2.23	0.19
4510	445,609.10	617,902.40	2.67	Deck	3	0.88	1.79

*FEMA Elevations from OceanNJ_CHAMP.mdb (interpolated, as necessary).

The above information should also be used to address an additional unanswered comment contained in our December 17, 2013 letter – specifically,

> *"...that [FEMA] appears to have failed to account for the presence of attenuating structures, including bulkheads, around the westerly peninsula at the north end of the Borough (Channel Lane, immediately north of Transect 4510) which is shown as completely within the V-Zone. Furthermore, it is our understanding that the delineation of the V-Zone between transects is based on LIDAR and other topographical information to derive the location of the V-Zone boundary. The correct application of this method would result in the V-Zone working its way around the peninsula, not cutting directly across it as the Preliminary Work Map shows."*

Based on the additional data obtained by HMM's Professional Land Surveyor, this concept should be applied at all transects, not just Transect No. 4510. (See additional discussion of this issue in Section 4.0.)

4.0 Additional Concerns

- As indicated in the FIS and mentioned in Section 3.0 of this report, transect elevation data is used to determine the expected height of the wave crests and run-up utilized by WHAFIS modeling to determine the FIRM's flood boundary limits. As these transects are quiet a distance apart, it is mentioned that elevations were interpolated using topographic maps, land-use and land-cover data and engineering judgment to determine the extent of the flood zones. HMM has reviewed these determinations of the proposed zones and offers at least three (3) distinct proposed revisions per the attached Plates (1-3), where significant grade changes exist which were not captured in the flood mapping. Please note that the suggested revisions shown on Plates 1-3 are meant to serve as examples of how the flood zones may be redrawn based on the additional provided survey information along the transects as well as on the high-accuracy topographic mapping, which we have attached for your use and

consideration. They are not meant to represent a precise delineation of those zones, but an outcome that we would expect as a result of more detailed analysis to be performed by FEMA, utilizing underlying data in your possession. We can also provide the detailed topographic data in a CAD file, in NAD83 and NAVD88 datums, for your use.

- On Map Number 34029C0218G (Panel 218 of 660), it was noticed that there is a discrepancy with a flood zone designation as a Zone X provided with Base Flood Elevation of VE15. Clarification shall be provided on the flood designation of this area.

- As mentioned in FEMA's March 28, 2014 letter transmitting the proposed Preliminary FIRM and FIS documentation, it will be approximately 7 to 10 months until the new FIRM and FIS become effective. FEMA should be aware that the Borough will be undergoing various projects along their oceanfront that will mitigate the flood risk to the Borough prior to the issuance of the FIRM/FIS. One project includes the installation of a steel sheet pile sea wall with crest elevation 15 NAVD88 within the dune system that will extend from the Southern municipal limit of Brick Township through Lyman Street of the Borough of Mantoloking (a newly constructed stone revetment with crest elevation 18 NAVD88 now exists from Lyman Street to the Borough's Northern municipal border which continues into the Borough of Bay Head). Another project that is scheduled for installation is the USACE Beachfill and Dune Project, Manasquan Inlet to Barnegat Bay Inlet. The steel sheet piling project has been awarded with installation activities scheduled to commence in May 2014 while the USACE Beachfill is scheduled to be awarded in October 2014. If these projects are constructed prior to the issuance of the new FIRMS and FIS, will the FIRM/FIS be revised to address this change prior to issue?

5.0 References (Relative to Section 2.0 of this Report)

Moffatt & Nichol Memorandum, Santiago Alfageme, PE and Arturo Jimenez (Moffat & Nichol) to Robert Mainberger (HMM), March 14, 2014.

Federal Emergency Management Agency (FEMA). www.fema.gov

Federal Emergency Management Agency (FEMA). (2007). "Guidelines and Specifications for Flood Hazard Mapping Partners." Section D.2.7 Overland Wave Propagation.

National Oceanic and Atmospheric Administration (NOAA) National Weather Service. http://www.weather.gov/

Rohweder, Jason, Rogala, James T., Johnson, Barry L., Anderson, Dennis, Clark, Steve, Chamberlin, Ferris, and Runyon, Kip. (2008). "Application of wind fetch and wave models for habitat rehabilitation and enhancement projects." U.S. Geological Survey Open-File Report 2008–1200, 43 p.

Shore Protection Manual (SPM) Volume One. (1984). U.S. Army Coastal Engineering Research Center. P 3-66.

Hatch Mott MacDonald

Additional attachments by reference:

- Plates 1, 2, and 3 – Specific Flood Zone Modification Markups – Examples
- Topographic Mapping – Four (4) sheets, National Map Standard Accuracy, 1"=50' on NAD83 and NAVD88.

Thank you for your attention to this matter. Should you have any questions, please do not hesitate to contact our office.

Very truly yours,

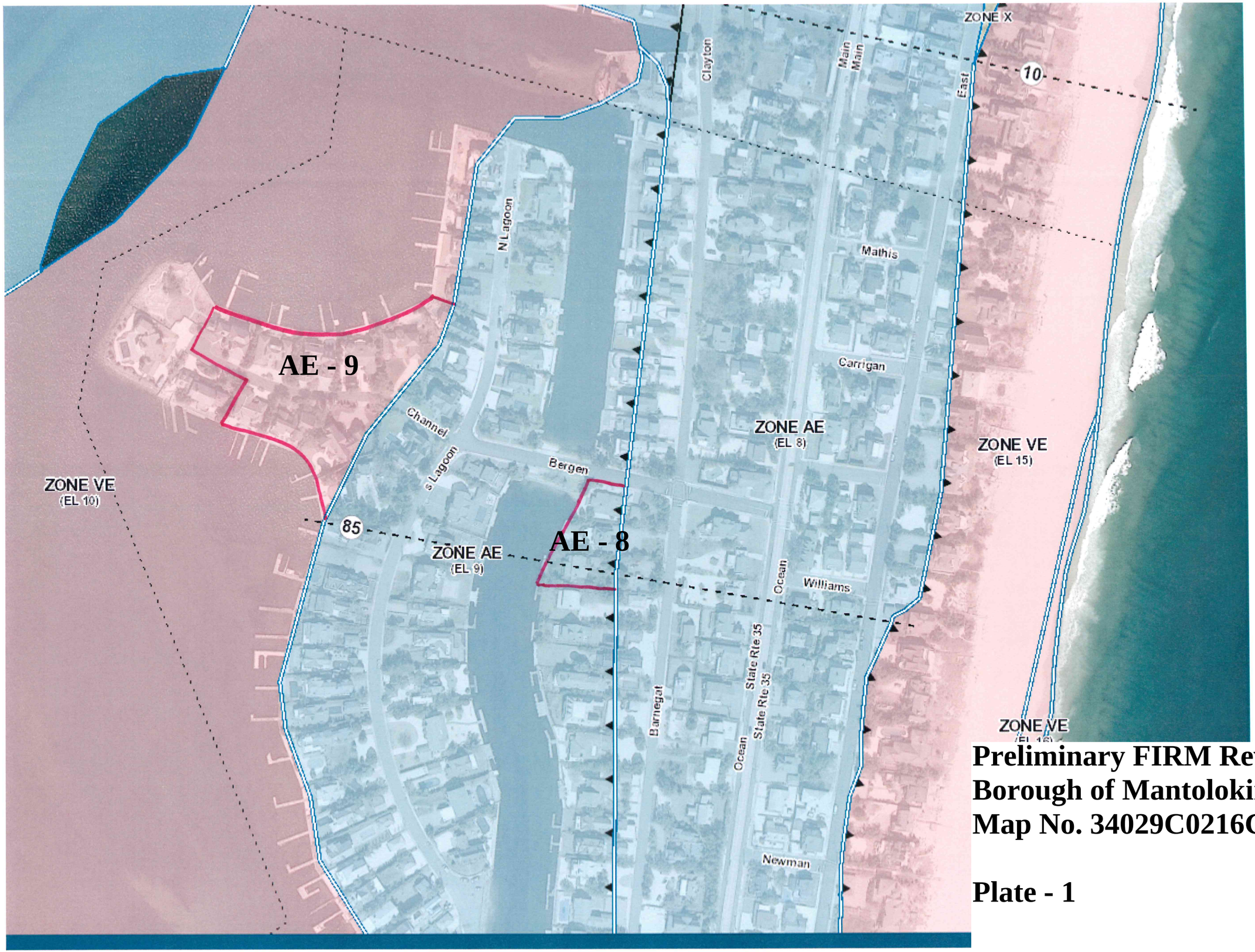
Hatch Mott MacDonald

Robert C. Mainberger, PE, CME
Senior Vice President
T 732.780.6565 F 732.577.0551
robert.mainberger@hatchmott.com

Thomas R. Thornton, PE, CME
Senior Associate
T 609.465.9377 F 609.465.5270
thomas.thornton@hatchmott.com

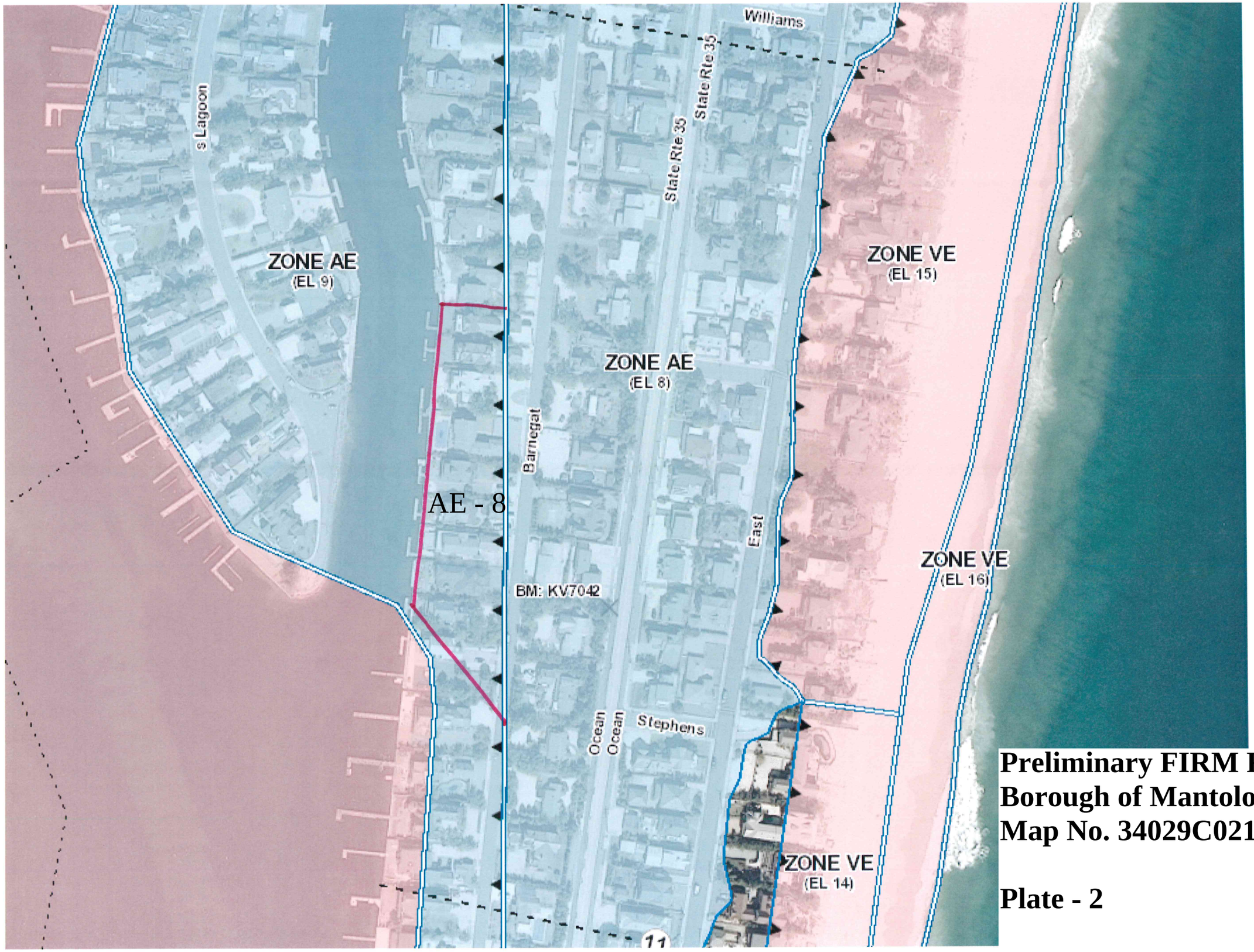
TRT/RCM/FXB
encl.

cc: The Honorable George C. Nebel
Edwin J. O'Malley, Esq.
Robert J. Schaefer, FEMA
John Moyle, PE, NJDEP
Tolga Yilmaz, RAMPP
Jean Huang, RAMPP
Joseph Ruggeri, NJDEP
Paul Weberg, FEMA Region 2
Eric C. Betz, PE, BCEE, CME, Hatch Mott MacDonald
Frank Bruton, CFM, Hatch Mott MacDonald
Santiago Alfageme, PE, Moffatt & Nichol



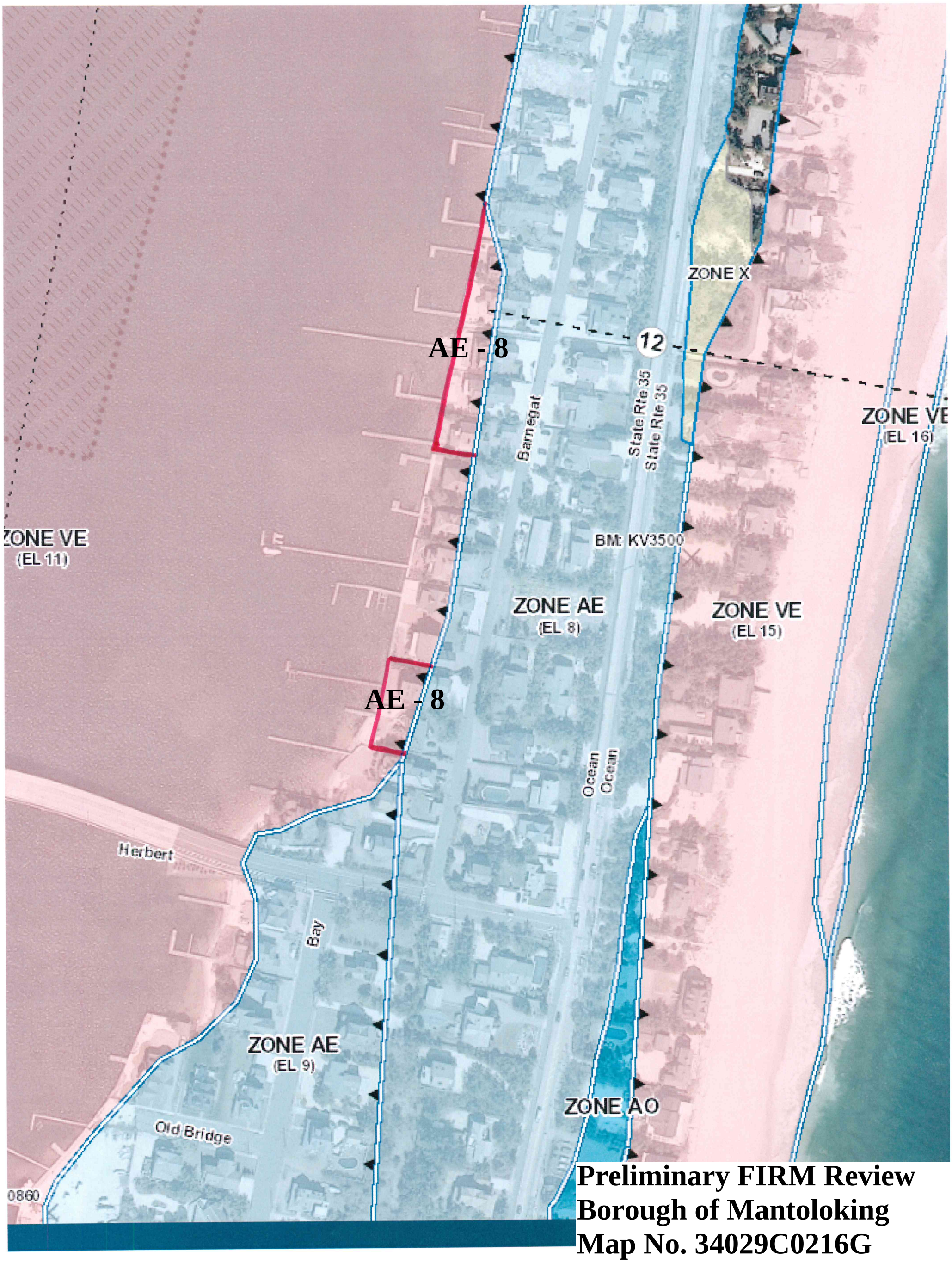
Preliminary FIRM Review
Borough of Mantoloking
Map No. 34029C0216G

Plate - 1



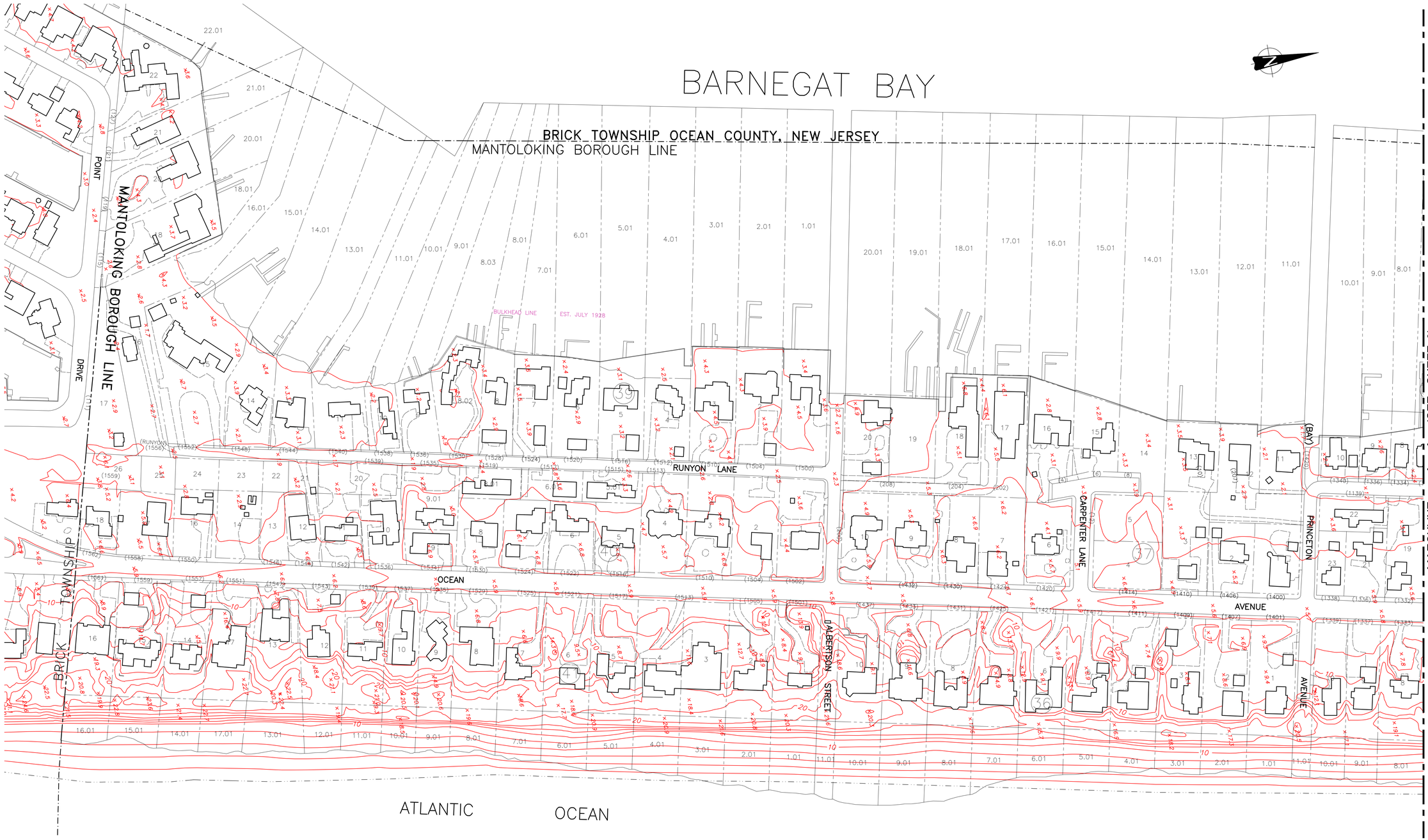
Preliminary FIRM Review
Borough of Mantoloking
Map No. 34029C0216G

Plate - 2



Preliminary FIRM Review
Borough of Mantoloking
Map No. 34029C0216G

Plate - 3



PLAN

100 0 100 200
SCALE IN FEET

Hatch Mott MacDonald
Certificate No. 24GA28016600
3 Paragon Way
Freehold, New Jersey 07728

BOROUGH OF MANTOLOKING
OCEAN COUNTY, NEW JERSEY

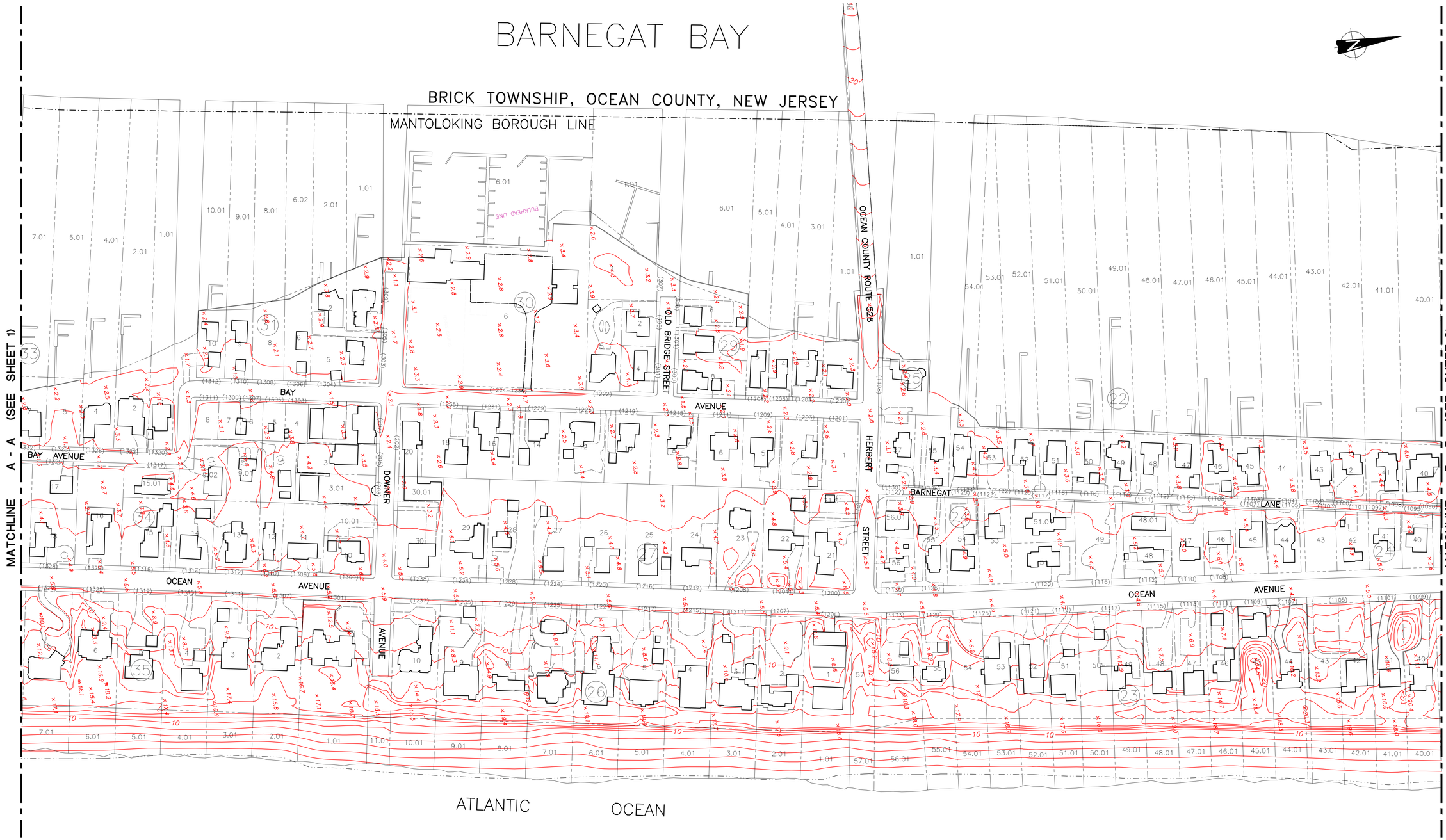
HURRICANE SANDY
BOROUGH-WIDE MAPPING

PLAN

Job	No.	
	1	
	B/O	Total
	1	4

Contract No. –

G:\USERS\CCK35050\APPDATA\LOCAL\TEMP\ACPUBLISH_5524\HURRICANE SANDY CONTOUR MAP 4-24-14.DWG 04/25/2014



PLAN

100 0 100 200
SCALE IN FEET

Hatch Mott MacDonald
Certificate No. 24GA28016600
3 Paragon Way
Freehold, New Jersey 07728

BOROUGH OF MANTOLOKING
OCEAN COUNTY, NEW JERSEY

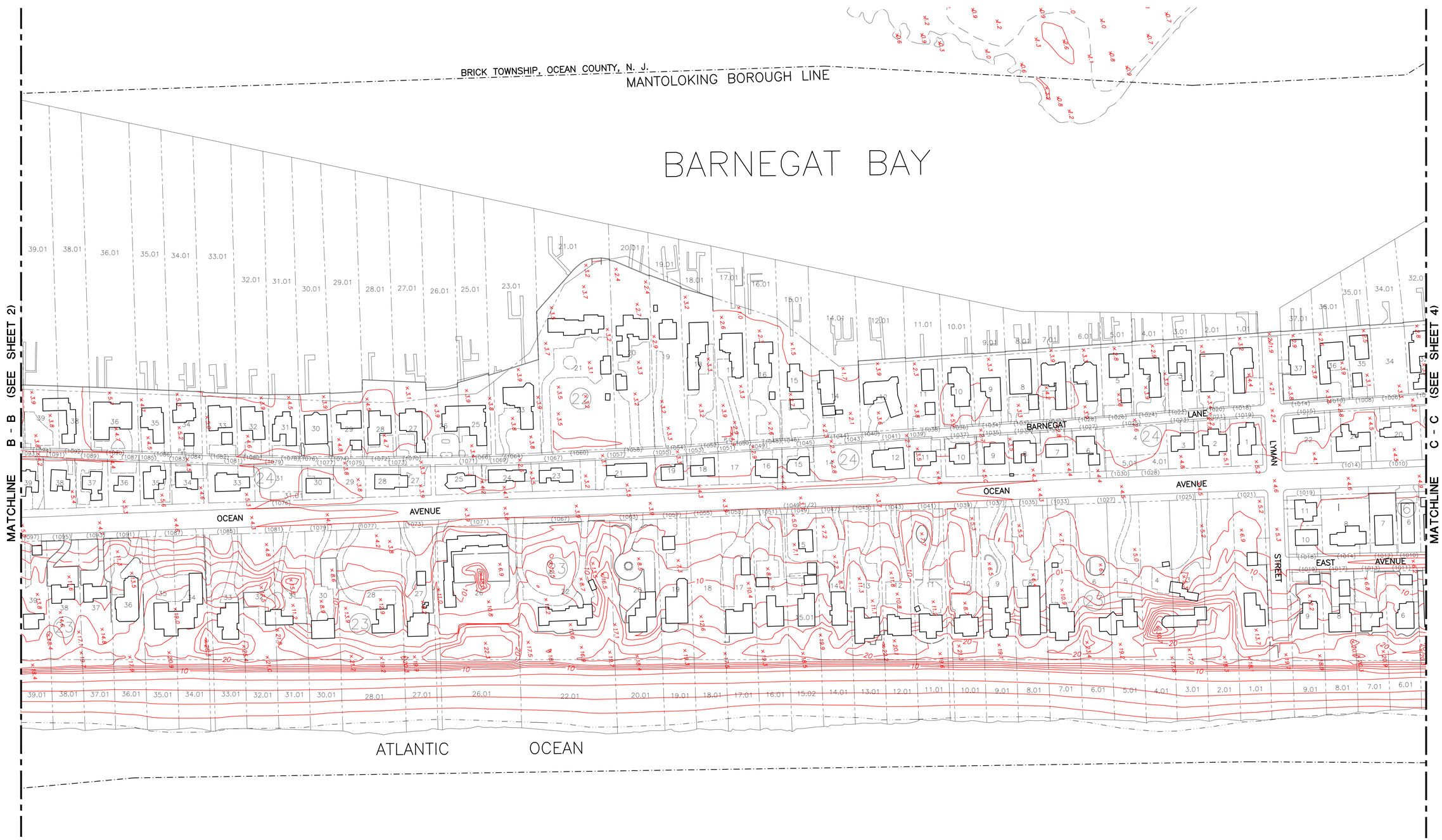
HURRICANE SANDY BOROUGH-WIDE MAPPING

PLAN

Job	No.	
	2	
	B/O 2	Total 4

Contract No. –

Q:\USERS\CGK35050\APPDATA\LOCAL\TEMP\ACPUBLISH_5524\HURRICANE SANDY CONTOUR MAP 4-24-14.DWG 04/25/2014



PLAN

100 0 100 200
SCALE IN FEET

Hatch Mott MacDonald
Certificate No. 24GA28016600
3 Paragon Way
Freehold, New Jersey 07728

BOROUGH OF MANTOLOKING
OCEAN COUNTY, NEW JERSEY

HURRICANE SANDY
BOROUGH-WIDE MAPPING

PLAN

Job	No.	
	3	
	B/O	Total
	3	4

Contract No. –

C:\USERS\EX35050\APPDATA\LOCAL\TEMP\ACPUBLISH_5924\HURRICANE SANDY CONTOUR MAP 4-24-14.DWG 04/29/2014

PLAN

SCALE IN FEET 100 0 100 200

BOROUGH OF MANTOLOKING
OCEAN COUNTY, NEW JERSEY

HURRICANE SANDY BOROUGH-WIDE MAPPING

PLAN

Hatch Mott MacDonald
Certificate No. 24GA28016600
3 Paragon Way
Freehold, New Jersey 07728

Job	No.	
	4	
	B/O	Total
	4	4

Contract No. –

P:\MANTOLOKING BOROUGH\HURRICANE SANDY\26--FLOOD ZONES A - V AND LMMA\HURRICANE SANDY CONTOUR MAP 4-24-14.DWG 04/25/2014