Panel Decision & Report

SRP NHRR030916 – Rye, Rockingham County, NH

January 23, 2017

National Institute of BUILDING SCIENCES

Table of Contents

Summary

Based on the submitted scientific and technical information, and within the limitations of the Scientific Resolution Panel, the Panel has determined that the Town of Rye, Rockingham County, NH data and methodology does not satisfy NFIP standards, therefore FEMA's data is not corrected, contradicted, or negated.

Introduction

This report serves as the recommendation to the Federal Emergency Management Agency (FEMA) administrator from the National Institute of Building Sciences (Institute) the Town of Rye, Rockingham County, NH (Community) Scientific Resolution Panel (SRP). SRP's are independent panels of experts organized, administered and managed by Institute for the purpose of reviewing and resolving conflicting scientific and technical data submitted by a community challenging FEMA's proposed flood elevations. The SRP is charged with helping to efficiently resolve appeals between FEMA and communities by acting as an independent third party in an effort to obtain the best data possible for the community's Flood Insurance Rate Maps (FIRM's).

Panel

Panel ID: NHRR030916
Panel Name: Rye, Rockingham County, NH
FEMA Region: I

Panel members:

- **Rafael Cañizares Ph.D.**, Associate Vice President and Senior Coastal Scientist, Moffatt & Nichol, New York, NY.

  Dr. Cañizares joined Moffatt & Nichol in 2000, where he leads the development and application of 2D and 3D numerical models of estuarine and coastal environments. He possesses significant experience in the development and application of morphological models of coastal and estuarine areas, which includes the integration of hydrodynamic, wave, and sediment transport modeling. His experience in the field of storm surge modeling and forecasting includes development of regional coastal models and their integration with data assimilation techniques for the purpose of model correction, calibration, and initialization, which earned him a Ph.D. at the Technical University of Delft in the Netherlands. While a post-doctoral scientist at the Lamont Doherty Earth Observatory of Columbia University, he conducted research on a coupled ocean-atmosphere tropical pacific model for El Niño Southern Oscillation predictions. Dr. Cañizares has also been involved in the evaluation process of potential impacts associated with projects in coastal and estuarine environments using numerical models, including water quality models.

- **Michael Giovannozzi, P.E.**, Senior Coastal Engineer, AquaTerra Consulting Intl., West Palm Beach, FL

  Mr. Giovannozzi has over 16 years of experience in coastal engineering with the US Army Corps of Engineers and with the private sector. His wide-ranging expertise includes dredging and navigation studies, marina planning and design, wave and hydrodynamic studies, beach nourishments, physical and numerical modeling, and the design of traditional and innovative shore protection structures. He has considerable experience in FEMA coastal flood plain mapping and Letter of Map Revision (LOMR) applications. His education includes a Bachelor of Civil Engineering and a Master of Civil Engineering (with coastal engineering specialty) from the University of Delaware. Michael is a working group member of the World Association for Waterborne Transport Infrastructure (PIANC), Vice-Chair of PIANC Young Professionals (YP), and a member of the American Society of Civil Engineers (ASCE) Coasts, Oceans, Ports and Rivers Institute (COPRI). He is a Registered Professional Engineer in nine states.

- **David L. Kriebel, Ph.D., P.E., D.CE**., President, Coastal Analytics LLC , Millersville, MD

  Dr. Kriebel is a consultant in coastal and ocean engineering through his firm Coastal Analytics LLC. He is also a Professor of Ocean Engineering at the U.S. Naval Academy in Annapolis, Maryland, where he has taught coastal engineering and other courses for 29 years. He has authored about 100 papers and reports on coastal and ocean engineering topics, including sea level rise, ocean waves, coastal flooding, coastal erosion, coastal structures, port and harbor structures, dredging, ship-generated waves, and hurricane and tsunami impacts. He has contributed to the Corps of Engineers *Coastal Engineering Manual*, the FEMA *Coastal Construction Manual*, and the American Society of Civil Engineering standard *ASCE-7 Minimum Design Loads for Buildings and Other Structures*. Dr. Kriebel has served as President, and on the Board of Directors, of the Coasts, Oceans, Ports, and Rivers Institute (COPRI) of the American Society of Civil Engineers (ASCE), the major professional society serving coastal engineers. He also served as one of three civilian members appointed to the Coastal Engineering Research Board, a federal advisory committee to the U.S. Army Corps of Engineers. Dr. Kriebel received his Ph.D. from the University of Florida in coastal and oceanographic engineering. He is a Registered Professional Engineer in Virginia and Alaska, and is certified as a Diplomate in Coastal Engineering by the Academy of Coast, Ocean, Port, and Navigation Engineers. Dr. Kriebel Chaired this SRP.

- **Spencer Rogers**, Extension Specialist in Hurricane-Resistant Construction and Shoreline Erosion, North Carolina Sea Grant, Wilmington, NC.

  Spencer Rogers joined North Carolina Sea Grant in 1978 as a coastal engineering extension specialist in hurricane-resistant construction techniques, shoreline erosion, coastal management and marine construction. His faculty affiliations are with the University of North Carolina at Wilmington's Center for Marine Science and an adjunct with the North Carolina State University's Department of Civil Engineering. He was previously employed by Florida Bureau of Beaches and Shores. His education includes a B.S. in Engineering from the University of Virginia in 1973 and a M.S. in Coastal and Oceanographic Engineering from the University of Florida in 1975. Recent work includes participation in FEMA's Hurricane Katrina Mitigation Assessment Team (MAT), damage assessments for the American Society of Civil Engineers (ASCE) following Hurricanes Katrina and Ike, as well as damage assessment projects for the Corps of Engineers following Sandy. He co-authored *The Dune Book*, a North Carolina Sea Grant guidebook on dune species, planning, and best management practices along developed shorelines. He also has contributed to the FEMA Coastal Construction Manual.

- **Elizabeth Sciaudone, Ph.D., P.E.**, Research Assistant Professor, North Carolina State University, Raleigh, NC.

  Dr. Sciaudone has worked at North Carolina State University, in Raleigh, North Carolina, since 2007. Prior to that, she worked in private consulting with Moffatt & Nichol Engineers. She has over 15 years of experience in coastal engineering research and design. Projects include work on beach stabilization, post-hurricane dune construction, Letters of Map Revision (LOMR), sediment budgets, and coastal highway vulnerability analyses. She has published peer reviewed articles on vulnerability of coastal dunes, identification and analysis of coastal erosion hazard areas, remote sensing of barrier island morphology, and topographic analysis of dune volume and position. She has presented at national and international sediment transport and coastal engineering conferences. Dr. Sciaudone has served on the North Carolina Science Panel, advising state regulators on coastal issues, since 2010. Current research work includes development of highway vulnerability indicators and dune construction guidelines for overtopping considering a constructed beach berm. She has taught introductory coastal engineering and fluid mechanics courses as well as preparatory courses for the F.E. and P.E. exams. Her educational background includes a B.S.E. from Duke University and M.C.E. and Ph.D. from North Carolina State University. She holds a P.E. in the state of Florida.

Basis for Appeal

In a letter dated 28 November 2014, the Community, NH appealed a portion of the Preliminary Flood Insurance Rate Maps (PFIRMs) for Rockingham County that were released on April 9, 2014. This appeal was received within the initial 90 day appeal period following the announcement of the FIRM revisions in the *Federal Register*. The appeal focused on the Special Flood Hazard Area (SFHA) in the vicinity of 2220 Ocean Boulevard, Rye, NH, which appears on PFIRM panel #33015C0432F.

The appeal sought to amend the preliminary base flood zone elevations and SFHA delineations in the vicinity of FIRM Transect TR-39. There were two elements of the PFIRM being appealed. The first element of the appeal was a request to revise Base Flood Elevations (BFEs) based on a restudy of wave setup, runup, and overtopping conducted by Woods Hole Group. The second element of the appeal contested the extent of the mapped VE zone based upon FEMA's alleged misidentification of a Primary Frontal Dune (PFD) in this area.

FEMA and the Town engaged in dialogue for about 10 months with numerous additional communications and submissions of data from the Community. By letter dated 20 November 2015, FEMA issued a decision regarding the appeal.

FEMA accepted the first element of the appeal, thus accepting the revised wave setup and runup analysis submitted by the Community. FEMA rejected the second element of the appeal, noting that that:

> "The PFD delineation for the subject area originated from a regional approach, including examination of overall coastal morphology between FIS Transects 36 and 43. While the area does not exhibit typical dune features as a result of development patterns, topographic profiles generated from LiDAR substantiate the presence of a dune footprint."

The FEMA letter also recognized that the property under consideration was located behind a privately-owned seawall and further stated:

> "Retaining the PFD delineation, coupled with the fact that the seawall at the subject address is not a FEMA-certified structure, results in the VE zone extent remaining as originally mapped based upon FEMA 2007 Atlantic Ocean and Gulf of Mexico Coastal Guidelines Update, Section 2.10.2.1."

FEMA subsequently issued a Revised PFIRM on 24 February 2016. On 9 March 2016, the Community then reissued a request for a Scientific Resolution Panel (SRP), originally dated from 8 December 2015. Data from the Community for the SRP appeal was then received by FEMA on 8 August 2016. This included: Coastal Hazard Analysis Modeling Program (CHAMP) Modeling Files, Geographic Information Systems (GIS) shapefiles, Simulating WAves Nearshore (SWAN) Modeling Files, a Wood Hole Group report dated 28 November 2014, the FEMA resolution letter of 20 November 2015, and the revised PFIRM from 24 February 2016.

Based on FEMA's acceptance of the first of the two appeal elements, the issue before the SRP is the second of the two appeal elements: whether the site (transect) contains a PFD that would serve to establish the landward zone of the VE zone boundary. In addition, however, FEMA's response in the 20 November 2015 letter also raises the issue of the seawall on site, something noted but not addressed or analyzed in the Community's appeal package. As the FEMA letter states, the role of the seawall is "coupled" to the question of the PFD, and thus is also an important factor for the SRP to consider. In fact, the central issue in this case is whether the VE zone should be located at the landward heel of the PFD, as FEMA proposed in the PFIRM, or at the seawall location, as the Community proposed in the appeal.

Summary of Panel Procedures

The SRP was selected in late September 2016 and a kickoff meeting was held on 21 October 2016 via web-based teleconference. Ms. Dominique Fernandez, Director for National Institute of Building Sciences, presented the procedures to be used by the panel, panel members were introduced, and a panel chair was selected. The proposed schedule for the SRP review was established. A discussion of communication protocol between the Panel, the Community, FEMA, and the Institute was also conducted.

The Panel was tasked to review only the technical information and appeal data provided to the Panel. Those data were conveyed to Panel members via the Institute's web-based portal. Deliberations were to be focused on the scientific and technical issues presented and the correctness of the appeal data. The Panel's objective was to determine which of the two provided analyses, FEMA or the Community, was more scientifically and technically correct. Panel members were instructed that they could not introduce new data, suggest alternative methods, or conduct alternative analyses, nor could the Panel offer any alternative determination as a resolution.

After reviewing the Community's and FEMA's data, the Panel was to arrive at a majority decision regarding the data. A written report of the analysis and findings was to be prepared. All internal Panel decisions were to be considered confidential until the final Panel decision was made public by the Institute or FEMA Administrator. All subsequent Panel meetings and presentations were conducted via web-based teleconference calls.

A second Panel meeting was held on 10 November 2016 to review the panel timeline and to review appeal documents provided by the Institute. Discussion focused on the primary issue of the PFD as well as on the implications of the seawall to the case. A set of questions were developed by the panel and these were subsequently passed to the Institute for dissemination to both FEMA and the Community.

A third meeting was held on 17 November 2015 during which both FEMA and the Community made presentations to the panel. Panel members posed questions to the presenters to clarify the information presented and to evaluate the issues.

A fourth Panel meeting was held on 22 November 2015 to discuss the information from the Community and FEMA presentations and to assess the correctness of the data and analyses presented. This meeting was preceded by a "straw poll" or non-binding vote of panel members so that preliminary opinions could be assessed to guide discussion.

A fifth Panel meeting was held on 1 December 2015, preceded by a second straw poll of Panel members. In the straw poll, panel members provided comments for their non-binding vote as points of discussion.

A sixth and final meeting of the Panel occurred on 15 December 2015. A voice vote was conducted at this meeting with a near unanimous vote. However, one member requested additional time to clarify a matter related to the SRP review policy. Following clarification of the SRP review policies, a final vote was conducted a week later by email on 22 December 2015. The result was a unanimous opinion of the Panel.

A draft Report was prepared by the Panel Chair containing the conclusions of the Panel. The draft Report was distributed to the Panel members on 11 January 2017. Panel members provided editorial feedback and the final report was submitted to the Institute on 20 January 2017.

Recommendation

Based on a unanimous vote, the Panel recommends denial of the Community's appeal regarding the PFD and location of the VE zone boundary. The Community's data does not satisfy NFIP mapping standards defined in FEMA's Guidelines and Specifications for Flood Hazard Mapping Partners (References [1] and [2]). FEMA's data is not corrected, contradicted, or negated.

Rationale for Findings

Findings Related to Seawall

Both FEMA and the Community have agreed that the seawall on site is not a FEMA Certified structure. As a result, per FEMA Guidelines, the seawall cannot be considered as providing complete protection during the 1-percent-annual-chance flood, and flood effects including erosion and wave action would occur landward of the seawall location. The SRP therefore concluded that the Community's proposed VE zone boundary at the intact wall location cannot be correct.

The Community's appeal submitted during the original appeal period only considered an intact seawall. The data submitted by the Community during the 90 day review period, which is the only information that can be considered by the SRP for review, did not include a seawall failure analysis nor did it consider wave action and erosion, either scour at the base of the wall or erosion landward of the wall, per FEMA guidance. The Community's appeal therefore did not correctly evaluate the effect of the non-certified structure and therefore does not satisfy the NFIP standards or negate FEMA's original analysis.

In the absence of certification of the structure, or of a failure analysis in the original appeal document and data, the SRP must therefore remove the seawall from consideration. SRP rules prohibit the SRP from conducting its own detailed analysis. Given the above, the SRP can only conclude that the Community's proposed mapping of the VE zone boundary at the intact seawall location is not consistent with FEMA guidelines and the VE zone boundary should be mapped at a location landward of the seawall.

Relevant guidance regarding the effect of the seawall on the VE zone boundary is contained in Reference [1] in section D.2.11.2.1 as follows:

> "It is possible that a PFD may be identified landward of a shore protection structure. If the structure can be certified per the criteria in the April 23, 1990, FEMA memorandum (FEMA 1 990), Criteria for Evaluating Coastal Flood Protection Structures for National Flood Insurance Program Purposes (see Subsection D.2.10.2.1), the VE Zone should be delineated based on the wave analyses for that transect (criteria 1-3, as applicable), not on the PFD heel. If the structure cannot be certified and will partially or completely fail during the base flood, the VE Zone should be mapped to the PFD landward heel."

This indicates that the VE zone boundary should be located at the landward heel of any Primary Frontal Dune that might be located behind the seawall.

Findings related to PFD

In general, FEMA Guidance for the inland limit of VE zones allows for four possibilities (From Section D.2.11.2.1 of Reference [1]) as:

- The wave runup zone occurs where the (eroded) ground profile is 3.0 feet or more below the 2-percent wave runup elevation.
- The wave overtopping zone landward of the crest of an overtopped barrier, in cases where the potential 2-percent wave runup exceeds the barrier crest elevation by 3.0 feet or more.
- The breaking wave height zone occurs where 3-foot or greater wave heights could occur
- The primary frontal dune zone, as defined in 44 CFR Section 59.1 of the NFIP regulations

The actual VE Zone boundary shown on the FIRM is then defined as the farthest inland extent of any of the four criteria listed above.

In this appeal, the absence of wave runup, overtopping, or wave height analysis landward of the failed seawall in the original appeal documents therefore makes the presence of a PFD the key factor in determining the VE zone boundary.

FEMA regulations define a PFD as follows [44 CFR Section 59.1, Reference [2]]:

> "Primary frontal dune means a continuous or nearly continuous mound or ridge of sand with relatively steep seaward and landward slopes immediately landward and adjacent to the beach and subject to erosion and overtopping from high tides and waves during major coastal storms. The inland limit of the primary frontal dune occurs at the point where there is a distinct change from a relatively steep slope to a relatively mild slope. "

The appeal package included ground photographs, beach profiles or cross sections of the transect, Light Detection and Ranging (LiDAR) topographic data for the transect and surrounding areas, and information from a GIS layer identifying sand dune resources from the New Hampshire Department of Environmental Sciences (NHDES). Regarding the NHDES layer, the SRP cannot accept the state delineation of dunes because the state's methodology does not follow FEMA Guidance nor does it identify dunes for the same regulatory purposes as FEMA. The SRP then concluded that the other data supported the presence of a PFD on the transect and did not negate, contradict, or correct the FEMA analysis.

Based on the reviewed information, the SRP concluded that the project area meets the definition of a PFD for the following reasons:

1. The transect, LiDAR data, and PFIRM show that a continuous or nearly continuous mound or ridge exists on the site, and that such a ridge would be expected from regional interpretation of geomorphic features of the surrounding area as stated by FEMA.

2. The transect shows relatively steep seaward and landward slopes either side of the topographic high point or ridge. While slopes are not "steep" in an absolute sense, they are steep relative to the topographic high point and to areas farther landward. Ground elevations landward of the seawall rise and then fall again back toward the road. This gives an appearance in the transect of a dune.

3. The transect landward of the seawall location would be subject to erosion. All parties agree that sediment landward of the seawall is erodible, and under the assumption that the wall will fail, erosion will occur.

4. The transect landward of the wall location would be subject to overtopping from high tides and waves during major coastal storms. This would be expected under the assumption that the wall will fail and erosion occurs.

FEMA's response letter of 10 November 2015 states that: "While the area does not exhibit typical dune features as a result of development patterns, topographic profiles generated from LiDAR substantiate the presence of a dune footprint." The SRP considered the Community argument that a PFD no longer exists in this area, and that the area did not have certain common features of a typical dune as a result

of prior development (grading) and vegetation (maintained yard rather than native dune grasses). The SRP concluded however that any land modification (cut, fill, or regrading), alternative vegetation type, or the presence of the home and driveway did not negate the fact that the area functions as a primary frontal dune.

The SRP discussed the fact that the VE zone boundary seemed to follow a topographic contour from the LiDAR surveys that wrapped around homes and followed building pad outlines, as opposed to another method of defining the landward heel of the PFD. However, the SRP was not asked to propose any alternative mapping procedure and can only compare FEMA's proposed mapping with that proposed by the Community. As noted, the SRP concluded that the Community mapping at the location of the intact seawall was incorrect. The Community did not provide any compelling new evidence to suggest that FEMA's delineation was incorrect.

References

[1] Guidelines and Specifications for Flood Hazard Mapping Partners, FEMA, February 2007. Atlantic Coast and Gulf of Mexico Guidelines Update. Final Draft.

[2] National Flood Insurance Program Regulations, 44 CFR, Section 59. https://www.fema.gov/media-library-data/20130726-1622-20490-9635/section59_1.pdf