



Public Employees for Environmental Responsibility

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Before the U.S. Department of Commerce
National Oceanic and Atmospheric Administration (NOAA)
WASHINGTON, D.C.

PUBLIC EMPLOYEES FOR
ENVIRONMENTAL
RESPONSIBILITY

Complainant,

v.

U.S. DEPARTMENT OF COMMERCE
Agency.

Dkt. No. _____

November 19, 2009

Data Quality Act Challenge

*Assessment of Potential Tsunami Impact
for Pearl Harbor, Hawaii*

**COMPLAINT OF
PUBLIC EMPLOYEES FOR ENVIRONMENTAL RESPONSIBILITY (PEER)
PURSUANT TO THE DATA QUALITY ACT OF 2000**

To: NOAA Section 515 Officer
NOAA Executive Secretariat
Herbert C. Hoover Building – Room 5230
14th & Constitution Avenue, N.W.
Washington, D.C. 20230



Pursuant to the Data Quality Act of 2000 [Section 515 of the Fiscal Year 2001 Treasury and General Government Appropriations Act, Pub.L. 106-554], Public Employees for Environmental Responsibility (PEER) respectfully demands that the National Oceanic & Atmospheric Administration (NOAA) withdraw or rescind its August 2006 *Assessment of Potential Tsunami Impact for Pearl Harbor, Hawaii* (NOAA Technical Memorandum OAR PMEL-131, hereinafter "the Assessment").

The Assessment is based on inaccurate, incomplete and unreliable information regarding the risks of tsunami impact on Ford Island, the proposed site of the Pacific Tsunami Warning Center. Because of the potential loss of life that could result from moving the Pacific Tsunami Warning Center (PTWC) to an island in an inland waterway, PEER respectfully demands that NOAA withdraw or rescind the Assessment. Moreover, PEER strongly urges NOAA to conduct a new, thorough assessment of such risks *prior* to moving the PTWC to Ford Island.

The PTWC bears significant responsibility for interpreting data and disseminating information to emergency response officials, the media and the public concerning tsunami-related events. The PTWC's ability to perform this vital function is a major public safety concern. Not only does the PTWC serve the citizens of Hawaii and the Pacific Coast, but it also serves also nearly all the other countries surrounding the Pacific, Indian and Caribbean basins. If the Center is moved based on the conclusions of the Assessment as it is currently drafted, NOAA will have significantly jeopardized PTWC's ability to successfully warn and protect the public from a tsunami disaster. This risk is unnecessary and unacceptable considering that the safety of millions could be jeopardized.

Through this complaint, PEER seeks to induce NOAA to take immediate action to ensure that its decisions about relocating the PTWC are based on sound science and reliable evidence that the new location would not threaten the capability of the PTWC to function precisely when it is most needed.

Standing

PEER is a non-profit organization chartered in the District of Columbia with the mission to hold government agencies accountable for enforcing environmental laws, maintaining scientific integrity, and upholding professional ethics in the workplace. PEER is an “affected person” as defined in NOAA’s Information Quality Guidelines in that PEER has thousands of employee and citizen members nationwide, including employees both within NOAA and in other public agencies whose work is hampered by reliance upon inaccurate, incomplete and poor quality information that is the subject of this complaint.

The Assessment is Influential Scientific Information and Subject to NOAA’s Information Quality Guidelines

The Assessment clearly meets the definition of influential information, subject to information quality standards. NOAA Guidelines define information as “any communication or representation of knowledge such as facts or data, in any medium or form, including textual, numerical, graphic, cartographic, narrative, or audiovisual forms.” See Guidelines, p. 2. The Assessment is a written report composed of numerical data, graphical images and interpretation of such data. It purports to be a representation of NOAA’s knowledge and data on tsunami inundation on the island of Oahu.

The Assessment is influential because it is reasonably expected to “have a genuinely clear and substantial impact on major public policy and private sector decisions.” See Guidelines, p. 3. The PTWC serves a vital role in protecting populations from a tsunami hazard and therefore the location of said center is a matter of major public policy. The Assessment plainly states that its purpose was to study the suitability of Ford Island as a site for the Pacific Region Center facility. See Assessment, p. 1-2. In order to accurately assess the fitness of the Ford Island site, NOAA must use the best available data and processes, but has failed to do so in this case.

I. The Assessment’s Methodology is Inaccurate and Unreliable.

The content of the Assessment is inaccurate and unreliable, directly violating the purpose of the Data Quality Act:

a. The Shallow Water Modeling Used is Inaccurate

Information is considered accurate if it is “within an acceptable degree of imprecision or error appropriate to the particular kind of information at issue.” See Guidelines, p. 6. The Assessment falls short of this benchmark because a) methods used in the modeling were insufficient, and b) no error estimates for the predicted tsunami amplitudes are provided at all. Experts have stated: “There's a lot of uncertainty in all of these estimates [the Assessment and other reports], and I don't think we know enough to claim that any of them is the "true" answer.”¹

¹ USGS ocean modelers, Jan 14, 2008, in reference to The Assessment, compared to the URS Corp study’s results.

The Assessment assumes that water flow is described by shallow water equations, or a minor variation thereof. As a result, the modeling on which the Assessment relies has an unacceptable margin of error on the order of factors of 2 to 10 uncertainty. Using any of the current shallow water numerical techniques for any tsunami hazard evaluation will not produce results better than within a factor of 10. In addition, “The shallow water codes in use today by PMEL (The Assessment) and UH are unable to model wave runup, wave reflections and interactions, or friction correctly for an assumed initial tsunami wave profile in deep water. So any long term effects in local areas can not be modeled even qualitatively.”²

Given the 10-20 meter grid resolutions used, little confidence can be placed on a 5 foot versus a 10 foot predicted wave at Ford Island. Because the margin of error is ± 5 meters, the modeling could easily produce a wave that exceeds 20 feet. Because this Assessment evaluates risk that affects thousands of people, results accurate only within a factor of 10 are not within the acceptable degree of imprecision.

The State of Hawaii Civil Defense Science Advisory Working Group notes the following inadequacies of shallow water modeling:³

² Charles Mader, Hawaii State Civil Defense (SCD) Tsunami Modeler and member of both the Tsunami Technical Review Committee (TTRC) and the Science Advisory Working Group (SAWG) convened by SCD to draft new Tsunami Evacuation Zones. For the State of Hawaii (Cf. Consensus Item Additional Input C. Pacific Wide Tsunamis No. 3, 2006, TTRC, State Civil Defense Advisors (SAWG), 1/29/2007.

³ Tsunami Technical Review Committee (TTRC) Science Advisory Working Group (SAWG) Consensus Statements, 12/10/2006. (This is the group that makes official recommendations to the SCD on tsunami risk, evacuation recommendations, etc.)

(1) Runups and inundations may be underestimated because the tsunami source mechanism in some instances may be more complex than the source mechanism of the earthquake derived only from seismic waves;

(2) Unusual underwater or shoreline barriers such as reefs, roads, trees, buildings, and other structures or features could, in some areas, focus the tsunami so strongly that runups and inundations could far exceed any estimates from shallow water modeling.

Such ambiguities and uncertainties make the Assessment inaccurate and unreliable in clear violation of the Data Quality Act.

b. The Coefficient of Friction is set at an Inappropriate Constant

The Assessment draws its conclusions largely from models designed to simulate tsunami events from various locations. The modeling employs a constant coefficient of friction as one of the many input parameters. See pg. 11. The Coefficient was set at .00625, which suggests an environment similar to dense forest. Different coefficients of friction should be utilized in the various simulations in order to increase their accuracy. Instead, this constant coefficient of friction creates an overly generalized picture that weakens the accuracy and dependability of the modeling, and thus the Assessment as a whole.

c. The Historical Data for Hawaiian Islands Is Ignored

Given these many limitations, estimates of inundation should be based primarily on historical data. Yet, the Assessment states that recorded historical tsunamis did not

provide sufficient reliable data to be used as parameters in the modeling and instead relied upon parameters from test cases. See pg. 25.

In its Executive Summary, the Assessment contains the following statement:

“The study focused on the distant tsunami hazard because historical data do not reflect a local tsunami hazard over the expected life of the NOAA building (60 years).”

It is highly questionable that any responsible evaluation of potential safety risks and operational effectiveness could be made based upon such sweeping assertions for which no statistical or other evidence is proffered.

In 2005, the Hawaii Office of Civil Defense issued the following warning that in the event of a tsunami, residents are directed to “Avoid inland waterways connected to the ocean due to wave surges and possible flooding.” Pearl Harbor is just such an inland waterway. This simple, common sense warning appears in every Hawaiian phonebook. The Assessment conclusions are at odds with this warning but no effort is made to explain why any inland waterway should not be at risk for inundation in the event of a tsunami.⁴

In addition, a Tsunami Advisor to the Hawaii State Civil Defense concluded that “A megatsunami from these regions could have effects on the southern and western shores of the Hawaiian Islands far beyond those resulting from tsunamis generated in the North Pacific or

⁴ Additional Notation for 2006 Tsunami Evacuation Maps, Brian Yanagi, TTRC Recommendation, 2005.

Southeast Pacific.”⁵ The Assessment did not include the possibility of megatsunamis in its analyses.

Such a worst case scenario could include a M8 on the Kona coast of the Big Island, or even for the rare event up the island chain, or even the far less likely case of a flank collapse. In that case only a location at 100-plus feet above sea level would be safe for the PTWC.

Thus, the Assessment eschewed any reliance on available hard data and instead posited hypothetical scenarios as sole bases for its conclusions. This deficiency violates NOAA’s objectivity standard that the interpreted work must contain data of known quality.

d. The Assessment’s Conclusions Contradict Its Own Scientific Sources

Two of the Assessment's final conclusions are:

“When the typical incident wave period reaches 48 min or more, a characteristic resonance with a period of around 96 min at Pearl Harbor is excited, resulting in similar maximum wave amplitudes both inside Pearl Harbor and on the open coast. Larger wave heights and higher velocities are found in the Entrance Channel, the West Loch, and the channel near Hospital Point.”

However: “Model results show no inundation at the NOAA building site for any of the simulations, including the five historical destructive tsunamis and the worst-case scenario.”

⁵ Recommendations of 8/7/2005 to the SCD, from Dan Walker, Tsunami Advisor to the SCD and Team Lead for the SAWG.

These two conclusions together assert that the maximum wave amplitudes (at 48 to 60 minute period) at Ford Island and at the open coast will be the same for a very large earthquake, yet not big enough to inundate the proposed NOAA building site. The assessment thus fails to address the possibility of an earthquake generating an even larger period, over 60 seconds, even more closely approaching Pearl Harbor's resonant period of 96 minutes, an event that could indeed inundate the NOAA site.

This omission is significant, as it may understate a significant threat to the site.

Moreover, the Assessment draws conclusions that are not based on the full evidence reported from relevant studies. The Assessment asserts that the models based on the 1960 Chile and 2003 Hokkaido Tsunamis all produced waves that would give similar maximum wave amplitudes as off the open coast. The Assessment concludes that there is no danger based on a much smaller period wave of 24 minutes, which would come from a much smaller earthquake.

This conclusion contradicts the earlier evidence within the body of the same document that a wave of large enough magnitude (at a period from about 32 minutes, up to the Harbor's resonance period of about 96 minutes) could trigger resonance inside Pearl Harbor – resulting in waves much larger than those in the open coast.

II. The Assessment is Incomplete Because It Fails to Address Several Key Issues.

a. The Possibility of a Multiple Wave Tsunami Pileup

The Assessment fails to address the possibility of a multiple wave tsunami pileup on a flat surface—Ford Island. The multiple wave pileup effect is caused by slow drainage of the tsunami resulting from the small seaward component of gravity in flat areas. Thus the next tsunami wave arrives before the water from the previous wave has drained off the

land. As the new waves “pile up” on top of the retreating waves, a larger amplitude inundation than predicted occurs.⁶

Because Ford Island is flat, the drainage will be slow and additive effects of waves are more likely. Additionally, such a pileup effect is of particular hazard to regions with harbors, channels and rivers, such as the Pearl Harbor area.

Such a multiple wave pileup was observed in Sri Lanka after the 2004 Indian Ocean Tsunami and was well documented. A multiple wave pileup could result in multiple smaller amplitude waves that are more hazardous than a single higher amplitude wave.

The pileup phenomenon observed in the 2004 Indian Ocean Tsunami has potential application to the Hawaiian Islands. This significant risk could be a major factor in determining the fitness of the Ford Island site for location of a tsunami warning center and therefore must be included in the Assessment.

b. The Potential of a Sumatra-Sized Wave Is Ignored

The Assessment uses a contour interval of 10 meters as the parameter for wave depth. This is too conservative of an estimate in light of the large parameters observed in the Sumatra Tsunami. The maximum tsunami for Sumatra was almost twice the size of the maximum fault offset in the Assessment.

The Assessment does not consider this possibility, nor does it consider a Sumatra size Tsunami.

Although this phenomenon is relatively newly observed, it should nonetheless be included and should serve as a reference for possible larger source tsunamis. The 12/26

⁶ Bruce Jaffee and other USGS Tsunami experts have pointed out this effect in numerous informal reports and presentations to the Scientific Community.

tsunami showed that anything below 100 feet is in the risk zone.⁷ One study gave the following recommendations: “1. Evacuate all areas below 15 meters above sea level and within 0.25 miles of the shoreline or along rivers. 2. Evacuate all areas below 10 meters above sea level and within 1.0 mile of the shoreline or along rivers. 3. Evacuate all areas below 5 meters above sea level and within 3 miles of the shoreline or along rivers.”⁸ Another report conducted by NOAA in 1989 recommends: “Evacuate areas less than 50 feet below sea level and near the shoreline.”⁹

This possibility of a Sumatra-sized tsunami is a critical factor in determining the potential risks to Ford Island but was not considered in the Assessment.

c. Conflict with External Reports

Scientists in the Hawaii State Civil Defense Science Advisory Working Group, the U.S. Geological Survey and other parts of the international tsunami modeling community have all reached conclusions in regard to the potential risk of tsunami impact on Pearl Harbor that contradict the Assessment’s conclusion. For example, one such external report, “A Probabilistic Approach to Tsunami Hazard Analysis”¹⁰, is directly at odds with

⁷ “Ford Island for PTWC,” 5/24/2005, Charles Mader, Tsunami Modeler and member of the TTRC .

⁸ “Observations by the International Survey Team in Sri Lanka”, Liu et al., Science 308, 5728, 1595, 2005.

⁹ An example consistent with the historical record of inundations and runups throughout the Hawaiian Islands as suggested by Cox and Pararas – Carayannis (personal communications with supporting data in “United States Tsunamis”, Lander and Lockridge, NOAA, NGDC, Publication 41-2, 265pp.,1989).

¹⁰ A Probabilistic Approach to Tsunami Hazard Analysis; URS Corp, Hong Kie Thio et. al, 1/17/2007. (See local Tsunami threat from Big Island event, and 1-2 meter at Pearl Harbor from a large teleseismic EQ.)

the Assessment's conclusions. Another tsunami modeler from the USGS reports that "Even a quick calculation using Abe's Mw-runup relationship yields a mean runup of 2.6 meters for a maximum credible earthquake, almost identical to the 0.1% annual probability event calculated by URS Corp" (see footnote 1).

The Assessment's failure to consider or address these reports renders it incomplete and therefore in violation of the Data Quality Act.

d. Probable Hazards to the Pontoon Bridge Accessing Ford Island Not Addressed

There is a probable tsunami-related hazard to the sole access to Ford Island, the pontoon bridge, which is not addressed in the Assessment. Tsunami-generated waves could damage the bridge and severely impair the ability to evacuate the island. History cannot provide a complete answer in this case, as strong currents that could damage the bridge could be generated (depending on the period(s) of the tsunami waves entering Pearl Harbor).¹¹

This factor is surely an important impact of a tsunami on Pearl Harbor and speaks directly to the fitness of Ford Island as a site for the PTWC. Therefore, the hazards to the bridge should be included in the Assessment.

e. Probable Hazard of Strong Tsunami-Induced Currents Ignored

Even in cases where the actual amplitude of the tsunami is low, there remains significant hazard from tsunami-induced currents. Small boats and debris can be

¹¹ George Curtis, Tsunami Modeler and member of the SCD TTRC and SAWG, as well as the modeler responsible for the current Tsunami Evacuation maps in the Hawaii phonebooks, 5/2005.

dislodged by these currents and cause damage elsewhere. There is a probable hazard to the bridge and for anyone attempting to go to or from the Island by boat from these potentially large currents.

Furthermore, should the PTWC issue a Tsunami Watch or Warning for the Hawaiian Islands, the bridge might be opened to allow the Navy's vessels to evacuate to deeper water. All emergency egress being considered to date depends upon the use of boats to evacuate the Island, or to enable the PTWC scientists to get onto the Island to relieve the previous shifts.

III. The Assessment Does Not Meet NOAA Objectivity Guidelines.

The NOAA guidelines state that "objectivity ensures that information is accurate, reliable and unbiased." See p. 6. The Assessment is an example of "interpreted products", as it includes original data and synthesized products which have been interpreted and contextualized. As such, NOAA's objectivity standard requires the Assessment to contain data of known quality, apply sound analytical techniques, and be externally reviewed before dissemination. See Guidelines, p. 8. Unfortunately, the Assessment has failed to meet these criteria.

On February 10, 2009, PEER submitted a request to NOAA under the Freedom of Information Act (FOIA) for "information documenting the peer reviewing of this assessment prior to its publication or, in the alternative, explaining the lack thereof" concerning NOAA Technical memorandum OAR PMEL-13, *Assessment of Potential Tsunami Impact for Pearl Harbor, Hawaii*.

In a letter dated March 30, 2009, NOAA responded but did not provide any documentation that external or internal reviews had occurred. Instead, the agency offered only the following statement:

The Assessment “was reviewed, in advance of publication following standard PMEL procedures for technical reports, including peer review by other PMEL scientists, review by laboratory management, and editorial review by the PMEL editor. The publication was also informally reviewed, in advance of publication, by Professor Fai Chung, University of Hawaii ocean engineer and tsunami specialist, who complimented the lead author on her scientific approach and results.”

In a FOIA appeal on April 28, 2009, PEER again requested documentation that a peer review process had actually occurred. NOAA has yet to respond to this request. Consequently, the only reasonable conclusion, other than a NOAA violation of FOIA, is that there are no responsive records to the PEER request for proof that peer review took place.

It is clear that NOAA conducted nothing that could be accurately termed an external peer review, directly contrary to its own guidelines. An assertion that a university professor made a favorable remark about the Assessment hardly constitutes such a peer review. Moreover, even taking the agency representations at face value, the internal review process wholly lacks a paper trail or any other indicia showing that the review actually took place.

NOAA’s reliance upon this cliquish, informal review suggests that the Assessment is a study based on incompletely or wholly erroneous evidence, created solely in order to buttress a politically-motivated decision by the agency to relocate its tsunami warning

center to a location that, ironically, is itself vulnerable to disruption in the event of a tsunami.

Relief Requested

Accordingly, PEER demands that the Department of Commerce and its National Oceanic & Atmospheric Administration take the following steps to comply with the Data Quality Act:

1. Remove the *Assessment of Potential Tsunami Impact for Pearl Harbor, Hawaii* from official publication and cease further distribution.
2. Issue a public statement, posted on official websites, that the Assessment has been withdrawn from publication due to violations of the Data Quality Act.
3. Undertake a new externally peer-reviewed assessment concerning the potential impact of a tsunami on Pearl Harbor.

Thank in advance for your prompt attention to this complaint.

Sincerely,



Jeff Ruch
Executive Director
Public Employees for Environmental Responsibility (PEER)