Oregon State University

Marine Studies Initiative
Building Complex

Site Selection Criteria Findings

July 2016

Confidential

APPENDIX

MSI Program Summary

Program Delivery – Matrix criteria and summarized outcomes

Building *offsite* – bottom line: Building at an offsite location would significantly compromise Program delivery and meeting the MSI Programmatic goals, due to the extensive spatial disconnect between OSU and agency researchers, and access to core research facilities, including seawater. Further, students would still spend the majority of their time at HMSC, completely negating the intended goal of keeping them away from the tsunami zone. Operationally, there would be added complications and likely costs in administering and maintaining the offsite facilities. Finally, OSU would miss the opportunity (and promise) to demonstrate state-of-the-art innovation in seismic and tsunami resilient engineering to coastal communities locally and globally.

Distance would significantly inhibit the collaborative nature and goal of building out MSI at Newport:

- Day-to-day contact and unscripted hallway meetings with colleagues are impeded by separate locations;
    - A recent National Academy study confirms that "Researchers from centers with unbroken, co-located office and laboratory space reported an 'innovation outcome' measure higher than researchers from centers occupying split spaces" (NRC, 2014).
    - The degree of collaboration, including enhanced research grant success, is directly proportional to how close researchers are located to each other (Kabo et al. 2015).
    - As physical distance increases, the likelihood of collaboration decreases. This drop-off in collaboration can be seen over a distance as little as 30 m (Olson et al., 2002)
- Researcher connection to HMSC Seawater (SW) laboratories and staff/students working in those laboratories would be significantly reduced;
- Regular participation in seminars would be diminished by offsite location;
- Regular access and collaborative interactions between OSU and State and federal scientists would be curtailed;
- Scientists and staff (OSU and state/federal) remaining at HMSC site would perceive loss of HMSC collaborative dynamics – lead to difficulty recruiting/retaining critical scientists and eventually state/federal partnerships.

Student presence at HMSC site would still be required for majority of the time for many students (i.e., offsite building location does *not* preclude student exposure to HMSC site):

- Library, teaching SW laboratories, and HMSC classroom use would require student presence at HMSC >50% time;
- Time required at HMSC for students to work/intern with OSU/State/federal scientists and in their laboratories, 10-50% time at HMSC *in addition* to above class-related time;
- K-12 programs will remain at HMSC site due to location of SW teaching laboratories and Visitor Center.

Infrastructure/facilities coordination would be complicated overall, and eliminated in some cases altogether:

- Combining instrument heavy laboratory facilities for shared access between OSU and state/federal scientists would be compromised (e.g., OSU genomics will be in new building offsite, whereas state/federal scientists – and their instrumentation - will be remaining at HMSC);
- Facilities maintenance staff (i.e., Mechanical and Trades Maintenance) need to regularly move between locations (increase time spent driving [*and need for extra vehicles*], parking, etc. from one site to the other), often several times during each day – leads to significant inefficiencies;
    - Cost of 1-2 vehicles (~$30,000 ea.)-plus maintenance
    - Est. mean travel time/d/staff = 1 hr; 12.5% reduction in efficiency (est. cost = $52K/yr)
- Facility administration, safety/security and general maintenance/custodial more complicated as two separate campuses rather than all contained at one location.
    - On site Personnel needs: 5 additional facilities/custodial staff; est. addl. Annual cost: $274,935

Ability to serve as Oregon's lead innovator and problem-solver severely compromised by building off-site:

- Opportunity to meet Key program goal to build 'demonstration project' highlighting seismic and tsunami resilient engineering innovation and providing value to coastal communities locally and worldwide would be lost;
- Opportunity to inject greater safety options for HMSC campus occupants also lost (i.e., potential to build building with vertical evacuation capability serving entire HMSC and NOAA MOC-P community).

Ease of access between Newport campuses feasible, but require considerable planning and investment, as well as time spent 'commuting' between campuses:

- Coordination with City, County and State DOT – as traffic flow would be different than that planned and already invested for by these relevant agencies (~$3.2M – per City of Newport letter);
- Primary campus access from US 101 to offsite location would require left hand turn (across traffic) – which has significant negative impact on driver safety (i.e., probability for increased accident rate):
    - Auto accidents from left turns (crossing traffic) occur ~10 fold more times than right hand turns (53.1% vs 5.7% of 1.7M accidents in 1998; Naim et al., 2001)
- Shuttle system (including shuttle and personnel) would be valuable in increasing opportunity for moving between campuses easily; added costs:
    - Purchase two shuttle buses @ $120K/bus = **$240,000**
    - Annual Operating expenses:
        - Operate 10 hr/day (7:30 am – 5:30 pm)
        - 5 days/wk, 48 weeks/yr
        - $82/hr/bus (includes driver, fuel, depreciation)
        - Total = **$393,600/yr** (data from Mark Zandonella – OSU Shuttle Mgr)

- Need for parking lots expanded/built at **both** campus locations to allow drivers to easily find parking so back and forth transportation is fast and easy; Cost of extra parking at HMSC:
    - 150 spaces X $7500/space (includes grading, pavement, lighting, landscaping, storm) = **$1,125,00**

Summary of Additional Costs (not covered in Fortis Assessment) related to building MSI off-campus site:

Construction related:

Land Purchase (the current fair market for property of this sort/size is estimated to run between)	$1M-4M
Shuttle	$240,000
Parking Lot at HMSC	$1,125,000
Traffic flow	>$1,500,000??? (new HWY 101 left turn lane and traffic light)
Facilities Vehicles (2)	**$60,000**
TOTAL	**$2,925,000 (plus land purchase)**

Operational Costs (annual estimate)

Shuttle	$393,600
Facilities/Custodial	
Travel time inefficiencies	$52,000
Add'l Personnel	$275,000
TOTAL	**$720,000**

References

Kabo et al. 2015. Shared paths to the lab: A sociospatial network analysis of collaboration. Environ. and Behavior, 47:57-84.

Wassim G. Najm, John D. Smith, and David L. Smith. 2001. Analysis of Crossing Path Crashes. National Highway Traffic Safety Administration. 76 p.

National Research Council. 2014. Convergence: Facilitating Transdisciplinary Integration of Life Sciences, Physical Sciences, Engineering, and Beyond. Washington, DC: The National Academies Press.

Olson, J.S., Teasley, S., Covi, L., Olson, G., 2002. The (currently) unique advantages of collocated work. In: Hinds, P.J., Kiesler, S. (Eds.), Distributed Work. Academic Press, Cambridge, MA, pp. 113–136.

Estimated Numbers for HMSC Campus – 2016

<u>HMSC estimated number – 2015/2016</u>

OSU Faculty, Staff –> 100

OSU Students and interns –> 60-140
- UGrad –> 20-60 (Mean = 40)
- Grad –> 40
- Interns (Summer) –> 40

OSU Ship Ops –> ~20

Total OSU –> 200 (260 during the summer peak)

Agencies –

- NOAA –> 162
- USFWS –> 17
- USEPA –> ~20
- USDA –> 3
- USGS –> 2
- ODFW (State Agency) –> 50

Total Agency –> 254

TOTAL HMSC –> ~ 450 mean (510 – summer peak)

Estimated/Projected Personnel Numbers for HMSC Campus – 2016-2025

Grouping	Estimated – 2015	Projected – 2025
OSU Faculty, Staff –> 100	105-110	195
OSU Students and interns - Total	60 (winter) 140 (summer)	405 (winter) 505 (summer)
Undergraduates in courses	20-60 (mean = 40)	~300/term
Ugrad (summer) interns	40	80-100
Graduate Students (resident)	40	105
OSU Ship Ops	20	25
Total OSU	**185 (winter)** **265 (summer)**	**625 (winter)** **725 (summer)**
Agencies –		no basis for future growth projections of agencies
NOAA	54	54
USFWS	17	17
USEPA	45	45
USDA	3	3
USGS	2	2
ODFW (State Agency)	50	50
Total Agency	**171**	**171**
Total HMSC	**356 (winter)** **436 (summer)**	**796 (winter)** **896 (summer)**
NOAA MOC-P (not HMSC)	**75 (plus ships' crews)**	**75 (plus ships' crews)**

Marine Studies Building – Seawater Access

- The HMSC facilities include laboratory and classroom access to seawater at 700,000 to 1,000,000 gallons per day.
- Due to this resource, the programming of the MSI building has consistently included access to *existing* seawater capability without a need to provide seawater laboratories in the new building.
- Regardless of the building site, students and faculty researchers will need to access the seawater laboratories and classrooms located at HMSC, as well as OSU and multi-agency researchers located at the HMSC site.
- Planning for a new building *without* seawater reduces building facility costs that can be re-programmed into engineering required for seismic and inundation conditions.

From the onset, placement of the new Marine Studies building at the Hatfield Marine Science Center was predicated on the desire to provide students and researchers with outstanding *access* to the full spectrum of research and educational facilities already offered at HMSC, as well as easy connection to HMSC's OSU and federal and state partners. Initial design elements and placement of the building were focused on leveraging all that HMSC currently offers to maximize the collaborative nature of HMSC and its specific teaching and research facilities, including its world-class seawater system.

Explicitly, by placing the building immediately adjacent to the education wing at HMSC and the Guin Library, the MSI academic program can utilize the existing classrooms and seawater teaching laboratories already available at HMSC, as well as small classrooms and study areas available in the Guin Library. This co-location option efficiently utilizes existing resources, allowing focus for the new building to be on providing new "collaboration-oriented" spaces (classrooms and collaboratories), as well as researcher office and laboratories. This decision (i.e., *no seawater*) also reduces the per sq. ft. costs of the new building, allowing for those resources to go to the engineering required for meeting the seismic and inundation issues. Further, many of the researchers who will be resident in the new building will require seawater laboratories that would be too extensive for the new building and unnecessary given the existing seawater facilities immediately nearby. Co-location of the buildings also promotes the idea of the academic program being surrounded by the research activities of HMSC.

It is important to note, given current consideration of alternate siting, regardless of where the new building is built, we will have to hold classes in the Education wing and Guin Library at HMSC, particularly for any courses that require seawater access. Similarly, all students participating in research projects with our partner agency scientists, or in OSU seawater laboratories at HMSC will be spending their time at HMSC (vs. the new building).

HMSC

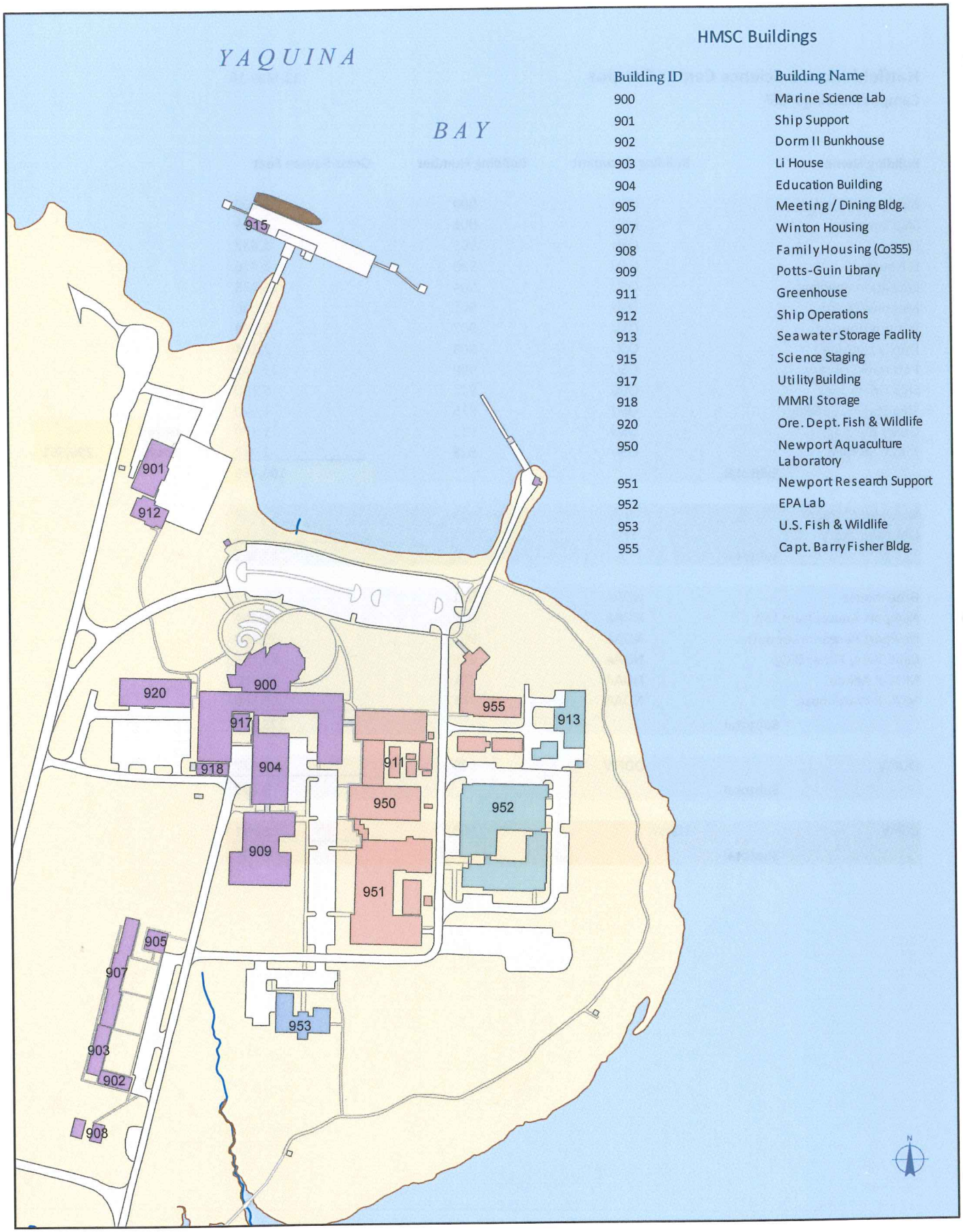
Hatfield Marine Science Center Campus

11-May-16

Campus Buildings/GSF

Building Name	Building Occupant	Building Number	Gross Square Feet
Marine Science Lab	OSU	900	35,100
Ship Support	OSU	901	5,286
Dorm	OSU	902	1,632
Li House	OSU	903	2,476
Education Building	OSU	904	15,125
Meeting/Dining	OSU	905	1,600
Winton Housing	OSU	907	5,588
Family Housing	OSU	908	2,164
Potts Guin Library	OSU	909	21,441
Ship Operations	OSU	912	5,200
Ship Staging Building	OSU	915	1,970
Utility Building	OSU	917	1,170
MMRI Storage	OSU	918	1,717
Subtotal			**100,469**
Seawater Storage	EPA	913	?
EPA Laboratory	EPA	952	45,991
Subtotal			**45,991**
Greenhouse	NOAA	911	?
Newport Aquaculture Lab	NOAA	950	30,204
Newport Research Support	NOAA	951	32,500
Capt. Barry Fisher Bldg.	NOAA	955	19,159
MOC-P Admin	NOAA	NA	18,500
MOC-P Warehouse	NOAA	NA	25,500
Subtotal			**125,683**
ODFW	ODFW	920	9,677
Subtotal			9,677
USFW	USFW	953	8,731
Subtotal			8,731

Grand Total:	**290,551**



HMSC Buildings

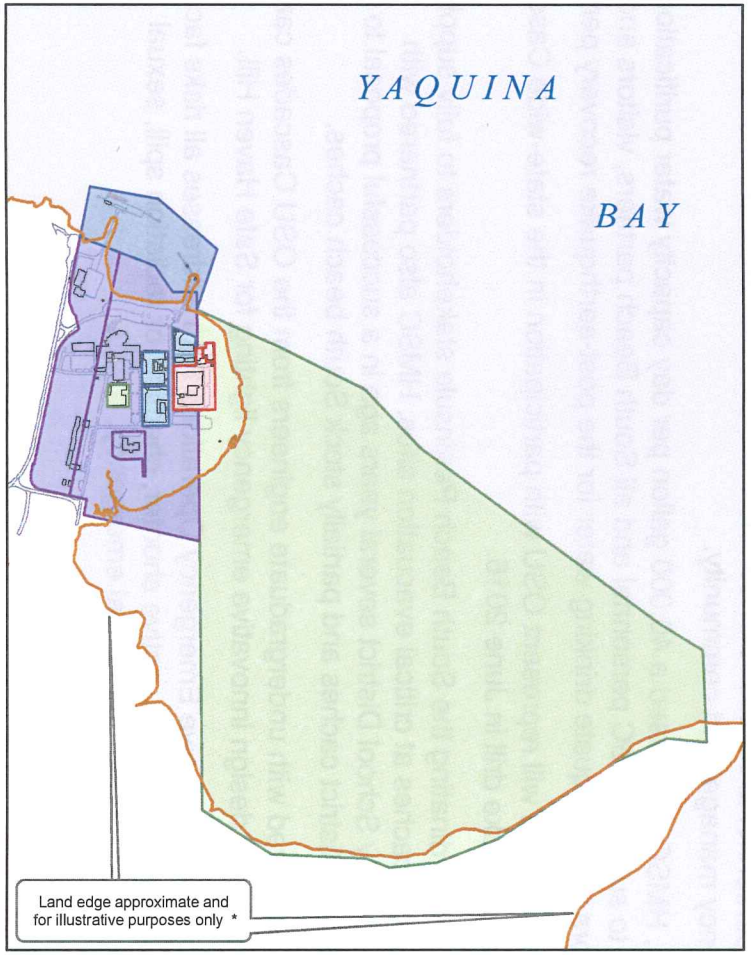
Building ID	Building Name
900	Marine Science Lab
901	Ship Support
902	Dorm II Bunkhouse
903	Li House
904	Education Building
905	Meeting / Dining Bldg.
907	Winton Housing
908	Family Housing (Co355)
909	Potts-Guin Library
911	Greenhouse
912	Ship Operations
913	Seawater Storage Facility
915	Science Staging
917	Utility Building
918	MMRI Storage
920	Ore. Dept. Fish & Wildlife
950	Newport Aquaculture Laboratory
951	Newport Research Support
952	EPA Lab
953	U.S. Fish & Wildlife
955	Capt. Barry Fisher Bldg.

High. Ed. - OSU | USA - EPA | USA - NOAA | USFWS

Building ownership does not necessarily reflect land ownership.

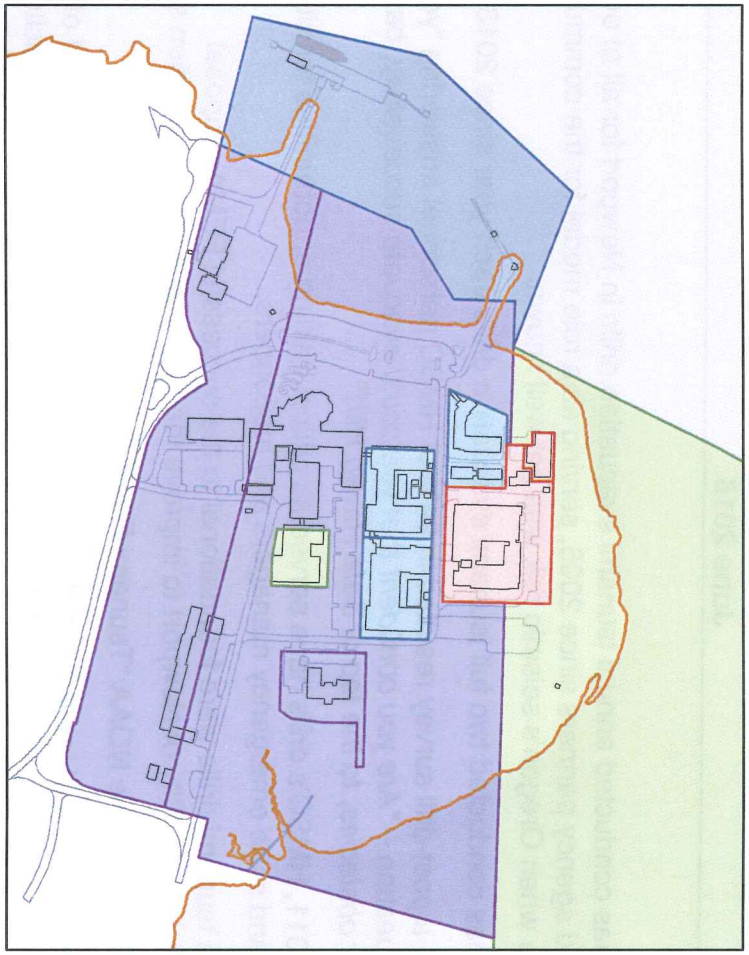
Document Path: S:\Geospatial\WorkSpace\Projects\4_MapBox\HMSC_Base_Owners.mxd

OSU Hatfield Marine Science Center -- Land Ownership



HMSC Ownership - Full Extent

* Land Edge based on Mean-High-Water (or Mean-High-Tide)



High. Ed. - OSU | Ore - DSL | Port | USA - EPA | USA - NOAA

Emergency Preparedness Activities at the OSU Hatfield Marine Science Center
June 2016

- HMSC has conducted annual tsunami evacuation drills in Newport for all of our OSU and agency partners since 2005, serving as a role model for the community at a time when Oregon's seismic risk was not well known.
- HMSC has conducted two full tsunami evacuation drills each year since 2013.
- In 2011, a post-drill survey resulted in 94% of HMSC personnel answering "yes" to the question – "*Are you confident that you could evacuate successfully, barring injury or obstacles, to the top of Safe Haven Hill?*"
- Since 2011, HMSC's drills have served as critical training opportunities for city, county and state emergency managers and responders.
- HMSC's tsunami drills were foundational to the successful FEMA proposal submitted by the City of Newport to improve the Safe Haven Hill evacuation site.
- HMSC achieved the NOAA "Tsunami Ready" designation in 2013.
- HMSC designed and implemented the Tsunami Interpretive Trail on behalf of community partners, which educates thousands of visitors to the HMSC Visitor Center and Oregon Coast Aquarium each year. The "Tsunami Dock" exhibit serves as the starting point for the interpretive trail.
- HMSC personnel are FEMA-trained and are active members of the coastal emergency management community.
- In 2015, HMSC purchased a 40,000 gallon per day capacity water purification system to supply HMSC personnel and all South Beach partners, visitors and neighbors with adequate drinking water for the post-earthquake recovery period.
- HMSC personnel will represent OSU with participation in the state-wide Cascadia Rising earthquake drill in June 2016.
- HMSC is coordinating the South Beach Peninsula stakeholders to fully supply two disaster caches at critical evacuation sites. HMSC also partnered with Lincoln County School District several years ago in a successful proposal to fully stock school district caches and partially stock South beach caches.
- HMSC partnered with undergraduate engineers from the OSU Cascades campus to envision and design innovative emergency lighting for Safe Haven Hill.
- HMSC's comprehensive Emergency Operations Plan addresses all risks faced, including earthquake, fire, active shooter, chemical or radiation spill, sexual assault, bomb threat and medical emergency.

HMSC EARTHQUAKE/TSUNAMI EVACUATION PLAN

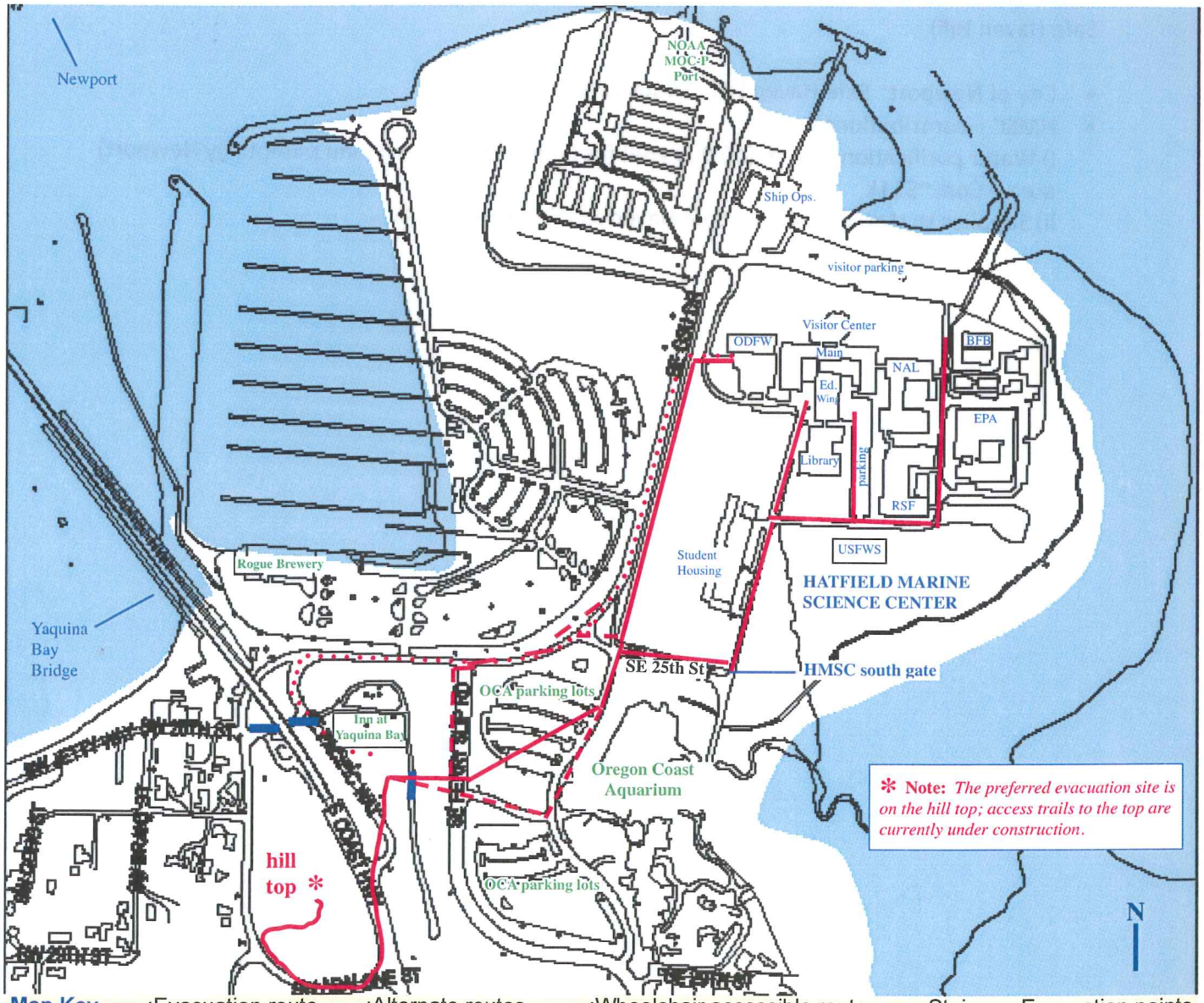
If you feel an earthquake:

- Protect yourself but evacuate the building as soon as you deem it safe; note the time if possible. You must reach a tsunami evacuation point within 15 minutes.
- When the shaking stops enough to walk, immediately evacuate to high ground. The nearest evacuation point from the HMSC campus is the high ground around the south entrance of the bridge. Stay off the bridge.
- Bring only items you can easily grab, including backpacks especially packed with emergency gear, coat, hat, phone, essentials (i.e. handbag).
- Walk; don't try to drive. Encourage others to move quickly.
- Be prepared for aftershocks. Remain at high ground until the all-clear signal is given. Remember that tsunamis occur as a series of waves.

Do not make these potentially life-threatening mistakes:

- DO NOT go back to your office or spend time packing; grab your emergency gear ONLY if it is handy. Evacuate to higher ground immediately.
- DO NOT wait for an official warning. Evacuate even if the shaking is slight.
- DO NOT re-enter buildings. You will not have time, and they may be unstable.
- DO NOT return to the HMSC campus until an "all clear" from local officials has been issued; beware of unfounded rumors of an all-clear.

Remember, you have 15 minutes or less to reach an evacuation point.



Map Key —:Evacuation route - -:Alternate routes • • •:Wheelchair accessible route ▬:Stairs Evacuation points

Escape Route
Confirm cost estimate - $410k additional

Horizontal Evacuation Path

- Construction costs - $395,400 (per Fortis report)
- Soft costs - $119,600 - includes design, geotech analysis, survey, permits, special inspections, project management, contingency
- Total - **$515,000**
    - There may be other associated costs i.e. negotiating rights-of-way, if necessary, outside the city street right-of-way.

Elaborate on collaboration with Partners (for use/cost share of South Beach escape route to Safe Haven Hill)

- City of Newport: Safe Haven Hill - $900k currently invested
- HMSC – contributions to date:
  i) Water purification system (40,000 gpd) for Entire south Beach (and potentially Newport) area – Cost ~$11k
  ii) Supplies to storage cache at Safe Haven Hill/OCCC — ~$3-4k

Poland Report

Marine Studies Initiative Building Complex
Earthquake & Tsunami Considerations

Oregon State University

Hatfield Marine Science Center

Newport, Oregon
March 18, 2016

Final Report

Chris D. Poland
CONSULTING ENGINEER

ESTIME
Science & Technology
Facilities Planners

Table of Contents

1.0 Executive Summary

Oregon State University's Marine Studies Initiative (MSI) is a bold opportunity for the University to expand its teaching and research role in improving the health of the Pacific Ocean and increasing marine-related educational opportunities for OSU students. Because of the potential for earthquakes and tsunamis and the controversy about siting the project in a tsunami inundation zone, Oregon State University contracted with our firms to develop appropriate seismic and tsunami design criteria and assist with the site selection of the new MSI Complex.

It appears logical for the MSI to expand the existing HMSC campus and take advantage of the proximity to the sea, the existing facilities and research staff, and the area's research partners. Such a building location also means making a major capital investment and expanding the population at a location that will eventually be inundated by a major tsunami.

This report strives to clarify the issues related to earthquakes and tsunamis as they relate to the proposed MSI Complex and the HMSC to facilitate an informed and balanced decision about the short and long term status of the Center. It clearly states that major earthquakes and tsunamis will occur with a low probability and that the facilities and emergency response procedures can be designed to protect the lives of the students, faculty, staff and visitors.

Figure 1 Hatfield Marine Science Center, Newport Oregon

2.0 Introduction

Oregon State University (OSU) may expand the Hatfield Marine Science Center (HMSC) as part of their newly launched Marine Studies Initiative (MSI). As shown in Figure 2, the expansion is a complex reportedly planned to include new research facilities, teaching laboratories and classrooms for approximately 350 new students, faculty and staff. The facility is a key part of the University's commitment to pioneer a new research and teaching model that will help sustain healthy oceans and ensure wellness, environmental health and economic prosperity for future generations. It is a university-wide commitment that will have local and global impacts on the economy and environment. (www.marinestudies.oregonstate.edu)

Figure 2 HMSC Site with conceptual location of new facilities (orange)

The HMSC is strategically located in the South Beach area of Newport Oregon to retain close connection to world class seawater facilities and proximity to a number of state and federal agency partners. As with all of the coast of Oregon, it is also located in an area subject to major earthquakes and within the resulting tsunami inundation zone. Figure 3 illustrates the area and the extent of the expected tsunami inundations. The yellow line shows the worst expected extent of inundation where only Safe Haven Hill and the Community College sites are on high ground.

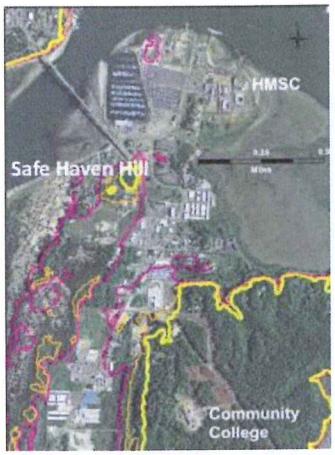


Figure 3 South Beach Area showing the location of the community College, Safe Haven Hill, and HMSC.

Because of the potential for earthquakes and tsunamis and the controversy about siting the project in a tsunami inundation zone, OSU contracted with our firms to develop appropriate seismic and tsunami design criteria and assist with the site selection of the new MSI Complex. The focus of the work was on addressing the prevailing vulnerabilities and concerns related to expanding the existing HMSC campus.

OSU is committed to the safety of all students, faculty, staff and visitors. The HMSC facility currently has a robust emergency response program that includes tsunami evacuation plans and annual drills that are considered to be the best at OSU. The University understands and is addressing the seismic and tsunami hazards that include strong shaking, liquefaction and inundation.

The University has established the following "Building Principles" related to the planned expansion.

- All housing will be located on high ground, outside of the inundation zone.

- All new buildings will be seismically resilient structures that will survive and allow occupants to exit and follow the tsunami evacuation plan.
- Structural design criteria for the proposed building will exceed current seismic codes using state-of-the-art structural design criteria and options.
- The proposed expansion will improve current earthquake readiness and tsunami training.
- HMSC will continue to collaborate with the Tsunami Evacuation Plan Partners.

The 2011 Tohoku earthquake and tsunami brought the world instant images of the destructive power of a major tsunami not unlike the one that is expected along the coast of Oregon. Japan is rebuilding, but in a very cautious manner. Their new standards mandate that all 24/7 occupancies must be built on high ground and all other occupancies must be built with adequate plans for vertical and horizontal evacuation.

That event as well as the concerns expressed by many OSU professors lead to this study that is focused on what might happen and what can be done to mitigate the consequences. It began with meetings with a working group that was formed to manage the decision making process related to the siting and construction of the expansion. It involved a series of interviews with a wide variety of experts in the various disciplines related to earthquake and tsunami safety. It resulted in this statement of the issues, suggested design criteria, and opportunities for OSU to consider implementing.

3.0 Proposed Earthquake and Tsunami Design Criteria

Newport, Oregon, is located in a high seismic zone. As with the entire west coast of the United States, strong earthquakes have occurred over regular intervals and will continue to occur. In the Pacific Northwest, these earthquakes have three basic sources; shallow crustal events, deep Benioff zone events, and Cascadia subduction zone events. Over 1,000 earthquakes per year are recorded but only a few are large enough to be felt. Seismologists expect that a major earthquake ranging in magnitude 7.0 to 9.0 is possible but only expected every few hundreds of years.

Design for Earthquakes

Today, buildings and infrastructure systems at OSU, throughout the west coast and much of the United States are designed for the largest expected earthquakes as determined by the United States Geological Survey (USGS). USGS uses probabilistic theory to determine how strong the shaking will be throughout the region based on thousands of potential events. Estimates of the strong shaking with 2% probability of being exceeded in 50 years along with the levels of resulting damage that is considered acceptable are the basis of the building codes adopted and used today. The resulting designs take into account the expected strong shaking as well as the occurrence of landslides, liquefaction and lateral spreading where appropriate.

The minimum levels of acceptable damage incorporated in today's building code depend on the occupancy and function of the building or infrastructure system. At a minimum, all construction is designed to avoid damage that will cause serious injury or loss of life but without specific regard for re-use. In addition, buildings and infrastructure systems that are needed to support the immediate response and the early days of recovery are designed to remain usable. To accomplish these goals, the designs must provide appropriate foundations, robust structural systems as well as anchorage and protection of non-structural elements and contents. The new MSI complex is required by code to be designed only to the minimum code level, that is, as a Risk Category II building.

In the South Beach area of Newport, Oregon, the current building code requires design for a peak ground acceleration of .48g with consideration given to the maximum considered peak ground acceleration of .68g. At this intensity of ground shaking, liquefaction is expected to cause subsidence of up to 3 feet and lateral spreading of up to 30 feet at the HMSC sites. No liquefaction is expected in the vicinity around the Community College, though there may be some areas subject to landslides. Because of the proximity to the Cascadia subduction zone, the South Beach design values are about 50% higher than used for the design of buildings built in Corvallis at the main OSU campus.

Design for Tsunami Threats

The Cascadia subduction zone has the ability, and is expected at some time, to generate a major earthquake that will result in a significant tsunami that will inundate the Pacific Northwest Coast much like what happened in Japan in 2011. The arrival time and depth of the inundation at any particular site along the coast will depend on the size and location of the earthquake. An event of this magnitude has not occurred in over 300 years. Using turbidite paleoseismology, seismologists have been able to identify up to 41 Tsunami events of various sizes that have occurred over the past 10,000 years. They have subsequently determined that in the 100 year life of the MSI complex, there is a 39% to 58% probability that a tsunami of some size will occur at the site.

The characteristics of the expected tsunami inundation along the Oregon coast was the topic of a multi-year study by a group of experts convened by the Oregon Department of Geology and Mineral Industries (DOGAMI). The effort resulted in an Open File Report O-13-19 entitled Tsunami Inundation Scenarios for Oregon that included a digital data release of their modeling. They developed seven scenario events, five related to local Cascadia subduction zone events -- designated S, M, L, XL, and XXL and two related to events in Alaska.

In 2011, the Oregon State Legislature unanimously approved a resolution supporting the development of the Oregon Resilience Plan: Reducing Risk and Improving Recovery for the Next Cascadia Earthquake and Tsunami. The subsequent report was published in 2013 and included a series of recommendations related to actions that needed to be taken to make Oregon more resilient to a tsunami generating earthquake. A Governor's task force was convened after publication to develop specific

recommendations for the plans implementation. This task force report was submitted to the legislature in 2015. Included in their recommendations is to designate the DOGAMI "L" Tsunami as the design and planning inundation zone for new construction as required by ORS 455.446 and 455.447. The following new facilities are therefore not permitted inside the "L" inundation zone.

- Hospitals and other medical facilities
- Police and Fire Stations
- Government communication centers and other facilities required for emergency response.
- K-12 schools and child care centers with a capacity greater than 250.
- Colleges or adult education schools with a capacity of greater than 500 persons
- Jails and detention facilities

All MSI buildings being considered to be located within the HMSC campus are permitted to be built in the tsunami inundation zone according to the recommendations of the Governor's Task Force. (http://www.oregon.gov/OMD/OEM/docs/resilience_tf/2014%2009%2029%20ORTF%20Report.pdf)

Regardless of the legal requirements, OSU has stated that consideration will be given to the feasibility of designing the MSI complex to be repairable given the occurrence of a DOGAMI "L" event. In addition, an evaluation of the risk to ongoing research projects and evacuation planning will be done based on the occurrence of a "XXL" event.

Figure 4 illustrates the estimated inundation depths at the HMSC site (DOGAMI Station 86) and arrival times for DOGAMI's five local events. Note that the depths at the site vary from less than 1 foot to 27 feet for the five local events and the arrival times are all about 30 minutes after the initial rupture.

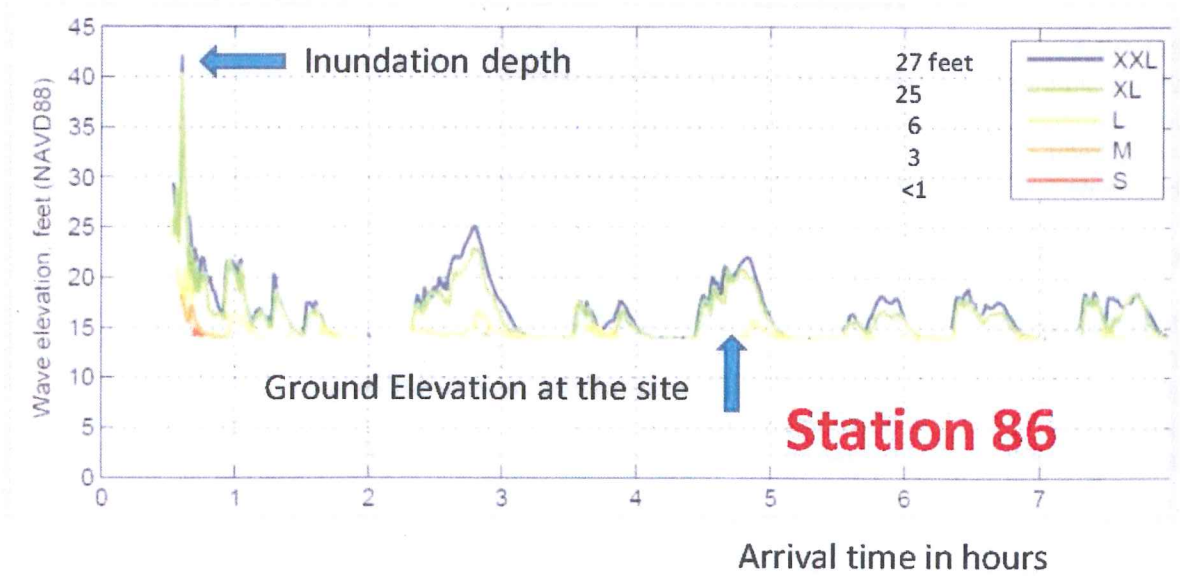


Figure 4 Tsunami Inundation Scenarios for HMSC Site (DOGAMI Station 86)

4.0 Considering the Effects of Earthquakes and Tsunamis

The consulting team worked with and interviewed OSU faculty and staff, DOGAMI staff, Newport City and Port Officials and members of Oregon Emergency Management to understand how to put these facts into perspective. The interview began with a brief written survey of issues to be considered followed by a series of questions related to the tsunami hazard, the associated risks, and the appropriate mitigation measures. The survey form and summary of results are included as Appendix A. The list of interview questions are attached as Appendix B.

The interview participants were selected by the working group and provided to the consultants. In person group interviews were conducted in 2015 on March 12-13 and November 16-17 and two additional interviews were conducted by phone later in November. As is apparent in the survey results, all participants were keenly interested in the MSI complex and committed to the program, as well as the health and safety of the University students, faculty and staff. The interviewers kept notes of the sessions and used them as the basis of the observations and considerations that follow.

The following people participated in the study as members of the working group, people interviewed, or both.

OSU College of Earth, Ocean, and Atmospheric Sciences

Jack Barth	Professor and Associate Dean for Research
Bob Cowen	Director, Hatfield Marine Science Center
Patrick Corcoran	Associate Professor, Geography, Environmental Sciences and Marine Resource Management
Bob Dziak	Affiliate Professor, Geology and Geophysics
Chris Goldfinger	Professor, Geology and Geophysics
John Nabelek	Professor, Geology and Geophysics
Anne Trehu	Professor, Geology and Geophysics
Bob Yeats	Professor Emeritus, Geology and Geophysics

OSU Administration

Mike Bamberger	Emergency Preparedness Manager
Glenn Ford	Vice President for Finance and Administration
Steve Clark	Vice President, University Relations and Marketing
Jock Mills	Government Relations
Kirk Pawlowski	University Architect, Capital Planning and Development

OSU College of Engineering

Scott Ashford	Kearney Professor of Engineering and Dean

OSU College of Engineering, Civil and Construction Engineering

Andre Barbosa	Assistant Professor, Structural
Dan Cox	Professor, Coastal and Ocean
Ben Mason	Assistant Professor, Geotechnical
Armin Stuedlein	Associate Professor, Geotechnical
Harry Yeh	Professor, Coastal and Ocean

DOGAMI

George Priest	Geologist
Ian Madin	Interim Director, State Geologist
Jonathan Allan	Coastal Geomorphologist

City of Newport and Port Officials

Spencer Nebel	City Manager
Kevin Greenwood	General Manager, Port of Newport
Derrick Tokos	Community Development Director

Oregon Office of Emergency Management

Dennis Sigrist	State Hazard Mitigation Officer
Althea Rizzo	Geologic Hazards Program Coordinator

There was considerable variation in the opinions expressed about the characteristics of the expected earthquakes and tsunamis and the opportunities for understanding and mitigating the consequence. Over 90 percent of those interviewed expressed support for locating the MSI complex as planned at HMSC. They collectively expressed the following major benefits and suggested mitigation measures to reduce the inherent life-safety risks. Some of the mitigation measures are already included in the building principals and design criteria established by the university. A number of other suggestions were made by those that did not support the current plans.

Major Benefits

1. Promotes increased collaboration among researchers at HMSC.
2. Enhances students' educational experience.
3. Strengthens the collaboration between the South Beach research partners.
4. Brings economic benefit to the community.
5. Provides access to the highest quality seawater for use in the labs.
6. Establishes new benchmarks for when and how to build in a tsunami inundation zone.
7. Creates an opportunity to improve the existing HMSC evacuation plans.
8. Provides an opportunity to enhance safety for all occupants in the South Beach area.

Additional Mitigation Measures

1. No 24/7 occupancies ever at HMSC (i.e. student housing). Relocate all that currently exist.
2. Evacuation measures should be based on worst-case inundation (XXL) -- regardless of probabilities.
3. Work closely with DOGAMI to define the "worst-case" scenario.
4. Consider relocating non-essential teaching and research activities to higher ground.
5. Design for sea level rise.
6. Design facility to be usable after repairs for the "L" tsunami with consideration given to the expected debris impacts.
7. Plan for total building loss and subsequent reconstruction of HMSC after a significant tsunami.

Other Suggestions

1. Relocate HMSC and the new MSI Complex to high ground. Maintain only the existing dock, tool shed, and warehouse facility at the current location.
2. Build the new MSI Complex on high ground with the intention of a complete relocation of HMSC in the long term.

5.0 Recommended Considerations

The Marine Studies Initiative is underway and well rooted in the future of Oregon State University. A decision to site the MSI complex within the Newport, Oregon community, has been made, with the needed student housing to be located at a new site on high ground near the Community College. Funding for the project is well developed and includes a monetary commitment from the State of Oregon Legislature. The process is obviously in motion, but there is time to make a balanced decision about how to proceed.

We recommend that the University consider proceeding on two parallel tracks. The first is related to expanding the evacuation planning in a move to enhance its effectiveness and support for the surrounding community. Regardless of the final decision about the location(s) of the MSI Complex, there is ample opportunity to improve the excellent plans now in place based on the refined information and modeling techniques available. The second is related to commissioning the selected A/E design team to complete the conceptual studies needed to explore the suggestions offered during the interviews, develop cost models of the options explored, and complete the designs based on the selected solutions. Detail of each track follow.

Initiate Expanded Horizontal Evacuation Planning

1. Base evacuation planning going forward on the DOGAMI "XXL" event.
2. Expand the current planning committee to include representatives from the City of Newport and South Beach businesses and residents.
3. Build upon, augment and utilize available new technology to refine the evacuation process to improve efficiency and completeness. Seek counsel from ADA groups.
4. Determine optimized evacuation routes to Safe Haven Hill and the Community College area based on site specific, state-of-the-art agent based modeling now under development at OSU. Consider the opportunity to provide vertical evacuation structures, perhaps for use as a last resort. Strive to define a path to safety for every occupant of South Beach.
5. Seek state and local funding for evacuation route improvements including additional signage, automated alerts, evacuation route modifications, and temporary shelter support for evacuees.
6. Develop and implement a South Beach-wide evacuation plan that brings awareness and includes briefings, training and regular exercises.

Initiate the Design Process

1. Develop a cost and schedule model for relocating HSMC and the new MSI Complex on high ground.
2. Commission site specific studies related to strong shaking, liquefaction, subsidence and lateral spreading potential, tsunami inundation potential, identification of debris sources and the potential for large ship impacts at the HSMC site. Site specific design criteria is key to developing appropriate cost models.
3. Confirm the program and the adjacencies needed for the target research and teaching environment. Determine if any of the MSI Complex activities can be accomplished on high ground at the housing complex.
4. Develop alternate solutions for the design of the facilities that need to be at the HMSC. Determine cost models for code minimum construction and for construction that will be repairable after an "L" level inundation.
5. In collaboration with the evacuation planning efforts, determine the feasibility and a cost model for providing vertical evacuation at the site, perhaps as a last-resort option.
6. Using triple bottom line style of comparison (social, financial, environmental) , determine the best options for the short term and long term status of the HMSC and the new MSI Complex.
7. Design and construct the selected solution.

Appendix A

Survey Form and Summary of Results

Survey Form

OREGON STATE UNIVERSITY - HATFIELD MARINE SCIENCE CENTER
MARINE STUDIES INITIATIVE

Respondent Name: _____

How would you rate the following site selection factors?

Site Selection Factors	1 Not Important	2 Somewhat Important	3 Important	4 Very Important	5 Extremely Important
a. Site Accessibilty (Pedestrian, Vehicular, Marine)					
b. Access to critical research infrastructure such as sea water system					
c. Proximity to other scientists conducting related marine science research					
d. Proximity to research subject matter					
e. Additional costs and time associated with conducting research from a remote location					
f. Building construction project costs					
g. Economic impact on the local community					
h. Local politics and political influence					
i. Safety and security of students, faculty & staff					
j. Risks associated with potential natural disasters					
k. Shovel ready site (with utilities and other improvements)					
l. Other: (Please specify) _____					

The Estimé Group, Inc. and Chris D Poland Consulting Engineer **May 12, 2015**

Survey Results

Respondent No.:	Site Accessibility	Access to Research Infrastructure	Proximity to Other Scientists	Proximity to Subject Matter	Additional Costs for Remote Location	Building Construction Costs	Economic Impact on Community	Local Politics	Safety & Security of Occupants	Risks Assoc. Natural Disasters	Shovel Ready Site	Other:	*Description of Other*
01	3.0	3.0	3.0	3.0	3.0	2.0		4.0	5.0	5.0	2.0	3.0	*Public Education*
02	3.0	4.0	4.0	3.0	3.0	3.0	3.0	4.0	5.0	5.0	2.0		
03	4.0	5.0	4.0	4.0	4.0	3.0	3.0	2.0	4.0	3.0	3.0		
04	4.0	5.0	5.0	5.0	4.0	4.0	4.0	3.0	5.0	4.0	4.0		
05	4.0	4.0	4.0	4.0	5.0	3.0	2.0	3.0	5.0	4.0	3.0		
06	3.0	4.0	2.0	1.0	3.0	3.0	2.0	1.0	5.0	5.0	2.0	5.0	*Hazard Resilience*
07	5.0	5.0	2.0	2.0	3.0	3.0	5.0	3.0	5.0	5.0	3.0		
08	3.0	3.0	3.0	3.0	2.0	3.0	3.0	4.0	4.0	4.0	3.0		
09	3.0	4.0	4.0	3.0	3.0	2.0	2.0	2.0	5.0	5.0	2.0		
10	2.0	2.0	3.0	3.0	3.0	2.0	4.0	4.0	5.0	5.0	1.0		
11	1.0				4.0	5.0	4.0		5.0	5.0			
12	3.0	3.0	4.0	3.0	2.0	3.0	4.0	3.0	5.0	5.0	3.0	4.0	*Vertical Evacuation*
13	3.0	5.0	4.0	3.0	2.0	3.0	2.0	4.0	5.0	5.0	3.0	5.0	*Decrease risk for community*
14	3.0	4.0	4.0	3.0	2.0	3.0	5.0	4.0	5.0	5.0	3.0	4.0	*Improve safety for community*
15			3.0			3.0	4.0	3.0	5.0	5.0			
16			3.0			3.0	4.0	3.0	5.0	5.0			
17	4.0	3.0	3.0	3.0	5.0	4.0	4.0	3.0	5.0	5.0	4.0		
18	3.0	3.0	3.0	3.0	3.0	3.0	4.0	3.0	5.0	5.0	2.0		
19	2.0	5.0	5.0	5.0	5.0	4.0	4.0	3.0	5.0	4.0	4.0		
Averages	*3.1*	*3.9*	*3.5*	*3.2*	*3.3*	*3.1*	*3.5*	*3.1*	*4.9*	*4.7*	*2.8*	*4.2*	

Appendix B

Interview Questions

HMSC MRI Marine Sciences Building
10 Questions for the March 12-13 2015 interviews
Roz Estime, Chris Poland

1. Does the MSB need to be located at the HMSC?
2. Can the MSB be designed to protect the faculty, students and visitors during an earthquake and Tsunami?
    a. Are there any longer term experiments that need to be protected?
    b. Should the damage to the MSB be repairable so that it can be reopened afterwards?
    c. How soon?
3. In terms of the following characteristics, what size earthquake and Tsunami do you expect in the next 50 years? What is the largest that could occur?
    a. Magnitude
    b. Water height
    c. Velocity of the flow
    d. Subsidence
    e. Lateral spreading
    f. Debris sources
4. How detailed and accurate is the computer modeling of the South Beach area?
    a. Is there agreement among scientists about how to model these events?
    b. Have the estimates been peer reviewed?
    c. Factors of safety
5. Is it possible to control/redirect the expected debris flow?
    a. Levy at the Marina
    b. River as the least path of resistance
6. What are the early warning systems now in place and what is planned?
7. What are the current evacuation plans for South Beach?
    a. Partner Agency Plans.
    b. How many people will need to evacuate?
    c. Are there plans to use the multistory buildings in the area?
    d. What high ground is available?
    e. Will the bridge approach be usable?
    f. What are the existing barriers?
8. What can be done to improve the evacuation plans?
    a. Vertical evacuation
    b. Elevated Road way
    c. Debris mound near NOAA
9. What benefits will the MSB bring to the community?
10. Other comments and suggestions

Executive Summary

As requested by Oregon State University (OSU), the following study provides an analysis of properties being considered for development of an instructional and research facility in support of OSU's Marine Studies Initiative (MSI). The sites are being evaluated as alternates to a previously identified site located on Marine Science Drive at Hatfield Marine Science Center (HMSC). Evaluation criteria focuses on site constructability and includes:

- Confirmation of a minimum of 5 acres of developable land necessary to support the proposed building and associated site improvements
- Civil engineering assessment including utility and road improvements
- Environmental assessment
- Geotechnical hazards and seismic considerations
- Structural engineering assessment
- Construction costs and duration

The alternate sites were identified by OSU. The sites are located south of the Yaquina Bay Bridge, are outside the tsunami inundation zone as identified by DOGAMI interactive maps (2013 edition) and are inside the City of Newport and/or the city's urban growth boundary.

Our team consists of **Fortis Construction** (lead project manager and cost/schedule consultant), **ABHT Structural Engineers** (structural engineering consultant), **Cascade Earth Science** (environmental consultant), **Foundation Engineering Inc.** (geotechnical consultant), and **KPFF** (civil engineering consultant). The work included literature reviews (including DOGAMI seismic hazard maps and landslide hazard maps), a site reconnaissance, environmental site assessments and land development feasibility assessments. Anticipated subsurface conditions were established by analyzing data from borings and test pits completed near the project sites by Foundation Engineering between the years of 1999 -2016. Geological hazard evaluation included addressing the potential for landslide hazards in sloping terrain. Seismic considerations included evaluation of the potential for liquefaction and earthquake-induced landslide hazards as well as tsunami inundation hazards. Existing infrastructure exploration was conducted by reviewing construction records from City of Newport and Lincoln County public works departments.

The following is a high level summary of the sites and their development potential:

GENERAL SITE HIGHLIGHTS

- Sites range in size between 24 and 36 acres and offer developable land between 11 and 29 acres, confirming the minimum 5 acres development requirement.
- Sites are highly wooded with undulating terrain. One site includes infrequent deep ravines.
- Sites are located within approximate 1-2 mile radius from the existing HMSC campus

CIVIL HIGHLIGHTS

- Site grading will require stripping and grubbing of 1-2' of surface vegetation and organic-rick soil.
- Public and private utilities are immediately adjacent to or within 900 feet of the sites. Extension of utilities may require easements from adjacent property owners.
- Roadway infrastructure is immediately adjacent to or within 900 feet of the sites.
- A booster pump station would be required for development on sites to obtain adequate pressure for domestic and fire suppression needs.

ENVIRONMENTAL HIGHLIGHT

- No apparent environmental issues or wetlands exist preventing development for the intended use.

GEOTECHNICAL HIGHLIGHTS

- No signs of slope instability were observed at the sites. DOGAMI SLIDO maps also indicate no mapped historic landslides at the sites.
- Anticipated subsurface conditions include ±1 to 2-foot thick mantle of topsoil, underlain by marine terrace deposits, which are likely to include medium stiff to stiff, low to medium plasticity silt extending to depths of ±2 to 5 feet followed by marine terrace sand. The marine terrace sand is underlain by Nye Mudstone at anticipated depths ranging from ±40 to 50 feet.
- Based on anticipated subsoil conditions, modest ground motion amplification is anticipated with a site response consistent with an Oregon Structural Specialty Code (2014) Seismic class D.
- The liquefaction (earthquake-induced loss of soil strength) and lateral spread (lateral movement associated with liquefaction) hazard are anticipated to be relatively low. However, exploratory drilling at would be required at the site to better evaluate these hazards.

STRUCTURAL HIGHLIGHTS

- Sites present low risk of earthquake-induced instability pre- and post-construction.
- Sites would consist of typical structural design standards such as shallow foundations consisting of continuous and spread footings, slab on grade over rock base, shear walls, steel structure with slab-on-metal composite decks, and metal stud with brick and/or metal panel exterior cladding system.

COST & SCHEDULE HIGHLIGHTS

- Construction schedule for sites range between 16-17 months including possible infrastructure and site preparation scope of work.
- Construction cost for sites range between a cost savings of 3-7% in comparison to baseline site at HSMC.
- Infrastructure (i.e. utilities, roads, lighting, etc) has been accounted for in the cost and schedule information provided.
- Land acquisition is not included in any cost comparisons.

ABHT
STRUCTURAL ENGINEERS
1640 NW Johnson St.
Portland, OR 97209
Tel 503.243.6682
Fax 503.243.6622
www.abht-structural.com

May 5, 2016

Mr. Tim Sissel
Fortis Construction, Inc.
1705 SW Taylor St., Ste. 200
Portland, OR 97205

RE: OSU MSI - Hatfield Marine Science Center FEMA P-154 Rapid Visual Screening Evaluation of (5) Existing Buildings

Dear Tim,

As described in our scope of services dated April 12, 2016, we have performed a FEMA P-154 Rapid Visual Screening seismic evaluation of (5) existing buildings at the Hatfield Marine Science Center located at 2030 SE Marine Science Drive in Newport, OR. The following buildings were evaluated:

1. Marine Science Lab/Visitor Center
2. Education Building
3. Potts-Guin Library
4. Ship Support
5. Ship Operations.

As part of the evaluation process, we performed a site visit on April 26, 2016 to perform a visual observation of the interior and exterior of each building. We observed structural and non-structural elements readily exposed to view. No destructive demolition was performed to expose concealed areas. Upon completion of our site visit, we reviewed available as-built drawings and completed the FEMA P-154 Level 1 and Level 2 Data Collection Forms for each building. Based on the results of the evaluation, we prepared a list of potential seismic deficiencies and hazards as well as a list of potential seismic upgrades. The lists were based on the limited P-154 evaluation only. No structural calculations were performed to verify the capacity of the existing structural system to meet current code strength and detailing requirements.

The results of the evaluation along with the list of potential seismic upgrades for each building summarized within this report were used by Fortis Construction, Inc. to develop schematic cost estimates for seismic upgrades and to ultimately assist OSU in their long range campus planning. A cost model is included for each building along with a final Cost Summary.

FEMA P-154 RAPID VISUAL SCREENING DISCUSSION

The limited seismic evaluation was performed in accordance with the FEMA P-154 Report, *Rapid Visual Screening of Buildings for Potential Seismic Hazards*, third edition. The rapid visual screening (RVS) procedure identifies and screens buildings which are potentially seismically hazardous. Once a building is identified as seismically hazardous, it is recommended that further study by a Structural Engineer (typically based on an ASCE 41-13 Evaluation) be performed to determine if in fact the building is seismically hazardous. The RVS procedure involves a visual observation of the building from the exterior, and if possible the interior, and review of available as-built documents and reports. No structural calculations are performed to verify the capacity of existing structural members. A two-page data collection form is then filled out based on the data collected, and a score is calculated that provides an indication of the expected seismic performance of the building. FEMA P-154 suggests that buildings which have a final score of 2.0 or greater will have acceptable seismic performance. Buildings with a final score less than 2.0 are considered potentially seismically hazardous and thus should be evaluated by a Structural Engineer. The results of the

FEMA P-154 evaluation along with a list of potential seismic deficiencies and potential seismic upgrades are summarized below. Please note that although liquefaction is a potential hazard for each building, the report does not recommend retrofit of the existing foundations. Based on the estimated settlement due to liquefaction, the buildings, if retrofitted per ASCE 41-13 or current building code, should provide a collapse prevention performance level when subject to an MCE (Maximum Considered Earthquake) ground motion.

EVALUATION RESULTS

Marine Science Lab/Visitor Center

The Marine Science Lab/Visitor Center is a 1-story precast concrete tilt-up building with a wood-framed roof structure supporting a concrete tile roofing system. A mechanical mezzanine occurs above the visitor center. The building has a final Level 2 score of 0.9 which indicates that the building is potentially seismically hazardous. Per FEMA P-154, further structural evaluation is recommended. A list of potential seismic system deficiencies and hazards as well as a list of potential seismic upgrades are as follows:

Seismic Deficiencies and Hazards

- Insufficient plywood roof diaphragm nailing and strapping
- Insufficient attachment of exterior pre-cast concrete wall panels to the roof diaphragm to transfer out-of-plane loads
- Insufficient drag struts to transfer roof diaphragm forces to concrete shear walls
- Unreinforced masonry chimneys
- Insufficient lateral bracing at the interior wood-framed mezzanine at west wing
- Lack of seismic anchorage and bracing of mechanical units and ceiling and lighting elements
- Potential for pounding between adjacent walkway structure to Education Wing
- Potential for soil liquefaction

Potential Seismic Upgrades

- Remove existing heavy concrete tile roofing and replace with lighter asphalt shingle or metal roofing system.
- Add plywood diaphragm nailing and strapping as required prior to installation of new roofing system.
- Upgrade attachment between pre-cast concrete wall panels and roof diaphragm.
- Add drag struts as required to transfer roof diaphragm forces to shear walls.
- Add new shear wall elements with localized foundation strengthening where necessary.
- Anchor and brace mechanical units and non-structural items such as ceilings and fixtures.
- Replace windows subject to shattering.

Cost Model

Marine Science Lab/Visitor Center										
First Floor	31600	sf								
Mechanical Mezzanine	3500	sf								
Total Area	35100									
	Demolition & Seismic	Roofing	Interior Finishes	Glazing	MEP (AFS NIC)	Scaffold / Weather Protect	General Conditions	Burdens	Contingency	Escalate - Q2 2017
Percentage							14%	10%	20%	5%
Area (sf)	35,100	48,436	31,600	4,800	31,600	31,600	1	1	1	1
Unit Price	$ 40	$ 9	$ 13	$ 70	$ 3	$ 4.00	$ 390,897	$318,302	$ 558,425	$ 139,606.2
Total	$ 1,404,000	$435,924	$410,800	$336,000	$79,000	$ 126,400	$ 390,897	$318,302	$ 558,425	$ 139,606
Summary Totals							Cost/SF	$ 119.64		$ 4,199,354
	****Exclude Soft Costs, moving existing furniture, displays, and any subsurface building support (due to liquifaction)									

Education Building

The Education Building is a 2-story precast concrete tilt-up building with a wood-framed roof structure supporting a concrete tile roofing system. The second floor was originally designed as a library and is now used as office space. The building has a final Level 2 score of 1.1 which indicates that the building is potentially seismically hazardous. Per FEMA P-154, further structural evaluation is recommended. A list of potential seismic system deficiencies and hazards as well as a list of potential seismic upgrades are as follows:

Seismic Deficiencies and Hazards

- Insufficient plywood roof diaphragm nailing and strapping
- Insufficient attachment of exterior pre-cast concrete wall panels to the roof diaphragm to transfer out-of-plane loads
- Insufficient drag struts to transfer roof diaphragm forces to concrete shear walls
- Lack of seismic anchorage and bracing of mechanical units and ceiling and lighting elements
- Potential for pounding between walkway structure and Marine Science Lab/Visitor Center
- Potential for soil liquefaction

Potential Seismic Upgrades

- Remove existing heavy concrete tile roofing and replace with lighter asphalt shingle or metal roofing system.
- Add plywood diaphragm nailing and strapping as required prior to installation of new roofing system.
- Upgrade attachment between pre-cast concrete wall panels and roof diaphragm.
- Add drag struts as required to transfer roof diaphragm forces to shear walls.
- Add new shear wall elements with localized foundation strengthening where necessary.
- Anchor and brace mechanical units and non-structural items such as ceilings and fixtures.
- Replace windows subject to shattering.

Cost Model

Education Building										
First Floor	11364	sf								
Second Floor	3761	sf								
Total Area	15125									
	Demolition & Seismic	Roofing	Interior Finishes	Glazing	MEP (AFS NIC)	Scaffold / Weather Protect	General Conditions	Burdens	Contingency	Escalate - Q2 2017
Percentage							14%	10%	20%	5%
Area (sf)	15,125	19,500	15,125	1,300	15,125	15,125	1	1	1	1
Unit Price	$ 40	$ 10	$ 10	$ 70	$ 3	$ 4.00	$ 159,679	$ 130,024	$ 228,113	$ 57,028.1
Total	$ 605,000	$ 195,000	$ 151,250	$ 91,000	$ 37,813	$ 60,500	$ 159,679	$ 130,024	$ 228,113	$ 57,028
Summary Totals							Cost/SF	$ 113.42		$ 1,715,406
	****Exclude Soft Costs, moving existing furniture, and any subsurface building support (due to liquifaction)									

Potts-Guin Library

The Potts-Guin Library is a 2-story precast concrete tilt-up building with a wood-framed roof structure supporting a metal roofing system. The second floor contains book shelves and a mechanical room. The building has a final Level 2 score of 0.9 which indicates that the building is potentially seismically hazardous. Per FEMA P-154, further structural evaluation is recommended. A list of potential seismic system deficiencies and hazards as well as a list of potential seismic upgrades are as follows:

Seismic Deficiencies and Hazards

- Insufficient plywood roof diaphragm nailing and strapping
- Insufficient attachment of exterior pre-cast concrete wall panels to the roof diaphragm to transfer out-of-plane loads
- Insufficient drag struts to transfer roof diaphragm forces to concrete shear walls
- Lack of seismic anchorage and bracing of mechanical units and ceiling and lighting elements
- Potential for soil liquefaction

Potential Seismic Upgrades

- Add plywood diaphragm nailing and strapping as required
- Upgrade attachment between pre-cast concrete wall panels and roof diaphragm.
- Add drag struts as required to transfer roof diaphragm forces to shear walls.
- Add new shear wall elements with localized foundation strengthening where necessary.
- Anchor and brace mechanical units and non-structural items such as ceilings, book racks and fixtures.
- Replace windows subject to shattering.

Cost Model

Potts-Guin Library										
First Floor	17890	sf								
Mechanical Mezzanine	3551	sf								
Total Area	21441									
	Demolition & Seismic	Roofing	Interior Finishes	Glazing	MEP (AFS NIC)	Scaffold / Weather Protect	General Conditions	Burdens	Contingency	Escalate - Q2 2017
Percentage							14%	10%	20%	5%
Area (sf)	21,441	29,295	21,441	2,700	21,441	21,441	1	1	1	1
Unit Price	$ 38	$ 12	$ 10	$ 70	$ 2	$ 2.50	$233,267	$189,946	$ 333,239	$ 83,309.6
Total	$ 814,758	$ 351,540	$ 214,410	$189,000	$ 42,882	$ 53,603	$233,267	$189,946	$ 333,239	$ 83,310
Summary Totals							Cost/SF	$ 116.88		$ 2,505,954
	****Exclude Soft Costs, moving existing furniture, and any subsurface building support (due to liquifaction)									

Ship Support

The Ship Support building is a 1-story precast concrete tilt-up building with a wood-framed roof structure supporting a concrete tile roofing system. The building has a final Level 2 score of 1.1 which indicates that the building is potentially seismically hazardous. Per FEMA P-154, further structural evaluation is recommended. A list of potential seismic system deficiencies and hazards as well as a list of potential seismic upgrades are as follows:

Seismic Deficiencies and Hazards

- Insufficient plywood roof diaphragm nailing and strapping
- Insufficient attachment of exterior pre-cast concrete wall panels to the roof diaphragm to transfer out-of-plane loads
- Insufficient drag struts to transfer roof diaphragm forces to concrete shear walls
- Lack of seismic anchorage and bracing of mechanical units, storage racks and ceiling and lighting elements
- Potential for soil liquefaction

Potential Seismic Upgrades

- Remove existing heavy concrete tile roofing and replace with lighter asphalt shingle or metal roofing system.
- Add plywood diaphragm nailing and strapping as required prior to installation of new roofing system.
- Upgrade attachment between pre-cast concrete wall panels and roof diaphragm.
- Add drag struts as required to transfer roof diaphragm forces to shear walls.
- Add new shear wall elements with localized foundation strengthening where necessary.
- Anchor and brace mechanical units and non-structural items such as storage racks, ceilings and fixtures.
- Replace windows subject to shattering.

Cost Model

Ship Support										
First Floor	2643	sf								
Mechanical Mezzanine	2643	sf								
Total Area	5286									
	Demolition & Seismic	Roofing	Interior Finishes	Glazing	MEP (AFS NIC)	Scaffold / Weather Protect	General Conditions	Burdens	Contingency	Escalate - Q2 2017
Percentage							14%	10%	20%	5%
Area (sf)	5,286	7,050	5,286	630	5,286	5,286	1	1	1	1
Unit Price	$ 35	$ 10	$ 8	$ 70	$ 2	$ 2.00	$ 50,826	$41,387	$ 72,608	$ 18,152
Total	$ 185,010	$ 70,500	$ 42,288	$ 44,100	$ 10,572	$ 10,572	$ 50,826	$41,387	$ 72,608	$ 18,152
Summary Totals							Cost/SF	$103.29		$ 546,015
	****Exclude Soft Costs, moving existing furniture, and any subsurface building support (due to liquifaction)									

Ship Operations

The Ship Operations building is a 2-story precast concrete tilt-up building with a wood-framed roof structure supporting a concrete tile roofing system. The first floor is warehouse while the second floor is office. The building has a final Level 2 score of 1.5 which indicates that the building is potentially seismically hazardous. Per FEMA P-154, further structural evaluation is recommended. A list of potential seismic system deficiencies and hazards as well as a list of potential seismic upgrades are as follows:

Seismic Deficiencies and Hazards

- Insufficient plywood roof diaphragm nailing and strapping
- Insufficient attachment of exterior pre-cast concrete wall panels to the roof diaphragm to transfer out-of-plane loads
- Insufficient drag struts to transfer roof diaphragm forces to concrete shear walls
- Lack of seismic anchorage and bracing of mechanical units and ceiling and lighting elements
- Potential for soil liquefaction

Potential Seismic Upgrades

- Remove existing heavy concrete tile roofing and replace with lighter asphalt shingle or metal roofing system.
- Add plywood diaphragm nailing and strapping as required prior to installation of new roofing system.
- Upgrade attachment between pre-cast concrete wall panels and roof diaphragm.
- Add drag struts as required to transfer roof diaphragm forces to shear walls.
- Anchor and brace mechanical units and non-structural items such as ceilings and fixtures.
- Replace windows subject to shattering.

Cost Model

Ship Operations										
First Floor	2600	sf								
Mechanical Mezzanine	2600	sf								
Total Area	5200									
	Demolition & Seismic	Roofing/Soft fit	Interior Finishes	Glazing	MEP (AFS NIC)	Scaffold / Weather Protect	General Conditions	Burdens	Contingency	Escalate - Q2 2017
Percentage							14%	10%	20%	5%
Area (sf)	5,200	7,020	5,200	1,000	5,200	5,200	1	1	1	1
Unit Price	$ 42	$ 10	$ 12	$ 70	$ 2	$ 2.00	$ 61,852	$50,365	$ 88,360	$ 22,090.0
Total	$ 218,400	$ 70,200	$62,400	$70,000	$10,400	$ 10,400	$ 61,852	$50,365	$ 88,360	$ 22,090
Summary Totals							Cost/SF	$127.78		$ 664,467
	****Exclude Soft Costs, moving existing furniture, and any subsurface building support (due to liquifaction)									

COST AND SCHEDULE SUMMARY

- The cost model is based the existing drawings, structural narrative and a site visit.
- The schedule to complete this project is based on an 8-10 month duration and the ability to work on multiple buildings at the same time. This provides an economy of scale for subcontractor pricing, saves general conditions, and can maximize the summer months to complete the roof work.
- Occupancy versus vacating the building to perform the work. Some considerations would include:
  - Public safety
  - Noise
  - Sensitivity of experiments
  - Weather and thermal comfort
  - Expense or relocating the occupants of the building (soft costs)
  - Type of work that would be performed – ex. Roof removal and nailing vs isolated shear wall construction with minimal area of impact. A detailed zone and work plan will be required once a design is completed
- The cost model is based on historical structural data to complete seismic work
- Glazing is based on new storefront, not just glass replacement
- The roofs once demolished will be replaced with a heavy duty shingle. Concrete tiles or shake roofs will not be reinstalled. At the library we would try and reuse the metal roofing
- Work not in pricing includes, but is not limited to:
  - Design, permit costs, abatement or handling of hazardous materials
  - Complete rework of existing interiors, work will only occur in areas affected by voluntary seismic work
  - All relocation costs and furniture relocation costs etc.
  - Rework of data/telecom
  - Exterior road or landscape work
  - Items associated with liquefaction or substructure support of the building
  - Energy upgrades, complete building renovation or deferred maintenance

Cost Summary – All Buildings

SUMMARY OF BUILDINGS								
Description	Marine Science Lab/Visitor Center	Education Building	Potts-Guin Library	Ship Support	Ship Operations	Totals	Ave $/Sf	Total Costs as a Percentage
Building Area	35,100	15,125	21,441	5,286	5,200	82,152		
Cost per Square Foot	$119.64	$113.42	$116.88	$103.29	$127.78	$116.20		
Demolition & Seismic	$1,404,000	$605,000	$814,758	$185,010	$218,400	$3,227,168	$39.28	33.51%
Roofing	$435,924	$195,000	$351,540	$70,500	$70,200	$1,123,164	$13.67	11.66%
Interior Finishes	$410,800	$151,250	$214,410	$42,288	$62,400	$881,148	$10.73	9.15%
Glazing	$336,000	$91,000	$189,000	$44,100	$70,000	$730,100	$8.89	7.58%
MEP - (AFS not included)	$79,000	$37,813	$42,882	$10,572	$10,400	$180,667	$2.20	1.88%
Scaffold/Weather Protection	$126,400	$60,500	$53,603	$10,572	$10,400	$261,475	$3.18	2.71%
General Conditions	$390,897	$159,679	$233,267	$50,826	$61,852	$896,521	$10.91	9.31%
Burdens	$318,302	$130,024	$189,946	$41,387	$50,365	$730,024	$8.89	7.58%
Contingency	$558,425	$228,113	$333,239	$72,608	$88,360	$1,280,744	$15.59	13.30%
Escalation	$139,606	$57,028	$83,310	$18,152	$22,090	$320,186	$3.90	3.32%
Summary Totals	$4,199,354	$1,715,406	$2,505,954	$546,015	$664,467	$9,631,196	$117.24	100%
****Exclude Soft Costs, moving existing furniture, and any subsurface building support (due to liquefaction)								

DATA COLLECTION FORMS

The Level 1 and Level 2 Data Collection Forms for each building are provided in Appendix A. The forms are applicable to buildings in a VERY HIGH Seismicity region as defined by FEMA P-154 using Ss and S1 values. A site map and site specific spectral response acceleration parameters are included at the end of the forms.

RECORD DRAWINGS

An index of available record drawings used in this evaluation is included in Appendix B for reference.

Please call us if you have any questions.

Sincerely,

Clinton J. Ambrose, P.E., S.E.
Principal

Attachments – Appendix A: Level 1 & 2 Data Collection Forms, Appendix B: List of Available Record Drawings

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Tsunami Evacuation Discussion for HMSC Site

OSU MSI Alternative Site Feasibility Study

May 17, 2016

Scope

The Fortis-led design team was retained to evaluate a proposed tsunami evacuation route between the HMSC site and Safe Haven Hill. The selection of the evacuation route was based on observation of the surface conditions, a review of seismic hazards, and an evaluation of existing underground utilities and anticipated subsurface conditions.

Literature Review

The evaluation of seismic hazards was based on a review seismic hazard maps and documents including the following:

- Tsunami Evacuation Map Newport-South, Oregon, Department of Geology and Mineral Industries (DOGAMI), December 12, 2012.
- The Oregon Resilience Plan, Oregon Seismic Safety Policy Advisory Committee (OSSPAC), February 2013.

The evaluation of subsurface conditions was based on the previous explorations by Foundation Engineering and others in the vicinity of South Beach. Exhibit 1 shows the approximate locations of these explorations relative to the HMSC site and the proposed evacuation route. These explorations include:

- A boring and four test pits completed by Foundation Engineering in 1994, for the HMSC visitor's center expansion.
- Six borings completed by Foundation Engineering in 2000, for a new wastewater transmission line extending north from OSU Marine Science Drive beneath Yaquina Bay.
- Three borings completed by Foundation Engineering in 2001, for a new wastewater transmission line on Ferry Slip Road and OSU Marine Science Drive.
- Three borings completed by Foundation Engineering in 2004, for a proposed Newport Exposition Center in the Rogue Brewery parking lot north of OSU Marine Science Drive.
- Nine borings and eight core holes completed by Foundation Engineering in 2010, for the South Beach Transportation Improvements project, which included reconstruction of OSU Marine Science Drive and a parallel paved bike path.

- Ten borings and four test pits completed by GRI in 2009 for the NOAA facility at the north end of OSU Marine Science Drive.
- Three borings completed by Foundation Engineering in 2011 and 2013, for the Safe Haven Hill tsunami evacuation site.

The evaluation of existing underground utilities was based on the following:

- Natural gas line locations were estimated using NW Natural's online mapping system.
- Water, sewer and stormwater lines were located based on a phone conversation with Olaf Sweetman (City of Newport).
- Electrical and telecom utility locations were determined by map request for the project area.

Discussion of Seismic Hazards

The seismic evaluation focused on a M9 Cascadia Subduction Zone (CSZ) earthquake capable of generating a tsunami. During a M9 CSZ earthquake, ground shaking is likely to last ±5 minutes or more with ±2 to 4 minutes of sustained hard shaking (OSSPAC, 2013). It is estimated there will be ±15 to 20 minutes between the earthquake and the arrival of a tsunami (DOGAMI, 2012). In addition to the shaking and tsunami, ±2 to 3 feet of ground subsidence is expected (OSSPAC, 2013). The subsidence will be a widespread rapid drop in the land during the earthquake. Liquefaction settlement (where it occurs) will be in addition to the subsidence.

The terrain in the South Beach area, including the HMSC site, is relatively flat, typically ranging from ±El. 15 to ±El. 18. Piezometer measurements for previous Foundation Engineering projects in the area indicate ground water levels vary seasonally, but typically range from ±El. 5 to ±El. 10. The area is underlain by a deep deposit of sand, which includes fill, dune sand and bay alluvium. The sand is predominantly medium dense grading to dense to very dense with depth. However, lenses of loose sand are present in some areas. The density of the sand varies with location and depth. As such, sporadic liquefaction and associated differential settlement should be expected as a result of a M9 CSZ earthquake. Considering the ground water depths and the thicknesses of the loose to medium dense sand lenses in Foundation Engineering's previous borings, it is anticipated the liquefaction settlement along the evacuation path may range from negligible to ±6 inches.

Lateral spread is likely along the Yaquina Bay shoreline. Lateral spread is not expected to extend to Marine Science Drive since, 1) this street is at least 300 feet from the shoreline in relatively flat terrain, and 2) the available borings do not indicate the presence of a uniform liquefiable layer between the Bay and this street.

Numerous underground utilities are present in project vicinity. The utilities include:

- NW Natural gas mains with diameters of 4 inches and 6-5/8 inches extend along Marine Science Drive. They are fed by an 8-5/8-inch diameter main that extends beneath Yaquina Bay. The gas mains on Marine Science Drive feed a 4-inch diameter line on Ferry Slip Road, as well as several 2-inch diameter lines that extend to adjacent properties. Exhibit 2 shows the approximate gas line locations.
- A 12-inch diameter PVC City water main extends along Marine Science Drive next to the HSMC. The 12-inch PVC water main changes to an 8-inch asbestos cement pipe under Marine Science Drive between the intersection with Ferry Slip Road and SE Pacific Way. The 8-inch asbestos cement main changes to an 8-inch diameter PVC main at the intersection with SE Pacific Way. This line follows SE Pacific Way to Hwy. 101. Exhibit 3 shows the approximate water main locations.
- A City pressure sewer main extends along Ferry Slip Road and SE Marine Science Drive. A gravity sewer pipe also follows Marine Science Drive. Exhibit 3 shows the approximate sewer line locations.
- There are several underground electrical and telecom lines in SE Marine Science Drive and several pad-mounted transformers adjacent to this street.

Exhibits 2 and 3 show the approximate locations of the Evaluation of the risks associated with these underground utilities depends on their condition and their ability to survive differential settlement associated with liquefaction. The asbestos cement water main, in particular, may be brittle and susceptible to breaking. Broken pressure lines can cause rapid erosion of the sand beneath the roads and pathways or fire hazards that could severely interrupt evacuation efforts. Therefore, we recommend contacting the owners of these underground utilities to discuss the risks.

Proposed Evacuation Route

The tsunami evacuation assembly area is at the top of Safe Haven Hill, which is located near the south abutment of the Yaquina Bay Bridge, ±2,300 feet southwest of the HMSC site (Exhibit 1). The assembly area lies at ±El. 85. It is anticipated SE Marine Science Drive and the associated streets (Ferry Slip Road and SE Pacific Way) or the bike paths along these streets will represent the main route selected by those evacuating between the HMSC and Safe Haven Hill. Therefore, we have focused our work on evaluating a proposed evacuation route in this area, and specifically, selecting a route suitable for wheel access between the HMSC and Safe Haven Hill.

The City has recently constructed pathways to the top of the hill, including gravel-surfaced trails on the north and east sides of the hill and a paved roadway and timber-framed stairway on the south side of the hill off of SW Abalone Street. The Yaquina Bay Bridge may collapse during a M9 CSZ earthquake making the trail head at the north side of Safe Haven Hill inaccessible or difficult to access from the area east of the bridge. Therefore, it is anticipated most evacuees will likely follow OSU Marine Science Drive to SW Pacific Way and then follow SW Pacific up to Hwy 101 and Safe Haven Hill. Those on foot could alternatively follow OSU Marine Science Drive to Ferry Slip Road and then run or walk cross country to Hwy. 101. Once on Hwy. 101, evacuees on foot can take the trail to the top of Safe Have Hill from

Hwy 101 near the south bridge abutment or go south to SW Abalone Street and then up the stairs or paved access road on the south side of Safe Haven Hill. Those in wheel chairs will need to use the paved access road on the south side of the hill.

Sporadic liquefaction is anticipated in the South Beach area, including in the vicinity of Marine Science Drive. Variable liquefaction settlement can cause cracking and vertical offsets in pavements and sidewalks along the evacuation route. Differential settlement may also lead to damage to underground utilities, including pressurized water, waste water and gas lines as previously discussed.

It is anticipated most evacuees will travel on foot following SE Marine Science Drive, Ferry Slip Road and SE Pacific Way. These streets are typically flanked with relatively flat grassy areas or gravel or asphaltic concrete surfaced parking lots. Therefore, streets damaged by differential settlement or broken underground utilities should also be passable by foot with modest detours.

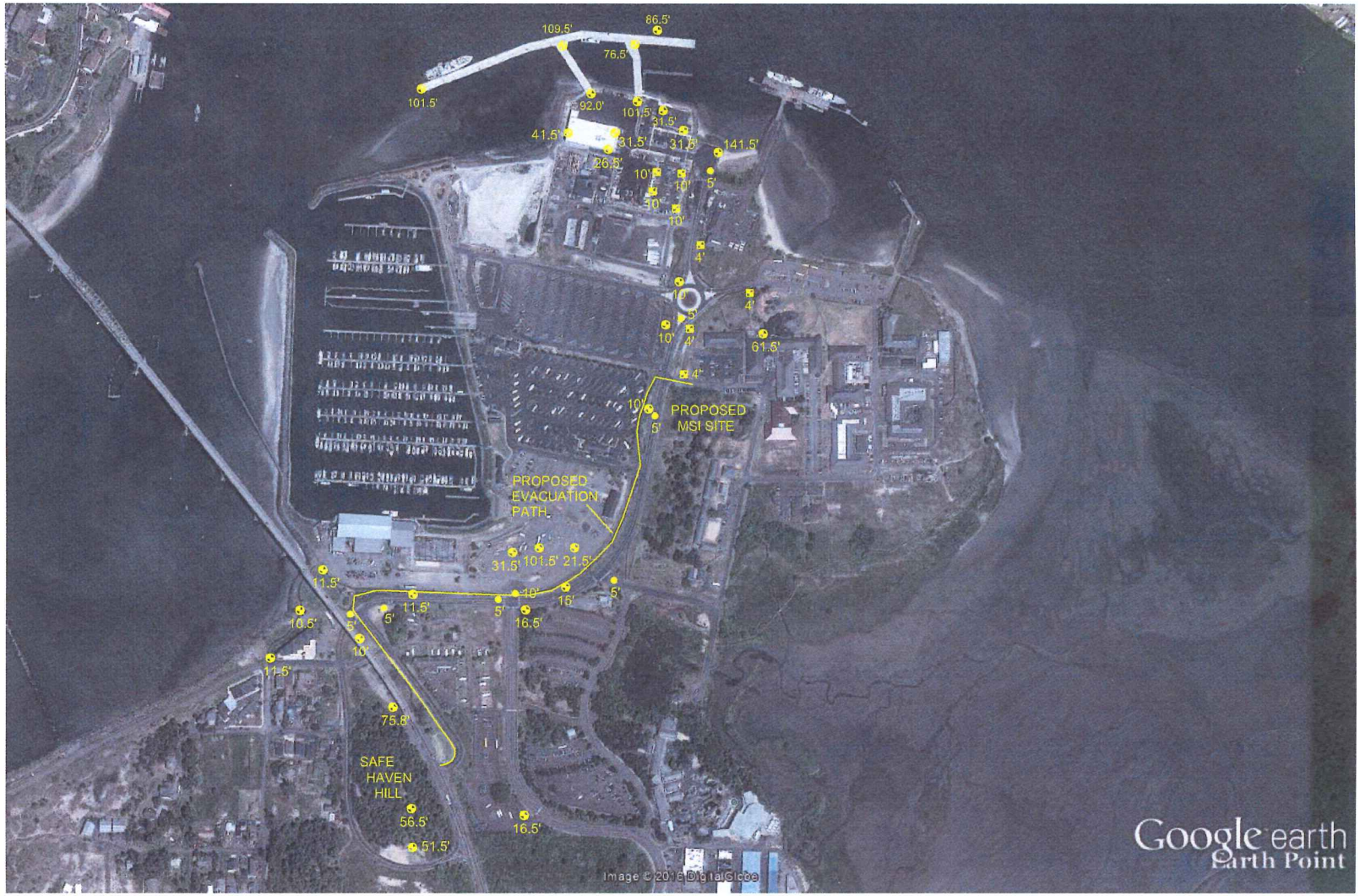
Cracked and faulted pavement and sidewalks along the evacuation route should be relatively easily passable on foot. However, faulted pavement can be problematic for people with disabilities, particularly those in wheel chairs. Ground improvement could be completed to densify the sand and mitigate the liquefaction risk along the preferred evacuation route, thereby mitigating the wheel chair access issues. However, such ground improvement would likely be cost-prohibitive and it could potentially adversely impact existing underground utilities. Because the locations and thicknesses of the potentially liquefiable sand deposits are variable and unpredictable, the work would likely unnecessarily treat some dense sand areas that do not require ground improvement.

Considering the site conditions, we believe it would be more prudent and cost-effective to improve disabled access by constructing the preferred pathway using a flexible asphaltic concrete pavement section reinforced with a strong geogrid. The geogrid will to help attenuate differential movement and reduce the risk of developing cracking and vertical offsets in the pavement.

It is proposed to develop a wheel chair accessible evacuation route following the current paved bike/pedestrian path that extends along the north/west sides of Marine Science Drive and the west side of SE Pacific Way. This approach is intended to minimize impacts to traffic and existing utilities. The bike/pedestrian path on the west side of SE Pacific Way currently ends at the bridge abutment. This path would need to be extended along the side of the street to SE Pacific Way Hwy 101. The proposed evacuation route is shown on Exhibit 1.

The existing pathway pavements along this route would be replaced with a geogrid-reinforced pavement to reduce the risk of pavement cracking and faulting. The proposed reinforced path would consist of 2.5 inches of asphaltic concrete (AC) over 10 inches of ¾" – 0 or 1" – 0 crushed base rock meeting the requirements in Section 02630 of the ODOT 2015 Standard Specifications for Construction (ODOT, 2015). The base rock should be underlain by an integrally-formed, Tensar BX Type 1 biaxial geogrid (or equivalent). The geogrid should be underlain by a nonwoven separation geotextile meeting the requirements in Table 02320-4 of the ODOT (2015).

Construction costs for the reinforced path were estimated to be $395,400 assuming a width of 8 feet and a length of 3,300 feet.



Note: Base image obtained from Google Earth.

LEGEND

- 10' TEST PIT LOCATION AND DEPTH
- 10' BORE HOLE LOCATION AND DEPTH
- 10' CORE HOLE LOCATION AND DEPTH

Foundation Engineering Professional Geotechnical Services	SITE MAP AND NEARBY GEOTECHNICAL EXPLORATIONS	EXH-1 5/16/2016

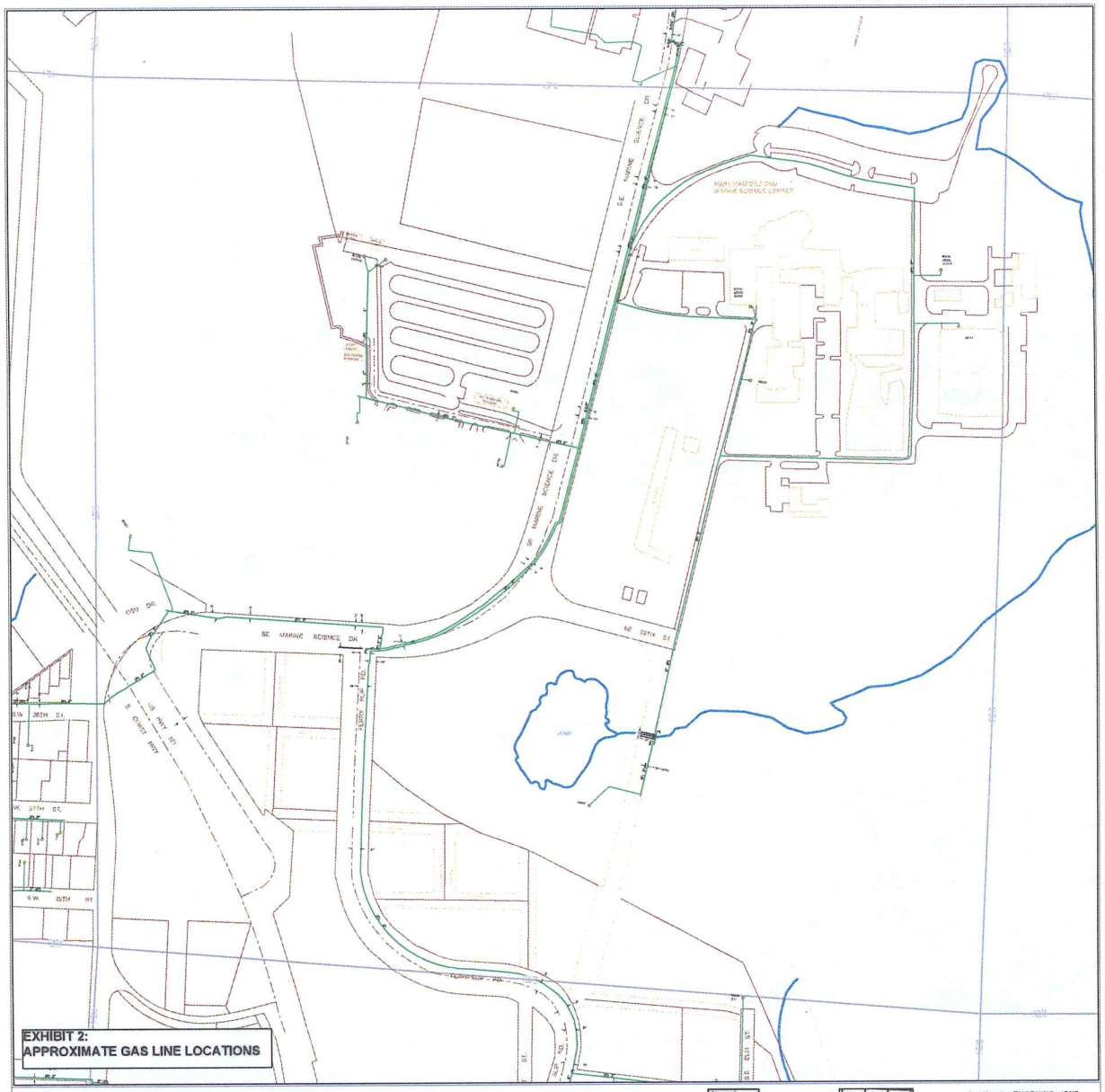


EXHIBIT 2:
APPROXIMATE GAS LINE LOCATIONS

NW Natural does not warrant the accuracy of this map. It should be used for informational purposes only. For a current and exact location of facilities, call your local utility locate center.

NW Natural
220 NW 2nd Avenue, Portland, Oregon 97209
(503) 226-4211

N

Legend
Meter Locations
w/Services
Gas Pipe
City Limit
Plat Boundary

1 inch = 100 feet

Legal Location: T11S R11W Sec17 NE
State: OREGON
County: LINCOLN
City: NEWPORT
Wallmap: NEWPORT

Plat ID: 2-155-106
Plot Date: 5/3/2016

EXHIBIT 3:
APPROXIMATE SEWER AND WATER LINE LOCATIONS

Geology and Geophysics Disciplinary Group Subcommittee on MSI Building Construction in Newport
College of Earth, Ocean and Atmospheric Sciences
Oregon State University, 104 CEOAS Administration Building, Corvallis, Oregon 97331-5503
T 541-737-3504 | **F** 541-737-2064 | http://ceoas.oregonstate.edu/research/gg/

June 2, 2016

Dr. Scott Ashford, Dean of the College of Engineering
Dr. Ronald Lynn Adams, Interim Vice-President for Administration and Strategic Initiatives
Oregon State University
Corvallis, OR 97331

CEOAS Geology and Geophysics Subcommittee Review of Hatfield Evacuation Narrative DRAFT (5-17-16)

The CEOAS Geology and Geophysics Disciplinary Group Subcommittee on MSI Building Construction in Newport has reviewed the draft Hatfield Evacuation Narrative Draft of 17 May 2016 produced by the Fortis-led design team. The Subcommittee considered the Narrative's assessment of geotechnical risk factors to be sound, with some minor reservations detailed below.

We note the recommendation for a new path made of geogrid-reinforced pavement to be more robust in an earthquake. Regardless of the final location of the MSI-related construction, such a reinforced evacuation pathway would provide improved egress to other facilities in and around the existing HMSC site, including OSU marine operations, the NOAA Pacific Fleet and the Newport Marina, a number of which would remain in their present locations even if most of the other facilities at the present-day HMSC location ultimately relocate to higher ground.

We agree with the statement in the narrative that more information is needed on the location of buried utilities. The impact of possible breaches of these buried lines on the integrity of the geo-grid path should be quantified. The uncertainties in the narrative's discussion of seismic hazards ("It is estimated there will be ±15 to 20 minutes between the earthquake and the arrival of a tsunami "), as well as other poorly defined factors (e.g. locally-generated high water immediately after the earthquake due to a seiche, landslide, movement on secondary faults, and chronology of inundation) argues for a conservative view of the time available for evacuation and for locating the evacuation route on as high ground as possible.

The evacuation plan considers the pathway from the originally proposed MSI building site at HMSC, to "Safe Haven Hill" (SHH). The mechanics of evacuation from inside the structures at HMSC are not considered. For instance, there is no mention of evacuation of those in wheelchairs from a powerless multistory building, or more generally how Universal Access design principles (e.g. factors considered by ADA) will be applied so those with physical impairments may safely make it from the interior of the structures to the geogrid-reinforced pavement.

In summary, the Hatfield Evacuation Narrative is broadly sound, providing a cost-estimate for a more hardened evacuation pathway from HMSC to the rise at the south end of the Yaquina Bay Bridge. Some technical questions remain that require additional information particularly from the

utility companies in order to fully assess the integrity of the hardened evacuation pathway. Finally, the issues raised in our previous report about provision of supplies, shelter and medical assistance to those able to reach the designated evacuation site remain open questions. The narrative would be strengthened if estimates of numbers of individuals seeking sanctuary on SHH were provided under different scenarios to evaluate the requirements for providing sufficient space, shelter, supplies and services. Estimates of likely occupation times at SHH in light of disruptions to the coastal road system and demands on emergency services are relevant factors in determining post-tsunami resource requirements.

Geology and Geophysics Disciplinary Group Subcommittee on MSI Building Construction in Newport
College of Earth, Ocean and Atmospheric Sciences
Oregon State University, 104 CEOAS Administration Building, Corvallis, Oregon 97331-5503
T 541-737-3504 | **F** 541-737-2064 | http://ceoas.oregonstate.edu/research/gg/

May 16, 2016

Dr. Scott Ashford, Dean of the College of Engineering
Dr. Ronald Lynn Adams, Interim Vice-President for Administration and Strategic Initiatives
Oregon State University
Corvallis, OR 97331

CEOAS Geology and Geophysics Subcommittee Review of MSI Building Reports

Following submission of a letter on February 3, 2016 by 23 CEOAS Geology and Geophysics faculty to President Ray, expressing concerns about the siting of the MSI building at Hatfield Marine Science Center, a subcommittee of that group (Drs. Adam Schultz, Anne Tréhu, Chris Goldfinger, and Andrew Meigs) was tasked with reviewing a set of documents provided by Scott Ashford and Ron Adams related to proposed development in Newport, Oregon in support of the Marine Studies Initiative (MSI). The materials under review include three documents, the Poland report on the MSI site at the Hatfield Marine Science Center (HMSC), the Executive Summary of a new report on potential alternative sites conducted by Fortin Construction and several subcontractors, and a spreadsheet of criteria for site section developed by OSU. A fourth document (an assessment of the seismic structural integrity and cost of seismic retrofitting for the existing five buildings under OSU ownership at the HMSC site) was received following the May 6th subcommittee meeting,. That document is also reviewed in the present report. We refer to all four documents collectively as the "MSI Site Evaluation Study", or MSISES.

Summary:

The MSISES documents indicate that the long-term evolution of the MSI and the HMSC is being explored through consideration of alternative sites that provide room for future growth of OSU's coastal campus, including the expanded population anticipated to support the MSI. The MSISES documents also examined the financial cost of improving safety for those working in the current buildings at the HSMC through seismic retrofit.

The selection criteria OSU has developed include earthquake and tsunami risk, the chronic long-term risk of sea level rise due to global warning, the programmatic goals of the MSI, the need for physical integration of the facilities to prevent fragmentation of faculty and programs, and the challenges associated with evacuation of individuals with physical disabilities. The Poland report exclusively considered building at the HMSC. The alternative site report, for which only the executive summary was provided, evaluates two nearby sites on higher ground. A fourth document provides cost estimates to retrofit existing OSU buildings at the HMSC to modern seismic safety standards.

Although the Poland report concludes that a building that can withstand a large earthquake and tsunami and provide life safety for an extra-large event is feasible, the other documents suggest that the alternative sites may provide the most cost effective solution in the long run. It appears that extension of roads and utilities to the alternative sites is relatively straightforward and that the sites are geologically stable and not prone to landslides or other secondary geologic hazards. Note that we did not evaluate this statement because we did not have access to the full report. The cost estimate for construction of a new building at these sites appears to be less than the cost of construction at the HMSC site, exclusive of the cost of the land but inclusive of the cost of extending roads and utilities.

The cost estimate in the seismic retrofits assessment of the OSU buildings at HMSC totals ~$9.6M to bring those facilities close to current code, although the cost of repair to these retrofitted facilities following inundation by tsunamis has not been factored into the life cycle cost of maintaining the existing infrastructure at HMSC. These structures were constructed prior to recognition of the regional seismic and tsunami hazards.

Taken together, these documents strongly suggest that establishing the MSI at one of the alternative locations to the current HMSC site makes sense in terms of economic, hazard, life safety, and longevity considerations. Moreover, a long-term plan to relocate existing facilities to the new site would substantively avoid the multiple natural hazards that exist at the HMSC site while maintaining proximity and integration of the overall mission of marine science at the Oregon coast. This solution, while more ambitious than the existing MSI plan for a new building would represent local, regional, and national leadership to build societal resilience and economic growth in the face of profound and inevitable natural hazards.

Review of Individual Documents:

1. Poland Report

The report, produced by Chris Poland and Roz Estime, was delivered in late March, and evaluated construction at a site on the current HMSC campus. The report did not evaluate the need to retrofit or replace existing facilities to meet seismic/tsunami factors, although this was mentioned as a possible need at the end of the report. There is also an implicit assumption that non-OSU research partners wish to or plan to remain in the tsunami zone and that MSI needed to be on the HMSC site to ensure coordination of activities between OSU, federal and state agency partners at the HMSC site. However, there is no evidence that NOAA, ODFW, or EPA representatives were contacted to determine their intentions regarding long-term planning for their own facilities in light of seismic and tsunami hazard information that has emerged since these facilities were established.

Statistical estimation of the hazard:
The Poland report introduction states that earthquakes and tsunami "occur with low probability." Although the statistics of earthquake recurrence as a function of magnitude in Cascadia contain large uncertainties, there is a general consensus that a major earthquake and tsunami is likely given the evidence for large earthquakes in the past and on-going build up of strain. Large

earthquakes (estimated to be >M8) have occurred ~40 times in the past 10,000 years, with the most recent in 1700. Figure 3 of the report demonstrates that in any scenario considered in the report, HMSC will be inundated. Tsunami inundation > 1m is considered high risk and designated the "Red Zone" by Japanese national law of 2012, which calls for restricted zoning in these areas. (We note that the report does not provide a reference for Figure 3, which is from a recent DOGAMI study). To place this in context, the Poland report indicates that an evaluation of the risk to ongoing research projects and evacuation planning will be done based on the occurrence of an "XXL" event, where there will be multiple waves of inundation during the tsunami, the first (Figure 4) producing a peak tsunami height above parking lot level predicted to reach 27 feet (8.3 m), over eight times the threshold for Japanese "Red Zone" designation. Both XL (7.6 m peak inundation) and the smaller L (1.8 m peak inundation) earthquakes also exceed this threshold.

Analysis of horizontal evacuation options:
The Poland report evaluates requirements for a structure built for life-safety, to be followed by a horizontal evacuation to "Safe Haven Hill" (SHH) 1.6 km away. The evacuation time available is assumed to be ~30 minutes based on the DOGAMI simulations. Although the Poland report focused on the building rather than on evacuation scenarios, it is important to note that several important factors were not considered in the scenario it assumed. First, the evacuation is in the direction of the incoming tsunami, and the tsunami will arrive earlier at SHH. This can be modeled and should be shown as isochrons of the inundation front on the evacuation map. Other factors not considered are the expected tectonic subsidence (~ 0.5-1m), and likely liquefaction subsidence (~ 0.5-0.75m). In high-tide/storm surge conditions, this may partially flood the evacuation route long before the arrival of the tsunami. Also likely are lateral spreading along the route, downed power lines, broken gas lines and other disruptions common in earthquakes. None of these factors were considered in the evacuation scenario. Another important consideration is the evacuation time, which depends in part on the eastern limit of the earthquake rupture itself, a factor not fully explored in the recent DOGAMI studies. This time could be either longer, or shorter than stated.

Horizontal and vertical evacuation scenarios need to account for the additional response time required from those in the MSI building to render aid to injured faculty, staff, students and visitors within that building as well as within the existing HMSC buildings and other nearby structures, which will likely experience serious damage in an earthquake. This factor can be reduced, although not entirely eliminated, by addressing seismic hardening of existing structures, as summarized in the seismic structural integrity report.

The Poland report does not address provision of shelter, emergency survival supplies and medical assistance to those who have successfully evacuated the HMSC area to higher ground. The DOGAMI report indicates there will be wide-scale disruption to infrastructure, including roads and bridges, following a large earthquake, so evacuees may require accommodation for extended periods of time.

Need for seawater:
As part of the report, the need to maintain OSU's "world class seawater facilities" is discussed. Certainly, some facilities are inevitably located on the water, such as the docks and ship

operations. However, the current seawater facility pumps water from the Bay at high tide rather than from the ocean. Moreover, only a relatively small number of researchers and the visitor center use this facility. Seawater can be pumped up the hill to alternative sites if existing wet lab space is relocated elsewhere (e.g. the Birch Aquarium at SIO, which was relocated uphill 243' above sea level and approximately half a mile from the end of Scripps Pier in 1992. At 64,157 square feet and educating nearly half a million visitors a year, the Birch Aquarium houses display tanks containing 175,000 gallons of seawater pumped up from La Jolla Cove). The marginal cost of additional pumping can be considered as part of a complete cost/benefit analysis.

Resilience of existing structures:
The Poland Report considers seismic resilience of new structures, but existing old buildings are not considered, nor are the aggregate impacts of damage to infrastructure. Whereas the new MSI building might perform to a life-safety standard for an "extra-large" event and be reusable in the event of a "large" event, it is not likely that the older structures would survive in either scenario. The Poland report states that OSU buildings comply with largest expected EQ; however this statement applies only to new construction, with no statutory requirement to retrofit to the higher standards except in major renovations.

Adherence to or exceedance of current codes:
The report indicates that the new MSI building should exceed current seismic codes. However there is no mention of the degree to which the current seismic codes will be exceeded or anticipation of future changes to the codes. The report refers to Japanese standards, which became more stringent following the 2011 M9.0 earthquake. The Japanese national law of 2012 is much more restrictive than current Oregon laws. For example, their "Red Zone" is all areas with >1 m of inundation, and development within this zone is highly restricted. This designation is retroactive, and is causing significant shifts in existing infrastructure and facilities in Japan today. We consider Japanese practices as a model to examine carefully. Greater clarity is required to understand Japanese construction and occupancy standards and their utility for MSI building planning.

The report lists Peak Ground Accelerations (PGA's) of 0.48g and 0.68g as the expected shaking levels, though the reason for citing these two different values is not clear. No reference is given, and these estimates are both lower than current USGS PGA estimates for the site. For example, the USGS online tools based on US national Seismic Hazard maps show that the aggregated PGA is ~ 0.74g [http://earthquake.usgs.gov/hazards/designmaps/]. We note that this site is also on top of the Yaquina Bay fault (not mentioned in this report), and the USGS PGA estimate may include aggregate of all fault motions [http://earthquake.usgs.gov/hazards/qfaults/].

The survey:
The report includes a survey of various aspects of the MSI project summarizing responses by individuals listed in the appendix, who were interviewed during preparation of the report. The reported statistic that 90% expressed support for construction at the HMSC site is not consistent with the stated position of at least 2 of the 19 respondents to the survey, leading us to question the validity of this statistic. Moreover, many of the respondents do not have technical expertise in tsunami/seismic hazards. The survey may also be significantly biased. For example, the questions

about alternative sites implied, with no apparent basis, that such sites would be more expensive, nor was the long-term possibility of relocation of HMSC facilities to an alternative location considered in the survey. One striking conclusion from the survey is that Safety/Security and Risks are the primary concern for most respondents.

2. Report on Alternative Sites

A study has been commissioned by OSU to consider at least two alternative sites in the Newport Area. Only the Executive Summary of this report was supplied to our committee, presumably because of concerns about making the detailed locations public at this time. We are therefore unable to provide a technical evaluation of geologic hazards at this site compared to the HMSC site. Nevertheless, this report suggests that a wide range of economic and geotechnical factors are being considered for the alternative sites. The unspecified sites considered are in the Newport/South Beach area and are out of the inundation zone and appear to be viable. The report states that 3-7% cost savings would accrue to the alternative sites due to the stable geology and lack of tsunami consideration. It is not immediately clear how these percentages were calculated, as the Poland report contained no specific cost estimate. Nonetheless, costs in the alternative site report include expenses such as extending water, power and roads to the sites. As we do not know the seismic risk class, the PGA values or other design standards, we cannot evaluate the basis for this estimate.

3. OSU Selection Criteria Spreadsheet

The site selection criteria include a comprehensive listing of factors related to site selection, including the programmatic goals of the project as well as multiple natural hazards, including earthquakes, tsunamis, and sea-level rise. Whereas proximity to other researchers at the HMSC is a programmatic goal, an alternative approach in which existing facilities are relocated to an alternative site out of the tsunami is not considered.

There was an item in the selection criteria called "Legislative Intent." As the legislature provided $20M in matching funds, this is an important external consideration. However, the committee had concerns that interest in coastal development by the Coastal Caucus may unduly pressure OSU to develop a demonstration project in the tsunami zone.

We agree that it is important to include ADA requirements and sea-level rise in a multi-hazard approach.

Under Life Safety/Geotech evaluation, co-seismic subsidence is not included as contributing to the tsunami hazard.

4. Fortis Construction Report: Estimate to Retrofit Existing Buildings

This brief desktop report, dated May 5 but made available to the G&G subcommittee on May 9, covers the costs for seismic retrofit to the five existing buildings at HMSC. This company did a rapid visual screening of the existing structures and prepared a list of likely seismic deficiencies and hazards as well as a list of needed upgrades to bring these structures up to current seismic code. The method used was 'FEMA P-154 Rapid Visual Screening', which apparently is a standard method used by industry to assess seismic vulnerability. Using this method, all buildings were classed as having 'a final Level 2 score of 0.9 which indicates that the building is potentially seismically hazardous'. No verification was done to determine whether existing main structural elements have the capacity to meet current codes with the suggested upgrades.

The total cost to retrofit these structures is ~ $9.6 M. These costs do not include remodeling of interiors, design or permitting, abatement of hazardous materials, reworking of data and telcom facilities, ground improvements for liquefaction, or existing deferred maintenance. The cost of repair of these structures following tsunami inundation is also not included in the report.

From:	Azarenko, Anita
To:	Fulton, Lori; Raleigh, David; "Roz Estime"; "Chris Poland"; Office, HMSC Main; Barth, John A
Subject:	FW: [Inform-c09] Marine Studies Initiative: Invitation to a meeting for an update on outputs from specialist interviews
Date:	Saturday, December 12, 2015 8:41:00 AM

Additional input

From: John Dilles [mailto:dillesj@science.oregonstate.edu]
Sent: Thursday, December 10, 2015 9:39 PM
To: Azarenko, Anita
Cc: Fulton, Lori
Subject: Re: [Inform-c09] Marine Studies Initiative: Invitation to a meeting for an update on outputs from specialist interviews

Anita, Lori

I teach a class in Corvallis at this time, and cannot attend this meeting.

I concur with most of the other 28 faculty in our Geology and Geophysics (G&G) Program in CEOAS that it is unwise to build a new OSU facility in a Tsunami zone and in an area likely subject to liquefaction and building failure during an earthquake. Moreover, if our OSU and the State of Oregon are to have credibility in public service they must serve as models for planning for future earthquakes. For example, Dean Scott Ashford of the Engineering School is now proposing that OSU lead an earthquake program focussing on safely engineered buildings and public education and outreach (unfortunately, the current plan does not include geological or geophysical studies of specific sites). Moreover, the CEOAS Board of Advisors (representing OSU alumni of the Earth Sciences programs) is very concerned that the proposed Hatfield site is not ideal. The former state geologist Vicki McConnell was a member of our BOA, and wrote to OSU about this concern. Yes, special engineering on the building site might address many of the seismic and tsunami issues, but at significant cost (I cannot evaluate if these would truly be effective in the event of a magnitude 9 earthquake that is predicted to hit Oregon in the next 200 years. Furthermore, the G&G group who represent the leading earth science experts at OSU (and some of the foremost in the world) have not been engaged in the siting to my knowledge. I personally don't want to be known to be an OSU geologist in an institution that builds in a site that is potentially dangerous. Chris Goldfinger and Andrew Meigs and Bob Yeats (emeritus) of our program should be consulted and their advise should be considered carefully.

Thanks for your time. We are very supportive of a safe OSU building in Newport, but I would like to be convinced the OSU plan is the right one and the most cost-effective one.

Best,

john

John Dilles
Professor of Geology
College of Earth, Ocean, and Atmospheric Sciences
104 CEOAS Admin Bldg

Oregon State University
Corvallis OR 97331-5503
ph 541-737-1245; fax 541-737-1200
dillesj@geo.oregonstate.edu

On Dec 10, 2015, at 3:23 PM, Azarenko, Anita <Anita.Azarenko@oregonstate.edu> wrote:

Dear Colleagues,

As part of the new Marine Studies Initiative, the university is planning for a new building in Newport to house the program. Extensive consideration has been given to the exact location of the building. The key issue is balancing the need of having the building on the HMSC site with concerns associated with major seismic events and associated tsunamis. In response to this issue, a specific process has been established to assess, plan, design and build with life safety as the primary goal. We seek to pursue a transparent process and ultimately design a building that can serve as a demonstration to other communities facing similar seismic conditions, whether in Oregon or around the world.

This process and planning was initiated with the establishment of a set of Building Principles (again, highlighting Life Safety) and has proceeded in seeking input via interviews with a broad range of specialists including seismic geologists, tsunami experts, structural engineers with seismic and/or tsunami experience, and emergency managers.

The outputs of these interviews have now been assimilated and we wish to share what we have learned with the OSU community, along with an opportunity for Q&A.

So please join us on **7 January 2016** from **10:30 am to noon** at the **Hatfield Marine Science Center Auditorium** (in the Visitor Center).

Steps following this meeting include: i) presentation of recommendations to the OSU Leadership, ii) communicating the interview outputs and recommendations to the coastal community; and iii) development of a clear set of criteria, based on final recommendations for site preparation, and building and engineering design to guide the Architect and Engineering team.

We look forward to seeing you on 7 January.

Happy holidays.

Anita Nina Azarenko
Special Assistant to the Vice President of Finance and Administration
Capital Planning and Development
3015 SW Western Blvd., Corvallis, Oregon 97331
Ph: 541-737-7695
anita.azarenko@oregonstate.edu

Lori Fulton
Manager, Capital Administration
Capital Planning and Development
Ph: 541-737-4625 |
lori.fulton@oregonstate.edu

From: Azarenko, Anita
To: Fulton, Lori; Raleigh, David; "Roz Estime"; "Chris Poland"; Office, HMSC Main; Barth, John A
Subject: FW: [Inform-c09] Marine Studies Initiative: Invitation to a meeting for an update on outputs from specialist interviews
Date: Saturday, December 12, 2015 12:38:00 PM

FYI

From: Anne Trehu [mailto:trehu@coas.oregonstate.edu]
Sent: Saturday, December 12, 2015 10:27 AM
To: Azarenko, Anita
Cc: Nabelek, John Ludvik
Subject: Re: [Inform-c09] Marine Studies Initiative: Invitation to a meeting for an update on outputs from specialist interviews

Dear Professor Azarenko;

We are seismologists in CEOAS and have a number of questions and concerns about your email inviting the community to a presentation at the Hatfield Marine Science Center on January 7. Having studied earthquakes around the globe for many decades, we cannot help but question the wisdom of having OSU build a major new facility in the tsunami inundation zone. Moreover, the sediments beneath HMSC could liquefy during a major quake resulting in an additional hazard for the building. We are skeptical about the statement that "extensive consideration has been given to the exact location to the building" and question why the building must be on the current HMSC site. A true "demonstration to other communities facing similar seismic conditions" would be a building on higher ground.

While timing of the next earthquake is impossible to predict at present, there is a broad consensus among geologists and geophysicists that large megathrust earthquakes have occurred here in the past and will recur in the future - perhaps tomorrow, perhaps in a few hundred years. If Newport were on a large plain with no option of retreating to higher ground, then an unproven engineering experiment might be justified. However, we consider that it is irresponsible of the university to be advocating for building in the tsunami zone when alternative, safer sites are nearby. After conversations with several of our colleagues, it appears that OSU geophysicists were not included in the deliberations about alternative options.

Sincerely,

Anne Tréhu
CEOAS Professor of Geophysics and Fellow of the American Geophysical Union
John Nabelek
CEOAS Professor of Geophysics

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> <Anita.Azarenko@oregonstate.edu> wrote:
>
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>
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Anita Nina Azarenko
Special Assistant to the Vice President of Finance and Administration
Capital Planning and Development
3015 SW Western Blvd., Corvallis, Oregon 97331
Ph: 541-737-7695
anita.azarenko@oregonstate.edu

Lori Fulton
Manager, Capital Administration
Capital Planning and Development
Ph: 541-737-4625 |
lori.fulton@oregonstate.edu

COE Faculty Report

School of Civil and Construction Engineering
Oregon State University, 101 Kearney Hall, Corvallis, Oregon 97331-3212
T 541-737-4934 | **F** 541-737-3052 | http://cce.oregonstate.edu

May 19, 2016

To: Scott Ashford, Dean, College of Engineering
From: Daniel Cox, Professor, School of Civil and Construction Engineering

Re: **Summary of CCE ad-hoc faculty meeting to discuss MSI site alternatives**

An ad-hoc CCE faculty meeting was held on May 2, 2016, 4-5pm in Kearney 311 and attended by Dan Cox (convener), Judy Liu, Solomon Yim, David Sillars, Armin Stuedlein, Haizhong Wang, Andre Barbosa, Harry Yeh, Kate Hunter-Zaworski, Chris Higgins, Pedro Lomonaco, Michael Scott. Tara Cooper, CCE administrative assistant, attended and took notes.

The purpose of the meeting was to discuss the proposed MSI project site at the HMSC and two alternative sites. The general description of the two other sites was provided (e.g., 2 miles away from the HMSC, outside of the inundation zone). The details of the sites were not provided. The CCE faculty were asked to review the Poland/Estime report and a Site Evaluation Matrix spreadsheet prior to attending the meeting.

The CCE faculty did not have major concerns for life safety due to the earthquake at the three locations because the MSI project would be new construction that would have to conform to seismic codes. There was little discussion about meeting programmatic goals because this is beyond the CCE expertise. Therefore, the CCE discussion focused on life safety and the evacuation out of the tsunami inundation zone.

The general tone of the one-hour discussion was that there are major technical challenges in building on the coast, particularly in the tsunami inundation zone. The discussion did not reveal any 'red flags' or technical challenges which could not be overcome. Some CCE faculty were of the opinion that a well-designed building within the tsunami inundation zone would increase life safety (decrease the risk) to people in the surrounding area. There was a consensus that the new construction and plans to increase life safety should be integrated with the overall planning for the Newport campus. This planning would require a comprehensive education or outreach plan for effective evacuation from the HMSC site to either Safe Haven Hill or the community college.

The notes taken by Tara are attached.

From: Cox, Daniel
To: Ashford, Scott
Cc: Adams, Ronald
Subject: Re: [Inform-c07] OSU Marine Studies Initiative - Academic and Research Building
Date: Wednesday, April 13, 2016 2:19:06 PM

Scott,

Here are some comments:

Page 6, first paragraph after "design for tsunami threats". The report writes that "Using turbidite paleoseismology, seismologists have been able to identify up to 41 Tsunami events of various sizes" It is more accurate to state that "41 subduction zone events" occurred rather than 'tsunami events'. The paleoseismologists can estimate whether or not a seismic event occurred and even come up with reasonable estimates of the magnitude of the event. However, its a different story to figure out what level of tsunami might correspond to a turbidite event.

"They have subsequently determined that in the 100 year life of the MSI complex, there is a 39% to 58% probability that a tsunami of some size will occur at the site." For the above reasons, I think this statement is incorrect. There may be a 39% to 58% probability that a subduction zone earthquake may occur, but it is likely that many of these events will not produce an tsunami of sufficient magnitude to inundate the site. For example, DOGAMI's estimate of the "small" event is a rather large (full rupture) Mw 8.7 event and the inundation depth is less than 1 foot at the site. Many of the "41 events" are partial ruptures, and although they might produce a tsunami somewhere (Gold Beach?), they won't inundation the site.

On page 10 under Additional Mitigation Measures, I'm not sure what is meant by #7 Plan for total building loss and subsequent reconstruction of HMSC after a significant tsunami. The word "significant" might be vague. For example, I would consider the "L" to be a significant event (it is based on Mw 9.0 earthquake). We state earlier that we would be planning to resuse the facility after the "L" in #6, so #7 seems to be a mixed message. Maybe change 'significant' to 'most extreme case'?

Page 11 — I like what is written under "Initiate Expanded Horizontal Evacuation Planning". I had a good conversation with Gloria Krahn in the College of Public Health regarding evacuation planning for persons with disabilities. I'll follow up in early May.

Dan

From: "Ashford, Scott" <Scott.Ashford@oregonstate.edu>
Date: Wednesday, April 13, 2016 at 1:39 PM

To: Dan Cox <Dan.Cox@oregonstate.edu>
Cc: "Adams, Ronald" <Ronald.lynn.Adams@oregonstate.edu>
Subject: FW: [Inform-c07] OSU Marine Studies Initiative - Academic and Research Building

Dear Dan,

I believe you already have this, but as noted in my earlier email, this is one of the reports we would appreciate your input and comments on.

Sincerely,

Scott

Scott A. Ashford, Ph.D.
Kearney Professor and Dean
College of Engineering
Oregon State University

From: inform-c07-bounces@lists.oregonstate.edu [mailto:inform-c07-bounces@lists.oregonstate.edu] **On Behalf Of** Adams, Ronald
Sent: Monday, March 21, 2016 9:15 AM
To: Inform-C06 (Classified); Inform-C07 (Professional Faculty); Inform-C08 (Instructors, Research Associates/Assistants); Inform-C09 (Professors, Associate/Assistant Professors); Inform-c12 (Academic Wage & Other Misc)
Subject: [Inform-c07] OSU Marine Studies Initiative - Academic and Research Building

March 21, 2016

To the Oregon State University community,

As part of Oregon State's Marine Studies Initiative, the University plans to construct an academic and research building in the next few years in Newport. Given the importance of the MSI and the priority for safety in light of an eventual significant seismic event occurring along the coast, Oregon State is conducting thorough evaluations of multiple site locations for this building.

Oregon State faculty are being included in this process to provide expertise in evaluating sites and in the building's design, engineering and construction. As well, a thorough and independent third-party evaluation of each site alternative for this building will be completed. I will coordinate this evaluation and assemble a report to be provided to President Ed Ray sometime this summer. Meanwhile, College of Engineering Dean Scott Ashford will serve as a liaison to Oregon State faculty during this process.

Site evaluations provided President Ray will be based upon criteria that are being developed and that will be shared in advance with the OSU community and other stakeholders for input. Throughout this evaluation process, we will provide regular updates and share information gathered.

Attached for your review is the first such report: a third party, independent report commissioned by OSU to evaluate the earthquake and tsunami considerations of possibly locating the MSI building within the Hatfield Marine Science Center campus. This report was compiled by Chris D. Poland, a consulting engineering, and Estime Science and Technology Facility Planners.

Regardless of the eventual location selected for the MSI building, Oregon State will meet the following building principles:

- The building will be designed to ensure that structural integrity is maintained for the expected Cascadia Subduction Zone earthquake.
- The building's design and safety features will serve as a national and global showcase and demonstrate state-of-the-art structural options for future buildings in seismically active regions worldwide, as well as for earthquake and tsunami readiness.
- If located in a tsunami zone, the building will have a design occupancy of not more than 350 people.
- The building's occupants – including those with disabilities – will be able to survive a future seismic event, exit the building in a timely manner and, if required, safely follow a tsunami evacuation plan.

Thank you for your interest in the Marine Studies Initiative.

Ron Adams

Ronald Lynn Adams
Interim Vice President for Administration
Oregon State University
B211 Kerr Administration Building
Corvallis, OR 97331
Phone: (541) 737-2447
Fax: (541) 737-3033
Email: ronald.lynn.adams@oregonstate.edu

From: Cox, Daniel
To: Ashford, Scott
Cc: Adams, Ronald
Subject: Re: Draft MSI Building Site Selection Criteria
Date: Thursday, April 14, 2016 9:54:21 AM

Scott,

I will provide more comprehensive comments by May 6. Here are my initial thoughts on the tsunami portions:

1. Life safety, tsunami resistant design — several options exist to improve the building performance under tsunami loads (e.g. building orientation relative to the principle flow direction, large openings on first floor). Tsunami resistant design must be balanced by earthquake resistant design. Benefits include 'demonstration' project on how to build in a tsunami prone area.

2. Life safety, tsunami evacuation options

Vertical evacuation

Small tower — unless there are other benefits of having a tall tower (bird watching?), I don't see the advantage this 'single purpose' approach.

Roof top on new building — it makes sense to build a portion of the structure above the XXL level to provide some vertical evacuation options. The ASCE code will require it to be 30% higher than the design level. This type of construction is already underway in the US http://thedailyworld.com/news/local/ocosta-elementary-and-its-tsunami-safe-haven-look-toward-2016-opening

Horizontal evacuation

Evacuation to high ground — currently, HMSC practices two options: (1) safe haven hill, (2) Oregon coast community college. Under typical conditions (variations in milling time, normal walking speeds, evacuation on foot, etc.) both of these options appear to be low risk, even for the XXL event. There are still some concerns about unplanned network disruptions (e.g., earthquake causing downed power lines, etc.), so this should be checked into. I have also had people ask questions about the capacity/accessibility of SHH and OCCC. SHH recently underwent an upgrade in improve accessibility.

ADA special requirements — The "all disabilities" approach is important (ie more than just mobility for horizontal evacuation). Disabilities include vision/hearing, mental health, etc. I'm having ongoing discussions with people at OSU, OHSU and State of Oregon (OEM) on this one and will get back to you.

Early warning systems — could provide 10 sec to 30 sec early notification. This may be useful, for example, for Reverse-911 calls to first responders, emergency planners, assisted living facilities, schools, etc. Statewide, this could be a benefit.

I think it might be good to have a bullet item under the HMSC life safety for "EQ/Tsunami hazard

training/education".

Long-term and sustained viability of site

Sea level rise — the relative sea level rise for Yaquina Bay is about 1.33 mm/yr based on work published by P. Ruggiero in CEOAS. That adds up to about 5 inches over the next 100 years. I would categorize that as 'not an issue'.

From: "Ashford, Scott" <Scott.Ashford@oregonstate.edu>
Date: Thursday, April 14, 2016 at 9:01 AM
To: Dan Cox <Dan.Cox@oregonstate.edu>
Cc: "Adams, Ronald" <Ronald.lynn.Adams@oregonstate.edu>
Subject: Draft MSI Building Site Selection Criteria

Hi Dan,

I've attached the latest version of the draft site selection criteria. I look forward to your comments by May 6.

Thanks!

Scott

Coastal Community Input

President Ray Listening Session
June 16, 2016
Facilitated by Janet Webster

Bruce Mate, Marine Mammal Institute: Made 4 points in favor of the HMSC campus location (see separate document sent to President Ray):

- We have mitigated the life safety risks with tsunami drills
- OSU engineers have the talents to design and help construct a 'demonstration' building to show how structures can be made safe
- Most present and future faculty do/will much prefer the HMSC campus location so they can conveniently access the library, seminars and interact easily with fellow academic and agency researchers.
- Students in the MSI instructional program will be spending much (if not most) of their time at the HMSC campus for access to other campus resources

Jeff Wiseman, Ag/Marine Business Office: If we move this building someplace else, that raises concerns for other employees who will remain here. Also, our neighboring partners will remain here, they will still be in danger.

President Ray: I went to Safe haven Hill, and we got there in less than 15 minutes at a leisurely pace and we are pretty sure able bodied people can get there safely. There is still an issue of those with physical challenges. We will do what we can with concern for all, and we will not abandon the coast. Residences being moved is important, and understanding of collaborative opportunities with co-location of partners. I am waiting on a report from outside consultants and I have heard from leadership on the coast, but hadn't yet heard from people like yourselves. A decision will be made in July, and I will not dither. Concerning the people who will still work on the current HMSC campus, could this facility provide a safe haven for those who cannot make it to Safe Haven Hill? Oregon's Senate President is supportive of retrofitting, which will help us save lives of those here.

Rick Brown, NOAA: In 2002, NOAA built the Barry Fisher Building at HMSC to the best seismic standards. Following that, as we became aware of the risk of a tsunami event, we realized that we need to practice tsunami evacuation. We have no trouble recruiting people to work here, with full disclosure during the interview process. I have never lived in a place without risk, in fact, NOAA puts its people in path of tornados. We accept the risk and come to work every day. I was co-located as a student with NOAA which enabled my career in NOAA, so this interaction is irreplaceable. Can we still do it, a mile away? Maybe. An example is NOAA's Montlake facility, which was located nearby to foster collaboration. I feel that I won't see Bruce Mate and others who are in the new building if it were not co-located. I feel that we need to keep the campus intact.

Minda Stiles, Marine Mammal Institute: Please keep in mind that students do not necessarily accept this personal risk.

Gil Sylvia, Coastal Marine Experiment Station: Training at HMSC is meant to be experiential, and students will be in wet labs, in dry labs and in the community, in industry and working with community members. Our partners live and work in the tsunami zone and we can't keep them out of it. That is where students will be. The Marine Experiment Station works shoulder to shoulder with partners and it is important for them to see us here with them.

Su Sponaugle, Department of Integrative Biology: I can speak about many aspects but want to build on Gil's comments. IB conducted a survey of students, about where they are looking to go with their career and training. Many want to go into non-academic careers and are increasing their exposure to these types of opportunities in this "living lab". This is what they need to make a decision about career direction.

Shanda McCloskey, Ag/Marine Business Office: I am not an academic, just an "average Joe". I have lived in many types of environments, with all kinds of risks. We actively prepare here and I am impressed with that. We made over $400 this week in a fundraiser for emergency supply caches, and the fear of "what ifs" is not as important as being prepared. In my job, I am especially happy to be here in Newport interacting with all the HMSC community. I think it is important that the building stays here and that we keep this community going with interaction among faculty, agency and students.

Minda Stiles, Marine Mammal Institute: Of importance is being prepared for whatever risk. I am nervous about people being trapped, or injured, or not being able to evacuate, with 25 minutes or more of chaos possible.

Kathy Minta, Marine Mammal Institute: I would like to have more experience with drills, especially for dealing with injured people. Leaving them behind is an awful option.
Also, what about rebuilding? How quickly can we recover? What about insurance?

Steve Rumrill, ODFW: HMSC is unique as far as agency, academic collaboration and also courtesy faculty. I am in favor of having it at HMSC, but want to bring up a few things for consideration:
It is important to realize that communities have moved their schools, as in Waldport. Seaside has done the same. This goes with the idea of assuming and assigning risk. Our ODFW group is making the same decision, since we need to build new or retrofit. I hope you are considering the agency presence and opportunities for the future. ODFW will look to OSU to see the direction we go in regarding whether we stay or not stay in our current location. Also, in our last meeting, information was shared about the risk of extreme liquefaction and that our route may be underwater. I am in favor of vertical evacuation.

President Ray: Talking about proximity, we should try to a sense of where other agencies are at in their planning for the future. They may be waiting to see what OSU does, and may not be able to say. We also want to make the evacuation route more secure.

Leigh Torres, MMI and Oregon Sea Grant: Regarding the concept of MSI for student recruitment and how to promote this place as attractive to students - Marine experience is a big part of it. Like Duke's marine lab with a small boats program, students want to come to the water, not be up in the forest. The key is to have students want to come here to the waterfront.

Daniel Ottmann-Riera: In terms of recruiting students – As a grad student here at HMSC, I can say that students think about many benefits and disadvantages to being here, but tsunamis are not one of them. We are confident in our evacuation abilities but we come here to have access to the ocean. Being in the forest is not part of the experience.

Jessica Miller, Coastal Marine Experiment Station: I agree with much of what has been said, but I also have not seen all of the information that you have access to for your ultimate decision. I appreciate you coming out. It seems important that for MSI, we need to really know how we will actually make this work, how we will compensate for the disadvantages if the buildings are not co-located. I have trouble having a really strong opinion without the other info.
President Ray: I anticipate having a narrative that explains the decision.

Jim Lewis, HMSC Facilities: I am a proponent having it here, but I want to relate a personal experience. I participated in the tsunami evacuation and planning and it made me feel not very good, the gravity of it hit me and I found myself terrified. I wanted to quit, and I had a choice to make, like if I want to ski or surf in big waves. The choice for me was clarified by the Safety Coordinator for the Lincoln County School District, Sue Graves. Born and raised here, she never thought about it till the science came in, and then had to deal with this new threat. She related, "I am not worried anymore because we have a plan." We can accommodate and mitigate and have a plan, and have a choice whether we want to be here. School kids can't accept risks, but I do and I love being here.

Chris Powers, undergrad at HMSC: I am a major in biology, and take a lot of classes that are at HMSC. K12 students don't have a choice, but we as undergrads, we want the internships and jobs that will come from the hands on education at OSU, being right in the community and having easy access to everything that is here.

President Ray: is there anyone here who don't think the building should be in the tsunami zone?

Kathy Minta, Marine Mammal Institute: This is like the issue of building in the Mississippi delta in a flood plan, you need to expect it the tsunami event. We need to use different considerations, and not build the same that you would at high ground, i.e. need to build for the local risk.

President Ray: There are no guarantees with the built environment.

Shanda McCloskey, Ag/Marine Business Office: Rogue, OMSI, and other community partners are building in the tsunami zone, communities need to keep building here on the coast.

Minda Stiles, Marine Mammal Institute: This building will also put more strain on Safe Haven Hill, so we may need the new building to be a vertical evacuation site.

Carol Cole, Coastal Marine Experiment Station: We are a marine lab, and belong on the waterfront.

Craig Hayslip, Marine Mammal Institute: A good example is a recent rooftop built in a different coastal community that can hold 2000 people.

Cait Goodwin, Oregon Coast STEM Hub: I think the point is looking long term and also holistically, and it is not just Newport but we need to work out the risk mitigation. We have come a long way since 2011. The more preparation the better, and the vertical evacuation opportunity is huge. We need many options; we can lead the way in how we prepare.

Janet Webster, Emeritus Librarian: I am a proponent of building on the HMSC campus. Does anyone want to comment on sea level rise?

Maryann Bozza, HMSC Director's Office: As a marine lab, we are embedded in the community like Extension agents and Experiment Stations, and our presence on the coast as part of the maritime culture and the Blue Economy is critical. Sea level rise reminds us that our work has never been more important, and we need the synergy that comes with co-location.

Stacia Fletcher, Oregon Coast STEM Hub: I am very aware of my surroundings and as a new employee, I look at Safe Haven Hill and it doesn't look like we all will fit up there. The thought of a vertical evacuation site is a great option.

Mary Markland, Guin Library: I have been here for a year. I am totally freaked out by all of this and I don't feel like I was informed before I came. I look at my building and wonder about how many of us will die if our buildings collapse. I tell my students to get out and run, do not try to save anyone. I like the vertical evacuation idea and I would really like to know how stable these buildings are and whether or not we can get out.

Joe Haxel, CIMRS: These are survivable events, and in other at-risk countries there is a plan for these events because they happen generationally. First of all, not everyone dies. Second, the data shows that like massive magnitude quakes happen every few thousand years, sort of like comets. It is not like dropping a bomb.

President Ray: Systematic assessment of building vulnerability and retrofitting needs to be done. I am talking to Bob and Jack and others and there is a systematic assessment and planning going on. It could be thousands of years and or tomorrow, and I wish we had more clarity as the probabilities are imprecise.

Ron Adams: First level assessment is part of this process and will be part of the report. I'd characterize that as the first step of the process, and while some entities like HD in Corvallis have retrofitted their entire campus, we are at the early stages of assessing plan and cost analysis.

Janet Webster, Emeritus Librarian: DOGAMI did an assessment and as information keeps getting better, standards are higher.

Bruce Mate, Marine Mammal Institute: Comments have indicated how much of a cultural shift there has been – our undergraduate has been here a few days and is already completely well versed in tsunami evacuation. We know the risks, we prepare and we share information, with all having a higher awareness. Most people in the room have emergency gear at the ready (show of hands was a majority), and this change in culture has made us more prepared than even other marine labs. I feel more empowered all the time.

Clare Reimers, CEOAS: I see this as a real opportunity, with the MSI as a world-class marine lab, we have to build a world-class marine building, so, let's do it! We have world-class engineers at OSU, so we should stop talking about it and do it!

Steve Rumrill, ODFW: South Carolina, Moss landing, Scripps – all are rebuilding from natural disasters and erosion – would like to see lessons learned.

Su Sponaugle, Department of Integrative Biology: It seems that those who have just arrived are most nervous, and a way to address fears is for them to learn about it and prepare. By leading and showing how we are addressing the risks and with a world class facility we can overcome fears with education, especially since we are an educational institution.

President Ray: We will take this all to heart.

Added after event:
Brent Butler, HMSC Facilities: We need to retain the trees and the native vegetation and really consider where to site the building and associated structures to retain wildlife habitat on the HMSC campus, and minimize car use and parking lots.

Hatfield
MARINE SCIENCE CENTER
OSU
Oregon State
UNIVERSITY

Cooperative Institute for Marine Resources Studies
Oregon State University
Hatfield Marine Science Center, 2030 S.E. Marine Science Drive, Newport, Oregon 97365-5229
Phone 541-867-0181 | Fax 541-867-0221

May 17th, 2016

Dr. Ed Ray
President, Oregon State University

Dear President Ray,

RE: Siting of the coastal building for MSI on the HMSC campus

For over 100 years Oregon State University has engaged in close working relationships with coastal partners at the "level of the sea." These partnerships harness a spirit of shoulder-to-shoulder collaboration for which we are recognized as a global leader. Although these activities can sometimes expose participants to certain risks, OSU has always employed "best practices" while engaging our communities and partners who must site their vessels, fish processing houses, research laboratories, tourist businesses, and bait shops at sea level where they conduct their enterprises. ODFW, CIMRS, COMES, MMI, NOAA, EPA, USDA (ARS) and USFW represent institutional partnerships that have developed and thrived at HMSC for more than 30 years as a consequence of this collaboration.

OSU's Marine Studies Initiative (MSI) represents the next step in leading the nation and the world by providing transdisciplinary programs and experiential learning that meet 21st-centuary needs. But this is only possible due to the co-location of state, federal and university programs at HMSC. To assure our safety, all of the HMSC campus (OSU and State/Federal agency personnel) practice every six months on evacuation to Safe Haven Hill (approximately one mile). This requires less time than the lowest estimated arrival time for a tsunami following even a XXL earthquake event. Our concern is that siting the new OSU/MSI building at high ground away from the HMSC campus will weaken our core partnerships and threaten the effectiveness of future MSI research and educational programs. And the practical reality is that many students will spend the majority of their time at HMSC given the location of other classrooms, seawater laboratories, and unique experiential/cooperative education and collaborative projects in constant generation at HMSC.

We strongly support the need for due diligence in evaluating risks associated with natural hazards including earthquakes and tsunamis, and taking the necessary safety precautions. However, given the critical importance of our community partnerships, we believe that by conducting regular evacuation drills and using state of the art engineering and construction principles, we will significantly mitigate the risks of building on the HMSC campus. Further, the OSU engineering expertise that can be brought to such a project will make this an excellent example of how to build earthquake- and tsunami-safe buildings in coastal communities. As an additional consideration, this new building at the main HMSC campus could be engineered to increase survivorship for individuals working at South Beach by acting as an alternate on-location "safe haven" for the disabled and injured. By adopting the highest and best standards as well as improving on those standards over time, we will maximize the safety for students and staff, support experiential research and education partnerships, and honor our commitments to the greater community working at the level of the sea.

Sincerely

Michael A. Banks
Director, CIMRS

Gil Sylvia
Director, COMES

Bruce Mate
Director, MMI

CC Ron Adams, Jack Bath, Bob Cowen, Cindy Sagers

MSI Building Siting – Community Forum
Siting Criteria

Life Safety Factors

- Engineering & seismic factors - Life safety for building Occupants
  - Geotechnical evaluation
    - Seismic shaking
    - Liquefaction
    - Lateral spreading
    - Landslides
  - Foundation/structural engineering options
    - Earthquake resistant design
    - Tsunami resistant design
- HMSC Life safety and evacuation systems
  - Tsunami Evacuation options
    - Vertical evacuation
      - Small tower (current state/community plan)
      - Roof top on new building
    - Evacuation to high ground
  - ADA special requirements
  - Early warning systems
  - Upgrade of existing building to meet seismic building standards
- Legislative considerations
  - Legislative intent (bond)
- Local and state requirements
  - Building size/occupancy limits
  - Zoning
  - Traffic flow
  - Agency/Commission governance
  - Remediation (e.g. wetlands)
- Long-term and sustained viability of site
  - Potential Sea level rise
  - Potential Landslides

Cost

- Financial analysis
  - Site costs
    - Purchase/lease
    - Site preparation
      - Utilities
      - Roadway
      - Traffic flow
      - Remediation
  - Vertical evacuation options
    - Bird tower
    - Roof top on new building
  - Foundation/structural engineering options
    - Earthquake resistant design
    - Tsunami resistant design
  - Seismic upgrade to existing buildings
  - Total HMSC move
- Site environmental considerations
  - Wetlands

- Landslides
- Industrial wastes

Schedule

- Time required to open facility
  - Site availability (purchase/lease)
  - Raise additional capital
  - Site preparation
    - Utilities
    - Roadways
      - Site specific
      - South Beach traffic flow
  - Zoning

Program Delivery

- Effective collaboration/access with OSU and agency scientists
  - Day to day contact
    - Ease of meeting with colleagues
    - Ability to have unscripted, valuable hallway conversations
    - Connection with laboratories (Seawater) and staff/graduate students
  - Seminar participation
  - Library access
  - Classroom access
  - Coordination activities
    - Administration coordination
    - Facilities coordination
  - Long term perspective of federal partners
- Proximity to existing HMSC Visitor Center and Oregon Coast Aquarium
  - Location of K-12 education programs
  - Access to public - exploration of the coast
  - Public perception of retaining VC at HMSC
  - Engagement of scientists in VC mission
- Status/impacts on HMSC community not in new building
  - Perceptions
  - Future investments by University
  - Safety options
- Traffic and other transportation requirements and impacts
  - City, county and State (DOT) planning and current construction
    - Current plans and investments
    - Need for revised traffic flow
    - Change in safety (right vs left turn [cross-oncoming traffic] exit)
  - Shuttle requirement
  - Parking (single lot vs two lots)
- Infrastructure requirements
  - Safety/security
  - Collaborative laboratory plans (e.g. shared genomics space between OSU and agency scientists)
  - Location of HMSC administration
  - Location of facilities maintenance
    - Need for transportation between sites?

May 9, 2016

Information to President Ray by end of May
Siting Advisory Committee

What components are important to ensure life safety?
What are the costs?
What factors under consideration would affect schedule?
How will factors affect program delivery?

Open, transparent process – in the end we will have a sound basis for making decisions.

Audience comments:
Bill Chadwick
Is there going to be another forum after data and before decision?
No, but the info collected which the decision is based on will be available.

Stephen Webster
What parcel size would be needed for the building?
100k sq ft but footprint could vary with multiple floors. Would need parking, etc so a min of 5 acres.

Ken Sexton
How many people work on the site? How many will be in the new building? How many including boats, etc – i.e. how many would have to evacuate?
About 1000-1200. Safe Haven Hill would accommodate up to 3000.

Steve Rumrill
What would vertical evacuation look like?
Towers would accommodate about 50 people, "bird nests" would be geared to folks who can't evacuate. The building could possibly also be a vertical evacuation site.

Bill Hanshumaker
Are the engineers looking at standing ground water? At mold issues? These were seen in recent school buildings.
The engineers are carefully considering these.

Caren Braby
What about sea level rise?
This is being considered, along with other natural hazards.

Ken Sexton
What about the other new buildings, like MOC-P? Is the engineering available from these efforts?

Yes, they have shared all of their data.

Rob Suryan
What other buildings will be needed longer term at HMSC? In addition to student housing?
Student housing will all be offsite, but how we utilize the former dorms needs to be determined. Will likely have a new master plan developed. Some interest in the VC expansion, where would that be, or where ODFW will put a new building if they get one is not known.

Terry Thompson
Elsewhere in the US, communities plan for floods, hurricanes, tornados etc. Do you think federal money might be available to prepare for disaster?
Yes, but competition for funds is considerable. Long-term plan is to strengthen core facilities and increase building code requirements so that as our buildings are replaced they will be increasingly resilient and eventually are all to the highest code.

?
What can be learned from Japan?
We have access to the science and preparedness lessons to be learned from Japan.

David Gomberg
Missing from criteria is how this message affects the communities. If the university leaves the coastline, then how will this retreat affect the community and the economic impact aspect of this.
Need actual transcript

Steve Rumrill
Is there technical information on how the wave might behave that would inform building?
Yes, we have the DOGAMI model for the inundation at the outer coast but that has been expanded on by OSU, with detail for the bay including the HMSC site including direction of water and debris field as it flows in and out. Also architects will be working with colleagues from Japan and others to refine this.

Bruce Mate
As a member of the leadership here, I am glad of the preparedness we do here, but wonder about vertical evacuation? Do we make the building higher with a smaller footprint? How will the idea of vertical evacuation be vetted?
Vertical evacuation is an option – it could be crowded but would only be for 24 hours. It would be possible to have first floor as parking.
Horizontal evacuation is part of what we do –it is important to drill to reduce the milling time, to be sure that everyone can reach high ground in time. Also we have installed the signage and the City has completed the build-out of Safe Haven Hill. We are also discussing ways to harden the pathway to protect from liquefaction.

Janet Webster

Cost – properties on the coast are expensive. Where will the funds come from?
This will be incorporated into the cost analysis, whether that would be money taken out of the money raised, or from a different source, has not been discussed yet but is a consideration.

Debra Crawford
What about the costs of moving seawater?
These are in the cost analysis. The plan is not currently to have seawater in the building.

Spencer Nebel
City Council was very keen to have the building on South Beach and the Council is still very supportive. Building here would be a tremendous statement by the university to inform building here in Newport where we have limited land. The council would certainly want to see the technology built into it to preserve life safety, and they have not revisited the issue so their resolution can serve as their current thinking.

Stephen Webster
From a capital development perspective, a 50-year lifespan is typical, but could it be longer, like 100?
We are looking at the 75-year lifespan.

Jody Stecher
Is 100 year right now. The forward-looking aspect of the document is commendable, but what about the sustainability? Is the energy of thinking ahead going to be carried forward? This forward-thinking model will be as important as the building.
Yes. There will be a significant 25-50 year master planning process that will ensue.

Rosie Shatkin
TY from Roblan for all the visits to the Capitol to keep the coastal caucus updated.
What does tangible federal assistance look like? What else do you need from legislature?
What is the discussion with other coastal communities? Resiliency and recovery is a topic of conversation. Is there collaboration?
How you prepare ahead of time for recovery = resilience. Within our building siting we are mostly thinking about the building survival, but are also looking to a resiliency plan. I.e., we have purchased a water purification system to supply the community. Economic Summit Aug 8-9 is a good forum for that larger discussion. In the criteria, what we need from our legislative partners, includes language the bonding as to the intent of the legislation.

Gil Sylvia
How can they quantify the life safety component, or is it just quality? For example, considering the different scenarios where the tsunami can happen, ie. day or night? Season?
Cost-benefit risk analysis – emergency managers plan for the worst case scenarios, i.e. biggest at the worst possible moment. Building regulations take these into consideration in a different

way. They include risk management, so maybe as long as the building is standing in an XXL but would be usable in a M that might be ok.

Minda Stiles
Vertical evacuation, might have a mass rush of people heading to the bird nests.
We will continue to run drills and increase awareness, which is key. You are right about human nature, with the small towers we'd need more or it could be a problem. Drilling is key.

Bruce Mate
We would be less likely to entice people to join a split campus. The Port might be willing extend our lease another 100 years to extend our ability to plan long term and continue to invest. We have had good investment in our site by the city/county.

Ken Sexton
Basic assumptions – there are other natural disasters. What is the level of magnitude that is considered to be survivable for the building?
Several considerations: life safety is XXL, building survivability is less.

Michael Banks
MSI is bringing in new research in the social sciences, and our forward thinking aspects are impressive.

Jeff Wiseman
Will there be an opportunity for us to voice our concerns to President Ray before the final determination is made?
Let's set up a comment line.

Jeff Wiseman
What about the people who will be here before the new building is built, or what about retrofit for seismic?
Yes we are working on it, hope for as quickly as possible.

Bill Chadwick
Will the report from that team be available?
Yes, when done.

Caren Braby
We did a retrofit analysis for ODFW building – significant logistics and costs but it is doable.
The 2013 report is available on Scholar's Archive.

Steve Rumrill
Other marine labs have had hazards affect them. Have the leaders talked about this to compare notes?
Not yet but as NAML President-elect I can implement this. Good idea.

Jim Lewis
Should we get a second opinion?
Yes, and in essence that is what we are doing: we have multiple perspectives and now another external group working on this. We are at the end of our data gathering but still want to hear other voices.

Rob Suryan
Will there be an analysis of existing buildings and will the new building be a replacement?
Yes, in longer term planning we need to consider replacement and relative costs of retrofit or rebuild. Will need to be part of master planning. New building standards are meant to achieve this in time, but in some cases we might want to speed up the timeline.

Janet Webster
Timeline for decision making?
Data will be presented to President Ray by end of May.

Terry Thompson
Where are we at today for fundraising? What if we need to raise more money for this? Could we lose the building? When we will know status?
We have completed the programmatic funding and state funding, but still have $2.7M to raise philanthropically for the building. IF design is more expensive than originally planned, we can design for a smaller building, can make building more efficient to build, can try to get money from the university. Should know decision by June.

From: Azarenko, Anita
To: Cowen, Robert; Barth, John A; Fulton, Lori; "Roz Estime"; "Chris Poland" (cpoland@cdoce.com)
Subject: FW: [Inform-c08] Reminder: Marine Studies Initiative: Invitation to a meeting for an update on outputs from specialist interviews
Date: Monday, January 04, 2016 6:15:00 PM

FYI

From: Hooven, Louisa
Sent: Monday, January 04, 2016 3:05 PM
To: Azarenko, Anita
Subject: FW: [Inform-c08] Reminder: Marine Studies Initiative: Invitation to a meeting for an update on outputs from specialist interviews

I doubt I will have time to attend this, but have a few comments, which may not be central to the conversation.

My son lives in a sailboat in the South Beach Marina. I think that much of South Beach would not fare well in a Tsunami. The community around the marina / aquarium / brewery / hotel are supposed to walk up to the south end of the bridge in the event of a tsunami, I am skeptical of this plan. Would the building shelter some of the local community in the event of an impending tsunami?

In the event of a seismic event / tsunami, i.e. the Big One, OSU could be pivotal in getting communities back on their feet. Can the building be designed to be a center of resilience and recovery? For example, could you work with internet / cell phone providers to figure out whether the building could be used to house / protect what is needed to quickly get the internet and telecommunications back up? This would enable Ecampus to continue offering classes, and Extended Campus to get critical information out to people on the coast. On a side note, I wish the Oregon Kicker went into a Resilience Fund.

This sounds like a challenging project, I look forward to seeing what you figure out.

Louisa

From: inform-c08-bounces@lists.oregonstate.edu [mailto:inform-c08-bounces@lists.oregonstate.edu] **On Behalf Of** Azarenko, Anita
Sent: Monday, January 04, 2016 2:23 PM
To: Inform-C01 (Chief Officers, Executives, Deans); Inform-C08 (Instructors, Research Associates/Assistants); Inform-C09 (Professors, Associate/Assistant Professors); msi_all_faculty@lists.oregonstate.edu
Subject: [Inform-c08] Reminder: Marine Studies Initiative: Invitation to a meeting for an update on outputs from specialist interviews

Dear Colleagues,

We would like to remind you of the meeting that is scheduled to share updates on special interviews related to the new building on the HMSC site for the Marine Sciences Initiative and answer your questions related to the information that will be provided. The meeting is scheduled for **7 January 2016** from **10:30 to noon** and the **Hatfield Marine Science Center Auditorium** (in the visitor center). See the bottom section of this e-mail for more details that were in the original invitation e-mail.

Many of you requested a mechanism to connect via the web to the meeting. You will be able to access the meeting via Adobe Connect (http://oregonstate.adobeconnect.com/hmsctalks/ . The following image is what you will see when you click on the link provided. If you wish to join the meeting, you can enter the meeting by signing up as a guest. The link will only work during the live stream.

We look forward to seeing you on 7 January.

Happy New Year.

Anita Nina Azarenko
Special Assistant to the Vice President of Finance and Administration
Capital Planning and Development
3015 SW Western Blvd., Corvallis, Oregon 97331
Ph: 541-737-7695
anita.azarenko@oregonstate.edu

Lori Fulton
Manager, Capital Administration
Capital Planning and Development
Ph: 541-737-4625 |
lori.fulton@oregonstate.edu

From: Azarenko, Anita
Sent: Thursday, December 10, 2015 3:23 PM

Dear Colleagues,

As part of the new Marine Studies Initiative, the university is planning for a new building in Newport to house the program. Extensive consideration has been given to the exact location of the

building. The key issue is balancing the need of having the building on the HMSC site with concerns associated with major seismic events and associated tsunamis. In response to this issue, a specific process has been established to assess, plan, design and build with life safety as the primary goal. We seek to pursue a transparent process and ultimately design a building that can serve as a demonstration to other communities facing similar seismic conditions, whether in Oregon or around the world.

This process and planning was initiated with the establishment of a set of Building Principles (again, highlighting Life Safety) and has proceeded in seeking input via interviews with a broad range of specialists including seismic geologists, tsunami experts, structural engineers with seismic and/or tsunami experience, and emergency managers.

The outputs of these interviews have now been assimilated and we wish to share what we have learned with the OSU community, along with an opportunity for Q&A.

So please join us on **7 January 2016** from **10:30 am to noon** at the **Hatfield Marine Science Center Auditorium** (in the Visitor Center).

Steps following this meeting include: i) presentation of recommendations to the OSU Leadership, ii) communicating the interview outputs and recommendations to the coastal community; and iii) development of a clear set of criteria, based on final recommendations for site preparation, and building and engineering design to guide the Architect and Engineering team.

We look forward to seeing you on 7 January.

Happy holidays.

Anita Nina Azarenko
Special Assistant to the Vice President of Finance and Administration
Capital Planning and Development
3015 SW Western Blvd., Corvallis, Oregon 97331
Ph: 541-737-7695
anita.azarenko@oregonstate.edu

Lori Fulton
Manager, Capital Administration
Capital Planning and Development
Ph: 541-737-4625 |
lori.fulton@oregonstate.edu

From:	Azarenko, Anita
To:	Fulton, Lori; Cowen, Robert; Barth, John A; Adams, Ronald
Subject:	FW: [Inform-c09] Reminder: Marine Studies Initiative: Invitation to a meeting for an update on outputs from specialist interviews
Date:	Wednesday, January 20, 2016 1:24:00 PM

FYI

From: Azarenko, Anita
Sent: Wednesday, January 20, 2016 1:23 PM
To: 'Andrew Meigs'
Subject: RE: [Inform-c09] Reminder: Marine Studies Initiative: Invitation to a meeting for an update on outputs from specialist interviews

Dear Andrew,

Thank you for your very thoughtful e-mail. I will share your concerns and thoughts with the MSI team.

Sincerely,

Anita Nina Azarenko
Special Assistant to the Vice President of Finance and Administration
Capital Planning and Development
Oak Creek Bldg. ❖ Corvallis, OR 97331-2121
Ph: 541-737-7695 ❖ anita.azarenko@oregonstate.edu

From: Andrew Meigs [mailto:meigsa@geo.oregonstate.edu]
Sent: Friday, January 15, 2016 11:47 AM
To: Azarenko, Anita
Subject: Re: [Inform-c09] Reminder: Marine Studies Initiative: Invitation to a meeting for an update on outputs from specialist interviews

Dear Anita,

I was unable to take part in the January 7 event. I am not sure what avenues exist for comment, so I wrote the following note of concern in the hopes that it makes it into the record somehow.

My perspective on the proposed growth of OSU in Newport at the Hatfield Center reflects my experience as a researcher focused on earthquake geology, as a teacher of courses on earthquakes, hazards, and society for graduate and undergraduate students, providing outreach talks on earthquake hazards in the Pacific Northwest, and as a native Oregonian, a parent, and a concerned citizen.

I am very excited about OSU's plans to increase and diversify their presence in Newport. The

concept represents a wonderful opportunity demonstrate to Oregonians, the people of the Northwest, and the people of the nation how to promote sustainable economic development and investment in a region faced with a known and certain threat from a major natural hazard.

As every great earthquake on a subduction zone demonstrates, and Newport is no exception, sites such as the Hatfield Marine Sciences Center are faced by at least 4 compounding phenomenon because of its elevation at sea level and its construction on unconsolidated estuarine sediment. Sites like the HMSC will be affected by strong ground motion, a subsidence of the land surface by about 1 meter with respect to sea level during the earthquake, liquefaction, and then sustained attack from tsunami. What is particularly concerning to me is that nothing separates the HMSC from the open ocean and that the jetty will likely focus energy directly at the HMSC site. The dramatic and frightening reality of the hazard is reinforced in my classes here at OSU, in outreach conducted by people on campus and in our Extension branch, by all branches of the State Government, by the media, by all available geological research, and by the experiences of vulnerable populations in Chile, Alaska, Japan, south Asia, and other regions.

My hope is that OSU uses the resources planned for the HMSC expansion to build all new facilities up and away from the current site of the HMSC. Our university could take the position and respect the fact that our region is faced by a real and inescapable hazard. The knowledge of that hazard and threat post-dates most infrastructure along the coast. In my mind the prudent course is to (1) make new investment at the coast to promote the university and local economy and (2) make that the investment in an area where people and resources are moved up and out of the hazardous area. The message communicated to the population has 2parts. First, an earthquake and the inevitable tsunami deserve respect because of the scale and unpredictable nature of their impacts. Second, that moving up and away from the hazard both promotes the tremendous potential of the coast and models how those communities can proper wile lower their exposure and vulnerability.

OSU can be a global leader in a model for development in the face of an off-scale natural hazard if we choose to invest new resources that promote development upwards and out of the tsunami inundation zone. Pursuing major investment in the inundation zone goes against common sense, unnecessarily exposes the students, faculty, and staff to harm, and ignores the large body of evidence, much of it coming from OSU research, that low-elevation sites along the coast are regions with the highest exposure to the inevitable large-scale impacts of an earthquake on the Cascade subduction zone.

The tsunami evacuation routes of the Oregon Coast, including Newport, are meant to advise the population of where to go in the event of an earthquake. I hope OSU takes the position that "evacuation" can also be a model for future development. Move to high ground before the event occurs to demonstrate how a coastal community can grow and diversify in a way that insulates its population, economic vitality, and resources from catastrophic loss.

Andrew

> On Jan 4, 2016, at 2:23 PM, Azarenko, Anita <Anita.Azarenko@oregonstate.edu> wrote:
>
> Dear Colleagues,

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<image003.jpg>

We look forward to seeing you on 7 January.

Happy New Year.

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3015 SW Western Blvd., Corvallis, Oregon 97331
Ph: 541-737-7695
anita.azarenko@oregonstate.edu

Lori Fulton
Manager, Capital Administration
Capital Planning and Development
Ph: 541-737-4625 |
lori.fulton@oregonstate.edu

From: Azarenko, Anita
Sent: Thursday, December 10, 2015 3:23 PM

Dear Colleagues,

As part of the new Marine Studies Initiative, the university is planning for a new building in Newport to house the program. Extensive consideration has been given to the exact location of the building. The key issue is balancing the need of having the building on the HMSC site with concerns associated with major seismic events and associated tsunamis. In response to this issue, a specific process has been established to assess, plan, design and build with life safety as the primary goal. We seek to pursue

a transparent process and ultimately design a building that can serve as a demonstration to other communities facing similar seismic conditions, whether in Oregon or around the world.

This process and planning was initiated with the establishment of a set of Building Principles (again, highlighting Life Safety) and has proceeded in seeking input via interviews with a broad range of specialists including seismic geologists, tsunami experts, structural engineers with seismic and/or tsunami experience, and emergency managers.

The outputs of these interviews have now been assimilated and we wish to share what we have learned with the OSU community, along with an opportunity for Q&A.

So please join us on **7 January 2016** from **10:30 am to noon** at the **Hatfield Marine Science Center Auditorium** (in the Visitor Center).

Steps following this meeting include: i) presentation of recommendations to the OSU Leadership, ii) communicating the interview outputs and recommendations to the coastal community; and iii) development of a clear set of criteria, based on final recommendations for site preparation, and building and engineering design to guide the Architect and Engineering team.

We look forward to seeing you on 7 January.

Happy holidays.

Anita Nina Azarenko
Special Assistant to the Vice President of Finance and Administration
Capital Planning and Development
3015 SW Western Blvd., Corvallis, Oregon 97331
Ph: 541-737-7695
anita.azarenko@oregonstate.edu

Lori Fulton
Manager, Capital Administration
Capital Planning and Development
Ph: 541-737-4625 |
lori.fulton@oregonstate.edu

Coastal Agency Plans

Agency -- Plans to address Tsunami issues, staying put, watching OSU siting choice, future growth

NOAA – Rick Brown has requested NOAA Facilities management for an engineering assessment and potential action for the NAL and RSF buildings. As of this date, not action or funding has occurred. The BFB was built in 2003 to the then current seismic standards with engineering to also address liquefaction potential, so this building is not seen as an immediate issue. NOAA agencies on the HMSC campus and MOC-P will continue to collaborate with OSU on both evacuations to Safe Haven Hill or the Community College. NOAA shares interest with OSU in the potential for Vertical evacuation for those that would not be able to make it to other higher ground in a timely manner - the elderly or mobility challenged.

OSU (HMSC) has briefed NOAA senior leadership at a variety of opportunities over the last two years about the MSI. NOAA leadership is supportive since MSI will provide broad undergraduate and graduate exposure to marine issues and marine policy, which are areas that Federal Resource Management Agencies will draw from for future hires as our aging workforce retires and Marine policy issues continue to be a priority. There is discussion with NOAA leadership about the potential to help fund an OSU faculty line or two in support of this workforce training.

Location of the MSI building offsite could be an inconvenience for the students if NOAA creates an undergraduate internship or Co-Operative Education program where the students would also work with NOAA researchers while they are taking classes. Logistics and Transportation for students from a remote site to the HMSC Marine Campus would need to be addressed by OSU and the community.

USEPA – USEPA plans for seismic retrofit of their HMSC building are currently uncertain. They are keenly aware of the conditions present at the HMSC site, but have no plans to leave this location. USEPA staff are active participants in all HMSC campus tsunami exercises and plan to continue to be so. MSI and the expanded student population are seen as a positive for EPA as opportunity to train student interns, increase collaborations with OSU faculty and even contribute to some teaching.

USDA - USDA (thru the ARS) is currently in the mode of deciding whether to keep their Oyster ecology/genetics program at HMSC. The decision is both fiscal and competitive (HMSC competing against a NOAA lab in Washington). MSI, and the promise of the marine genetics/genomics stronghold we are trying to build at HMSC, is a key factor in their internal deliberations, and siting would clearly affect their decision. Beyond that, future growth in USDA is not a current topic of discussion with this agency, but could occur if ARS chooses to expand their aquaculture focus.

USF&W – USF&W does not have any plans in the near future for retrofitting the building for seismic events (Refuge Deferred Maintenance Backlog - not in the 5-year Plan). Such plans could be implemented in the future. They plan to continue following HMSC's lead in tsunami evacuation training and planning efforts as it makes sense to work with their HMSC partners for consistency, experience, and combined resources.

The USF&W's formal Refuge planning efforts do not currently include the MSI program (Comprehensive Conservation Plans for the 6 refuges were wrapped up in 2013, focused on refuge land management, and have not been updated). However, they have had informal discussion at the staff level regarding the potential opportunities for both MSI and the refuge programs to benefit from collaboration related to MSI science programs, visitor services program, and communications program. They are excited about the opportunities and the direction OSU is moving with the MSI.

They plan to remain on site as part of the HMSC community and the collaboration efforts. Any growth would be the result of tying in with the MSI resources and student body.

ODFW – ODFW is giving very strong consideration to their building and siting needs for two reasons. They are in an old building that needs major renovation to be seismic resilient and their current building is too small. Currently, their coastal group is spread over three separate buildings across town, and they find that very disrupting to their own internal interactions and efficient operations. They are looking closely at OSU with respect to our choice of siting as they do value our collocation. Further, they would even consider the option of OSU building sufficient space (either within the new building or an adjacent building) at HMSC that they could lease (as they do not believe capital funding will be available for their own building).

Finance and Administration
Oregon State University
640 Kerr Administration, Corvallis, Oregon 97331-2156
T 541-737-2447 | **F** 541-737-3033

March 21, 2016

MEMORANDUM

TO: Oregon State University Board of Trustees

FROM: Ron Adams, Interim Vice President for Administration

SUBJECT: Site Selection for the Marine Studies Building in Newport

At the March 31, 2016 Board meeting, I will provide an overview of the process, timeline and criteria that will be used later this spring to recommend to President Ray a location for the construction of a Marine Studies Initiative building in Newport. I will also present a summary of findings from an evaluation of the Hatfield Marine Sciences Center (HMSC) as a potential site for the building. My presentation will be followed by a panel discussion regarding the many considerations in selecting a suitable location for this building. The panel discussion will be moderated by the College of Engineering Dean Scott Ashford and will include faculty members from the colleges of Earth, Ocean and Atmospheric Sciences (CEOAS) and Engineering, as well as a coastal community representative.

As background for this discussion, I am enclosing the HMSC site evaluation findings, letters to President Ray from faculty in the Geology and Geophysics Disciplinary Group of CEOAS, faculty in the School of Civil and Construction Engineering, and the State Geologist. President Ray's responses to the letters are also included. A letter from the Seismic Safety Policy Advisory Commission to the Governor and Legislature is also included.

Enclosures

Geology and Geophysics Disciplinary Group
College of Earth, Ocean and Atmospheric Sciences
Oregon State University, 104 CEOAS Administration Building, Corvallis, Oregon 97331-5503
T 541-737-3504 | F 541-737-2064 | http://ceoas.oregonstate.edu/research/gg/

February 3, 2016

Dr. Ed Ray
President, Oregon State University

Dear President Ray;

The undersigned faculty of the Geology and Geophysics disciplinary group within CEOAS support the Marine Studies Initiative as part of the University's Strategic Plan 3.0 and recognize the economic importance of the MSI to the Oregon coastal community. Nevertheless, as Earth Science experts, we wish to express concern about plans to place the MSI building in the tsunami inundation zone. In the future, an offshore subduction earthquake of magnitude >8 is bound to occur, and would produce ground liquefaction, subsidence, and tsunami inundation at the planned MSI site at HMSC. This would threaten lives, damage buildings, and hobble the research capacity of this flagship Institute. In order to avoid putting students, staff, the public and the institution at risk, we urge you to request a full and independent technical analysis of alternative sites outside of known tsunami flooding zones.

As Oregon's leading science and technology research and educational institution, we have a special responsibility to address societal problems with state-of-the-art and forward-looking solutions based on the best research. New understanding of the science and attendant risks to infrastructure, human life and the economy from great megathrust earthquakes often leads seismic- and tsunami-specific building codes by many years. In light of our current knowledge of the expected inundation of HMSC during such an event, we are concerned that construction of the laboratory and classroom building in the current plan, as presented at a meeting on January 7, 2016 in Newport, includes unnecessary exposure to the hazard of a major tsunami. Consideration of an alternate site nearby outside of the tsunami inundation zone could enhance the connection between the MSI and the Oregon Coast Community College, and would fulfill the promise in the MSI Strategic Plan to consider such options and their potential for long-term safety and cost savings.

The current HMSC campus was established before the risk of a large earthquake and tsunami on the Cascadia subduction zone was widely recognized, and the existing structures are ageing and constructed to standards that do not meet current seismic codes. Given the inevitable need to eventually replace or move the existing facilities, consideration of an alternate site for the MSI facility can be viewed with this long-term need in mind. We believe that OSU, as a public institution with faculty expertise in community resilience and in earthquake/tsunami science and engineering, should hold itself to a high standard regarding public safety and accountability, even if this requires going beyond current building codes. Development of the MSI provides OSU with a unique opportunity to lead sustainable development by providing Oregonians with a safe and forward-looking model for coastal development.

Yours sincerely,

[signed on the following page]

Signed digitally, in alphabetical order:

Peter Clark	Professor ✓
Jessica Craveling	Asst. Professor ✓
John Dilles	Professor ✓
Gary Egbert	Professor ✓
Chris Goldfinger	Professor ✓
David Graham	Professor ✓
Anita Grunder	Professor, Assoc. Dean for Academic Programs ✓
Rob Harris	Professor ✓
Adam Kent	Professor ✓
Eric Kirby	R.S. Yeats Assoc. Professor of Earthquake Geology and Active Tectonics ✓
Anthony Koppers	Professor ✓
Vern Kulm	Professor Emeritus — Kulmvs@cs.com
Mitch Lyle	Professor (Senior Research) ✓
Jennifer McKay	Asst. Professor (Senior Research) ✓
Andrew Meigs	Professor ✓
Alan Mix	Professor ✓
John Nabelek	Professor ✓
Adam Schultz	Professor ✓
Shanaka de Silva	Professor ✓
Frank Tepley	Assoc. Professor ✓
Anne Trehu	Professor ✓
Kaplan Yalcin	Senior Instructor and Program Director ✓
Bob Yeats	Professor Emeritus ✓

cc/ Ron Adams, Jack Barth, Steven Clark, Bob Cowen, Michael Goodwin, Roy Haggerty, Patrick Hughes, Cindy Sagers

sent by email

Office of the President
Oregon State University, 600 Kerr Administration Building, Corvallis, Oregon 97331-2128
Phone 541-737-4133 | Fax 541-737-3033

March 2, 2016

Dear Colleagues:

Thank you for your letter of February 3, 2016, regarding Oregon State University's consideration of the Hatfield Marine Science Center campus as a location for a new marine studies building.

I welcome your offer to provide faculty expertise in this building's eventual siting, design, engineering and construction. Your world-class knowledge and capabilities are an asset that we will wisely engage.

I have requested a thorough and independent third-party evaluation of site alternatives for this building and have charged Ron Adams, interim vice president for administration, to coordinate this evaluation. As part of this effort, Dean Scott Ashford will serve as a liaison to expert Oregon State faculty and will work to engage you in this process.

Regardless of the eventual location for this building, I will require that the marine studies building meets the following principles:

- The building will be designed to ensure that structural integrity is maintained for the expected Cascadia Subduction Zone earthquake;
- The building's design and safety features will serve as a national and global showcase and demonstrate state-of-the-art structural options for future buildings in seismically active regions worldwide, as well as for earthquake and tsunami readiness;
- If located in a tsunami zone, the building will have a design occupancy of not more than 350 people; and
- The building's occupants – including those with disabilities – will be able to survive a future seismic event, exit the building in a timely manner and, if required, safely follow a tsunami evacuation plan to higher ground.

Again, my appreciation for your letter and offer of engagement.

Sincerely,

Ed

Edward J. Ray
President

cc: Ron Adams, Interim Vice President for Finance
Roy Haggerty, Interim Dean and Hollis M. Dole Professor of Environmental Geology, College of Earth, Ocean and Atmospheric Sciences
Scott Ashford, Dean, College of Engineering

OSU
Oregon State
UNIVERSITY

School of Civil and Construction Engineering
Oregon State University, 101 Kearney Hall, Corvallis, Oregon 97331
Phone 541-737-4934 | Fax 541-737-3052 | http://cce.oregonstate.edu

February 12, 2016

Dr. Edward J. Ray, President
Oregon State University

Dear President Ray:

The Cascadia Subduction Zone presents a major threat to life safety, especially along the Oregon Coast where the intense earthquake shaking will be followed quickly by tsunami inundation. It is only over the past decade or so that coastal communities have made a concerted effort to be more resilient to this hazard.

It is not the intent of our letter to endorse or to protest the expansion of the Hatfield Marine Science Center campus and the construction of a new Marine Studies building. Instead, we note that Oregon State University is in a unique position to provide evaluation in planning, design and construction, and education to reduce the coastal impact of the Cascadia Subduction Zone event. This is the first important building in Oregon to be designed within what is now recognized as a tsunami inundation zone. As a first of its kind, the design and construction of such a structure will set precedence for the standard of practice into the future. It must be recognized that being first demands special care and attention to achieve desired performance, resilience, and life-safety. The faculty of the School of Civil and Construction Engineering provide expertise in engineering for multi-hazards, and we encourage the OSU Administration to utilize these resources to build an exceptional educational facility that will serve as a state of the art model of resilient coastal construction in earthquake and tsunami hazard areas.

We encourage the university to consider:

- Characterization of the earthquake hazard, including ground motion, liquefaction, and the tsunami inundation hazard, including arrival time, flow depth and flow speed, debris, and scour potential, beyond that required by ASCE building codes. This includes performing site-specific probabilistic as well as deterministic development of seismic and tsunami hazard curves. It also entails detailed site topographic and bathymetric mapping.

- Use of innovative ground improvement methodologies to prevent liquefaction and tsunami-induced scour around building foundations.

- Design of the building for collapse prevention utilizing performance-based seismic and tsunami design methodology instead of conventional prescriptive methods, as allowed per ASCE 7, following alternate means and methods of design.

- Consideration that the new ASCE 7 design standards for tsunami resistance are as of yet untested. The expected performance of unique structures under tsunami conditions can be validated through physical model tests. OSU is uniquely qualified to conduct such physical model testing in the O.H. Hinsdale Wave Research Laboratory to assess hydraulic demands on the building and components. Experimental results combined with numerical modeling inform the design process to provide the most reliable and economical building.

- Instrument the structure and site to monitor strong shaking of the ground and the building to provide an early warning system and to analyze the performance of the structure immediately after an event as to assist in emergency response.

- Design of the building to include exposed interior structural elements to serve as a learning building for both students as well as the many visitors to the HMSC.

- Evaluation of the building design and orientation, including flow-through effects and flow diversion that may impact neighboring areas.

- Tsunami evacuation planning, utilizing dynamic simulations that include scenarios with unplanned transportation network disruption (i.e., bridge failures, or roadway blockage by building collapse) and realistic populations of the entire south Newport area and including vulnerable populations and people with disabilities. Consideration of vertical evacuation alternatives.

- Utilizing the collective faculty experience in earthquake and tsunami engineering through informal peer-review.

Kearney Hall, the home to Civil and Construction Engineering, was renovated with faculty input such that the building itself serves as a teaching tool for sustainable design and construction. Similarly, the Marine Studies building can be designed and constructed so that those building elements which make it more resilient to earthquakes and tsunamis can be highlighted to increase awareness and understanding of hazard-resilient coastal construction and further serves to reassure occupants that they are in a building designed to meet the challenge.

We, the undersigned members of the faculty in the School of Civil and Construction Engineering, encourage OSU to design and construct the new Marine Studies facility beyond the conventional code requirements to serve as a model for earthquake and tsunami resilience, and we stand ready to assist with the technical challenges if called upon.

W. Jason Weiss
Professor and Head, School of Civil & Construction Engineering
Edwards Distinguished Chair in Engineering
Director of the Kiewit Center for Infrastructure and Transportation Research

Dr. Andre Barbosa, P.E.
Assistant Professor

Dr. Daniel Borello
Assistant Professor

Dr. Daniel Cox
Professor

Dr. Christopher Higgins, P.E.
Drinkward Professor of Structural Engineering

Dr. Merrick Haller
Associate Professor

Dr. David Hill
Associate Professor

Dr. K.M. Hunter-Zaworski, P.E.
Associate Professor

Dr. Judy Liu
Professor

Dr. Michael Olsen
Associate Professor

Dr. Pedro Lomonaco
Director, O.H. Hinsdale Wave Research Laboratory

Dr. Michael Scott
Associate Professor

Dr. Armin W. Stuedlein, P.E.
Associate Professor

Dr. Haizhong Wang
Assistant Professor

Dr. Solomon C. Yim, P.E.
Glenn Willis Holcomb Professor of Structural Engineering

Dr. Harry Yeh, P.E.
Professor

sent by email

Office of the President
Oregon State University, 600 Kerr Administration Building, Corvallis, Oregon 97331-2128
Phone 541-737-4133 | Fax 541-737-3033

March 2, 2016

Dear Colleagues:

Thank you for your letter of February 12, 2016, regarding Oregon State University's consideration of the Hatfield Marine Science Center campus as a location for a new marine studies building.

I welcome your offer to provide faculty expertise in this building's eventual design, engineering and construction. Your world-class knowledge and capabilities are an asset that we will wisely engage.

I have requested a thorough and independent third-party evaluation of site alternatives for this building and have charged Ron Adams, interim vice president for administration, to coordinate this evaluation. As part of this effort, Dean Scott Ashford will serve as a liaison to expert Oregon State faculty and will work to engage you in this process.

Regardless of the eventual location for this building, I will require that the marine studies building meets the following principles:

- The building will be designed to ensure that structural integrity is maintained for the expected Cascadia Subduction Zone earthquake;
- The building's design and safety features will serve as a national and global showcase and demonstrate state-of-the-art structural options for future buildings in seismically active regions worldwide, as well as for earthquake and tsunami readiness;
- If located in a tsunami zone, the building will have a design occupancy of not more than 350 people; and
- The building's occupants – including those with disabilities – will be able to survive a future seismic event, exit the building in a timely manner and, if required, safely follow a tsunami evacuation plan to higher ground.

Again, my appreciation for your letter and offer of engagement.

Sincerely,

Ed

Edward J. Ray
President

cc: Ron Adams, Interim Vice President for Administration
Scott Ashford, Dean, College of Engineering

Oregon
Kate Brown, Governor

Seismic Safety Policy Advisory Commission
Oregon Emergency Management
Mailing Address: PO Box 14370
Salem, OR 97309-5062
Phone: (503) 378-2911
Fax: (503) 373-7833

February 1, 2016

Governor Kate Brown and Oregon Legislature
State Capitol Building
900 Court Street NE, 160
Salem, OR 97301

Dear Governor Brown and Members of the Oregon Legislature,

As Chairman of the Oregon Seismic Safety Policy Advisory Commission, I am taking the opportunity of the new Legislative session to review both successes and concerns of the Commission on Seismic Policy and the implementation of the Oregon Resilience Plan (ORP). This last year saw a number of successes as the Legislature created the position of the State Resilience Officer (SRO), significantly increased the funding for the Seismic Rehabilitation Grant Program (SRGP), allowed communities to create loan/loan guarantee programs for seismic retrofits for commercial buildings, and addressed liability issues for the Critical Energy Infrastructure hub stakeholders, all of which were based the ORP. We look forward to working with Derek Smith, the new State Resilience Officer (SRO) after his approval by the Senate. We are pleased with the recent response to the SRGP program which received 117 applications for the current $50 million budget, many of which will need to be considered in the next round. This investment will significantly improve the seismic safety of our schools and essential facilities.

One of our major concerns continues to be the adoption of the revised DOGAMI Tsunami Inundation Maps (TIM) and the updating of the administrative rules for higher development standards in the tsunami inundation zone. The coastal communities need to be provided with the best science and clear directions on development and risk in their communities. The example of the new Marine Studies Buildings proposed by Oregon State University (OSU) at the Hatfield Marine Science Center (HMSC) inside of the tsunami hazard zone in Yaquina Bay is instructive since the current decisions are based on the SB 379 line and administrative rules that have not taken into account the lessons of the ORP or a review of the effectiveness of the existing administrative rules. We are cognizant of the economic benefit this project will have for Newport and appreciate the higher design standards OSU is employing to improve the safety of the users and visitors to the new facility. However, pending the adoption of the TIMs and new administrative rules we propose the following safety issues be addressed:

- That the standards for tsunami risk be based on the DOGAMI TIMs maps which are currently the best peer reviewed science for tsunami risk. Other scientific studies used to for an individual project should meet the same level of peer review as the DOGAMI TIMs study.

- That tsunami evacuation studies be done for the new OSU facility and Hatfield Marine Science Center and be conducted looking at the "safe haven hill" and their proposed vertical evacuation element to include staff, students and visitors.

- The tsunami evacuation study of these facilities need to include a thorough review to meet the Americans with Disabilities Act access requirements. This issue is being raised in other parts of country with respect to emergency evacuation and could present future liability issues.

There are also a number of resilience issues that are relevant not only for the OSU project but for other state funded projects on both the coast and the rest of the State:

- Consistency of funding standards: Given that K-12 schools applying for SRGP must pass a FEMA-based Benefit Cost Analysis (BCA) in order to qualify for the state grant funds, it is not unreasonable to request that a BCA be completed for OSU (or other such projects) to substantiate the best use of HB 5005 bond funds from 2015 Legislature.

- We are discovering that Oregon's Universities have some unique funding vulnerabilities to natural hazards since they rely heavily on student tuition, which may need to be refunded following a disaster. Research institutions such as OSU have an additional vulnerability in that they may need to return federal grant money for projects that cannot be completed if the research facility is destroyed or the ability to conduct the research is lost. We recommend that Oregon's public universities develop continuity of operations and resilience planning, since the loss of these institutions would be a significant blow to recovery efforts.

- Besides the HMSC, Oregon has a number of other institutions that study the coastal environment, which include the Oregon Institute of Marine Biology, along with the South Slough National Estuarine Research Reserve and the newly formed Oregon Marine reserves. The Cascadia earthquake and tsunami will have enormous impact on the coastal environment and ecology and we will need these institutions to help us understand the changes. While their mission involves them being located near the ocean, thought needs to be given on how their vital missions can continue after the next Cascadia event.

- Universities and the research institutions play a big role in the economies of their community and need to be resilient in order for the communities in which they are located to be economically resilient. We recommend considering that projects like the OSU project and similar projects receiving State or Federal money have an independent peer review process ensure the basic safety for people using these new facilities and to include alternatives, such as location and design, for the project with regards to improving the facility's resilience for both economic and continuity of program concerns.

The OSU project is an opportunity for us to demonstrate best practices for our universities and communities to become resilient from a Cascadia earthquake and tsunami. The process should help us determine the best balance between risk, safety, and the current and future economic viability. We recognize that not all the questions can be answered in one project, but the path towards resilience means that we must take positive steps with each opportunity.

Having traveled three times to the damaged areas in Tohoku, Japan after the 3/11 earthquake and tsunami, I observed how they are now applying hard-learned lessons to recover and relocate important community facilities to avoid unnecessary exposure to future tsunami risk. In learning from Japan, it is time Oregon updated ORS 455.446 and 455.447 to bring stronger state agency engagement from the Department of Geology and Mineral Industries, Department of Land Conservation and Development, Building Codes Division and Oregon Emergency Management to better coordinate and assist in these types of coastal development decisions.

We need to approach these development decisions with a post-3/11 perspective. The Oregon Legislature did just that when they directed OSSPAC to deliver the Oregon Resilience Plan. We are optimistic that with the leadership and coordination from the Governor's Resilience Policy Officer, we can better integrate the ORP recommendations into everyday decisions and make our State a safer, sustainable, and more resilient place for current and future generations.

On behalf of all the members of OSSPAC, we look forward to working with you during and after the 2016 Legislative Assembly.

Respectfully,

Jay Wilson, Chairman

Jay Raskin, Vice Chairman

Oregon
John A. Kitzhaber, MD, Governor

Department of Geology and Mineral Industries
Administrative Offices
800 NE Oregon St., Suite 965
Portland, OR 97232-2162
(971) 673-1555
Fax: (971) 673-1562
www.oregongeology.org

November 24, 2014

Dr. Edward J. Ray
President
Oregon State University
600 Kerr Administration Building
Corvallis, OR 97331-2128

Dear Dr. Ray:

It has been my pleasure to serve on the College of Earth, Ocean and Atmospheric Sciences (CEOAS) Board of Advisors for several years. I am writing to you today to express my confidence that Oregon State University, through your leadership, will do the right thing in regard to its recent Marine Studies Initiative.

OSU and the CEOAS have engaged in a new initiative, the Marine Studies Initiative, and are actively fundraising for new facilities to be constructed at or near the Hatfield Marine Center in Newport. The proposal is for a new 100,000-sq.-ft. building for teaching and research with a capacity of 500 occupants built directly in the tsunami inundation zone at Newport. If designed for 501 or more occupants, this building would not be allowed under Oregon Revised Statutes (ORS) 455.446 and 455.447, which limit construction of certain critical and essential facilities in the tsunami inundation zone.

OSU researchers and engineers have been leaders in furthering the international understanding of the science and hazards associated with the Cascade Subduction Zone earthquakes and tsunamis. My agency has coordinated with said researchers to define the hazards, develop mitigation activities, and provide education and outreach to coastal communities to build resilience. An OSU professor co-chaired the Governor's taskforce to recommend implementation of the Oregon Resilience Plan, a plan specific to surviving and thriving after a Cascade Subduction Zone earthquake.

I urge you to show the same leadership now as the Marine Studies Initiative takes shape. If there is to be a new building funded and constructed through OSU in a recognized hazard area then I respectfully recommend you demand it be designed to be the most effective and safe tsunami vertical evacuation building possible. Better yet, locate the main occupancy building in the Newport area outside of the tsunami inundation zone

and maintain a modest research facility at Hatfield Marine Center. I know you are not willing to put even one, much less 500, students and researchers in peril every day.

I am happy to meet with you to discuss your options and your ideas to develop a new facility in Newport that will stand the test of time and coastal challenges.

Many regards,

Vicki S. McConnell, Ph.D., R.G.
Oregon State Geologist

CC:

Mark Abbott, OSU Dean CEOAS
Anita Grunder, OSU CEOAS Chair
Ken Barrow, Chair CEOAS Board of Advisors
Larry Givens, Chair DOGAMI Governing Board
Jay Wilson & Jay Raskin, Oregon Seismic Safety Policy Council Co-Chairs

Office of the President
Oregon State University, 600 Kerr Administration Building, Corvallis, Oregon 97331-2128
Phone 541-737-4133 | Fax 541-737-3033

December 12, 2014

Dr. Vicki S. McConnell
Department of Geology and Mineral Industries
Administrative Offices
800 NE Oregon St., Suite 965
Portland, OR 97232-2162

Dear Dr. McConnell,

Thank you for your letter dated Nov. 24, 2014 expressing your concerns with respect to OSU plans for expansion of the Hatfield Marine Science Center in anticipation of growing our teaching, research, outreach and engagement programs associated with the Marine Studies Initiative. We certainly share in your excitement of the Marine Studies Initiative as well as your realization of the challenges it creates. We are committed to meeting our institutional goals with the best possible solutions that ensure that we meet or exceed all safety standards for our students, staff and the community.

The points you raise are very much at the forefront of our planning process. Below, I provide a brief summary of our planning goals, as well as a few clarifications.

First, let me clarify our plans. We are planning for eventually supporting up to 500 students over the whole year. Since many students will also take advantage of the summer session, we anticipate no more than 300-400 students present at Hatfield during any given session. Moreover, our teaching facilities will ultimately include not only the new building, but at least two other OSU buildings already present on the HMSC campus – these latter buildings house a minimum of 8-10 classrooms/meeting rooms and laboratories. Consequently, we anticipate the students, staff and faculty 'occupants' of the new building to not exceed 250-300, which is well under the 501-occupant threshold you referenced. While this point clearly eliminates the Statute (ORS) 455.446 and 455.447 building issue, we stress that we remain extremely focused on what options we have to meet or exceed safety standards.

Second, while we are looking at building the new MSI facility on the HMSC campus, we are planning to site housing for the students off-campus, at a location 'up-the-hill' near the Oregon Coast Community College in or near the Wilder Development. This puts the students well out of the tsunami zone for the better part of their 24-hour day, and especially during the night when an event would be the most disorienting.

Third, our building plans will focus on maximizing the ability of the building, and its occupants, to survive the seismic event that may lead to the tsunami conditions so that people can follow our well-established evacuation procedures to higher ground. To this end, we are committed to working with experienced architectural and engineering firms to build a state-of-the-art seismically-resilient building as a demonstration project for other coastal residents/businesses to follow, as future building along such coastal environments as Oregon will continue out of necessity (e.g. Ports, communities). As leaders in research and innovation, there is considerable value in having a new OSU facility that is seismically strong as a demonstration of potential solutions where such building location is required, for whatever circumstance. We will also give a vertical evacuation design full consideration.

I reiterate our appreciation of your concerns and ensure you that we are very committed to the safety of our students and staff in our pursuit of meeting our academic mission. We will welcome your input throughout the entire process as we consider all of our options.

Sincerely,

Edward J. Ray
President

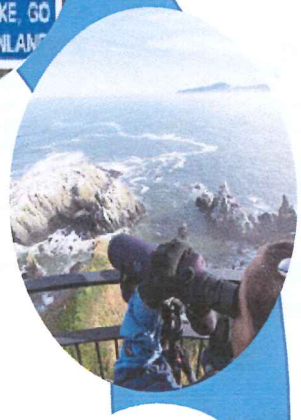
cc: Mark Abbott, OSU Dean CEOAS
Anita Grunder, OSU CEOAS Chair
Ken Barrow, Chair CEOAS Board of Advisors
Larry Givens, Chair DOGAMI Governing Board
Jay Wilson & Jay Raskin, Oregon Seismic Safety Policy Council Co-Chairs

TAB U

Marine Studies Initiative Building Site Selection

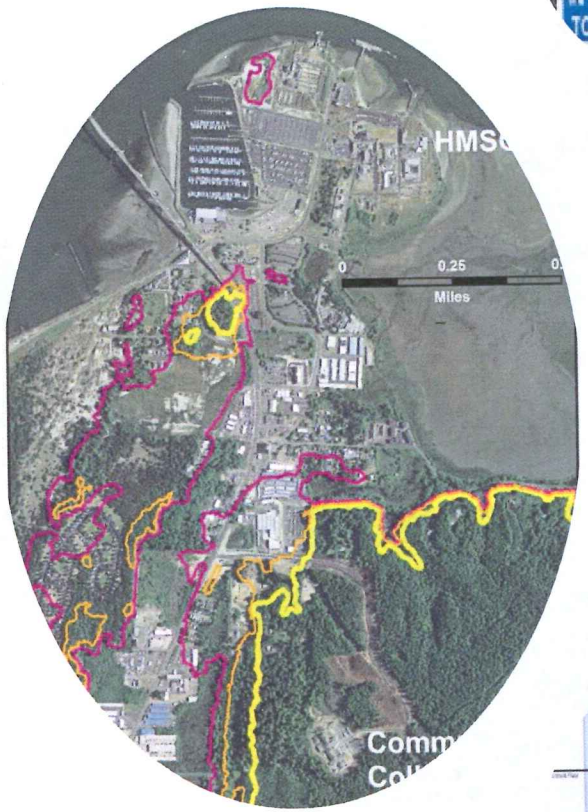
Site Selection Criteria

Life Safety:
Seismic/Tsunami Impacts

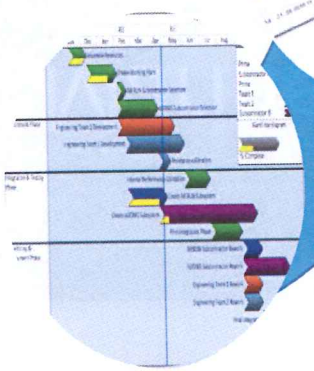


MSI Program Delivery:
Education, Research, Engagement

Budgetary:
Total Capital & Operating Costs

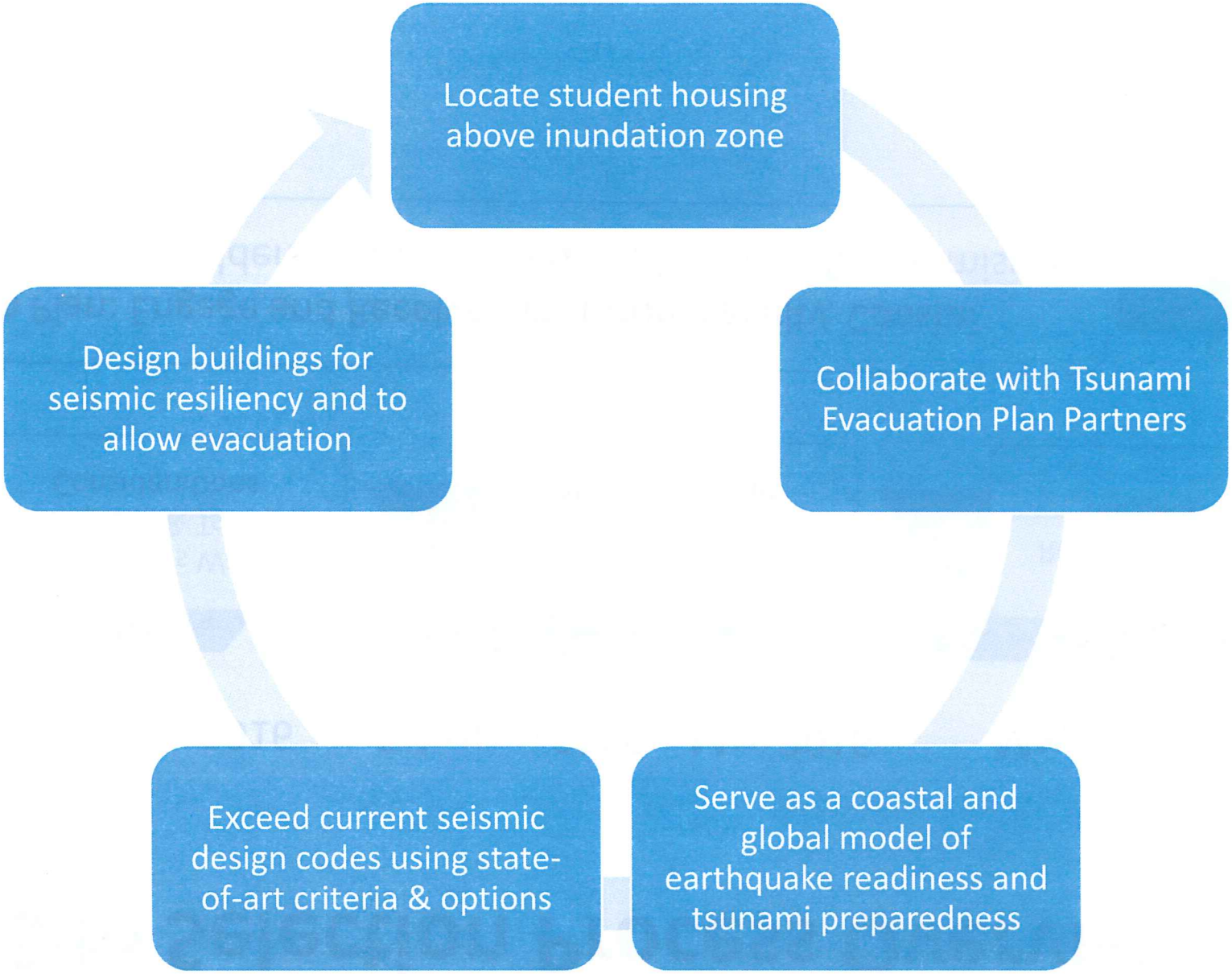


Possible site locations



Schedule:
Capital Fund Raising → Building Opening

Building Principles



Site Selection Process Overview

2015 – January 2016

Chris Poland's Work on Earthquake & Tsunami Considerations

February 2016 – May 2016

Third Party Evaluation of HMSC & Two Alternative Sites

May 2016

Recommendation to President Ray

Outreach Plan: Engage and Receive Input from Faculty, Coastal Community Stakeholders, State and Federal Agencies & Commissions

Marine Studies Initiative Building Earthquake & Tsunami Considerations

Chris D. Poland, Consulting Engineer
Member of the National
Academy of Engineering

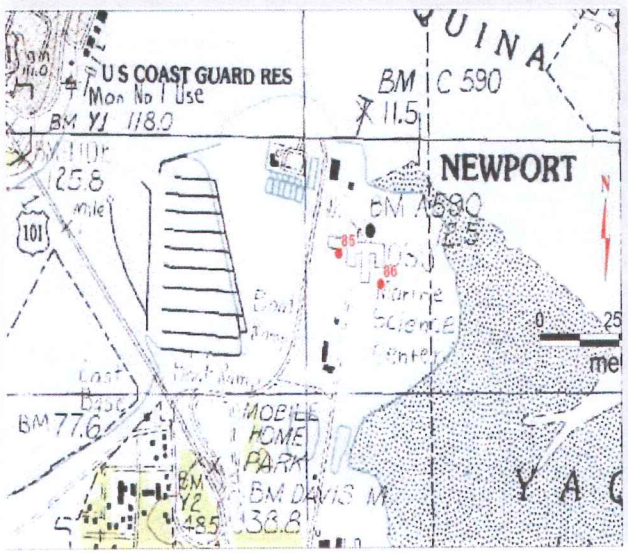
Roz Estime'
Estime' Science & Technology
Facilities Planners

The Earthquake and Tsunami Threats

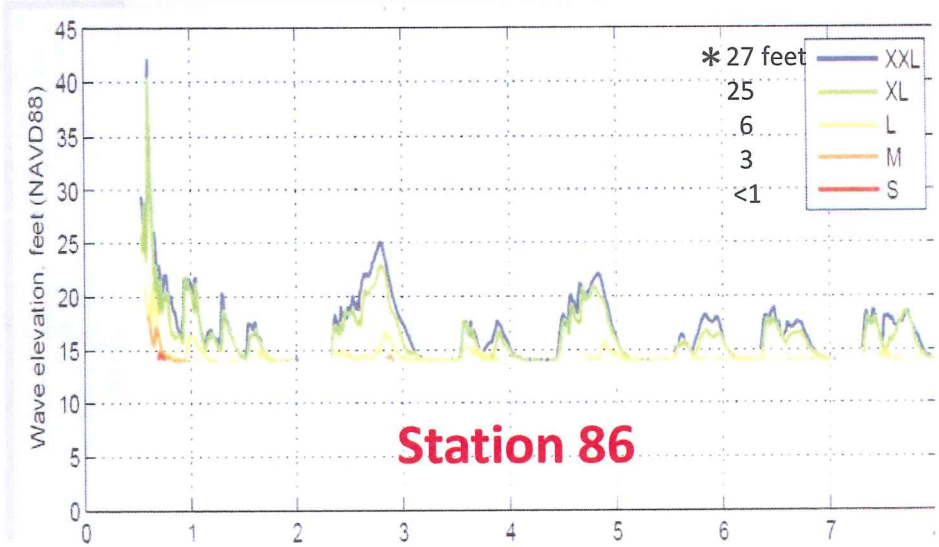
OPEN-FILE REPORT O-13-19

TSUNAMI INUNDATION SCENARIOS FOR OREGON

by George R. Priest[1], Robert C. Witter[2], Y. Joseph Zhang[3], Kelin Wang[4], Chris Goldfinger[5], Laura L. Stimely[1], John T. English[6], Sean G. Pickner[7], Kaleena L.B. Hughes[7], Taylore E. Wille[7], and Rachel L. Smith[7]



Ground Elevation



Chris Goldfinger reported that the probability of a Tsunami at the MSI site is 39% to 58% over the next 100 Years

*Department of Geology and Mining Industries (DOGAMI)

Initiate Expanded Horizontal Evacuation Planning

- Plan for DOGAMI "XXL" event
- Include City of Newport representatives & South Beach businesses and residents
- Improve efficiency and completeness through new technology and with ADA input
- Seek a path to safety for every occupant
  - Determine routes to Safe Haven Hill and Community College using OSU modeling
  - Consider vertical evacuation structures
- Seek state & local funding for route improvements
- Develop & implement South Beach-wide evacuation plan

Initiate the Design Process

- Model cost/schedule for relocating HSMC to high ground
- Commission site specific studies of:
  - strong shaking
  - liquefaction, subsidence and lateral spreading potential
  - tsunami inundation potential,
  - identification of debris sources and the potential for large ship impacts at the HSMC site
- Determine MSI activities that can be accomplished on high ground
- Develop design alternatives for MSI facilities at HMSC
  - Minimum seismic code
  - Repairable after "L" level inundation
- Determine feasibility and cost to provide vertical evacuation
- Use triple-bottom line analysis
- Design and construct the selected solution

Panel Discussion

Moderator

- Dean Scott Ashford, Dean of the College of Engineering

Panelists

- Jack Barth, MSI Co-Chair & CEOAS Professor and Associate Dean for Research
- Chris Goldfinger, Professor of Geology and Geophysics, CEOAS
- Dan Cox, Professor of Civil and Construction Engineering, COE
- David Gomberg, Oregon State Representative, District 10

OSU's Marine Studies Initiative
Jack Barth and Bob Cowen, Co-Leads

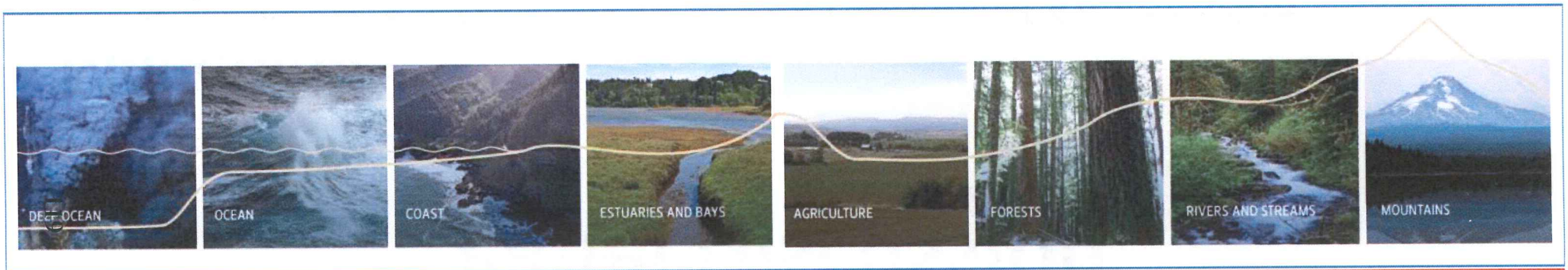
Opportunity – Develop a World-Class Marine Studies Program

Vision

Through its *Marine Studies Initiative*, Oregon State will be recognized as a global leader in 21st century transdisciplinary education and research and lead the development of inclusive strategies for successful stewardship of our ocean and planet for today and the future.

Mission

The mission of the *Marine Studies Initiative* is to create a healthy future for our oceans and the planet through transdisciplinary research and teaching that emphasizes collaboration, experiential learning and problem solving.



Programmatic Goals and Requirements

- Extend OSU's education, research, and outreach mission to the coast

- 500 full-time equivalent students annually in Newport by 2025: 400 undergraduate, 100 graduate
  - Classroom, laboratory, innovation and collaboration spaces
  - Housing (will be outside tsunami inundation zone)

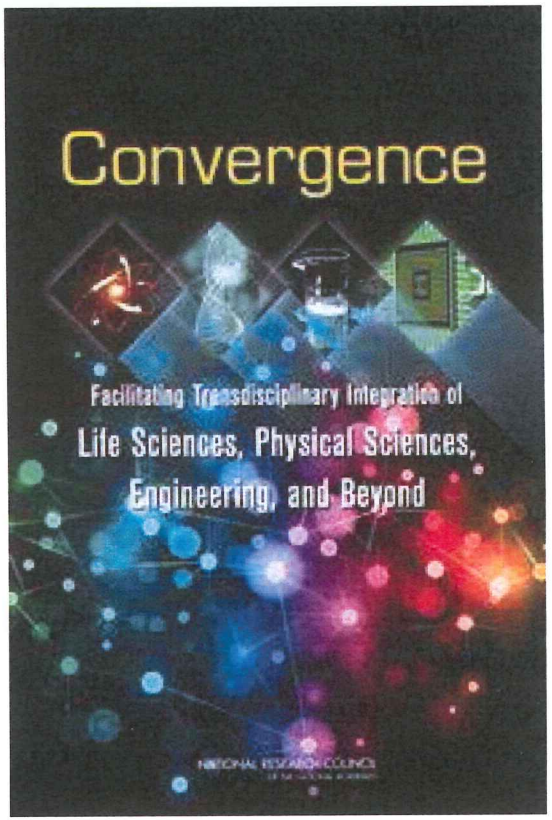
- Maximize OSU's past and future investments in marine-related education, research, and outreach and engagement at the coast
  - Hatfield Marine Science Center
  - Guin Library
  - Visitor's Center (free-choice learning laboratory)
  - Ship Operations docks
  - Community partnerships

- Enhance researchers and students "access to sea" in all its forms: estuarine and coastal waters; boats; agency scientists; adjacent classrooms and seawater facilities; etc.)

Programmatic Goals and Requirements

Goal: Build a collaborative environment that fosters synergy

- Convergence and collaboration
  - "Researchers from centers with unbroken, co-located office and laboratory space reported an 'innovation outcome' measure higher than researchers from centers occupying split spaces" (*NRC, 2014)
  - Degree of collaboration, including enhanced research grant success and innovation, directly proportional to distance (**Kabo et al. 2015)
- Examples of collaboration include
  - Sea Grant Visitors Center as a free-choice laboratory
  - Marine mammal research and underwater acoustics
  - Renewable energy and ecological impacts
  - Conservation biology and genomics



Goal: Demonstrate how to build safety in a seismically active region; opportunity for public education through high visitation numbers at HMSC visitors center

* National Research Council. 2014. *Convergence: Facilitating Transdisciplinary Integration of Life Sciences, Physical Sciences, Engineering, and Beyond*. Washington, DC: The National Academies Press.

** Kabo et al. 2015. Shared paths to the lab: A sociospatial network analysis of collaboration. Environ. and Behavior, 47:57-84.

The coming Cascadia Great Earthquake: How did we get here?

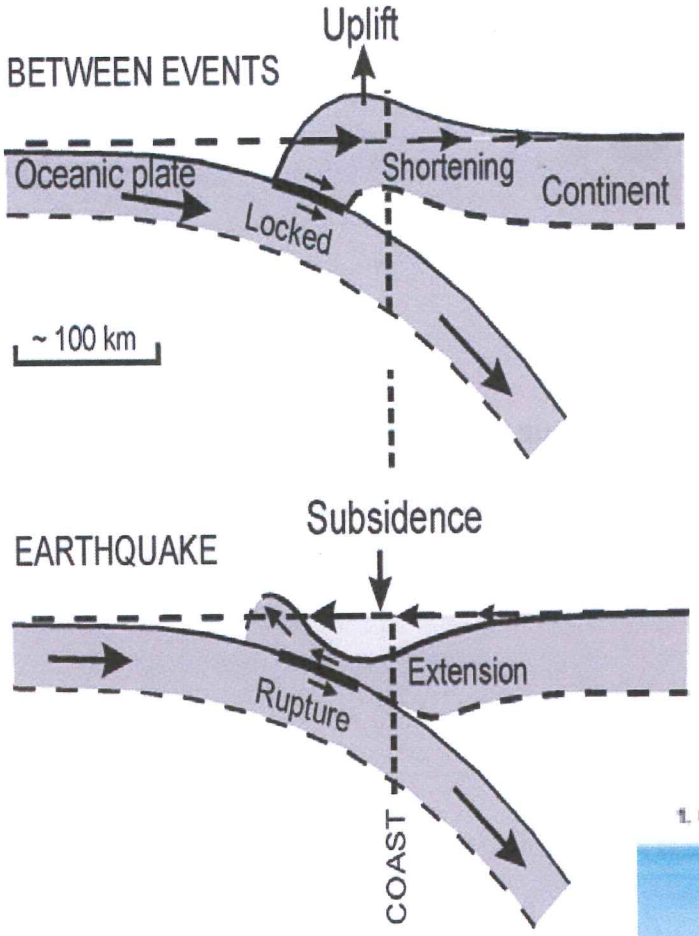
Chris Goldfinger

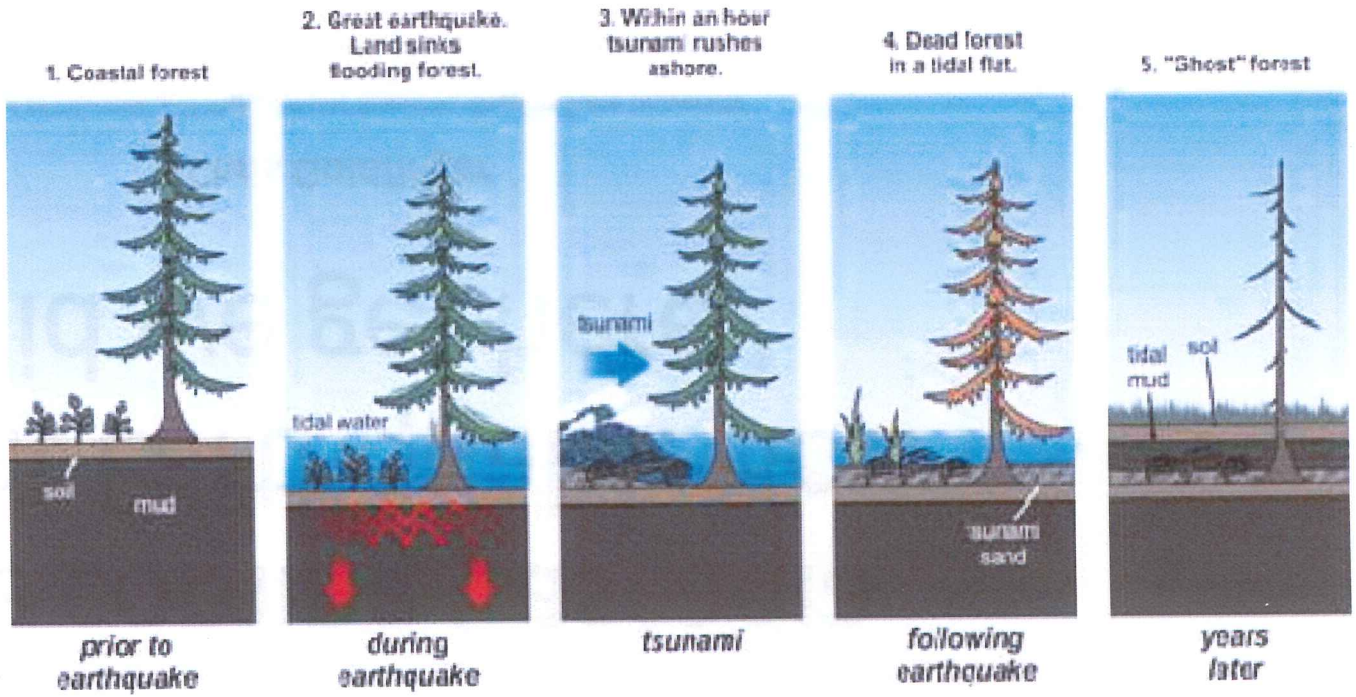
College of Oceanic and Atmospheric Sciences, Oregon State University

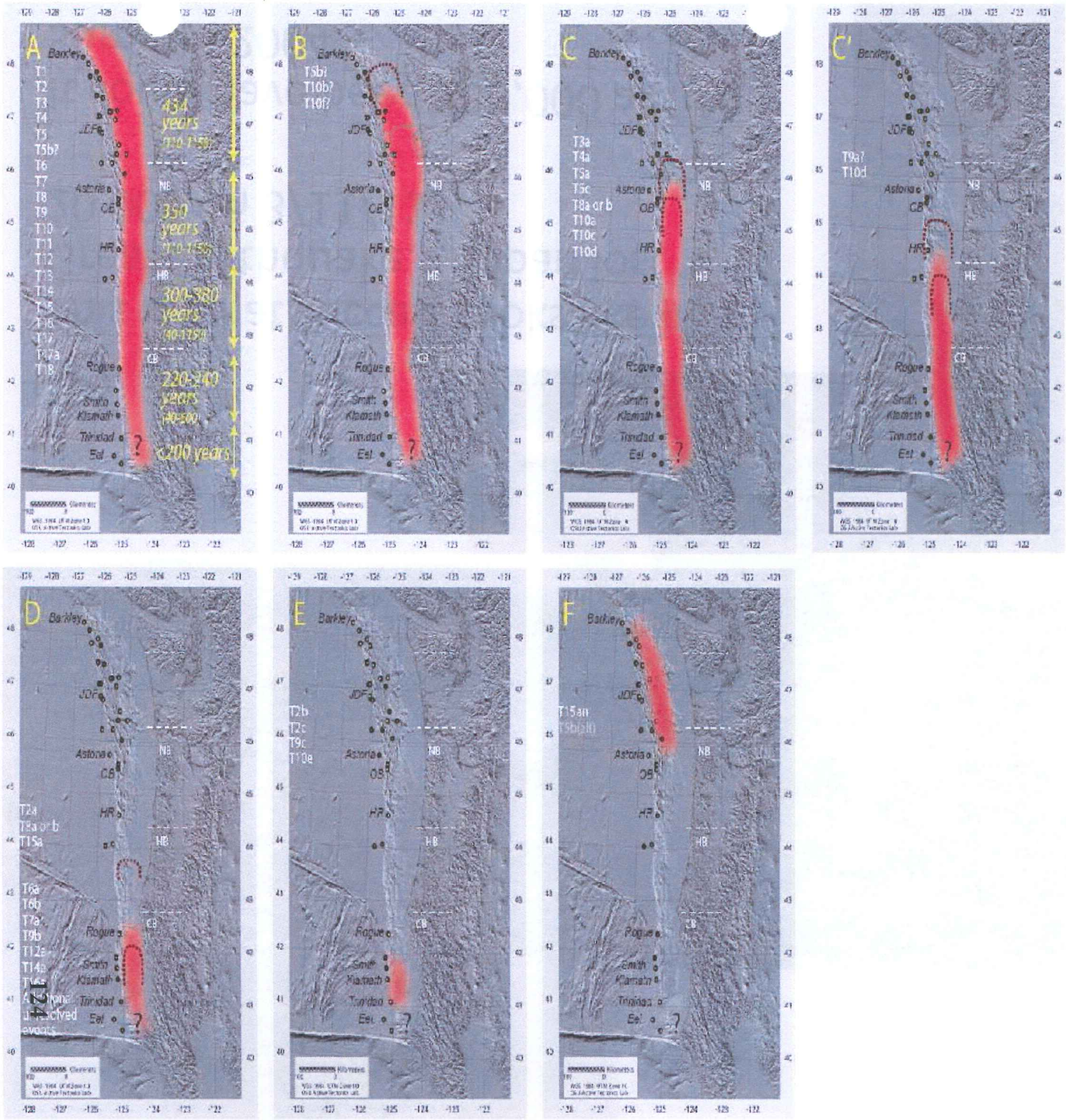
Active Tectonics Group, Ocean Admin Bldg 104, Corvallis OR 97333

gold@coas.oregonstate.edu

C. Hans Nelson[†], Joel E. Johnson*, Steve Galer, Jeffrey Beeson, Bran Black, Ann E. Morey*, Julia Gutiérrez-Pastor[†], Eugene Karabanov**, Andrew T. Eriksson*°, Rob Witter and George Priest[σ], Eulàlia Gràcia****, Kelin Wang***, Joseph Zhang[Σ], Gita Dunhill[††], Jason Patton*, Randy Enkin***, Audrey Dallimore*** , Tracy Vallier[§], and the Shipboard Scientific Parties (52 students, colleagues, technicians)


BETWEEN EVENTS
Uplift
Oceanic plate
Shortening
Continent
Locked
~ 100 km
EARTHQUAKE
Subsidence
Extension
Rupture
COAST


1. Coastal forest
2. Great earthquake. Land sinks flooding forest.
3. Within an hour tsunami rushes ashore.
4. Dead forest in a tidal flat.
5. "Ghost" forest
tsunami
tidal water
soil
mud
tsunami sand
tidal mud
soil
prior to earthquake
during earthquake
tsunami
following earthquake
years later



Cascadia Earthquake History

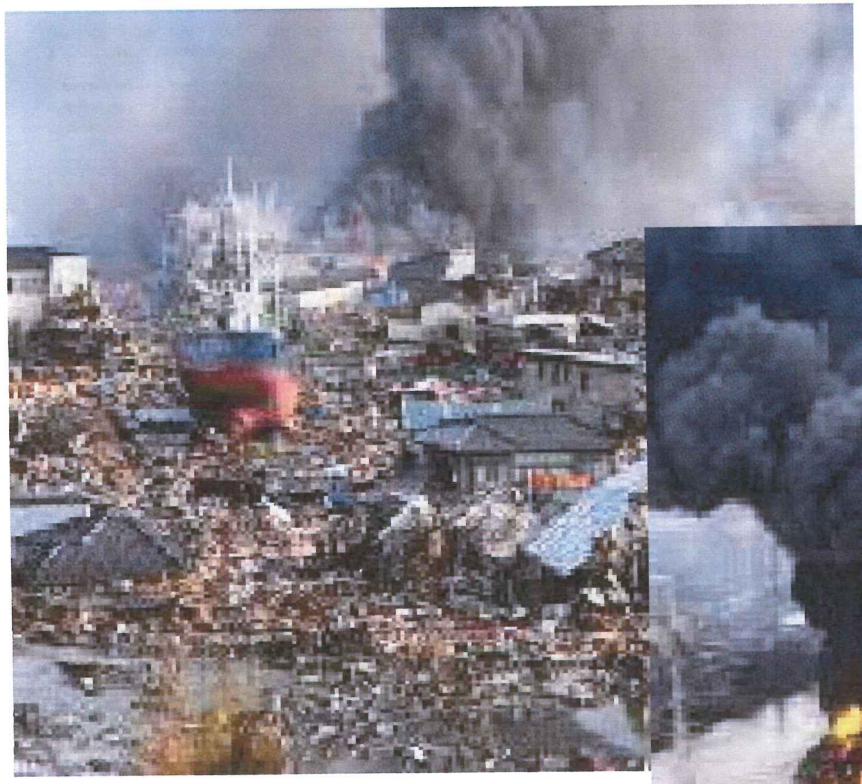
10,000 years long, 30 years of investigation, 100+ investigators.

43 earthquakes in total.

32 of them affect the Newport area, ranging from 7.4-9.2 in magnitude (estimated).
Average repeat time = ~320 years. Time since last: 316 years.

Probability in the next 50 years is ~ 18-22%.

(Goldfinger et al. in revision 2016)



This is what success looks like in a Great Earthquake. Japan lost ~ 20,000 on 3/11/11.

It could have been 230,000 as in Sumatra 2004.

This is what success looks like in a Great Earthquake. Japan lost ~ 20,000.

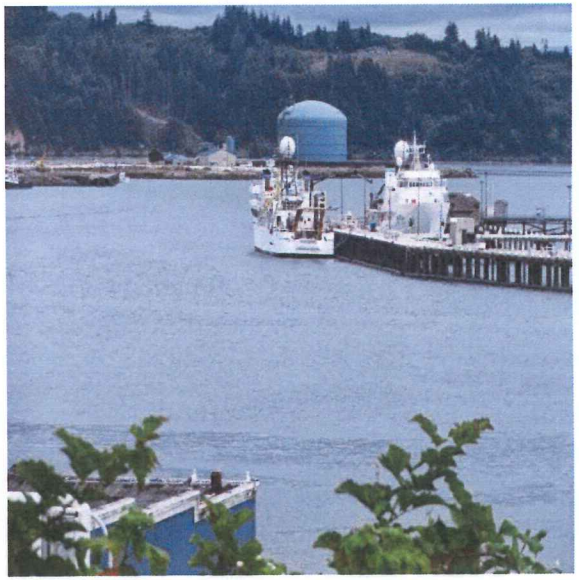
It could have been 230,000 as in Sumatra.

The Hatfield site is a liquefiable sandbar, with 2m of fill on top. It's barely above high tide.

We can't say what size tsunami will be next, it could be 6-10 ft, or it could be >30 ft as in Tohoku.

The land will likely subside 3-6 ft during the earthquake.

What would Mayor Sato do?



Daniel Cox
Professor, School of Civil and Construction Engineering

Tsunami Life Safety; Tsunami Engineering and Resilience

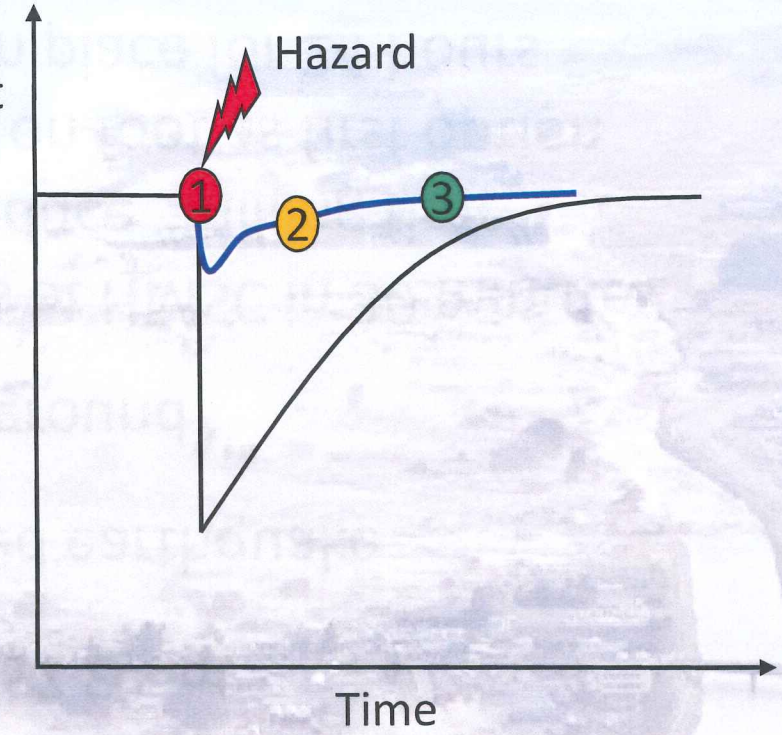
Tsunami Life Safety and CSZ Event

1. Survive anticipated earthquake
2. Evacuate to high ground
   - Tsunami arrives at HMSC in 30 minutes
   - Education to reduce "milling time"
   - Safe Haven Hill on foot as first option
   - Evacuees stay in place for 24 hours
   - Consideration for assisting disabled
   - Vertical evacuation as unplanned alternative

Disaster Resilience

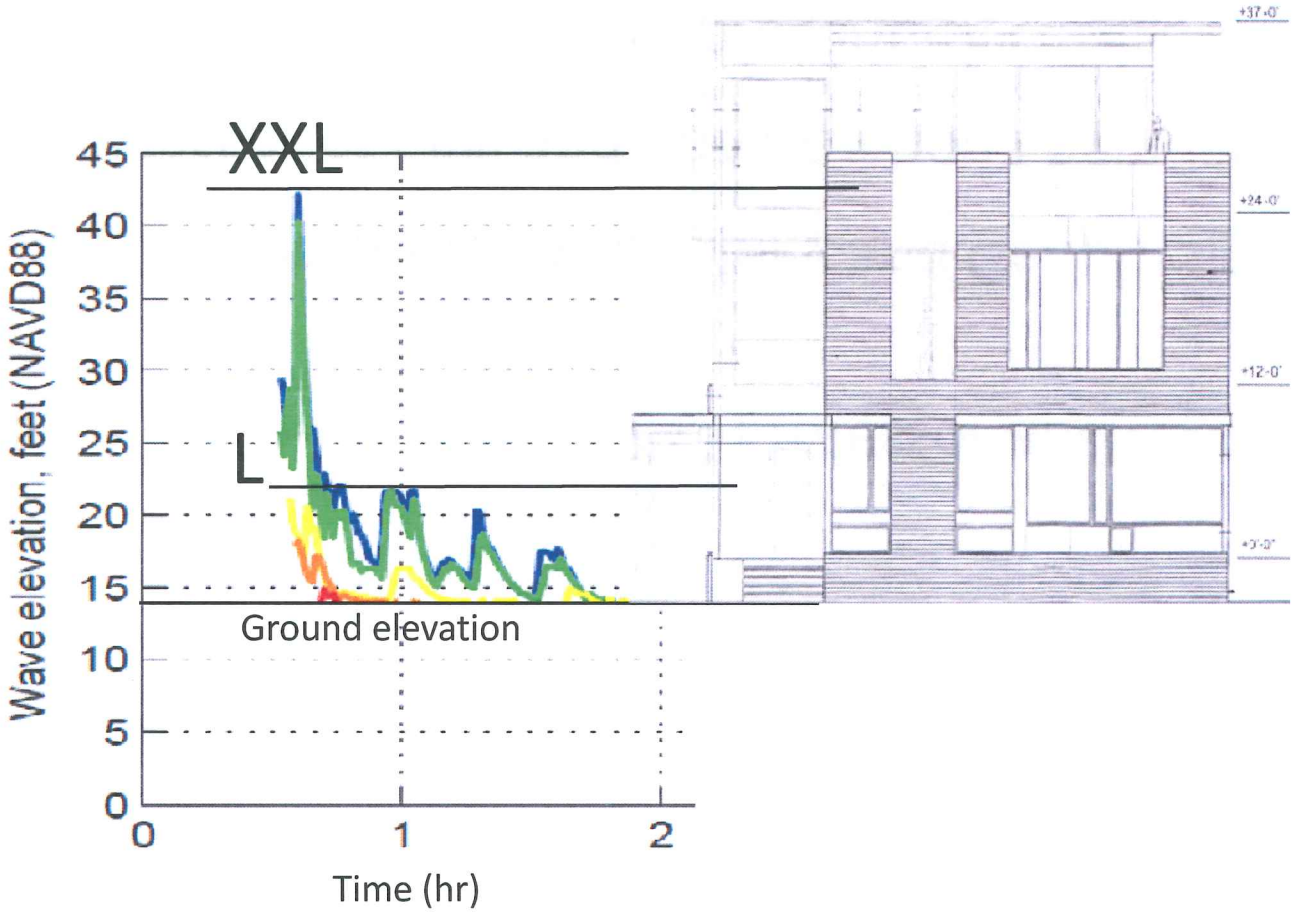
What we care about

1. People
2. Infrastructure
   a. Buildings
   b. Transportation
   c. Power
   d. Communication
   e. Water



This combination of three photos taken over a six month period shows the March 11 tsunami and its aftermath at Sendai Airport in Sendai, Miyagi prefecture, northern Japan. The top photo taken March 11, 2011 shows the tsunami engulfing the airport immediately after an earthquake. The middle photo, taken June 3, 2011 and the bottom [illegible] taken Sept. 6, 2011 show the restored and reopened airport. AP / Kyodo News

Tsunami Depth at HMSC for Life Safety (XXL) and Resilience (L)



❖ *Important technical challenges to reduce risk for life safety and to increase resilience*

Panel Discussion

Moderator

- Dean Scott Ashford, Dean of the College of Engineering

Panelists

- Jack Barth, MSI Co-Chair & CEOAS Professor and Associate Dean for Research
- Chris Goldfinger, Professor of Geology and Geophysics, CEOAS
- Dan Cox, Professor of Civil and Construction Engineering, COE
- David Gomberg, Oregon State Representative, District 10

OSSPAC
Communication

From:	Adams, Ronald
To:	White, Kay S
Subject:	FW: OSSPAC/Jay Wilson
Date:	Monday, June 06, 2016 8:14:48 AM

For notebook under "OSPAAC"

From: Ashford, Scott
Sent: Friday, June 03, 2016 9:36 AM
To: Adams, Ronald <Ronald.lynn.Adams@oregonstate.edu>
Cc: Meehan, Terry <Terry.Meehan@oregonstate.edu>; Mills, Jock <Jock.Mills@oregonstate.edu>
Subject: OSSPAC/Jay Wilson

Just completed my call with Jay Wilson, updating him on our process and Ed's upcoming decision. He said that "This is great." He is pleased with the robust process we have developed, and has more assurance in Ed making a thoughtful decision. He respects the weighing that we have to do, balancing our function with the life safety/seismic issues. He understood the trade-offs between Hatfield and building in town.

Very good call. Positive.

Side note: Mike Harryman has reached out to me, and it looks like we will meet the week after graduation.

Scott A. Ashford, Ph.D.
Kearney Professor and Dean
College of Engineering
Oregon State University

Oregon
Kate Brown, Governor

Seismic Safety Policy Advisory Commission
Oregon Emergency Management
Mailing Address: PO Box 14370
Salem, OR 97309-5062
Phone: (503) 378-2911
Fax: (503) 373-7833

February 1, 2016

Governor Kate Brown and Oregon Legislature
State Capitol Building
900 Court Street NE, 160
Salem, OR 97301

Dear Governor Brown and Members of the Oregon Legislature,

As Chairman of the Oregon Seismic Safety Policy Advisory Commission, I am taking the opportunity of the new Legislative session to review both successes and concerns of the Commission on Seismic Policy and the implementation of the Oregon Resilience Plan (ORP). This last year saw a number of successes as the Legislature created the position of the State Resilience Officer (SRO), significantly increased the funding for the Seismic Rehabilitation Grant Program (SRGP), allowed communities to create loan/loan guarantee programs for seismic retrofits for commercial buildings, and addressed liability issues for the Critical Energy Infrastructure hub stakeholders, all of which were based the ORP. We look forward to working with Derek Smith, the new State Resilience Officer (SRO) after his approval by the Senate. We are pleased with the recent response to the SRGP program which received 117 applications for the current $50 million budget, many of which will need to be considered in the next round. This investment will significantly improve the seismic safety of our schools and essential facilities.

One of our major concerns continues to be the adoption of the revised DOGAMI Tsunami Inundation Maps (TIM) and the updating of the administrative rules for higher development standards in the tsunami inundation zone. The coastal communities need to be provided with the best science and clear directions on development and risk in their communities. The example of the new Marine Studies Buildings proposed by Oregon State University (OSU) at the Hatfield Marine Science Center (HMSC) inside of the tsunami hazard zone in Yaquina Bay is instructive since the current decisions are based on the SB 379 line and administrative rules that have not taken into account the lessons of the ORP or a review of the effectiveness of the existing administrative rules. We are cognizant of the economic benefit this project will have for Newport and appreciate the higher design standards OSU is employing to improve the safety of the users and visitors to the new facility. However, pending the adoption of the TIMs and new administrative rules we propose the following safety issues be addressed:

- That the standards for tsunami risk be based on the DOGAMI TIMs maps which are currently the best peer reviewed science for tsunami risk. Other scientific studies used to for an individual project should meet the same level of peer review as the DOGAMI TIMs study.

- That tsunami evacuation studies be done for the new OSU facility and Hatfield Marine Science Center and be conducted looking at the "safe haven hill" and their proposed vertical evacuation element to include staff, students and visitors.

- The tsunami evacuation study of these facilities need to include a thorough review to meet the Americans with Disabilities Act access requirements. This issue is being raised in other parts of country with respect to emergency evacuation and could present future liability issues.

There are also a number of resilience issues that are relevant not only for the OSU project but for other state funded projects on both the coast and the rest of the State:

- Consistency of funding standards: Given that K-12 schools applying for SRGP must pass a FEMA-based Benefit Cost Analysis (BCA) in order to qualify for the state grant funds, it is not unreasonable to request that a BCA be completed for OSU (or other such projects) to substantiate the best use of HB 5005 bond funds from 2015 Legislature.

- We are discovering that Oregon's Universities have some unique funding vulnerabilities to natural hazards since they rely heavily on student tuition, which may need to be refunded following a disaster. Research institutions such as OSU have an additional vulnerability in that they may need to return federal grant money for projects that cannot be completed if the research facility is destroyed or the ability to conduct the research is lost. We recommend that Oregon's public universities develop continuity of operations and resilience planning, since the loss of these institutions would be a significant blow to recovery efforts.

- Besides the HMSC, Oregon has a number of other institutions that study the coastal environment, which include the Oregon Institute of Marine Biology, along with the South Slough National Estuarine Research Reserve and the newly formed Oregon Marine reserves. The Cascadia earthquake and tsunami will have enormous impact on the coastal environment and ecology and we will need these institutions to help us understand the changes. While their mission involves them being located near the ocean, thought needs to be given on how their vital missions can continue after the next Cascadia event.

- Universities and the research institutions play a big role in the economies of their community and need to be resilient in order for the communities in which they are located to be economically resilient. We recommend considering that projects like the OSU project and similar projects receiving State or Federal money have an independent peer review process ensure the basic safety for people using these new facilities and to include alternatives, such as location and design, for the project with regards to improving the facility's resilience for both economic and continuity of program concerns.

The OSU project is an opportunity for us to demonstrate best practices for our universities and communities to become resilient from a Cascadia earthquake and tsunami. The process should help us determine the best balance between risk, safety, and the current and future economic viability. We recognize that not all the questions can be answered in one project, but the path towards resilience means that we must take positive steps with each opportunity.

Having traveled three times to the damaged areas in Tohoku, Japan after the 3/11 earthquake and tsunami, I observed how they are now applying hard-learned lessons to recover and relocate important community facilities to avoid unnecessary exposure to future tsunami risk. In learning from Japan, it is time Oregon updated ORS 455.446 and 455.447 to bring stronger state agency engagement from the Department of Geology and Mineral Industries, Department of Land Conservation and Development, Building Codes Division and Oregon Emergency Management to better coordinate and assist in these types of coastal development decisions.

We need to approach these development decisions with a post-3/11 perspective. The Oregon Legislature did just that when they directed OSSPAC to deliver the Oregon Resilience Plan. We are optimistic that with the leadership and coordination from the Governor's Resilience Policy Officer, we can better integrate the ORP recommendations into everyday decisions and make our State a safer, sustainable, and more resilient place for current and future generations.

On behalf of all the members of OSSPAC, we look forward to working with you during and after the 2016 Legislative Assembly.

Respectfully,

Jay Wilson, Chairman

Jay Raskin, Vice Chairman

City of Newport Letter

Spencer R. Nebel
City Manager
CITY OF NEWPORT
169 S.W. Coast Hwy.
Newport, OR 97365
s.nebel@newportoregon.gov

May 25, 2016

Dr. Edward J. Ray, President
Oregon State University
600 Kerr Administration Building
Corvallis, OR 97331-2128

Dear President Ray:

On Monday, July 21, 2014, the Newport City Council voted unanimously to support the development of a Marine Study Campus Program on the grounds of Hatfield Marine Science Center in Newport, Oregon. The City continues to support the Marine Science Initiative (MSI) being placed at Hatfield. It was the feeling of the City Council that this development by OSU would complement the 3.2 million in investments that have been made, primarily by the City's Urban Renewal District, to develop infrastructure to support the buildout of this marine research and educational facility. The resulting streetscape creates a gateway entrance to the area with safe and efficient travel options for vehicles, pedestrians, bicyclists, and transit service.

Furthermore, the City and FEMA have completed a $900,000 project to improve the tsunami evacuation assembly area at Safe Haven Hill, to ensure that employees, visitors and residents in South Beach, including the Hatfield Campus, have a suitable and convenient location they can evacuate to in the event of a catastrophic Cascadia subduction zone earthquake. The City invested in these improvements because it recognizes the geological hazards that exist in the South Beach area and understands that prudent steps must be undertaken to safeguard against them. The safety of individuals in South Beach is a City of Newport priority and investments like those made at Safe Haven Hill demonstrate that reasonable measures can be taken to respond to this important issue while continuing to support vibrant growth of the marine science community on Yaquina Bay.

Earlier this month the City was invited to a discussion at the Hatfield Marine Science Center to receive an update on this critical project. At this meeting, Hatfield Executive Director Bob Cowen outlined the process that OSU had taken to address site location for the MSI building. We certainly appreciate the due diligence and care that OSU is taking relating to this decision and would like to share our view of the issues surrounding the sighting of this facility in Newport.

Several of our thoughts are as follows:

- There has been significant investment by OSU, the federal government, State of Oregon, the Port of Newport and the City of Newport that facilitated the creation and growth of a marine science community on Yaquina Bay in South Beach. The interconnection and proximity of the various agencies and programs helps build synergy that enriches and strengthens each of the programs and serves as a catalyst for future growth and investments in this area. Locating the new building off site would make this type of interaction amongst the marine science community more challenging.
- We all recognize that geological threats will significantly impact South Beach at some time in the future. This could happen tomorrow or several hundred years from now, and could cause significant property damage and loss of life over a broad geographic footprint, from the I-5 corridor to the Pacific Ocean - not just on the coast. This will include the Oregon State University Campus in Corvallis. The threat from the Cascadia Subduction Zone is not just a coastal issue and is not just a tsunami issue. Alternative locations outside of tsunami area may be subject to such threats as landslides, liquefaction, or other hazards that could impact the safety of individuals at those sites as well. There is no reasonable way to eliminate all risks, and we shouldn't view the risk in such an extreme manner as to use it as an excuse to disinvest in coastal communities like Newport and the wonderful facility that we have all worked so hard to establish at Hatfield.
- OSU could use this project as a prudent step towards responding to geologic risks, much like the City has done with Safe Haven Hill, by demonstrating, through engineering and technology, that public buildings can be constructed to withstand a Cascadia event and even provide for vertical evacuation of people faced with a tsunami threat. This effort could be a great demonstration project on how to live within the Cascadia Subduction Zone instead of permanently evacuating the coast due to these future threats. Please note that the City of Newport would be happy to work with OSU on any height restrictions that are in the current zoning ordinances so that vertical evacuation features can be incorporated into the design of structures at this location.
- The City of Newport agrees with OSU that student housing needs to be located outside the tsunami inundation areas. This addresses the greatest risk from tsunami hazards since the number of hours students or staff would be present and/or working on campus would likely be less than 25% of the time (if a student spent 40 hours a week on campus). The bulk of students' time would be in other locations presumably outside the tsunami zone. (If you base the student time in the academic facilities at 40 hours a week, with 168 hours being included in a seven-day week, then 23.8% of their time would be on campus.)

The Marine Studies Initiative is a big deal for the Oregon coast. It is important to locate this facility in a location that will truly help to continue to grow our marine science community for many years in the future in Newport. It is also an opportunity for OSU to create a state of the art building that will demonstrate how to build a sustainable building

on the Oregon coast. It is our opinion that OSU should continue with their plans to build the Marine Studies Initiative facility on the Hatfield campus incorporating reasonable standards for both seismic and tsunami evacuation at that location. If we can provide any additional information, please feel free to contact us.

Sincerely,

Sandra Roumagoux,
Mayor

Spencer R. Nebel,
City Manager

Lincoln County Letter

Board of Commissioners

Courthouse, Room 110
225 W. Olive Street
Newport, Oregon 97365
(541) 265-4100
FAX (541) 265-4176

June 2, 2016

Dr. Edward J. Ray, President
Oregon State University
600 Kerr Administrative Building
Corvallis, OR 97331-2128

RE: Siting of the Marine Studies Initiative Facility

Dear President Ray:

The Board of Commissioners of Lincoln County wishes to offer our support for the development of a Marine Studies Initiative Program on the campus of the Hatfield Marine Science Center in South Beach, Oregon.

The Marine Studies Initiative Program is an integral part of the rapidly developing economies of ocean research and marine-related industries in the Yaquina Bay area. As Oregon State University (OSU) progresses in its development of the marine studies program we recognize questions have evolved as to the value of additional investments in the area. We also commend the University for its public outreach seeking input on these issues as part of the due diligence process.

Within the South Beach vicinity significant investments made by the Federal Government, the State of Oregon, the Port of Newport, the County and the City, not to mention private individuals and private business already exists. This "critical mass" of investments is an important factor and additional investments by the University will not only access this momentum, but also achieve additional efficiencies and magnify the value of the direct investments made as part of this expansion.

By locating the campus in this area, the additional burden on infrastructure and community services will be minimized. The collective aggregation of personnel, students, support staff and visitors will be more easily accommodated and at a lower cost than would be realized should these facilities be located outside of the existing campus. As the program grows and expands additional needs will be better served with a consolidated well-planned vision.

We recognize the current University operations and related activities are in a tsunami inundation zone, raising concerns about the location of these additional undertakings. This risk is mitigated by the newly dedicated evacuation site Safe Haven Hill in South Beach, the on-going advancement in structural design to withstand tsunamis including vertical evacuation features, and by the advancement in effective early detection and warning systems. In addition, student housing will be located independently of this campus. Alternative locations still face considerable risks as supplemental risks of earthquakes, liquefaction, landslides and other hazards exist for the entire western portion of Oregon.

Our support acknowledges no location is risk free, but recognizes the ability to mitigate risks associated with the current university location through sound and advanced engineering, well-developed evacuation plans and frequent drill exercises, and the realization that a major disaster event will severely impact the entirety of western Oregon.

We would be pleased to provide any additional information for your consideration of this project. We look forward to the completion of this project which will have an extraordinarily positive impact on the economic development and vitality of our port, the city of Newport and our county.

Sincerely,

LINCOLN COUNTY BOARD OF COMMISSIONERS

BILL HALL, Chair

TERRY N. THOMPSON, Commissioner

DOUG HUNT, Commissioner

Govt Agency/Comm
Communications

Government Agency and/or Commission Communications

Over the last two years University officials have been in continuous contact with a wide variety of federal, state, and local government officials and entities. These include members of the Oregon Congressional delegation; the Governor's office; a variety of state agencies, including the Oregon Seismic Safety Policy Advisory Commission (OSSPAC), Higher Education Coordinating Commission, and Department of Geology and Mineral Industries (DOGAMI); state legislators and legislative committees, including the Coastal Caucus, and members and staff of the Joint Ways & Means Committee; and county commissioners and city government officials from the City of Newport and Lincoln County as well as other coastal communities.

Throughout the consideration of the capital project, both Governor Kitzhaber (who initially included the project in his proposed capital budget) and Governor Brown (who chose not to make any significant alterations in the capital budget as it was presented to the legislature during the 2015 session) were fully aware that plans provided for the construction of the building in the tsunami inundation zone.

In November 2014, DOGAMI Director Vickie McConnell, wrote to President Ray, with a number of concerns regarding the MSI location:

> If there is to be a new building funded and constructed through OSU in a recognized hazard area then I respectfully recommend you demand it be designed to be the most effective and safe tsunami vertical evacuation building possible. Better yet, locate the main occupancy building in the Newport area outside of the tsunami inundation zone and maintain a modest research facility at Hatfield Marine Center.

President Ray responded to McConnell in December and provided clarity about the university's plans:

> . . . building plans will focus on maximizing the ability of the building, and its occupants to survive the seismic event that may lead to the tsunami conditions so that people can follow our well-established evacuation procedures to higher ground. To this end, we are committed to working with experienced architectural and engineering firms to build a state-of-the-art seismically-resilient building as a demonstration project for other coastal residents/businesses to follow, as future building along such coastal environments as Oregon will continue out of necessity (e.g. Ports, communities).

Members of the Joint Ways and Means Committee directly addressed the project's location when the committee approved HB 5005 during the 2015 session. At the time the capital budget was approved and signed into law, there is no question that the legislation both anticipated and enabled the construction of the project on the campus of the Hatfield Marine Science Center (HMSC) which is located in a tsunami inundation zone. Nevertheless, because the precise location of the building was not specified in the capital construction bill, nothing in the legislative history of the project's consideration requires that it be located on HMSC campus.

Among other issues, OSSPAC chair Jay Wilson addressed the MSI project in a February 1, 2016 letter to Governor Brown. The Governor has not responded to the letter. Over the last month OSU College of

Engineering Dean Scott Ashford informally discussed the MSI-related issues raised in the letter with Mr. Wilson. Without expressing an opinion regarding precisely where the facility should be constructed, Wilson expressed that he was pleased with the robust process OSU has followed, understood OSU needed to balance function and seismic issues, and expressed assurance that through this process President Ray can reach a thoughtful siting decision, whatever that decision may ultimately be.

Governor Brown has recently named a State Resilience Officer, Mike Harryman. Ashford also informally updated him on the MSI project. Mr. Harryman indicated that he was impressed with OSU's approach, that the university has the expertise, and that many people are looking at how OSU will make the siting decision. He understood the need to balance program and location. He noted that OSU may be the most informed owner in Oregon, and a question going forward is how state laws or guidelines can help less informed owners arrive at good decisions.

Following adoption of the capital construction bill in 2015, OSU has maintained communications with the Governor and members of the Coastal Caucus as well as many other government entities. During a February 2016 meeting with the Caucus, all of the members present were adamant in supporting construction of the facility on the HMSC campus. A number of members expressed deep concerns regarding the precedent and possible impacts to the economic vitality of the coastal region if OSU were to decide to locate the facility outside of the tsunami inundation zone.

It is also clear from OSU's conversations with the wide variety of political and governmental entities over the last two years that construction within the inundation zone should be contingent upon the inclusion of design elements that will enable the building to withstand a significant seismic event as well as the provision of both an adequate evacuation infrastructure and plans for quickly moving individuals from the HMSC campus to high ground. These conversations have not explicitly specified the features needed to address the resilience of the building, the cost share involved, or the specific plans or provisions for evacuation.

Despite the extensive communications with legislators, staff, and others, it is quite possible – and likely – that OSU may face a reaction to whatever decision regarding the siting of the MSI building from those with whom the University has communicated over the last two years. The thoroughness and integrity of the process that OSU has followed in leading up to the decision will be most important factor in addressing the reactions that will occur from whatever decision is made regarding the location of the MSI facility. We believe that this process has been open, fair, and has included an extremely attentive review of all of the factors needed to justify whatever decision is made regarding the project's location.

Port of Newport
600 S.E. BAY BOULEVARD NEWPORT, OREGON 97365 (541) 265-7758 FAX (541) 265-4235

June 21, 2016

Dr. Edward J. Ray, President
OREGON STATE UNIVERSITY
600 Kerry Administration Building
Corvallis, OR 97331-2128

RE: SUPPORT FOR LOCATING THE MARINE SCIENCE INITIATIVE AT THE HATFIELD MARINE SCIENCE CENTER

Dear President Ray,

The Port of Newport is proud of its long history with Oregon State University and the Hatfield Marine Science Center. The South Beach campus houses several state and federal agencies and along with the $40-million local investment in the NOAA Marine Operations Center in 2011 has made Newport a world class center for marine education and research.

What makes Newport a growing center for marine studies is its unique location to the Pacific and Yaquina Bay. This community has invested heavily in securing improved transportation (both vehicular and pedestrian) access through South Beach, providing evacuation routes and safe havens, and locating future student housing out of the tsunami inundation zone.

The Port supports building the Marine Science Initiative facility at HMSC and taking advantage of this opportunity to build a state-of-the-art facility taking our unique location into account in the engineering and design of the building.

If we can provide any assistance in the decision making process, please don't hesitate to call the Port's General Manager, Kevin Greenwood at (541) 265-7758.

Sincerely,

Walter Chuck
President

Ken Brown
Vice President

Patricia Patrick-Joling
Secretary/Treasurer

Stewart Lamerdin
Commissioner

Steve Beck
Commissioner

ECONOMIC DEVELOPMENT ALLIANCE OF LINCOLN COUNTY

Strengthening Lincoln County's economy. Attracting and supporting primary jobs.

Post Office Box 716
Newport, Oregon 97365

President Ed Ray
Oregon State University
Corvallis, OR

June 17, 2016

Support for Locating Marine Studies Initiative at Port location:

Dear President Ray:
I am writing to gain your support for maintaining the location of the facility at a site generally close to the present location. In this proximity, we have current and recent building projects going in with very high dollar investments. The Oregon Coast Aquarium, with tens of thousands of visitors per year, which is adjacent to your site, has made continual additions over the years. Rogue Ales and Distilleries, which is across the street, is currently doubling its size and investing many millions. And then there is NOAA's dock and administration campus, and three recent hotels.

My organization has worked hard to create a working waterfront and a cluster of activities related to marine science ever since then-Vice President Dr. Rick Spinrad recommended we do so as an economic development initiative that he and Dr. George Boehlert kicked off in 2008. The Hatfield Marine Science Center is the linchpin or hub of this economic initiative. We are looking forward to having marine energy devices, the increased usage of the Ship Operations dock with a new vessel, and private companies that are incubated at OSU. We want to locate them all in the South Beach general area and benefit from proximity to each other.

We hope you will place the OSU Marine Studies Initiative campus in a site where seawater and ship operations are accessible to students, and that all possible modifications are made for safety, such as stilts, multilevels, and using state of the art technology to model a coastal large building.

The Economic Development Alliance of Lincoln County has been actively supporting the expansion of OSU in Newport. We believe that the donors to this effort have expectations about the campus serving the purposes it was designed for 50 years ago and continuing that great tradition. We are excited about this expansion and want to maximize the usability of the site for many purposes for many years to come.

Sincerely,

Caroline Bauman

Caroline Bauman, Executive Director

Hatfield
MARINE SCIENCE CENTER
OSU
Oregon State
UNIVERSITY

Cooperative Institute for Marine Resources Studies
Oregon State University
Hatfield Marine Science Center, 2030 S.E. Marine Science Drive, Newport, Oregon 97365-5229
Phone 541-867-0181 | Fax 541-867-0221

May 17th, 2016

Dr. Ed Ray
President, Oregon State University

Dear President Ray,

RE: Siting of the coastal building for MSI on the HMSC campus

For over 100 years Oregon State University has engaged in close working relationships with coastal partners at the "level of the sea." These partnerships harness a spirit of shoulder-to-shoulder collaboration for which we are recognized as a global leader. Although these activities can sometimes expose participants to certain risks, OSU has always employed "best practices" while engaging our communities and partners who must site their vessels, fish processing houses, research laboratories, tourist businesses, and bait shops at sea level where they conduct their enterprises. ODFW, CIMRS, COMES, MMI, NOAA, EPA, USDA (ARS) and USFW represent institutional partnerships that have developed and thrived at HMSC for more than 30 years as a consequence of this collaboration.

OSU's Marine Studies Initiative (MSI) represents the next step in leading the nation and the world by providing transdisciplinary programs and experiential learning that meet 21st-centuary needs. But this is only possible due to the co-location of state, federal and university programs at HMSC. To assure our safety, all of the HMSC campus (OSU and State/Federal agency personnel) practice every six months on evacuation to Safe Haven Hill (approximately one mile). This requires less time than the lowest estimated arrival time for a tsunami following even a XXL earthquake event. Our concern is that siting the new OSU/MSI building at high ground away from the HMSC campus will weaken our core partnerships and threaten the effectiveness of future MSI research and educational programs. And the practical reality is that many students will spend the majority of their time at HMSC given the location of other classrooms, seawater laboratories, and unique experiential/cooperative education and collaborative projects in constant generation at HMSC.

We strongly support the need for due diligence in evaluating risks associated with natural hazards including earthquakes and tsunamis, and taking the necessary safety precautions. However, given the critical importance of our community partnerships, we believe that by conducting regular evacuation drills and using state of the art engineering and construction principles, we will significantly mitigate the risks of building on the HMSC campus. Further, the OSU engineering expertise that can be brought to such a project will make this an excellent example of how to build earthquake- and tsunami-safe buildings in coastal communities. As an additional consideration, this new building at the main HMSC campus could be engineered to increase survivorship for individuals working at South Beach by acting as an alternate on-location "safe haven" for the disabled and injured. By adopting the highest and best standards as well as improving on those standards over time, we will maximize the safety for students and staff, support experiential research and education partnerships, and honor our commitments to the greater community working at the level of the sea.

Sincerely

Michael A. Banks
Director, CIMRS

Gil Sylvia
Director, COMES

Bruce Mate
Director, MMI

CC Ron Adams, Jack Bath, Bob Cowen, Cindy Sagers

Confederated Tribes of Siletz Indians
Tribal Council
P.O. Box 549 Siletz, Oregon 97380
(541) 444-8203 • 1-800-922-1399 ext. 1203 • FAX: (541) 444-8325

January 29, 2015

Dr. Bob Cowen, Hatfield Marine Science Center Director
Ed Ray, OSU President
2030 SE Marine Science Drive
Newport, OR 97365

Dear Dr. Cowen and President Ray:

On behalf of the Confederated Tribes of Siletz Indians, the Siletz Tribal Council would like to express its endorsement regarding the Oregon State University's Marine Studies Initiative and their proposal for expansion of the marine program at the Hatfield Marine Science Center.

The Siletz Tribal Council believes the Marine Studies Initiative will create many opportunities in a variety of marine studies, including support of enlightened natural resource management and the education of people, including our tribal members, interested in working in natural resource jobs.

The Siletz Tribal Council and/or Tribal management staff would also be interested in participating on a local advisory committee to assist in bringing other tribes and community members into the committee process to better understand the importance of the project and to become involved in its planning. Tribal representatives would bring cultural diversity and sensitivity to this process and would look forward to working with Oregon State University to assist in reaching its goal for this exciting education and research program.

Sincerely,

Delores Pigsley
Tribal Chairman

copy to: Ron, Jack Barth, Bob Cowen, Scott Ashford

Ed Ray, President
Oregon State University
Corvallis, OR

Ed

President Ray,

I hope this letter finds you well.

I have served on the faculty of Oregon State University for twenty eight years. For the past decade I have been a Hazards Outreach specialist for Oregon Sea Grant Extension. I work coast wide based out of the Clatsop County OSU Extension office in Astoria.

Central to my work is providing decision support to people, agencies, and institutions about development in and around tsunami inundation zones. The decision about the location of the MSI building is of particular interest to me. I have voiced my opposition to adding the MSI building to the OSU complex at South Beach. But, this personal note to you is different.

I want to articulate a positive future regarding Oregon State University and Cascadia. A future in which OSU demonstrates extraordinary leadership among institutions in the Pacific Northwest, by aligning our institutional behavior with what our own research indicates is true.

I stand for the possibility of Oregon State University embracing, as an organizing principle, Building Institutional Resilience to Cascadia across the enterprise and across the curriculum.

Across the enterprise. Risk management writ large. The coastal enterprises such as HMSC, OSU Seafood Lab, and the county Extension offices will experience the earthquake and tsunami, and will be the region with the greatest loss of life to OSU students, staff, faculty and visitors. The Willamette Valley enterprises including the Corvallis campus, research stations, county Extension offices, Food Innovation Center, etc. will experience the earthquake and have to deal with thousands of traumatized students, families, staff, and faculty. The Cascades campus and eastern Oregon enterprises will experience the least direct damage, and will be our center for disaster response, and recovery. Thriving in Cascadia requires strategic thinking about our physical enterprise. Developing OSU's assets in a manner that builds resilience to Cascadia, builds trust among taxpayers.

Across the curriculum. We must create a culture of resilience in a vacuum. We live in earthquake country, but we have no earthquake culture. Building a resilient culture is more than devising clever engineering solutions allowing us to continue bad behavior. Creating a culture commensurate with our condition will be manifest through every college and unit at Oregon State University. We need the talents of all our artists, poets, novelists, musicians, theatrical performers, political scientists, sociologists, and yes, engineers. We will know that we are creating a culture of resilience to Cascadia when, for example, OSU has a President's Awards for the best short story, rap song, theatrical production, visual image, etc. by a student that uses Cascadia as a theme in their work; or, the Dean of Engineering awards designs that prioritize building effectively on marginal property adjacent to, but out of, tsunami inundation zones.

The scientific consensus has only been since about 1990 that the Pacific Northwest even gets giant earthquakes and tsunamis. We are the only population on the planet to so recently learn about our greatest recurring natural disaster. It is entirely keeping with human nature to not take this seriously. We are neurologically challenged to change our behavior in significant ways to prepare for an event that has not occurred since western settlement.

An analogy. The Pacific Northwest has been recently diagnosed with a chronic condition called "Cascadia." Like diabetes, we can live a long and fulfilling life with this condition but there is no box big enough that we can check to make it go away. It is a condition to be managed. Like with diabetes, we must do easier things and harder things. Easier things like changing diet and exercise with diabetes, and creating tsunami inundation maps with Cascadia. And harder things like daily shots of insulin with diabetes, and avoiding development in inundation zones with Cascadia. In both cases, the most important thing is to acknowledge that we have the condition, that it's not going away, and that we need to adjust our lifestyles accordingly.

President Ray, are the first OSU President to fully understand the extent of our earthquake and tsunami hazard. Your administration will define our university's trajectory with regard to Cascadia. I stand for the possibility of OSU establishing, as an organizing principle, building institutional resilience to Cascadia. And, I will work tirelessly with you to advance that cause.

In all of your efforts on behalf of Oregon State University, I wish you the very best.

Pat

Patrick Corcoran

Hazards Outreach Specialist, Oregon Sea Grant Extension
Associate Professor, College of Earth, Ocean, and Atmospheric Sciences
County Leader, Clatsop County OSU Extension

Dr. Ed Ray

May13,2016

President, Oregon State University

Kerr Administration

Corvallis, OR 97333

Subject: An Invitation - MSI Building Decision

Dr. Ray,

Allow me to introduce myself to you. My name is Jeff Wiseman and I am an employee of this great university. I currently work in the AMBC Hatfield Business Office as an Accountant1. I have been here for 5years having come from OIT in Klamath Falls. Do I regret having moved to the Oregon Coast and working for another University, not at all.

The day I accepted this position was the day before the 2011 Japanese Tsunami struck. My wife and I sat and wondered what had I gotten us into. We visited Newport to look for a home and see what the locals thought of the Tsunami scare.

As we visited several stores, restaurants and motels we found the same thing, a positive attitude and all said that they had heard the same thing every time an earthquake struck somewhere.

So to make a long story short, we came and embraced the coast and OSU's Hatfield Marine Science Center. Yes we do think about the risk as does everyone, we are not naïve.

I sat and listened to Dr. Cowen's presentation 5/9/16 in the HMSC Visitors Center Auditorium and it made me think. I thought about the way this Building Siting issue is being addressed. OSU is taking a very cautious approach which I appreciate. Exploring all possible avenues to ensure the safety of Faculty, Staff, Students and Community, I believe OSU has the knowledge and expertise needed right in its own yard. The College of Engineering, College of Earth, Oceanographic, Atmospheric, Sciences and others have what it takes to engineer a Structure that can withstand an Earthquake of 9.2 or greater.

With all the Doom and Gloom prophesies being spouted and the nay Sayers preaching that only a fool would build in a Tsunami Zone. I came to the realization that 95% of those do not even live on the coast.

I would like to address some issues:

Are we prepared for a natural disaster of this size? No one can really say they are ready. We continually prepare by practicing Evacuation drills, improving our disaster plans, storing caches of supplies in safe zones and being aware of the possibilities. Lincoln County is a model for others in being ready. The collaboration of all agencies including, Sheriff, Fire, Police, County Emergency Management and the School District is amazing. The City of Newport has secured FEMA funds and built a Safe Evacuation Area on the South side of the Yaquina Bay Bridge that will accommodate 2500+ people for at least 24 hours.

HMSC has worked closely with our agency partners and the county, city, OSU Emergency Management to ensure everyone is well versed in evacuation measures, safety education, and preparedness. We are on the front line in Tsunami education, offering resources through the Visitors Center, Oregon Coast STEM Hub and an interpretive trail.

Are we not a Marine Science Research Center? Is MSI not about the Marine Sciences? As a member of the National Marine Sciences Labs (NAML) we are in a position to showcase the future of Marine Labs. Water is what the Marine Sciences is all about. With our existing Seawater facilities playing a critical part in the research being done here, we view the South Beach Campus an ideal location.

To quote an anonymous party:

"We are a Marine lab, with seawater central to our operations and self- image. No matter what aspect of Marine Studies students are involved in, being on the water front with access to the bay, the waterfront community, running seawater, the Visitors Center and marine infrastructure of boats, docks, industry and recreation is integral to the "experiential" education that is at the core of the Marine Sciences Initiative"

I am also a resident of Depoe Bay, serving on the town Council. I take this position seriously, speaking for the residents on issues affecting the town. Emergency preparedness is a high priority, which the council takes seriously. The town has taken great measures to insure the safety of everyone including an Emergency Warning system that can be heard by all residents within a 3 mile range of town. Establishing an evacuation plan, building cache stores for the residents, and backup systems that do not rely on the power grid are some things we have in place. As I talk with those residents I hear much the same thing, "We are prepared for an event, but we are not going to evacuate and leave this beautiful coast until we have to." As with all towns on the coast, this is a never ending task that will continue to be on the forefront.

Last but not least, an Invitation

On behalf of those who are working on the HMSC Campus every day, I would like to invite you to visit our campus and meet with us, to hear our thoughts on the new MSI Building and it's siting. A tour can be arranged to Safe Haven Hill, the interpretive trail, and walk through of our tsunami drill process.

Who better to talk with than those who will be affected by the decisions made. I can assure you there will be two sides of the coin here that will share their thoughts. As I have followed the news, memos, and announcements it seems everyone has had their say but those most closely affected by the decisions being made.

I hope to hear from you before you must make your decision and we can talk.

I offer that if you are unable to make it here, a group of HMSC staff, faculty and students are willing to go to Corvallis to meet with you.

Thank you ,

Jeff Wiseman

Oregon State University

AMBC-HMSC Business Office

541-867-0269 jeff.wiseman@oregonstate.edu