UP AND OUT 2

Oregon Tsunami Wayfinding Research Project
A Study in Seaside and Warrenton

Prepared by: The Portland Urban Architecture Research Lab (PUARL)
University of Oregon - Portland

For: The Oregon Office of Emergency Management (OEM)

PUARL

PUARL Project Team:
Dr. Hajo Neis (PI)
Perrin Wright
Kaeli Nolte
Hannah Pempus
Spencer Roedel

Client: Dr. Althea Rizzo
Oregon Office of Emergency Management

The PUARL Press, 70 NW Couch Street.
Portland, OR 97219
www.puarl.uoregon.edu

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TABLE OF CONTENTS

OREGON TSUNAMI WAYFINDING PROJECT: PHASE 2

SAFETY ZONE

FOREWARD

ALTHEA RIZZO

When the Cascadia Subduction zone earthquake ruptures along 600 miles of the fault zone, it will generate an awesome tsunami. There will be only minutes to get to high ground after ground the stops shaking. Clear and prominent tsunami evacuation wayfinding will saves lives by guiding residents and visitors to the safety of higher ground or vertical evacuation structures. Past wayfinding has been limited in scope showing a clear need for new ways of thinking about tsunami evacuation wayfinding. This report offers many improvements to tsunami evacuation wayfinding.

It has been a wonderful opportunity to work with the University of Oregon's Portland Urban Architecture Laboratory to make our coastal communities better prepared for tsunami by creating this report on improving wayfinding on the Oregon Coast. The team brought fresh ideas to this problem and should be very proud of what they have accomplished.

I encourage coastal communities to consider using many of the ideas in this report to re-think how they can improve safety. Future tsunami mitigation will save lives.

Althea Rizzo, Ph. D.
Geologic Hazards Program Coordinator
Oregon Emergency Management
PO Box 14370
Salem, OR 97309-5062

ACKNOWLEDGMENTS

HAJO NEIS

First, we would like to thank Dr. Althea Rizzo for entrusting us with a second “Up and Out” Research Project, this time emphasizing the practical planning of a Project Language and specific design proposals in the coastal cities of Seaside and Warrenton.

Secondly, we thank all the people that helped us develop our work. In particular, we want to recognize the city officials, emergency preparedness leaders, and private citizens from the cities of Seaside, Warrenton, and Cannon Beach as well as others working in Clatsop County who supported our efforts. Thank you to the many stakeholders who participated in our very successful charrette at Camp Rilea in May of 2015. Without the advice of these experts and citizens, we would not be able to have completed our work towards a Tsunami Wayfinding Pattern and Project Language. More details about the charrette participation can be found in “Community Participation,” in Chapter 3.

Additionally, we thank Dr. George Priest and Laura Stimely, geologists working for the Oregon Department of Geology and Mineral Industries (DOGAMI), for providing us with their knowledge of the geological impacts that affect tsunami evacuation, as well as for allowing us to review their latest work being done in Seaside and Warrenton. Laura’s participation as a presenter at our Camp Rilea charrette was greatly appreciated and allowed for all participants to be informed of the most current research and findings on escape routes and travel times.

Finally, I want to thank my team for their creative energy and commitment. They were able to apply some of the knowledge they learned, and valuable skills they developed while studying architecture and urban design at the University of Oregon to an important cause. I also want to thank them for the enthusiasm they had for presenting our research and findings at symposia and conferences in Oregon, California, and Europe

Dr. Hajo Neis, August 2015

Figure 1

PREFACE

HAJO NEIS

We are very pleased to present “Up and Out 2: Oregon Tsunami Wayfinding Research Project; A Study in Seaside and Warrenton.” This study is a continuation of a project that we delivered less than a year ago to the Oregon Office of Emergency Management (OEM), titled, “Up and Out: Oregon Tsunami Wayfinding Research Project; Guidance Document.” In the interest of public access, the first report is published on our website (puarl.uoregon.edu) and is also available on the OEM website for viewing and downloading. The second report will be made available in the same fashion.

Most of our projects at the Portland Urban Architecture Research Laboratory (PUARL) are related to urban and architectural design. These projects primarily deal with the investigation, design, and improvement of urban structure and buildings by utilizing architectural, urban design, and planning methods. Creating a town plan and urban project in order to help to prevent or mitigate a disaster situation, was a first in our research and public service projects in Oregon.

Work on these types of projects is critical for three primary reasons. First, it improves preparation by increasing awareness of the impending earthquake and tsunami that threatens the Pacific Northwest. Second, it enhances the wayfinding strategies that will help guide evacuees to safety during an event. Third, it addresses the planning and organization strategies required to establish successful post-disaster survival camps.

For both of the “Up and Out” reports, two methods have been very helpful for this line of research and investigation: first, the development of a Pattern Language for Tsunami Escape Wayfinding and second, the formulation of a Project Language for application in particular contexts. The Project Language method applies the strategies illustrated in the Pattern Language into more detailed projects for urban conditions in specific locations (in this case for the cities of Seaside and Warrenton, Oregon). Finally, the PUARL approach places a high degree of emphasis on local feedback and experience, ensuring contextually appropriate solutions which utilize the extensive knowledge base already existing in the affected communities.

The charrette in Astoria, on July 29, 2014, and the second on May 14, 2015 at Camp Rilea in Warrenton, highlight the necessity for stakeholder participation. A diverse group of planners, administrators, and residents provided PUARL with valuable advice, critiques, and inside information, helping us to arrive at the best possible solutions for improving tsunami evacuation wayfinding.

Interest in disaster planning and mitigation methodology is rising quickly, both regionally and internationally. We have presented this work at various symposia and public events in Portland as well as in Europe (Vienna, Austria and the University of Duisburg-Essen in Germany). In the wake of two horrific natural disasters (the 2011 tsunami in Japan and the 2004 Indian Ocean tsunami), it seems quite apparent that this topic is an international concern, and people from around the world are listening. Global recognition is a positive sign, supporting the movement for coastal communities, such as those in the Pacific Northwest, to prepare for a tsunami event. However, disaster preparation is a continuous process, and we need to develop new strategies and programs that will help our local community and other threatened countries threatened become TsunamiReady. It is our greatest hope that these “Up and Out” reports can act as a helpful tool for improving tsunami disaster preparedness efforts.

FIGURE 2

1. INTRODUCTION

1.1 TSUNAMI INTRODUCTION

The etymology of the Japanese word “Tsunami,” (Tsu-Harbour : Nami-Wave) is derived from the experience of fishermen returning home from fishing expeditions, to find that a wave had destroyed their village (History of Geology, 2011). Also known as a “Seismic Sea Wave,” a Tsunami is a series of ocean waves activated by seismic disturbances such as earthquakes, volcanic eruptions, landslides, and even meteorites (NOAA Tsunami Website, n.d.). Location and magnitude of a disturbance play a primary role in the formation of the tsunami, while the topography of the coastline and ocean floor will impact the size of the wave as it comes to shore (FEMA Tsunamis, n.d.). In the deep ocean, tsunami waves can reach speeds of 500 to 1,000 km (~300-600 mi) per hour. However, as they approach the shore, the wave speed decreases and water depth is reduced, causing a concentration of energy upon impact. A wave that reaches just over a meter in height in the ocean, can reach tens of meters high at the coast (IOC Tsunami Glossary, 2013).

The Pacific Ocean is known for its active tectonic plates where slippage along convergent and divergent plate boundaries cause a range of seismic sea wave types. A distant, or “Tele-Tsunami,” is caused from a source over 1,000 km from the coast, with a minimum of 3 hour travel time (IOC Tsunami Glossary, 2013). Although these waves are generally less destructive and provide enough warning time for mass city evacuation (DOGAMI Tsunami Clearinghouse, n.d.), distant tsunamis are a significant threat. On December 26th, 2004 an ocean-wide tsunami was caused by a magnitude 9.3 earthquake off of the NW coast of Sumatra Indonesia, which hit Thailand and Malaysia to the east, and Sri Lanka, India, the Maldives, and Africa to the west. The lack of prior tsunami experience caused coastal inhabitants to curiously watch the water recede into the ocean, before the oncoming waves killed nearly 230,000 people. This was perhaps the most tragic tsunami event, triggering one of the largest international relief efforts and motivating governments to improve warning and evacuation systems across the globe (IOC Tsunami Glossary, 2013).

Unlike distant tsunamis, local tsunamis originate from a source within 1,000 km to the coast, and have travel times of under one hour. The process of subduction causes oceanic plates to shift under their adjacent continental plates. These subduction zones exist close to land masses, and are a common source of local tsunamis. Local tsunamis are particularly dangerous, and are responsible for over 90% of tsunami related casualties (IOC Tsunami Glossary, 2013). The Japanese may have suffered the most from these earthquake/tsunami double disasters, as approximately one-third of the recorded large tsunamis impacted their island (NPR History of Tsunami, 2011). These experiences have ingrained a culture of preparation far more robust than any other in the world. The 2011 9.0 magnitude Tohoku earthquake was the most powerful earthquake ever recorded in that region. Sources say that waves reached heights of 40.5 meters (133 feet) and traveled up to 6 miles inland. The earthquake shifted the main island of Japan 2.4 meters to the east, and reportedly shifted the earth between 4-10 inches on its axis (Wikipedia, 2011 Tohoku, 2015). Even with a culture of tsunami resilience in place, the death toll and destruction reached extraordinary levels.

Unlike their neighbors across the sea, relatively newer communities along the North American coast have less experience with Tsunami. The Cascadia Subduction zone is a convergent plate boundary separating the Juan de Fuca and North American. This 620 mile long fault line runs parallel to the Pacific Coast from northern California to Vancouver BC (Wikipedia, Cascadia S. Zone, 2015). Major magnitude 8.0 - 9.0 earthquake events are separated by centuries of relative inactivity, that cause the first of many raging tsunami waves to strike the coast within 15-30 minutes (CREW, 2013). Over its 10,000 year rupture history, the average recurrence of major earthquakes strike approximately every 234 years. The last major event occurred Jan, 1700, just over 315 years ago (OPB, 2015). Unfortunately, the lack of major events occurring in the recent history of colonization along the Pacific Coast, is an indication that coastal communities are vastly unprepared for a threat that seems to be imminently looming just around the corner.

Disaster mitigation and emergency management is an intimidating assignment that is more commonly avoided than addressed. The lack of historical precedents, perhaps paired with the almost mythical nature of such events, caused tsunami preparedness programs to be historically underdeveloped in the Northwest region. However, the global broadcasting of the 2011 Tohoku earthquake caused many US coastal cities to be evacuated. While no waves ever reached the coastline, that experience has forced many communities and individuals to acknowledge the threat that has been so often ignored. Since then, the State of Oregon has been spearheading the TsunamiReady movement and organizations at all levels have been diligently working on understanding the disaster, implementing effective evacuation routes, and establishing Tsunami-Readiness programs (NWS, TsunamiReady, 2015).

Many state resources have been properly allocated to the Oregon Department of Geology and Mineral Industries (DOGAMI) for in depth scientific analysis of the disaster's potential impact. This group of engineers utilized the most advanced tsunami science along with GIS software to model tsunami inundation levels and times in different cities along the coast. Utilizing this information, which is based on the worst case scenario, they were tasked with mapping the safest and most efficient evacuation routes out of the inundation zones, to high ground (Priest, Watzig, & Madin, n.d.). Modeling these routes is an important aspect of establishing safe routes that lead to assembly areas. However, the implementation of physical tsunami evacuation elements that are carefully, and purposefully integrated into the urban fabric of a city, requires a different type of design consideration. The Oregon Office of Emergency Management (OEM Tsunami Information, n.d.), and the National Oceanic and Atmospheric Administration (NOAA Tsunami Website, n.d.), recognize the need to implement a robust tsunami evacuation system that addresses the human factor, and provide evacuees the best chance to find their way along those routes to safe ground.

1.2 PROJECT METHODOLOGY

The Oregon Office of Emergency Management commissioned the Portland Urban Architecture Research Lab, part of the University of Oregon's Portland Architecture and Urban Design Program, for the creative planning and design of wayfinding systems for the cities of Seaside and Warrenton. PUARL's work is meant to complement the ongoing scientific studies by the Oregon Department of Geology and Mineral Studies (DOGAMI). In the first project, "Up and Out," the PUARL team conducted in depth analysis of Oregon coastal tsunami evacuation systems with a special emphasis on the city of Cannon Beach. Through the Pattern Language method, the team was able to observe existing conditions, find common problems, and organize strategic solutions into the beginnings of a survival language, initiating a new approach for achieving a comprehensive tsunami evacuation wayfinding system.

"Up and Out 2" applies these the lessons and strategies learned into specific designed projects for the cities of Seaside and Warrenton, located in Clatsop County. While the two cities are in close proximity to each other, they differ greatly in terms of economy, density, and geography, making it a beneficial opportunity to understand how projects that solve the same problem, might manifest in dissimilar cities. PUARL's research began with an evaluation of each city's current evacuation wayfinding system. By determining which existing strategies were successful, and which failed to clearly guide people to safety along evacuation routes, the team was able to develop a method for suggesting wayfinding improvements. In addition to creating a Project Language, the PUARL chose a specific route within each city to develop in greater detail, with a wider range of applicable projects. Ideally, focusing on improving a single evacuation route will allow for evaluation, critique, and improvement before being implemented on a larger city scale.

The PUARL is known for utilizing the innovative and progressive method known as the "Pattern Language Approach." This approach was spearheaded by Christopher Alexander and his colleagues at the Center for Environmental Structure (CES) over a period of 50 years. Professor Hajo Neis, a close colleague of Alexander, and also a member of the CES board of directors, continues this line of research and practical projects at PUARL and the University of Oregon with his colleagues and research students.

FIGURE 3

The following three methods were instrumental in the development of both “Up and Out” research projects:

PATTERN LANGUAGE

The Survival Language of the first “Up and Out” report, established fundamental principles into individual patterns. This formed the beginnings of a new set of design knowledge that can be used to improve tsunami evacuation wayfinding systems. The Survival Language is broken into the before, during, and after stages of the tsunami experience titled: preparation, evacuation and response. These 24 sequential patterns aimed to highlight the different problems and solutions that are common in cities threatened by tsunamis, and were organized in a way that helped promote a comprehensive wayfinding chain. The link to the Survival Language, and a list of the Survival Patterns can be found in the appendix of this report and should be referenced as a resource to refer back to when proposing TsunamiReady projects.

PROJECT LANGUAGE

Out Project Language for the cities of Seaside and Warrenton was developed in this “Up and Out 2” report. Found in Chapter 3, the language is a culmination of many existing and proposed projects for making cities ready for a disaster event. While each project attempts to find a specific location to reference, they are effective ideas that could be used in any city. The application of designs from the Project Language is found in Chapter 4 as a Wayfinding Chain which highlights a specific evacuation route in each city. The chains propose a series of solutions along each route that will improve their effectiveness to guide people to safety during an event. Both the Project Language and Wayfinding Chain were included because it is important to implement projects in very specific locations, while understanding how the ideas behind these projects are not always site specific.

COMMUNITY PARTICIPATION

The method of participation is of considerable importance for the successful application of the Pattern and Project Language and to create a robust and dynamic problem solving tool. Concerned and involved people usually know more about their particular situation than any outside specialist. For this reason, the community design charrette at Camp Rilea was helpful in gaining insights and solutions to practical tsunami wayfinding problems.

The three methods of Pattern Language, Project Language, and participation work together to help people organize and understand complex problems in pieces as well as in a system or whole (for the critical role of participation in this process, see for example: The Oregon Experiment, Oxford University Press, 1974). Projects developed in this way with the inclusion of users and stakeholders are successful because they have the input and support of people and therefore can be developed bottom-up as well as combined bottom-up and top-down.

1.3 PROJECT DEFINITIONS

Below is a list of the terms that are necessary to understand and use this publication. Definitions are important for understanding the different meanings of key theoretical, practical, and methodology terms used in this research report.

A PATTERN LANGUAGE

The term "Pattern Language" is a systematic categorization of spatial problems and solutions, first explored by spatial theorist Christopher Alexander's aptly named book "A Pattern Language." It starts with the definition of an individual pattern, which is understood as an archetypal solution to a problem that repeats many times and in many situations. A Pattern Language is a collection of original patterns for the built environment in which each pattern is connected to at least one or more other patterns in a larger network of interdependent entities. A defined Pattern Language is used in the formulation of complex design problems, such as designing and constructing buildings, urban design projects, and all projects that have a spatial component, such as the Tsunami Wayfinding Projects. (A Pattern Language by Christopher Alexander, Sara Ishikawa, Murray Silverstein et. al. Oxford University Press, 1977)

PATTERN PROJECT LANGUAGE

A Pattern Project Language is a collection of Patterns for a particular context, domain, or project. It is made up of individual patterns relevant for a particular topic, such as a building project or a tsunami evacuation project. Patterns in A Pattern Project Language are connected in a structure or system of patterns. A Pattern Project Language is both, it is a Pattern Language of archetypal patterns and the implied phenotype patterns applied to a particular project in their real form and expression (also expressed in a Project Language). In the first project, we developed a Pattern Project Language for the survival of tsunami events based on our studies in the coastal town of Cannon Beach (this Pattern Project Language can be seen at the end of this report in the Appendix). For this project in Warrenton and Seaside, we use the existing Pattern Project Language to derive site-specific Project Languages.

TSUNAMI SURVIVAL WAYFINDING PATTERN PROJECT LANGUAGE

A Tsunami Survival Wayfinding Pattern Project Language is a particular language in one domain (Tsunami Survival Wayfinding). It is a very specific kind of Pattern Project Language that focuses on one area or theme of study or system of patterns, in this case on wayfinding in tsunami situations. In a complete sense, we developed a Tsunami Survival Wayfinding Pattern Language for the first report which was based on studies in the town of Cannon Beach. For the cases of the cities of Seaside and Warrenton, we apply patterns of this specialized language in an applied fashion to these two towns.

PROJECT LANGUAGE

A Project Language is based on a Pattern Language (or Pattern Project Language). It is primarily comprised of translations of the archetypal and more general patterns into specific phenotypical forms, organizations, and designs in individual situations, locations, and expressions. A Project Language is comprised of patterns but it also can include other entities such as ideas, proposals, smaller projects (entities that cannot be counted as patterns) for a very specific project or domain. The non-pattern elements of a Project Language are necessary to achieve a more complete understanding of a topic. Some of the elements may be further developed with rigorous analysis and/or testing. The contextually specific nature of a Project Language requires local input with public feedback being a critical component of the development.

TSUNAMI SURVIVAL WAYFINDING PROJECT LANGUAGE

Different from a Pattern Project Language, a Project Language is a further evolution of a Pattern Language. A Project Language for tsunami survival wayfinding lies within a particular domain, made up of patterns, projects, and other entities. This includes proposals that are needed to form a Project Language, in this case a Tsunami Survival Wayfinding Project Language which combines the general notion of a Project Language with a particular domain that can also be understood as a theme or topic.

DOMAIN

A domain is a specific area within a discipline or field of study. In the case of natural disasters, the domain can address language specific to life threatening events, such as survival of wild fire, earthquakes, tsunamis, river flooding, landslides, and so on. An earthquake and tsunami Survival Language covers the area of study for the Tsunami Escape Wayfinding Language.

WAYFINDING

“The process of determining and following a path or route between an origin and a destination. It is a purposive, directed and motivated activity.” (Golledge, 1999)

TSUNAMI ESCAPE WAYFINDING

Wayfinding with high stress factors that impact the ability to physically and mentally evacuate along routes uphill or inland.

TSUNAMIREADINESS WAYFINDING

Wayfinding system, not limited to physical elements, that incorporates preparation, evacuation, and response, in order to become ready for tsunami escape.

For more definitions regarding wayfinding, reference Section 2.2 in the “Up and Out” report.

1.4 EXECUTIVE SUMMARY

The PUARL team, was tasked with addressing tsunami evacuation wayfinding in the cities of Seaside and Warrenton in Clatsop County. These towns recently have been the target of local tsunami inundation studies by the Department of Geology and Mineral Industries (DOGAMI). PUARL's design implementation, coupled and informed by DOGAMI's analysis, seeks to improve evacuation infrastructure for a Tsunami event. Addressing the differences between the cities of Seaside and Warrenton demonstrates how wayfinding project chains and pattern methods lead to ways of cognitively and physically mapping; the necessary steps for safety and survival.

The first "Up and Out" study emphasized developing a universal Pattern Language for towns along the Oregon coast, utilizing a general format applicable to all potential Tsunami zones. The "Up and Out 2" study addresses the development of a Project Language as the main means of communication and tsunami preparation. The difference between a Pattern Language and a Project Language is that a Pattern Language is based on finding general and universal principles, and a Project Language is based on the translation of these universal principles into particular applications for specific places and locations. After establishing a Tsunami Project Language based on the universal Patterns, the design projects were applied to one route in each town to form two very different and specific "Wayfinding Chains."

CHAPTER 1: PROJECT INTRODUCTION

In Chapter 1, the "Up and Out 2" research project is introduced, and the three important methods of Pattern Language, Project Language, and User Participation are presented. Relevant Tsunami Survival Wayfinding Pattern Language terms and categories are defined, and the overall purpose and objective of the study is laid out.

CHAPTER 2: PROJECT SITES: SEASIDE AND WARRENTON

Chapter 2 introduces similarities and differences between the two cities of Seaside and Warrenton, located north of Cannon Beach along the Oregon Coast. While Seaside has a dense urban setting, Warrenton is much more spread out along the mouth of the Columbia River and the Pacific Ocean. Both cities are at risk during a tsunami situation; Seaside provides high ground and safety in its eastern hills while Warrenton has fewer vertical outlets, providing a thin strip of land towards the western edge of the city.

CHAPTER 3: TSUNAMI SURVIVAL PROJECT LANGUAGE

The main topic in Chapter 3 is the development of a Project Language for the two towns of Seaside and Warrenton. The Project Language takes relevant patterns from the Tsunami Pattern Project Language originally developed from research in the city of Cannon Beach, and develops these universal patterns into specific ideas, proposals, and projects for the cities of Seaside and Warrenton. The Project Language works with text, illustrations, diagrams and other graphic means to make an individual project easily comprehensible and understandable.

CHAPTER 4: SIGN SUITE
As exemplified in the previously described chapter on Project Language, different patterns can be applied to specific projects that manifest themselves based upon context. However there are several pattern ideas that are constant or even universal. Among these constant patterns, the redesigned signs are the most imperative for implementation. If all towns along the coast chose to implement a single facet of this report, it would be the sign suite. The sign suite is a culmination of the new redesigned signs along the entire evacuation wayfinding chain route. They include: beach warning signs, distance and directional warning signs, safety zone signs and assembly area informational signs.

CHAPTER 5: PROJECT LANGUAGE DESIGN APPLICATION - WAYFINDING CHAINS
The specific design of the selected wayfinding chains for Seaside and Warrenton are the main topic of this chapter. The purpose of the Wayfinding Chain is to take the general patterns that affect any tsunami wayfinding system from the first "Up and Out" project and find ways to implement them into specific projects in the two target cities.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS
In Chapter 6 general conclusions about the process in both towns a well as next step recommendations for the target towns and the coast are presented and discussed.

BIBLIOGRAPHY:
The Bibliography covers the different resources we utilized to create this report. It also sites our images and additional resources for reference.

APPENDIX:
The appendix includes bios for the PUARL team, links to the Pattern Language and references to the conferences where this report's research has been presented.

FIGURE 4

1.5 RECENT EVENTS

On June 1st 2015, while completing work for the “Up and Out 2” project report, a number of seismic events reminded us of the impending tsunami event along the Oregon Coast. In the early morning of June 1, an earthquake of magnitude 5.8 occurred off the Oregon coast, 280 miles to the west, at a depth of 6 miles. Another earthquake of similar magnitude occurred about 4 hours later at the exact same spot. A few hours later, three more earthquakes were reported, taking place at the same location and with similar magnitudes between 5-6. Two final earthquakes were reported a few hours later bringing the number of sizable quakes to seven. These earthquake events appeared as a potential crescendo to a much larger event, reminding us that the danger of a tsunami disaster may not be not so far away. Below are the times of the seven earthquakes in sequence as they occurred in a 24 hour period. Also shown is an image of the location of the earthquakes and aftershocks to the west of the Oregon Coast.

The Pacific Northwest bears the scars of a long history of tsunami disturbances. Researchers predict a significant earthquake/tsunami event every 250-300 years along the Cascadia fault line. Geologic evidence shows the most recent earthquake/tsunami occurred in the year 1700 C.E., which means the Northwest is overdue by 15-65 years. It is imperative that coastal communities prepare as much as possible for the inevitable tsunami, as planning and education will almost certainly be critical components of disaster mitigation.

Another highly publicized event occurred while finishing work on the Tsunami Escape Wayfinding Report “Up and Out 2”: the publication of a widely talked about article titled “The Really Big One,” published on July 15, 2015 in the New Yorker journal. This article, rapidly distributed with a huge social media presence, raised awareness of the immediate and major impact on public perception of the inevitable earthquake and tsunami in the Pacific Northwest. The article was well written by Kathryn Schulz with the ominous subtitle: “An earthquake will destroy a sizable portion of the coastal Northwest. The question is when.” Soon after the article, we received a number of emails about this publication and discussed aspects of the content with people in the streets and coffee shops of Portland.

THE SEVEN EARTHQUAKES May 31-June 1, 2015:

11:52 p.m. Sunday: 5.8 magnitude
12:01 a.m. Monday: 4.3 magnitude
3:46 a.m. Monday: 5.5 magnitude
7:46 a.m. Monday: 4.4 magnitude
1:11 p.m. Monday: 5.9 magnitude
7:50 p.m. Monday: 3.9 magnitude
8:11 p.m. Monday: 4.2 magnitude

http://portland.suntimes.com/por-news/7/89/91302/earthquakes-oregon-coast

FIGURE 5

Illustration:
Series of earthquakes off the Oregon Coast on June 1

While the article covers and discusses a number of important issues that would make anybody who lives along the Oregon and Northwest Coast concerned, there are a few especially critical points that are relevant to our work.

Schulz points out the truly worrisome lack of understanding about the Cascadia Subduction Fault with the following: “Thirty years ago, no one knew that the subduction zone had ever produced a major earthquake. Forty-five years ago, no one even knew it existed.” Most people in the United States and even internationally only know about the danger of the San Andreas Fault that runs along the California Coast, made even more popular by a current Hollywood movie with the same name, and directed by Brad Peyton. Just North of the San Andreas Fault lies the Cascadia fault line which starts in Mendocino, Northern California and goes to Vancouver Island in British Columbia, Canada. This fault line is known as a subduction fault because of its particular connection of two tectonic plates coming together, the Juan de Fuca Plate in the Pacific Ocean and the Continental North American Plate; it has more potential than the San Andreas Fault to cause an unprecedented natural disaster.

With this relatively recent understanding of the subduction zone, it is troublesome that the Pacific Northwest has no early warning system similar to those used in Japan. Their warning systems are credited with saving countless lives during the Tohoku Earthquake and Tsunami in 2011. Currently the seventy-one thousand people who live in Cascadia’s inundation zone (not including visitors), will only be notified by the earthquake itself and need to resolve on their own that they must find their way to safe ground within just 15-30 minutes before a tsunami inundation occurs.

The worst case scenario is a 9.0 Richter scale earthquake and consequent tsunami. However, earthquakes and tsunamis come in degrees of strength of destruction. While a 7.0 Richter scale earthquake starts to form smaller tsunamis with little destruction, an 8.0 Richter scale earthquake is already much more powerful with considerable destruction potential, but still far less destructive than a 9.0 earthquake. Consequently, there is a chance that “The Really Big One” will have some degrees of scalability (a 7.0 or 8.0 earthquake instead of a 9.0 earthquake), providing a substantially larger chance for escape. There is no way to know what magnitude earthquake will occur next, therefore it is important to prepare for all possibilities. It is this context of a more survivable earthquake that our work towards a tsunami survival wayfinding system becomes useful and purposeful.

Figure 6

2. PROJECT SITES: SEASIDE & WARRENTON

2.1 TARGET TOWNS: PROJECT SITE CONTEXT

This chapter of the paper sets the stage for the design and implementation of specific elements along the wayfinding chains. It explains the reasons for choosing the two target study cities in relation to the other work being done by DOGAMI. The chapter then focuses on each town individually, describing city context, examining existing wayfinding conditions, and evaluating a primary evacuation route to be studied in greater detail. The chapter concludes with a comparison between the two cities, and explores how different factors may or may not require a different solution for each of the two wayfinding chains.

Recently, the Department of Geology and Mineral Industries (DOGAMI) has been studying the same two target cities that the PUARL team has been addressing for this report—Seaside and Warrenton. The DOGAMI studies used tsunami inundation modeling for each city to determine safe ground elevation as well as the intensity and timing of the oncoming wave caused by a variety of earthquake magnitude scenarios. Using these time frames and elevation points, they created a "Beat the Wave" map which is the graphic representation of evacuation modeling at a variety of speeds. By determining general walking, jogging, and running speeds, they were able to illustrate what type of pace would need to be maintained from different locations in the city, in order to reach safe ground before the oncoming wave. The modeling programs used to generate these times are being combined with an effective design graphic methodology that can easily portray more detailed and relatable information to users.

Modeling these scenarios is a necessary process for establishing the best evacuation routes. The use of GIS overlays allows users to internalize the most effective escape route in a tsunami evacuation event. That being said, the signage and wayfinding information which is imperative to facilitate efficient evacuation must be purposefully integrated into the urban fabric, requiring nuanced design considerations. Invested tsunami organizations understand and support the relationship between the scientific studies necessary to establish the most effective routes and the design process to establish wayfinding strategies that assure those evacuation routes remain effective.

The "Up and Out 2" Wayfinding Chain utilizes the general patterns that affects any tsunami wayfinding system and implements them into specific projects in two target cities. As an example, utilizing the signage and mapping patterns to create effective forms of communication between key points on the wayfinding chains creates both very specific solutions as well as suggests universal ones. Since every evacuation route is different, it would be unwise to propose a universal system based solely upon one route. By creating a second chain that speaks to very different route criteria, this report shows how parts of the project language can be repeated and differentiated depending upon the context.

FIGURE 7

2.2.1 Seaside: City Context

HISTORY

The Native Americans who lived in this area called the area Ne-co-tat. These non-nomadic people lived in low-roofed partitioned lodges made from cedar. They also used cedar to build canoes which provided them with means to sustain their ocean based diet and trade. These fisherman relied heavily on salmon as their primary source of food, which were believed to be a divine gift from the coyote spirit, Talapus, who created this great gift during a time of near extinction for the inhabitants of this area.

A group of men from the Lewis and Clark Expedition built a salt-making cairn that helped them produce valuable trade goods. Due to their trade success, the group began colonizing the coastal region, which slowly began to develop due to the increased traffic along the Columbia River. The name Seaside is derived from the Seaside House, a historic summer resort built in the 1870s. By 1910 Seaside had a population of 1600 permanent residents, which could swell with visitors during the summer months of up to 10,000 people. Lumber companies and other industries continued to develop the city as a premier location for summer visitors which remain a major part of Seaside's economy to this day.

GEOGRAPHY

The city of Seaside has a total area of 4.14 square miles, 3.94 square miles of which is land, .20 square miles of which is bodies of water. It lies on the edge of the Pacific Ocean at the southern end of the Clatsop Plains. It is 18 miles south of where the Columbia River empties into the Pacific Ocean. The Nacanicum River bisects Seaside and goes out to the ocean at the northern edge of the city. The Tillamook Head, a promontory, rises out at the southern edge of the city. Highway 101 runs north to south parallel to the Nacanicum River which is to the west of the highway. Most of the city lies on relatively flat land, but east of the highway, slowly inclines towards a range of hills, which rise quickly and hold a smaller portion of the city's residential neighborhoods.

CLIMATE

Seaside has a fairly typical Pacific Northwest coastal climate, which receives rainy winters and mild-to-cool summers. Although it varies through the months, the average high, mean, and low are respectively 59.3, 51.68, 44.1 degrees. Precipitation in inches, at a low in July of 1.47 in July and 11.64 in November amount to an approximate year total of 74.39.

DEMOGRAPHICS

As of the 2010 census, Seaside had a total of 6,547 people, 2,969 households, and 1,565 families living in the city amounting to a population density of 1,638.8 inhabitants per square mile. The average home size was 2.16 persons and the average family size was 2.83 persons. The median age of Seaside was 41.5 years old.

CITY FEATURES

Prominent features of the city are the Seaside Aquarium, the Lewis and Clark monument, the Seaside Civic and Convention Center, the Bob Chisholm Community Center, and the Seaside Public Library. Various murals adorn local buildings that depict the history, marine life, and social life of the city.

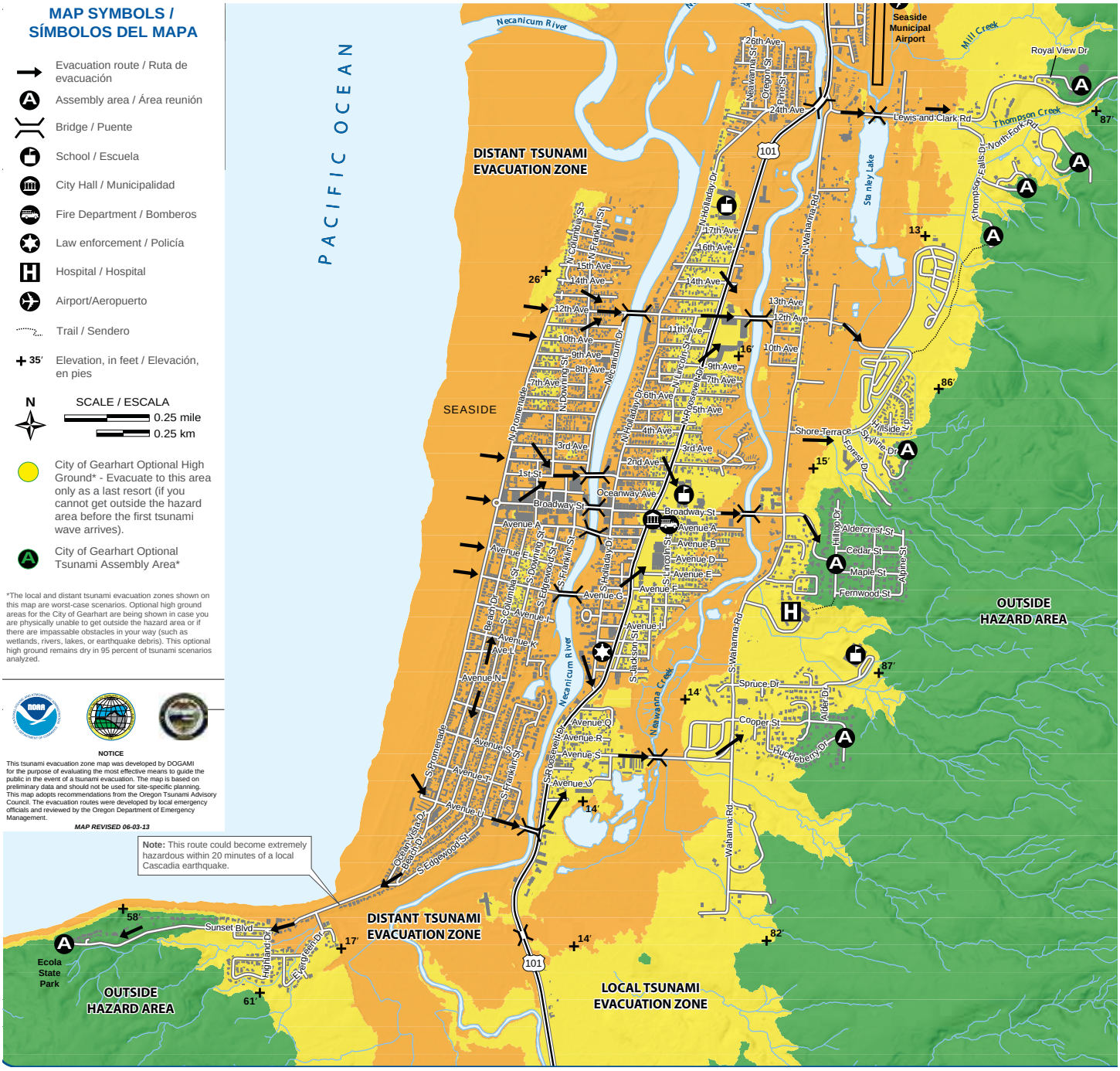

MAP SYMBOLS / SÍMBOLOS DEL MAPA
Evacuation route / Ruta de evacuación
Assembly area / Área reunión
Bridge / Puente
School / Escuela
City Hall / Municipalidad
Fire Department / Bomberos
Law enforcement / Policía
Hospital / Hospital
Airport/Aeropuerto
Trail / Sendero
35′ Elevation, in feet / Elevación, en pies
N
SCALE / ESCALA
0.25 mile
0.25 km
City of Gearhart Optional High Ground* - Evacuate to this area only as a last resort (if you cannot get outside the hazard area before the first tsunami wave arrives).
City of Gearhart Optional Tsunami Assembly Area*
*The local and distant tsunami evacuation zones shown on this map are worst-case scenarios. Optional high ground areas for the City of Gearhart are being shown in case you are physically unable to get outside the hazard area or if there are impassable obstacles in your way (such as wetlands, rivers, lakes, or earthquake debris). This optional high ground remains dry in 95 percent of tsunami scenarios analyzed.
NOTICE
This tsunami evacuation zone map was developed by DOGAMI for the purpose of evaluating the most effective means to guide the public in the event of a tsunami evacuation. The map is based on preliminary data and should not be used for site-specific planning. This map adopts recommendations from the Oregon Tsunami Advisory Council. The evacuation routes were developed by local emergency officials and reviewed by the Oregon Department of Emergency Management.
MAP REVISED 06-03-13
PACIFIC OCEAN
Necanicum River
DISTANT TSUNAMI EVACUATION ZONE
SEASIDE
Seaside Municipal Airport
Mill Creek
Royal View Dr
Lewis and Clark Rd
Thompson Creek
North Fork Rd
Thompson Falls Dr
Stanley Lake
N Holladay Dr
N Wahanna Rd
N Columbia St
N Franklin St
N Downing St
N Edgewood St
N Roosevelt St
N Promenade
Necanicum Dr
S Holladay Dr
S Wahanna Rd
S Columbia St
S Franklin St
S Downing St
S Edgewood St
S Roosevelt St
S Promenade
Broadway St
Oceanway Ave
Avenue A
Avenue B
Avenue D
Avenue E
Avenue F
Avenue G
Avenue I
Avenue J
Avenue K
Avenue L
Avenue N
Avenue Q
Avenue R
Avenue S
Avenue U
Shore Terrace
Forest Dr
Skyline Dr
Hillside Dr
Hilltop Dr
Aldercrest St
Cedar St
Maple St
Fernwood St
Alpine St
OUTSIDE HAZARD AREA
Spruce Dr
Alder Dr
Cooper St
Huckleberry Dr
Jackson St
Newsma Creek
Ocean Vista Dr
Beach Dr
Sunset Blvd
Highland Dr
Evergreen Dr
Ecola State Park
OUTSIDE HAZARD AREA
DISTANT TSUNAMI EVACUATION ZONE
LOCAL TSUNAMI EVACUATION ZONE
Note: This route could become extremely hazardous within 20 minutes of a local Cascadia earthquake.
101

FIGURE 8

2.2.2 Seaside: Analysis of Existing Wayfinding Conditions

FIGURE 9

Seaside is a coastal city that is accessed by highway 101, which runs parallel through the length of the city. It is separated from the city of Cannon Beach by a large hill containing Ecola State Park. The park provides a high ground refuge to north end of Cannon Beach and the south end of Seaside, where an assembly area is tucked into a wooded residential neighborhood. To the north, the smaller city of Gearhart rests on a flat plane of about 25-30 feet elevation above sea level. Although the majority of Gearhart is considered to exist out of the distant tsunami hazard zone, the entire city does rest in the local tsunami inundation zone. The extreme distances that have to be crossed through lower elevations to reach high ground, makes the decision of whether or not to evacuate Gearhart a difficult one for tsunami evacuation planners.

The vast majority of Seaside sits on a flat area of land sitting just above sea level. It runs about 5-6 miles along the coast, with a slow pitched elevation gain running 1-2 miles east towards a set of high hills that have a steep rise in elevation to safe ground. The composition of city streets lead up to three different target areas for assembly. The city's most northern assembly area splits into four assembly points because of the separation of streets. It is only accessed by a small portion of the city, made up of a small neighborhood, an industrial zone, and the Seaside Airport. The city's most southern assembly area lies on the hill that separates Seaside from Cannon Beach with the Ecola State Park. This assembly point is generally farther away, and is accessed only by a small residential area of city as well. This makes up for 8 total assembly areas, with the assumption that 5 general areas should be well organized and prepared to set up campgrounds independent of one another.

The hills that provide safe ground can be seen from anywhere in the city, which make the destination, and therefore general direction, very clear for tsunami evacuation. Even from the point where the ocean meets the sand, the distance to high ground never stretches over two miles, and usually is significantly less than that. These topographical features lend themselves to shorter and more intuitive tsunami evacuation routes.

However, these routes are intersected by the wider Necanicum River and narrower Neawanna Creek, which can only be crossed by bridges. A total of 6 bridges cross the Necanicum River, making for four primary evacuation routes across those bridges. The tsunami evacuation map provided by DOGAMI suggest that out of the 3 bridges that are in close proximity to one another and the downtown area, that only one of the bridge should be used for evacuation. These four evacuation routes to the east, converge into 3 crossings over the Neawanna Creek, which lies at the base of the hillside. After crossing the creek, a steep elevation winds up the hill to residential neighborhoods and the assembly points. The most northern evacuation route only has to cross the Neawanna Creek, while the most southern evacuation route does not have any bridges along route.

These bridges pose the greatest threat to evacuation in Seaside. Although there have been structural remodels completed in the past 15-20 years on a handful of the bridges, a potential 9.0 magnitude earthquake would almost certainly destroy the bridges. If this is the case, there would be no other way but to swim across, which may be impossible due to the strong currents and high tides that occur during severe weather conditions as well as a tsunami. If these bridges are destroyed during the earthquake, the vast majority of the tourist population, downtown residents, and shop owners which

inhabit the western edge of the Necanicum River, are given little to no chance of survival. It is imperative that evacuation routes remain intact after the earthquake, meaning that the bridge crossings must be strengthened, or an alternative form of vertical evacuation must be provided.

The primary downtown area consisting of commercial and motel/hotel type buildings, rest on the western edge of the Necanicum river. This entire area rests at the lowest elevation, meaning that it is in both the local and distant tsunami inundation zones. This area has a denser urban fabric, taller buildings, and narrower streets. It is gridded, which allows for elongated visibility, showing whether the street leads to a bridge, and further uphill, or whether it dead ends at the river. The urban edge of building facades is colorful and filled with window signs and awnings, making the identification of road access and evacuation signs more difficult to identify and decipher.

The piece of land that sits in between the river and the creek is dissected by highway 101 and has the primary civic and social structures such as city hall, the fire department, and the public schools. This area is far less dense than downtown, and includes a residential neighborhoods behind commercial blocks that abut the highway. This portion of the city rests on relatively higher ground, pulling it out of the distant tsunami inundation zone, only truly threatened by a local tsunami. However, before reaching the Neawanna river, the topography slopes downward again before crossing the hills and beginning to slope up the hillside.

The hillside consists of small pockets of neighborhoods that look over the city and out to the ocean. The roads that go up the hills twist and turn to the natural topography of the slope, which is a transition from the very straight roads leading from the more populated areas of the city. Behind these neighborhoods there is a vast unpopulated forested area that could potentially be traversed by foot between assembly areas. The assembly areas themselves have no assembly signs, and can only be assumed to be there based off of the A on the evacuation route map, and some small pockets of grass or empty lots in close proximity to the A.

The evacuation routes are simply laid out based off of the geography of the city, but are generally missing the essential wayfinding elements along the routes that inform people of where they need to go, guide them along route, and indicate arrival at the destination. The evacuation maps are often absent at the primary beach entrances. Present evacuation routes signs are of an older model, and many have been stolen, leaving almost all secondary streets unsigned, and most primary streets drastically undersigned. The assembly area sign only exists at one or two of the assembly points, leaving it up the user to decipher when they have reached high ground, and where they should be gathering.

The observations of existing wayfinding conditions in Seaside indicate that the systems of signs were put into place many years ago, and have suffered from a lack of upkeep. It is clear that the evacuation routes will require a whole new round of implementing evacuation maps, route signs, and assembly signs. However, it became apparent that there also has to be a new approach to the way that these wayfinding strategies are integrated into the urban fabric so that they can be more widely accepted by the community.

FIGURE 10

2.2.3 Seaside: Defining the Primary Evacuation Route

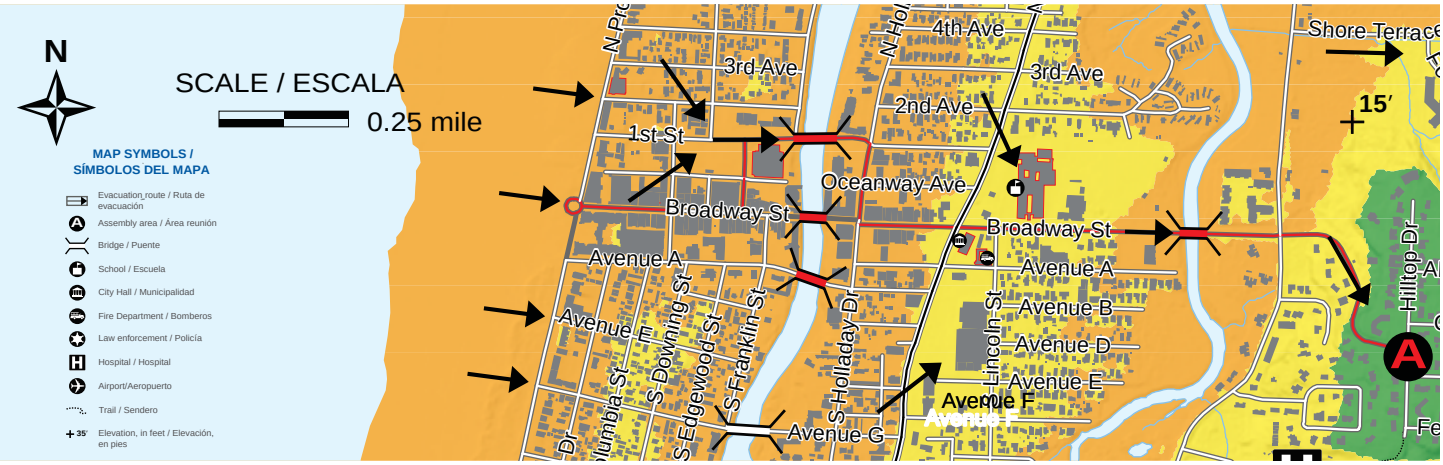


Figure 11

The PUARL team chose to study the evacuation route that goes through the heart of downtown in greater detail. This route begins at the Lewis and Clark Monument, and leads up Broadway Street through the heart of Downtown, before ending up at the Assembly Area at the intersection of Broadway and Hilltop Drive.

At the Lewis and Clark monument, which is in the center of the Broadway Street turnaround, there are two primary beach entrances. Most anyone that comes to visit Seaside will at some point come to this location, making it an ideal place to have an informational kiosk that includes the evacuation route maps, as well as other important tsunami related information. If this kiosk is designed well, it could be an attractive element that everyone will see, and can engage passersby to observe key instructions, if not examining the information in greater detail.

One of the primary reasons that this route was chosen was because it leads through the downtown area, which holds the densest urban structures that would most likely be housing or holding tourists and visitors during an event. This area is at risk, not only because of the large population, but also because a large group of high-risk people that will generally be unaware what to do in the event of an earthquake, and will be unprepared without an evacuation plan. These tourists and visitors will need the support of local residents and employees during an evacuation. Because this area is filled with commercial structures, these businesses should be trained to inform and prepare their customers, as well as to become tsunami evacuation leaders during evacuation.

Another key issue to this route is the current lack of signage. Most of the route signs are placed parallel to the street, indicating that evacuees should turn along the road in an event, however these signs are not included at every intersection. Furthermore, there are no signs perpendicular to the route, indicating that evacuees should continue along that path. It is important to not oversaturate the route, but make sure that it is well enough signed where people are confident in the signs directions. The density of signs and building types, along with the multitude of colors and materials, provide and opportunity for the tsunami blue color to make its way into other forms of signage including ground, post, and lighting designs.

One important consideration along this route is that the downtown area is accessed by 3 bridges over the Necanicum River. The current evacuation route map indicates travelling over the 1st Street bridge, indicating the Broadway Street and Avenue A bridges will not withstand the effects of the earthquake. However, after the Necanicum river, evacuees will have to return to Broadway Street in order to cross the Neawanna Creek. The lack of current signage, does not suggest this deviation from the main artery running through downtown, which people will intuitively go to as the escape route. It is important to clarify this information on the evacuation maps as well as the bridges themselves, if it is decided that they will not withstand the earthquakes effects.

Major civic buildings such as the Middle School, City Hall, Fire and Rescue, and Visitor's Bureau, Recreational District and Parks, and the Public Library are all along Broadway Street between the Necanicum River and Neawanna Creek. These key components of the city structure provide a great opportunity to enhance the evacuation routes and help raise awareness of tsunami inundation and evacuation planning, as well as provide leadership during the event. Most of these facilities only have to cross the creek, over a shorter distance, which provides them an easier path to safety if the bridges were to collapse. It is important that these groups of people are able to survive the event, as they will be key contributors to the rebuilding process.

As the evacuation route crosses the Neawanna Creek, and begins to slope and curve uphill, there are few evacuation route signs. There is no indication of when safe ground is officially reached, as well as where the assembly area is located. The "A" on the map is located on top of a parcel of land with a well groomed lawn, surrounded by short concrete posts, suggesting it as an assembly area. But this property is private land, and is not meant to house evacuees. The current plan is to rely upon a series of safe houses in the immediate neighborhood, but there is no indication of where those houses are or what evacuees should do. Although there is not much information, there are indeed a variety of solutions and possibilities to make this assembly area functional as an evacuee campsite that will have open space as well as residential structures that can support the campsites with shelter, stored resources, and community leadership.

Generally speaking, this route has a multitude of key issues that would prevent evacuation, but its density, central location, and proximity to thriving businesses provide ample opportunity to address major urban concerns, and provide effective evacuation wayfinding strategies for the people that will be using the route.

2.3.1 Warrenton: City Context

HISTORY

The original settlement within Warrenton was founded in 1848, then named Lexington, and became the first county seat for Clatsop county. The name was soon changed to Skipanon, after the Skipanon River which flows directly through town. Being that it is built on tidal flats, it relied on a system of dikes constructed by Chinese laborers in order to keep the Columbia River from flooding the town.

The town had a post office that was run intermittently between 1850 to 1857, but became cemented as the Skipanon post office which operated from 1871-1903. Fort Stevens was built in the surrounding Warrenton area in 1863. What is left is preserved as a portion of Lewis and Clark national and State Historical Parks. The city was officially incorporated under the laws of Oregon in 1899. The city is today named for Daniel Knight Warren, who was one of its early settlers. In 1913, Clara Cynthia Munson was elected mayor, representing the first female mayor to serve in the state of Oregon. Today, Warrenton incorporates the former communities of Fort Stevens, Hammond, and Skipanon.

GEOGRAPHY

The city has a total area of 17.66 square miles, 12.77 square miles of which is land and 4.89 square miles of which is water. The Pacific Ocean side of the city is primarily composed of a forested area in Fort Stevens State Park, which runs northward along Jetty Road to the a scenic area that looks out to the meeting point between the Pacific Ocean and the Columbia River. A slow pitched topography runs eastward towards the city, before it tops off at ridge, that begins to slope downward again towards the primary Downtown and Residential Areas. The Skipanon River runs through downtown, emptying out into Youngs Bay and the Columbia River. Highway 101 passes through the city, leading to the Youngs Bay Bridge, which spans 4,200 feet over the Youngs Bay estuary towards the larger and more populated city of Astoria.

CLIMATE

The region has warm and dry summers, with no average monthly temperature rising above 71.6 degrees Fahrenheit. According to climate classification systems, it has a warm-summer Mediterranean climate, abbreviated as “Csb” on climate maps.

DEMOGRAPHICS

As of the 2010 census, Warrenton had a total of 4,989 people, 1,948 households, and 1,287 families living in the city amounting to a population density of 390.7 inhabitants per square mile. The average home size was 2.45 persons and the average family size was 2.95 persons. The median age of Warrenton was 37.6 years old.

CITY FEATURES

The city of Warrenton is more rural in nature, with the Fort Stevens State Park, which include long beach expanses and scenic trails that run throughout the woods leading to pleasant lakes. Ridge Road run features multiple campground sites and recreational areas. Ocean View Cemetery is a well maintained and peaceful resting place looking over Cemetery Lake. The primary beach includes the Wreck of Peter Iredale, a decomposing shipwreck coming out of the sand, that is a key attraction for the city. To the east along highway 101, there are large commercial stores and the Astoria Airport that service many of the surrounding cities.

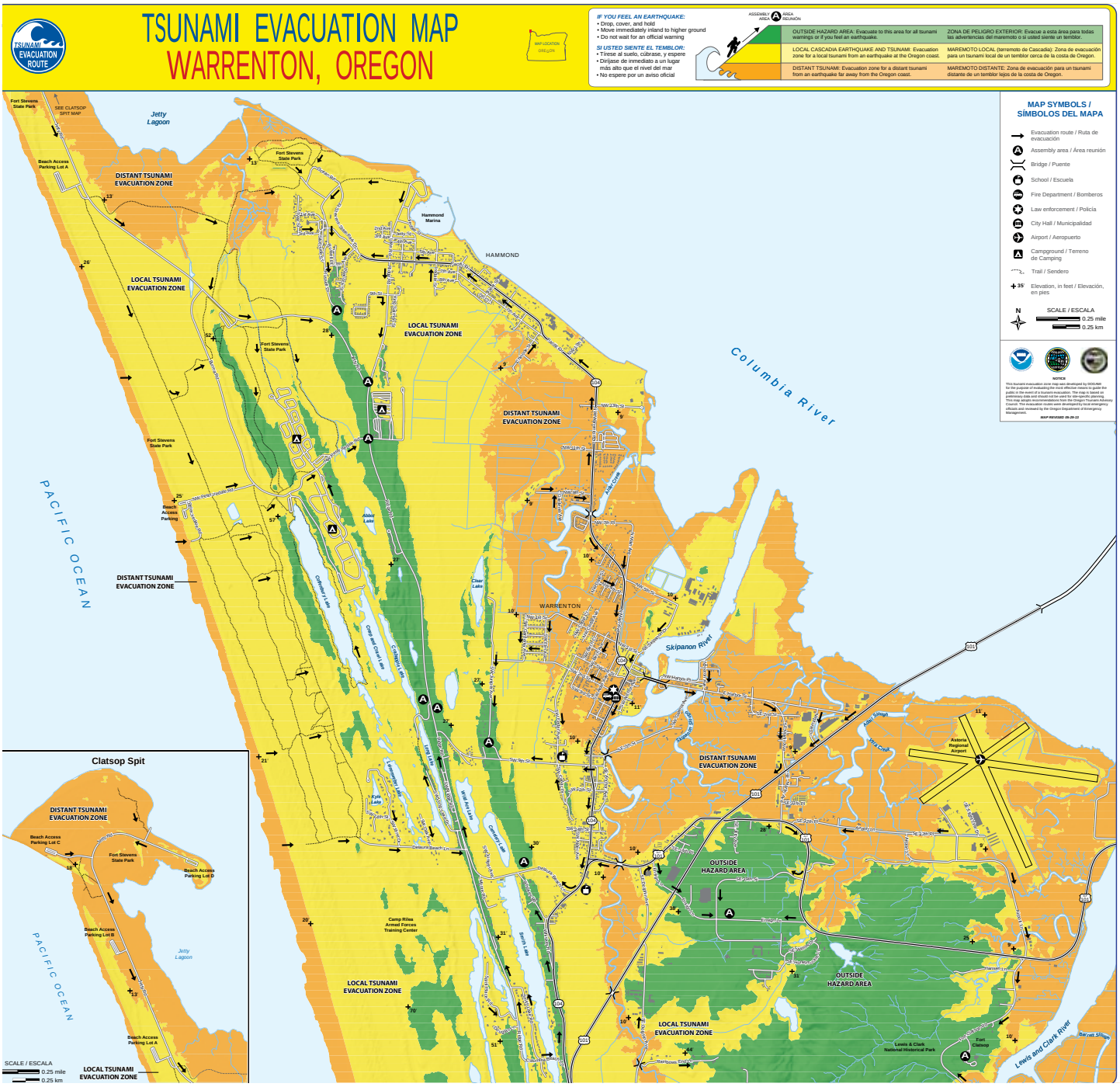

TSUNAMI EVACUATION MAP
WARRENTON, OREGON
TSUNAMI EVACUATION ROUTE
IF YOU FEEL AN EARTHQUAKE:
• Drop, cover, and hold
• Move immediately inland to higher ground
• Do not wait for an official warning
SI USTED SIENTE EL TEMBLOR:
• Tírese al suelo, cúbrase, y espere
• Diríjase de inmediato a un lugar más alto que el nivel del mar
• No espere por un aviso oficial
ASSEMBLY AREA
ÁREA DE REUNIÓN
OUTSIDE HAZARD AREA: Evacuate to this area for all tsunami warnings or if you feel an earthquake.
ZONA DE PELIGRO EXTERIOR: Evacue a esta área para todas las advertencias del maremoto o si usted siente un temblor.
LOCAL CASCADIA EARTHQUAKE AND TSUNAMI: Evacuation zone for a local tsunami from an earthquake at the Oregon coast.
MAREMOTO LOCAL (terremoto de Cascadia): Zona de evacuación para un tsunami local de un temblor cerca de la costa de Oregon.
DISTANT TSUNAMI: Evacuation zone for a distant tsunami from an earthquake far away from the Oregon coast.
MAREMOTO DISTANTE: Zona de evacuación para un tsunami distante de un temblor lejos de la costa de Oregon.
MAP SYMBOLS / SÍMBOLOS DEL MAPA
Evacuation route / Ruta de evacuación
Assembly area / Área reunión
Bridge / Puente
School / Escuela
Fire Department / Bomberos
Law enforcement / Policía
City Hall / Municipalidad
Airport / Aeropuerto
Campground / Terreno de Camping
Trail / Sendero
Elevation, in feet / Elevación, en pies
SCALE / ESCALA
0.25 mile
0.25 km
NOTICE
MAP REVISED 06-29-12
Jetty Lagoon
DISTANT TSUNAMI EVACUATION ZONE
LOCAL TSUNAMI EVACUATION ZONE
HAMMOND
WARRENTON
Columbia River
PACIFIC OCEAN
Skipanon River
Lewis and Clark River
Beaver Slough
OUTSIDE HAZARD AREA
Astoria Regional Airport
Fort Clatsop
Lewis & Clark National Historical Park
Camp Rilea Armed Forces Training Center
Clatsop Spit
Beach Access Parking Lot A
Beach Access Parking Lot B
Beach Access Parking Lot C
Beach Access Parking Lot D
Fort Stevens State Park
SEE CLATSOP SPIT MAP

FIGURE 12

2.3.2 Warrenton: Analysis of Existing Wayfinding Conditions

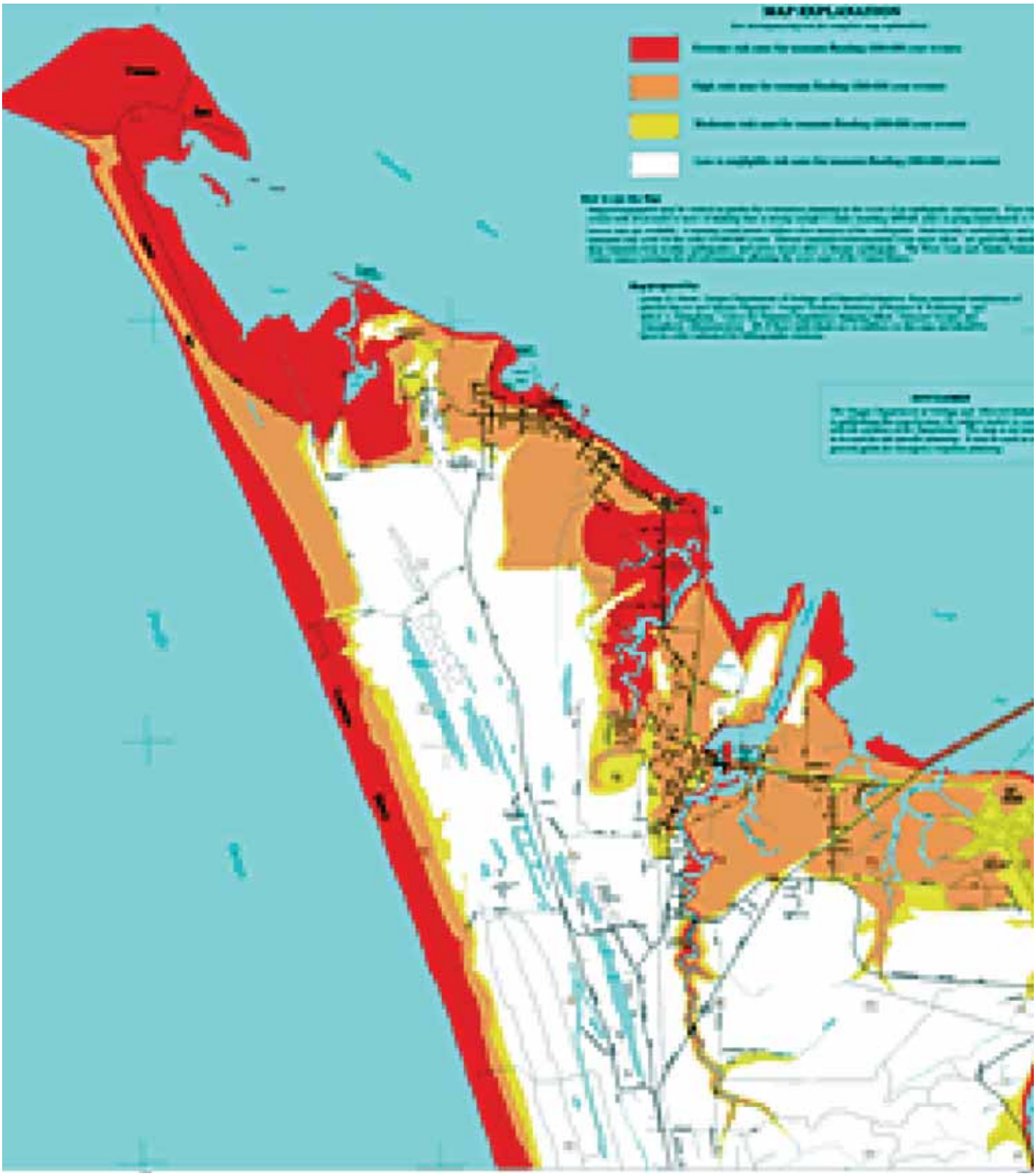


Figure 13

Warrenton is a very large and dispersed city that includes a variety of different types of evacuation routes and assembly points. A mix of residential, commercial, and state areas are scattered among the city. Each of the different areas seems to have a different function for the city, indicating that most visitors would most likely not be located near commercial and residential areas.

A major portion of the city rests in Fort Stevens State Park, a densely forested and generally low ground area. This northern area is farther away from high ground, which still only reaches up to 27-35 feet. However, the geography of the slow pitched hill along with the dense treescape provides an assumed buffer that could resist the force of the wave coming directly off of the Pacific Ocean. Many of the areas that would be being used during the daytime include the beach entrances and scenic viewpoint of the mouth of the Columbia River.

The old Hammond and main Warrenton downtowns are where most of the residences, small commercial structures, schools, and civic buildings are located. These areas are located relatively far away, but equidistant, from different areas of higher elevation and assembly points. The majority of the evacuation routes span anywhere from 2.5-4 miles to reach high ground, an incredible distance to be travelled by foot in 15 minutes. Although signage exists along the roads, it is not consistent. This makes it a less intuitive evacuation route, forcing effective signage to be the only indication of where to go. They generally lack any form of evacuation route maps and signs, which need to be implemented in order to clarify the direction that must be taken in order to reach higher ground. One interesting feature of the city is that it has a ridge which protects the downtown areas from the Pacific Ocean side. This means that the tsunami wave will likely have to make its way through the Columbia and flood the city. This provides longer evacuation times before inundation, and may decrease the forceful impact of the wave.

Alder Creek and the Skipanon River run through these areas, but the way the city is laid out with the variety of Assembly Points, means that the bridges will not have to be crossed to reach high ground. This is important, because these bridges will certainly fail in the earthquake. The areas that are located in close proximity to these bridges however are multiple miles from high ground, making effective and intuitive signs vital. A small community of elderly residences rests right next to Alder Creek, and these people will have to travel over 3 miles uphill to safety. This is one area where an alternative evacuation solution might be considered. A small hill, could be built up to become an occupiable berm, that would allow for a much shorter evacuation route, as well as become a viewpoint out along the Columbia River.

A natural feature that lends itself to effective assembly areas are the multiple public and private campsites in this area. These places include ample space and low maintenance structures that would support successful campsites, making the need for expensive assembly area development unnecessary. Park Rangers and campsite employees would likely be the only permanent inhabitants of the assembly areas, making them key to evacuation leadership.

A smaller area of larger corporate businesses such as Costco, Home Depot, Walgreens, etc are located off of highway 101. These places are mostly located out of the inundation area. In the event of an earthquake/ tsunami, there would most likely be a fair amount of the population working or shopping close to or in a safe zone. These buildings would also provide evacuees with shelter and a wide variety of resources for survival.

2.3.3 Warrenton: Defining the Primary Evacuation Route

The city of Warrenton has multiple at risk evacuation routes, that could all be interesting points of study. However, the downtown area of Warrenton is likely the most at risk evacuation zone for the following reasons.

First, this area lies in the distant tsunami hazard zone and although far away, high ground surrounds the area in all directions. The specific assembly area for this location is to the west, heading towards the Pacific Ocean, which would not be the intuitive evacuation route for people to take if they could not locate signs or were unaware of their route beforehand. People may naturally want to cross Alder Creek or the Skipanon River to reach high ground, but the bridges will be destroyed, It is imperative that the route is clearly signed, both indicating which direction to follow, and which not to. This will make people aware of their route beforehand, while also preventing possible misdirection and loss of valuable time during an event.

This area also houses the most residences, commercial businesses, schools, and civic structures. This is the core of Warrenton, and needs to be supported in order to provide the best chance of survival. The current routes are almost completely void of signage, amounting to a few rusted route signs, some of which are just blue arrows. This area is primarily composed of permanent residents. Its residents might not require as frequent of evacuation mapping and route signage, because they are more familiar with the streets that lead to high ground. Instead, it is important that the tsunami information kiosk be located in a communal area and that route signs are placed at key intersections. Instead of placing these signs at every street corner in all directions, key moments in this area that are used by its inhabitants everyday, could promote the necessary instructions, without being overbearing.

Warrenton Grade School is located within a mile of the appointed assembly area. The school regularly practice evacuation drills, ensuring that the students know where to go, and the teachers are prepared to lead them. It is important that these children understand what to do and are not required to travel such great distances, greatly increasing their ability to evacuate the entire schools. Not all, but many of the parents of these children may directed to the same assembly area, making it easier to take care of the kids post evacuation.

From either direction, the route leads from Cedar Ave and Main Ave/Fort Stevens Highway towards 9th street, which heads west, along a gentle slope, before reaching Juniper Ave, which quickly slopes uphill to the assembly site. While the evacuation routes are undersigned, the Assembly Area is highlighted with a large and effective sign, that can clearly be seen when travelling up the hill. The dedicated assembly site has a gated plot of undeveloped land, that is protected by a small berm and a series of trees, making it a great campsite with natural barriers for protection from the elements. Unfortunately, unlike the many routes in the city, this site is not already a visitor's campsite, and is provided with no manufactured shelters or amenities. There are some houses nearby, but most of them are on a downhill slope, making only a few of them officially located out of the hazard zone. Because this site fewer supporting features and houses than the others, it is key to make sure that there is a plan in place to provide evacuees with some form of shelter and resources.

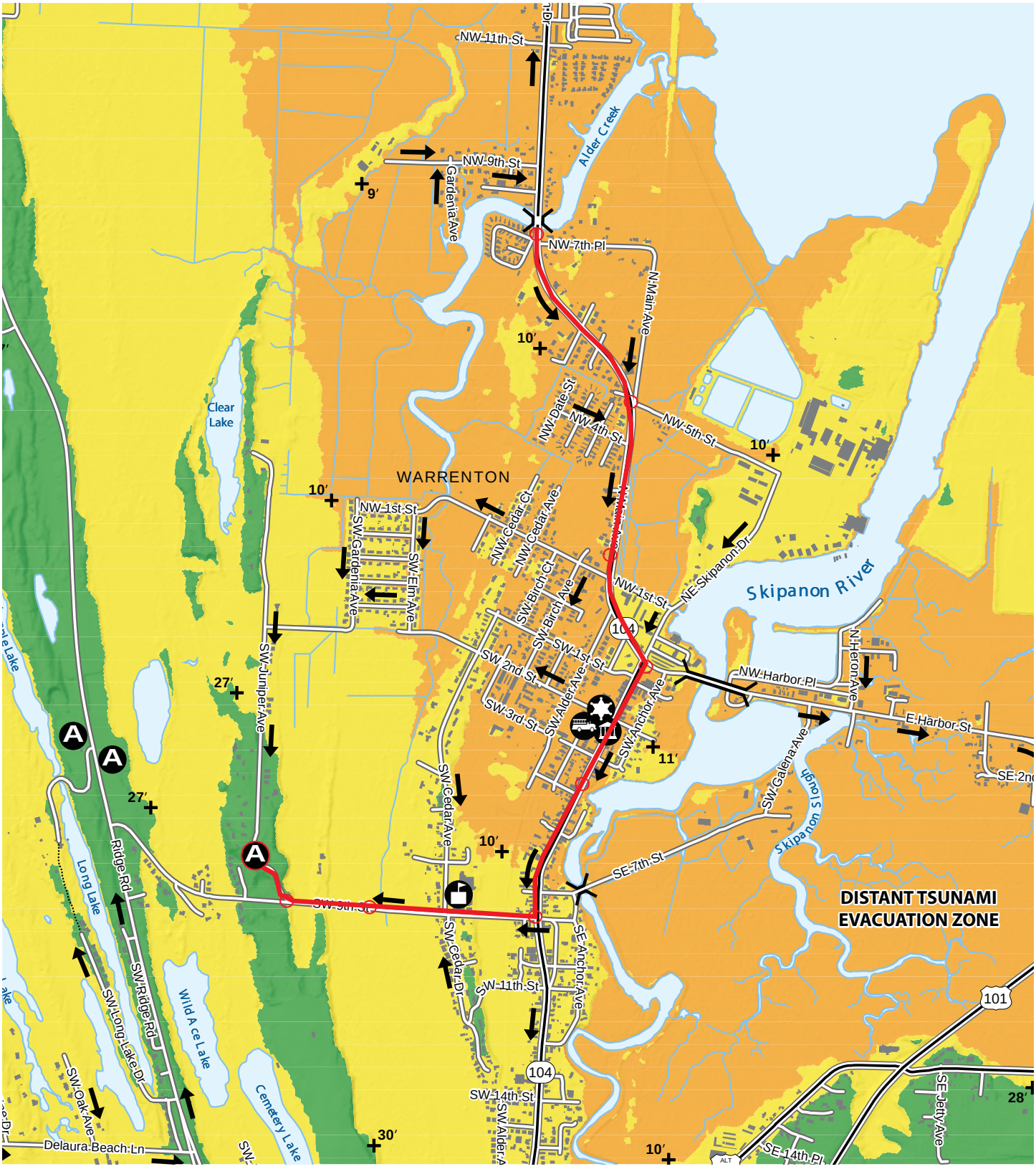

NW 11th St
NW 9th St
Gardenia Ave
9′
Alder Creek
NW 7th Pl
N Main Ave
10′
Clear Lake
NW Date St
NW 4th St
NW 5th St
10′
WARRENTON
10′
NW 1st St
SW Gardenia Ave
SW Elm Ave
NW Cedar Ct
NW Cedar Ave
SW Birch Ct
SW Birch Ave
NW 1st St
NE Skipanon Dr
Skipanon River
104
SW 1st St
SW 2nd St
SW 3rd St
SW Alder Ave
SW Anchor Ave
NW Harbor Pl
N Heron Ave
E Harbor St
SE 2nd
11′
SW Juniper Ave
27′
SW Cedar Ave
10′
SW Galena Ave
Skipanon Slough
SE 7th St
27′
Ridge Rd
Long Lake
SW 9th St
SW Cedar Dr
SW 11th St
SE Anchor Ave
DISTANT TSUNAMI
EVACUATION ZONE
101
SW Ridge Rd
SW Long Lake Dr
Wild Ace Lake
104
SW 14th St
SW Alder Ave
SE Jetty Ave
28′
SW Oak Ave
Delaura Beach Ln
Cemetery Lake
30′
10′
SE 14th Pl

FIGURE 14

FIGURE 15

FIGURE 16

2.3 DESIGNING TWO WAYFINDING CHAINS

The purpose of the “Up and Out 2” Wayfinding Chain is to take the general patterns that affect any tsunami wayfinding system, and find ways to implement them into specific projects in two target cities. As an example, utilizing the signage and mapping patterns to create effective forms of communication between key points on the wayfinding chains creates both very specific solutions as well as suggests universal ones. Since every evacuation route is different, not only in Clatsop County but in any city threatened by a tsunami disaster, it would be unwise to propose a universal system based solely upon one route.

Although Seaside and Warrenton are relatively close in proximity, the geographic and urban conditions could not be more different. These differences provide an opportunity to examine wayfinding strategies within site specific contexts which will help determine whether or not a pattern solution works universally, or must be tailored to the city in which it is designed. In order to propose a series of elements along the wayfinding chain, one of the primary evacuation routes had to be studied in more detail. The major factors that went into choosing a target routes were based upon the significance of the threats that would prevent successful evacuation. Things like population density and type (tourists versus locals), barriers to safety, distance, and assembly site conditions were all considered.

Creating a wayfinding chain links the different elements that affect preparation, evacuation, and response so they can be understood sequentially, suggesting that they are all integral parts of a greater whole. Commonly, an individual project is implemented by a city across all of the routes, making it too difficult and expensive to take on multiple projects at once. This is evident in the way that different types of signage, indicating different things, put in place at different times, can seem disconnected. By proposing a series of integrated elements that address the entire wayfinding chain, a city has the opportunity to understand the effectiveness of an individual projects in relation to one another. Beginning with a single recognizable wayfinding chain in a city provides an opportunity to study, test and improve wayfinding locally. These proposed test routes, will hopefully provide the target cities with specific designs that are to be expanded upon, as well as a framework for other coastal communities to improve their own wayfinding chains.

FIGURE 17

3. TSUNAMI SURVIVAL PROJECT LANGUAGE

3.1 SURVIVAL LANGUAGE INTRODUCTION

As discussed in the introduction, the Pattern Language method is derived from Christopher Alexander's work and the work of the Center for Environmental Structure (CES) in Berkeley. Patterns are created based on the "design thinking" formula which states that a particular context is examined in order to find prevalent problems and propose possible solutions. Pattern Languages are comprehensive design manuals for any type of system. This process can advance physical forms, such as architecture and urban design, non-physical forms, such as software or organization, and human actions, such as learning or collaboration. The original Pattern Language was developed as a socio-spatial and physical system for architecture and urban design (Alexander et al, 1977).

Each pattern in a language represents a concept that can be used to solve a common problem. Individually, these patterns can be developed into projects that take many forms in different contexts. Choosing a couple of patterns, and turning them into projects, is an effective strategy for making incremental improvements. Conversely, utilizing singular specific solutions to solve isolated problems results in marginal advances. This type of industrial process lacks the ability to make a comprehensive impact, and furthermore, prevents users from understanding the integrated nature of complex socio-ecological systems. It is easy to take an action without considering the many other reactions it will have on the other related, or seemingly unrelated, parts of the whole.

The integrated nature of the world's problems, highlights a critical predicament. The straightforward method of solving problems in the modern era has been an extremely efficient. However, it has developed our world so rapidly, that some believe it is actually contributing to the increasing complexity of the many existing crises society is facing today. But it is unfair to blame this type of thinking, just as it would to suppress it; because no single thing can be improved, solved, or invented without taking specific actions. Therefore, it is important that designers are capable of maneuvering between the global and local scales of a system. Observation of the entire system makes it easier understand where local change is needed, while evaluation of specific actions provides feedback on the relationships that compose the greater whole. This type of design thinking supports adaptation and transformation, characteristics of a resilient system.

The Pattern Language, is essentially a method of systems thinking that provides users, whether they

be designers, planners, or scientists, a strategy for making incremental changes to complex socio-ecological and spatial systems, while having a more in depth understanding of how those actions affect one another. Unfortunately, developing Pattern Languages is useless as an isolated theory. The practice of applying patterns into actual projects, is just as important as establishing the patterns themselves. It is only when the projects begin to work together, and respond to one another, that a Pattern Language breathes life. This is the proposed challenge of mastering the Pattern Language method. Patterns and projects, coupled with communal participation, represent the three key elements for effectively impacting systems. Understanding how these ideas work together should be the goal of any Pattern Language.

The following sections in this chapters describe how the Pattern Language method has been applied to this research. Although patterns, projects, and participation each play a specific role in this work, it is important that they continue to be developed together in order to achieve the goal of robust tsunami readiness wayfinding systems. At the end of the chapter, there is an extensive set of project proposals that together can be considered a type of Project Language. The concepts are not necessarily patterns, because they are formatted as proposed or existing design solutions. However, they cannot be considered projects ready for application, because they provide an opportunity to be implemented in many different forms and locations. It is vital that there is public participation when developing these ideas, and continued collaboration between cities that may use them in different ways. This type of adaptability allows for interdependent growth, integrating seemingly isolated solutions into a much more complex strategies for improving TsunamiReady systems.

3.2 PATTERN TO PROJECT: SURVIVAL LANGUAGE METHODOLOGY

In order to develop a comprehensive tsunami evacuation wayfinding system, the PUARL team utilized the Pattern Language method. The Pattern Language approach or method has captured the imagination of many people and is now applied in many disciplines and professional fields all over the world, notably computer science, education, community psychology, product design. Unlike most architecture and urban Pattern Languages, which are intended for improving the quality of a built environment, the purpose of the survival language is to reduce the loss of life in the event of natural disaster.

This earthquake survival language inspired PUARL to develop a language for surviving tsunamis (Up and Out Report, PUARL 2014). Although survival languages address a different type of design problem than the original architecture and urban design problems, the Pattern Language approach and method remains similar. The survival language is broken up into 3 sections: Preparedness, Evacuation, and Response. The three sections of the Survival Pattern Language are written sequentially to reflect how the wayfinding system exists as a chain of elements that address the before, during, and after stages of a tsunami event.

Although patterns can be chosen individually and put in to sequences, they are strengthened when they begin to work together. A resilient system is capable of adapting to chaotic and uncontrollable situations because of the interdependent nature of its structural organization. If unanticipated shocks cause one wayfinding element to fail, than the other members exist for reinforcement. Consequently, a successful Pattern Language is a sequence of individual patterns that are designed as a complex network of interdependent parts. The related patterns section references the elements that directly impact each other. When the appropriate relationships between the sequential patterns are developed in sync, the network extends beyond identifiable connections to integrate seemingly unrelated patterns into a resilient system. It is the hope that these patterns will provide coastal communities with a new tool for assessing their current tsunami readiness, and help them propose changes to improve their wayfinding chain.

A Project Language is the next step in the Pattern Language process. It can be thought of as a design application of a series of patterns into distinct projects. Essentially, the problems and solutions proposed in the Pattern Language are developed by users into specific designs for their own personal context. While the application of patterns into projects reflects an innovative solution for a repeated problem, not all of the designs in the Project Language are restricted by fitting into an archetypal patterns. These ideas need to take form into a unique system that reflects the qualities of its users and the characteristics of a its context. Proposals should include a variety of very specific designs and active uses that can be addressed immediately, alongside general themes and long term goals that can be integrated into the system over time.

The notion that patterns embody fixed archetypal concepts, where projects are solely a reflection of the pattern ideas needs to be clarified by the looking at the three primary methods for pattern development. The first is evidence based, derived from observations of existing solutions to repeating problems. The second method is analytical, exercising design ideas that are capable of solving repeated problems. The third method is holistic in which a pattern is evaluated on its wholeness, as a reflection of larger themes that are generally understood to enhance the quality of life. Patterns can therefore be considered a type of universal concept, which help derive a series of contextual solutions.

However, the concept of the archetype not only has to withstand, but also adapt to the process of any scholarly and scientific process which applies the ideas into a real world scenario. These type of scenarios are not fixed, and are impacted by many additional factors besides the concepts addressed by the pattern itself. This is partially representative of the need for a systems thinking approach that integrates patterns together, but also indicative of the need for a more comprehensive design approach. A Project Language is a messy thing, that can not rely solely on pattern concepts, but truly consider the other factors that impact which projects are chosen and how best to develop them. This means the language will include a range of proposals that may address the same pattern concept with a different type of solution. Depending on cost and scale, different projects might be more realistic for today, while others present a long term goal for a city. Some projects might have a very specific problem that they are addressing, where others are solving multiple problems at once. Lastly, some of these projects might be developed throughout the entire city, while others are meant for a very site specific location.

Whether or not a project presents the most effective solution in a given context, they directly influence the understanding of what makes a pattern. Therefore, the flow of information from project to pattern, back to project is an inescapable connection. In the new field of Pattern Language development such as survival languages, patterns should not be assumed fixed, but rather adapt along with the success or failure of their implemented projects. The primary distinction between a Pattern and a Project, is the tangible nature of the proposed designs, observable through form and/or function.

3.3 COMMUNITY PARTICIPATION: DESIGN CHARRETTE AT CAMP RILEA

The final element of the Pattern Language method is active participation by the local community. In order to gain as much input as possible, a variety of invested stakeholders from city government, emergency preparedness committees, disaster mitigation experts, and concerned residents were included in the development and design of the Pattern and Project Languages. Interviewing different members of this community and attending local emergency preparedness meetings was a valuable tool for learning about active programs and understanding existing issues. However, these conversations were more about gathering information, rather than encouraging participation in the design process.

The most successful form of participation in this project were two design and discussion charrettes that were attended by some of the most active and dedicated members of the disaster preparedness community in Clatsop County. The first charrette was held in Astoria during the summer of 2014. Over the course of a two days of presentations, workshops, and lively discussions, a variety of needs and priorities for different communities were addressed. Case studies of innovative prototype solutions were collected and shared between participants. The event was a creative and interdisciplinary method of working that empowered citizens and community leaders to collaborate with design thinkers, which led to the generation of possible solutions to some of the most pressing evacuation wayfinding concerns.

FIGURE 18

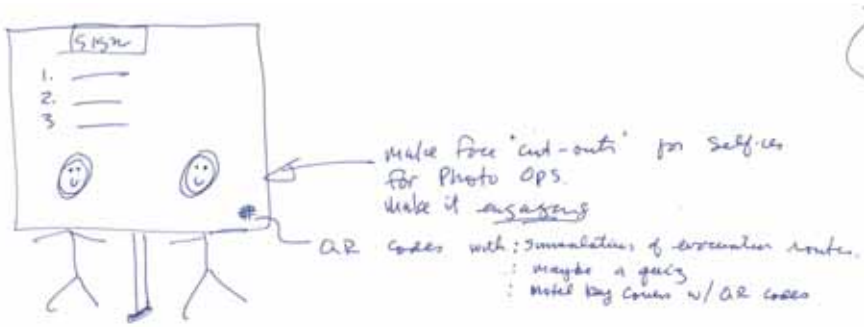


FIGURE 19

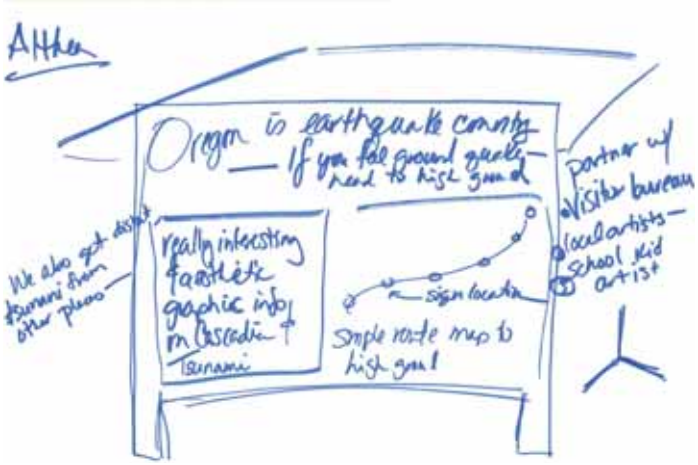


FIGURE 20

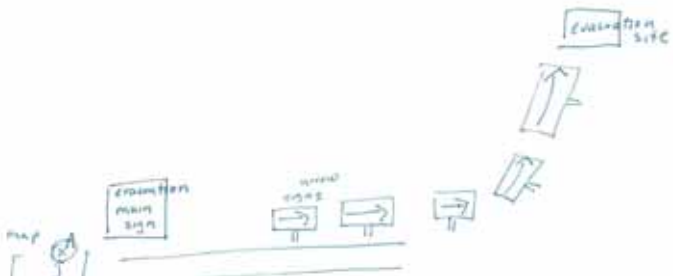


FIGURE 21

On May 14, 2015, the PUARL team held its second community stakeholder design charrette at Camp Rilea in Warrenton, Oregon. The charrette began with an introduction from the project advisor, Dr. Althea Rizzo from the Oregon Office of Emergency Management. Her introduction framed the reason for the project and the community design charrette. The emergency manager of Clatsop County, Tiffany Brown, presented the current work being done throughout the county to update Tsunami Evacuation Map Signs. Laura Stimely, a geologist from DOGAMI, presented her current work on tsunami evacuation modeling for the cities of Seaside and Warrenton. Les Weirson, a member of the Cannon Beach Emergency Prep committee, presented the progress that had been made in Cannon Beach in the last year to their maps and signage, as well as the other problems that they were currently working on solving.

The team held two design sessions for developing tsunami information stations and assembly areas response sites. These successful exercises were met with enthusiasm, and a variety of new design ideas and improvements were suggested that impacted multiple projects in the Pattern Project language. Some notable ideas were the incorporation of a universal blue sign post for all tsunami related signage and the organization of assembly area campsites revolving around a central sanitation station. An open floor discussion was held around sign and lighting designs, that provided valuable input for making final improvements to the Sign Suite found in Chapter 4.

FIGURE 22

FIGURE 23

FIGURE 24

FIGURE 25

3.4 PROJECT LANGUAGE PROPOSALS

In the final section of this chapter, we present “The Survival Project Language.” The Project Language incorporates the many different possible projects that could be implemented to improve tsunami readiness wayfinding. These proposals are a culmination of the many different ideas that were found through research, generated through design development, and suggested by members of the emergency preparedness community on the Oregon Coast. Unlike a purely local design application of a project language, these ideas are not necessarily isolated to one specific location. Although the concepts that they embody may have been inspired from an existing project or a site specific problem, it is important that these pattern derived ideas are capable of transcending their intended use, and are able to be adapted for use in other cities in a variety of forms along the Oregon coast and beyond.

Some of the included ideas are based on existing projects found in cities or other countries. Additionally, some of the ideas included were suggested to solve a particular problem observed in a specific location. This does not mean that this project could not solve a similar issue in a different city. If one of the included ideas seems to present an effective solution for a particular issue, it should be designed and developed based on the location and characteristics of that place, and not be copied without considering its new context.

The included projects are separated into three parts that address preparation, evacuation, and response. Each project is composed of its title, a statement of the intended purpose, an image illustrating the project, and a context paragraph that describes how it is solving a problem. Each project is directly related to a primary pattern, while including the other related patterns. Many of these ideas are potential projects that could be implemented based off of an observed problem, while others highlight existing projects on the Oregon coast and around the world.

FIGURE 26

3.4.1 BEFORE: PREPAREDNESS PROJECTS

1. "Blue Wave": Oregon's TsunamiReady Symbol
2. Tsunami Disaster Preparation Leaders
3. Seaside: Seawall Tsunami Wave Mural
4. Seaside: Cascadia History Wave Sculpture
5. Warrenton: 3D City Tsunami Evacuation Model
6. Seaside: Scenic Park at Assembly Area
7. Cannon Beach: Race the Wave 5k Event
8. Cannon Beach: MOOOO...vvve Uphill Evacuation Drill
9. Seaside: Tsunami Hazard Zone Signs
10. Personal Tsunami Evacuation Brochure
11. Seaside: Urban Mapping and Information Stand
12. Clatsop County: Triangular Tsunami Information Kiosk
13. Cannon Beach: "You Are Here" Arrow Sticker
14. Cannon Beach: Haystack Rock Landmark Sticker
15. Clatsop County: Tsunami Evacuation Maps for Individual Routes
16. Cannon Beach: Defining Local Evacuation Districts
17. Warrenton: Tsunami Evacuation Maps at Bus Stops
18. Seaside: Tsunami Evacuation Maps at Resting Areas
19. Cannon Beach: Tsunami Evac. Maps at Public Restrooms
20. Tsunami Information at Restroom Urinals & Stalls
21. OEM: Emergency Management Hotel Coordinator
22. Hotel Room Tsunami Evacuation Pack
23. OEM: TsunamiReady Certification Program

"Blue Wave": Oregon's TsunamiReady Symbol

Primary Pattern

-Recognizable Wayfinding Chain

Continue to integrate the "Blue Wave," which has become a recognizable international brand on tsunami related infrastructure, into new wayfinding strategies and TsunamiReady programs.

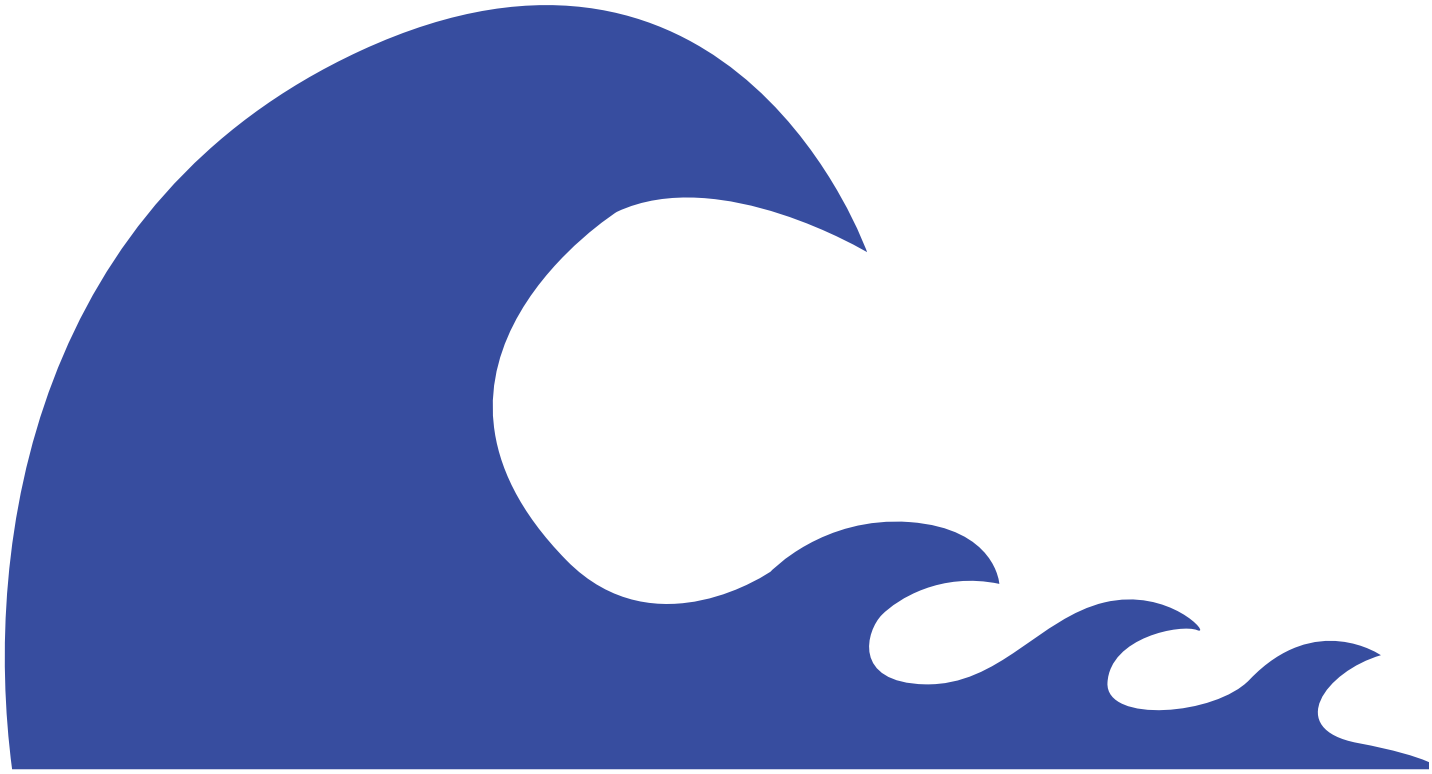


Figure 27

The wave symbol and the associated blue color that is found on tsunami wayfinding signage was originally designed in Oregon, and has since been used by many countries across the world. Beyond signage, this logo has come to represent tsunami disaster mitigation efforts across the state and internationally. It is important that this image continue to be integrated into the built and social environments, through artistic designs and murals, lighting strategies, road signs, public awareness events, certification programs, community networks, city plans, and statewide initiatives. With all of types of different programs being implemented through a wide range of scales and focus, the Blue Wave is the binding agent that can help bring these wayfinding strategies and preparedness efforts together into collaborative and resilient system. This brand represents the movement of the Oregon Coastal Community to become TsunamiReady, which can set a precedent for other states and countries threatened by a seismic sea wave to follow suit.

Related Patterns

All Current and Future Preparation, Evacuation, and Response Patterns

Tsunami Disaster Preparation Leaders

Primary Pattern

-Know What Zone

Enlist volunteers to canvas the beaches during the summer season when the population swells, in order to spread awareness and share resources with unprepared tourists and visitors.

Figure 28 Les Weirson of Cannon Beach EPREP Committee

Signage is undoubtedly a necessary communication tool, but should only be considered an individual component of a larger tsunami preparation strategy. Similarly, preparation leadership is not defined singularly, but represents a universal concern that actively addresses the education component of preparation. The coast has a substantial increase in visitors during the summer, and almost everyone spends some of their day on the beach. This is an opportunity for volunteers, from CERT organizations or high schoolers fulfilling required service hours, to canvas the beaches. They should be well informed about the threat of tsunami and evacuation strategies, in order to distribute outreach material personally and answer any questions or concerns from the public. They could wear a vest that is unmistakable and lead practice evacuations, offering participants coupons for local business discounts. This form of social interaction provides a method for delivering information to tourists that signs can not. If spoken to, people who may not have even noticed the signs on their way to the beach, are more likely to observe them on their way back into town.

Related Patterns

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Know What Zone, Public-Private Partnership, Mapping Your Neighborhood, My Personal Escape Route, Distance Matters, Primary Route Clarity, Follow the Leader, 'How-to-Guide', Campsites

Prepare 3

SEAWALL TSUNAMI WAVE MURAL

PRIMARY PATTERN

-Multi-Purpose Infrastructure

Incorporate artistic elements alongside Tsunami Evacuation Maps in order to attract people to the designs, making them more likely to observe the maps and examine the material in greater detail.

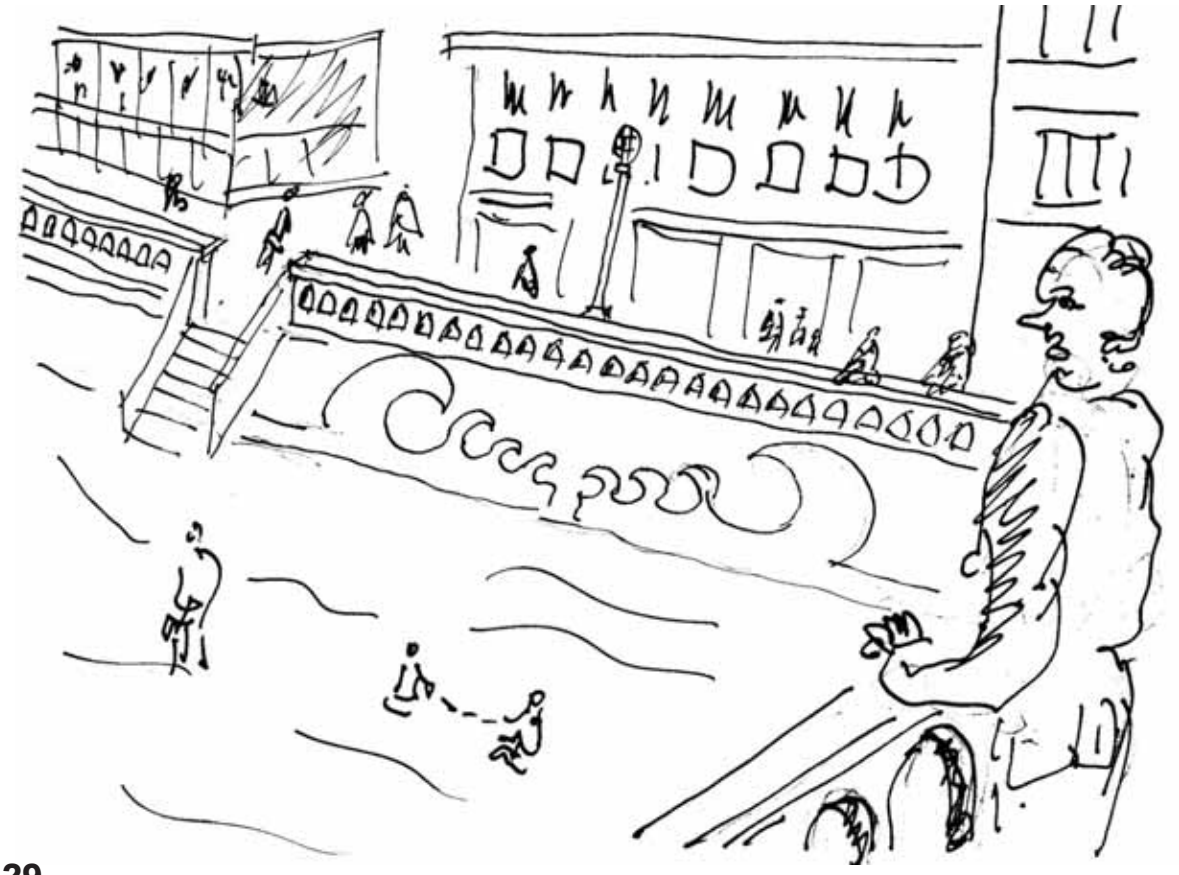


FIGURE 29

SEASIDE, OREGON

Tsunami evacuation maps are frequently located on unattractive concrete seawalls near beach entrances. Tourists that walk by these signs have repeatedly been observed passing by without a moment's notice. Because this is might be the only time that people are exposed to this information, there needs to be something that highlights the map, and engages them to learn their evacuation route. One common form of art that can achieve this purpose is painted murals. By allowing city artists in Seaside to paint adaptations of a tsunami wave on seawalls, the entrance to beaches can become much more attractive and interesting than a grey concrete wall. This mural will bring people to observe the art and gather around an area that was previously passed through and quickly walked away from. If placed strategically, Tsunami Evacuation Maps will benefit by increased viewership and examination.

Related Patterns

Recognizable Wayfinding Chain, Information Station, Know What Zone, Public-Private Partnership, My Personal Escape Route, Other Forms of Signage, Safety Zone Threshold

Prepare 4

CASCADIA HISTORY WAVE SCULPTURE

PRIMARY PATTERN

-Information Station

Design a locally appropriate installation, such as a dynamic wave sculpture, which incorporates historical information about past tsunami events caused by seismic activity along the Cascadia Subduction Zone.

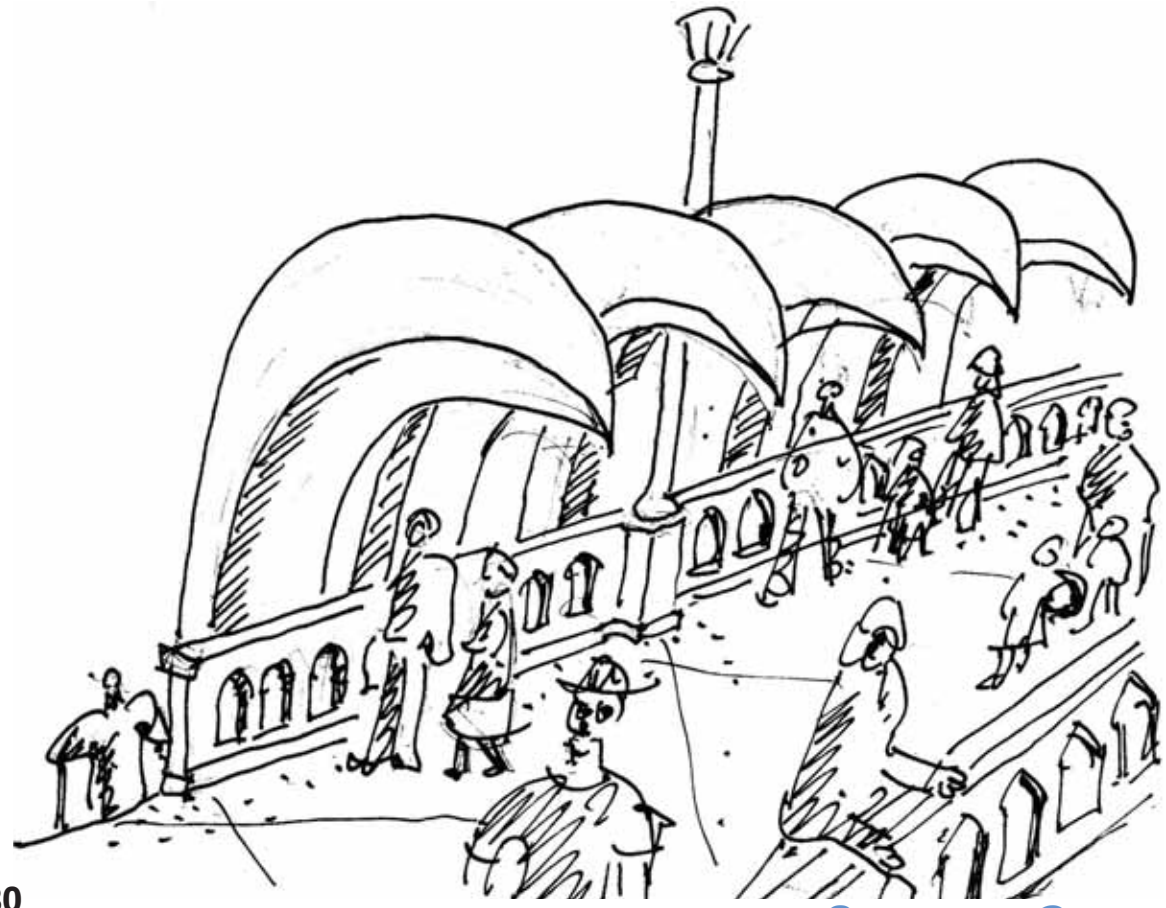


FIGURE 30

SEASIDE, OREGON

Tsunami related signage that is found throughout the city is exclusively dedicated to evacuating to assembly areas on high ground. While the evacuation maps and route signs are necessary elements for escape wayfinding, they represent the component of disaster preparedness which people find least interesting. The most common question people have when talking about the future event is not what to do or where to go, but rather what causes a tsunami and when will the next one occur. A well designed sculpture, that evokes the feeling of being inside of a wave, would be a fun and engaging method for teaching people about a tsunami and the Cascadia Subduction Zone. A series of metal or concrete forms could each represent a past seismic event, incorporating text or diagrams about its magnitude and impact on the Pacific Northwest. The last form might be left as a frame, representing the next event, provoking people's natural response to ask themselves, "When might it happen and how will it affect me?"

Related Patterns

Recognizable Wayfinding Chain, Information Station, Know What Zone, Public-Private Partnership, My Personal Escape Route, Other Forms of Signage, Follow the Leader, Safety Zone Threshold, Campsites, Sense of Place

3D City Tsunami Evacuation Model

Primary Pattern

-My Personal Escape Route

Bring unengaging Tsunami Evacuation Maps to life by designing a 3D model that will help users better understand the city topography, while highlighting evacuation routes and assembly areas.

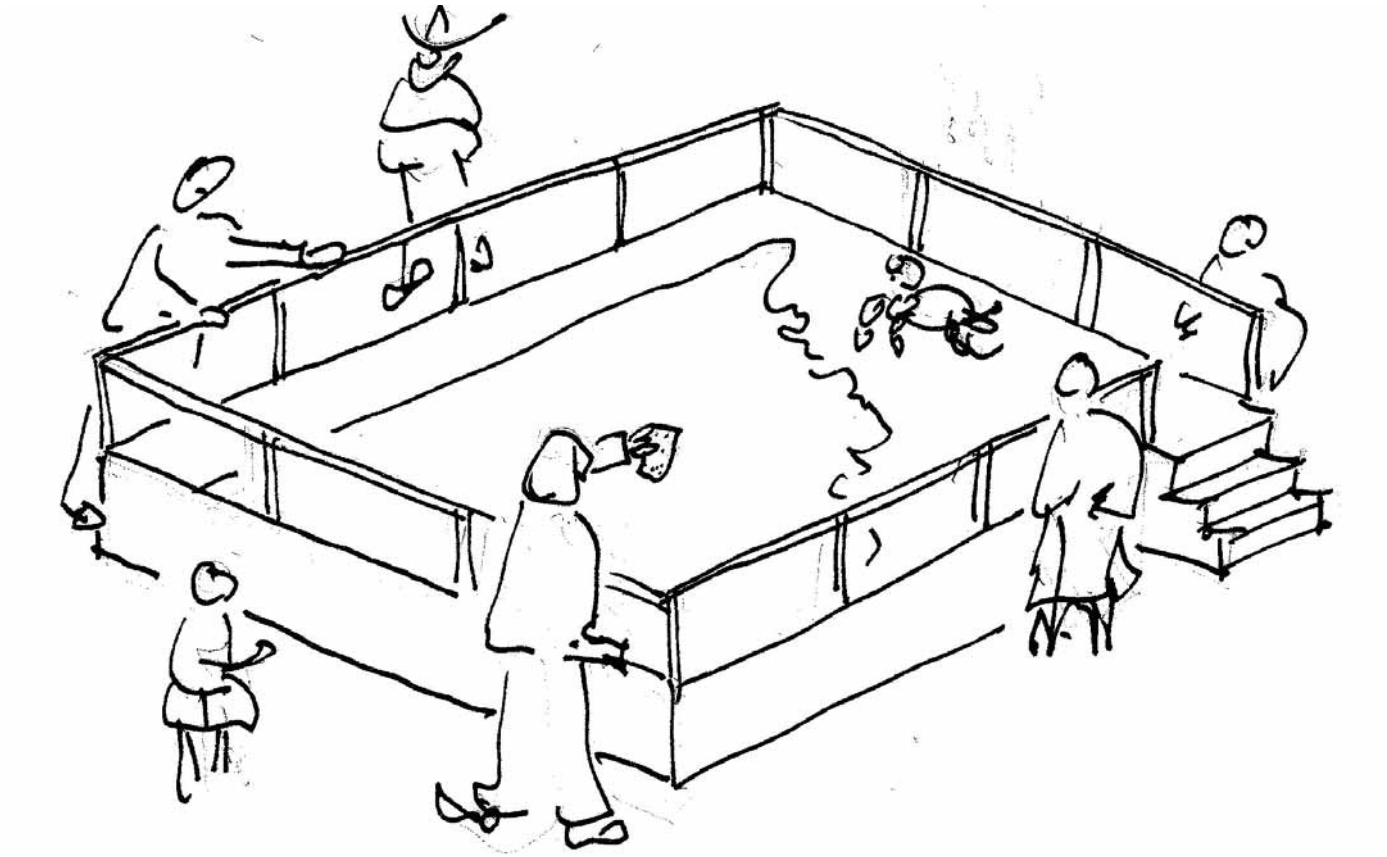


Figure 31

Warrenton, Oregon

The use of 2D maps is becoming less frequent through the development of smartphone technology, which allows users to easily locate themselves, plug in a destination, and follow the directions. While the majority of people are still capable of using a map, they no longer have a need for them. Therefore, unless the map is designed with extremely clear information, it will be glanced over without thoroughly being studied. In Warrenton, these maps are generally undervalued, and are hard to find around key areas throughout the city. However, a 3D interactive model could be an attractive feature, engaging users to touch and examine the city in its physical form. These types of models help people create a better cognitive understanding of their location within the city, and provide a dynamic method for users to learn the location of assembly areas, and the specific route that will take them there.

Related Patterns

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Information Station, Know What Zone, Mapping Your Neighborhood, Route Safety, Intuitive Signs, Distance Matters, Primary Route Clarity, Other Forms of Signage, Safety Zone Threshold, Campsites, Sense of Place

Prepare 6 Scenic Park at Assembly Area

Primary Pattern

-Multi-Purpose Infrastructure

Develop assembly areas into well designed parklets with views to the oceans, which familiarize people with the site's location; creating a cognitive link between the A on the Tsunami Evacuation Map and the memorable destination.

Figure 32

Seaside, Oregon

Many assembly areas are composed of a sign at the side of a road on safe ground. Even if that location is never meant to become a post-disaster response site, it is important that assembly areas have a memorable character, with a strong center and clear boundaries. For example, one of the northern evacuation routes in Seaside leads up to a neighborhood, where a small patch of grass rests between a series of houses. Although the A on the map seems to be on top of this patch, there is no existing Assembly Area Sign, likely because the surrounding homes are intended to shelter for evacuees. However, even without a sign, this small piece of land seems to have the natural characteristics for assembly. If it became a small parklet with a couple of benches and steps, it could easily become a popular scenic viewpoint of the ocean and coastline. This would help residents and tourists establish a cognitive map of the destination that they can rely on during an evacuation.

Related Patterns

Recognizable Wayfinding Chain, Information Station, Mapping Your Neighborhood, My Personal Escape Route, Distance Matters, Primary Route Clarity, Safety Zone Threshold, Assembly Area Essentials, Sense of Place

Prepare 7

Race the Wave 5k Event

Primary Pattern

-Recognizable Wayfinding Chain

Hold a fundraiser race that follows evacuation routes to assembly areas and response sites, in order to raise awareness of the threat, inform people of their route to safety, and increase participation of Cache Site programs.

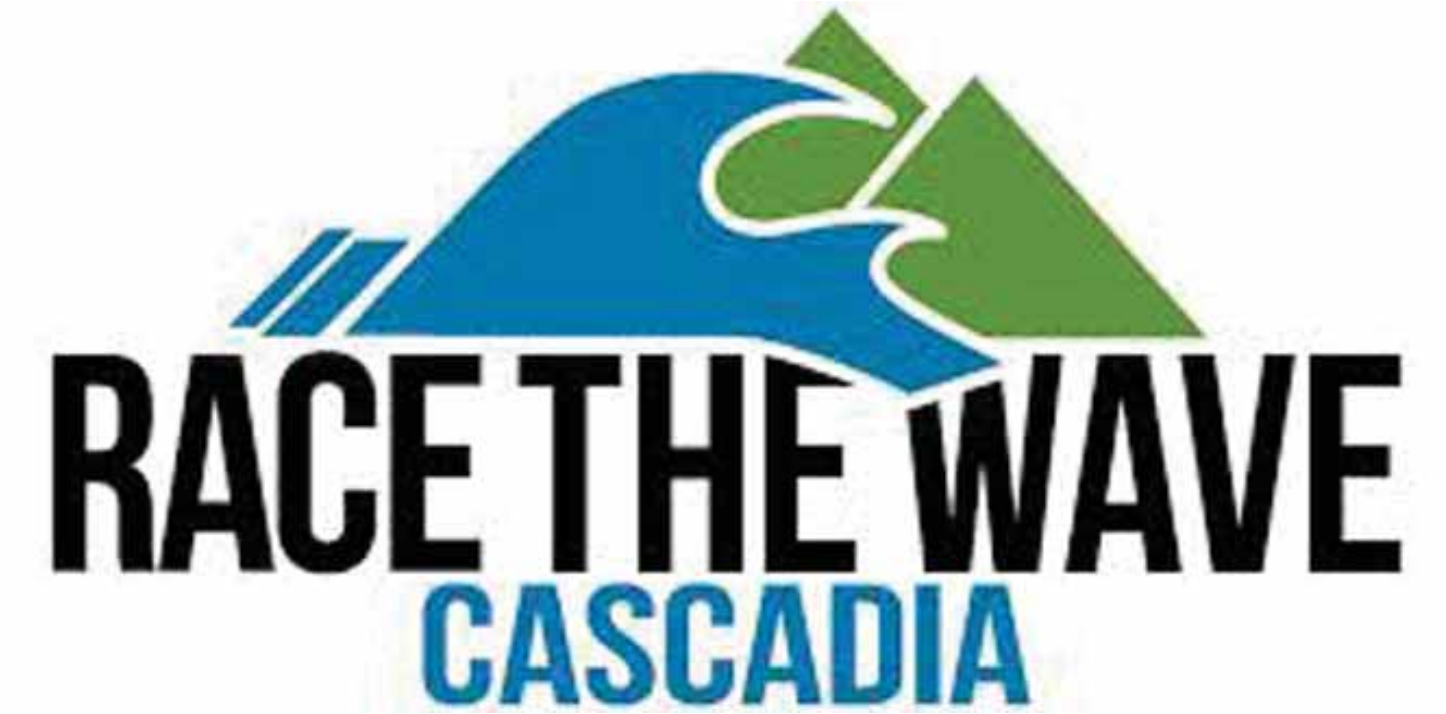


Figure 33

Cannon Beach, Oregon

A major issue with tsunami preparation is that people are either unaware of the threat or unfamiliar with their evacuation route. Wayfinding does not rely solely on effective signage, but also on repetitive use to help establish an individual's cognitive map. It is vital that people learn their routes and practice them, if they are expected to be able to find their way during an event when panicked and rushed. One way to get people to practice their routes is an event that Cannon Beach hosted on September 28, 2014 called Race the Wave. This 5k run started at the southern Tolovana Beach parking lot, and led runners along evacuation routes up to one of their three cache sites. At the end of the run, emergency management organizations had booths where they educated the participants about how they are helping make cities and individuals TsunamiReady. If possible, the extra supplies that went unused, as well as a portion of the proceeds could be donated to cache sites.

Related Patterns

Multi-Purpose Infrastructure, Information Station, Know What Zone, Public-Private Partnership, Mapping Your Neighborhood, My Personal Escape Route, Distance Matters, Primary Route Clarity, Follow the Leader, 'How-to-Guide', Cache Site Campsite, Multi-Purpose Cache Site

Prepare
8

MOOOO.....VVVE
UPHILL EVACUATION DRILLS

PRIMARY PATTERN
-Other Forms of Signage

Increase participation and support for practice evacuation drills by incorporating fun things that can lighten the moo...d of residents, who would otherwise be irritated by the interruption or ignore the sirens.

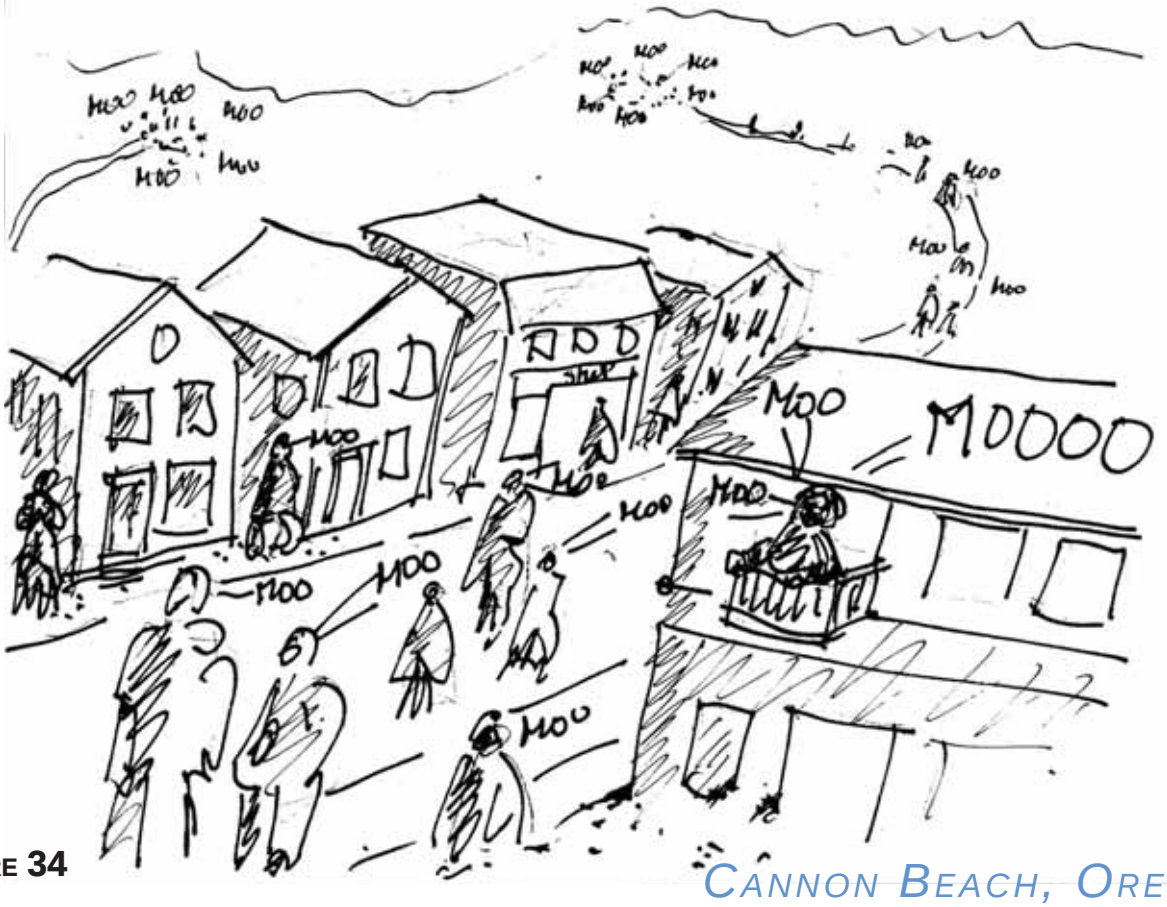


FIGURE 34 CANNON BEACH, OREGON

Twice a year, the city of Cannon Beach holds a city wide practice evacuation. They blare the sirens, and everyone is encouraged to stop what they are doing, pretend as if the earthquake just happened, and follow their evacuation route to high ground. However, many people do not participate, probably thinking to themselves that they would rather the earthquake occur than have to do another one of the drills. In order to make this less of a stressful task, they began mimicking herding cows, and started moooo....ing their way uphill. This allows them to share a playful joke that makes the drill seem like less of a burden. Since they have started doing this, the drills have a higher participation rate, and the whole thing seems more accepted by residents. It is beneficial to use similar strategies that will increase public support for practice evacuation drills and other emergency management efforts.

RELATED PATTERNS

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Know What Zone, Mapping Your Neighborhood, My Personal Escape Route, Primary Route Clarity, Follow the Leader, Safety Zone Threshold, Assembly Area Essentials, 'How-to-Guide', Campsites

Tsunami Hazard Zone Signs

Primary Pattern

-Know What Zone

Re-incorporate Tsunami Hazard Zone Signs into cities in order to noticeably state the threat of tsunami, while clearly instructing what do in the event of an earthquake.

Figure 35

The existing wayfinding system incorporates three primary signs. Maps are used to describe evacuation routes, route signs are used to guide evacuees, and assembly signs are used to indicate arrival on safe ground. While there is a very small amount of information included in the map, nowhere else in this system does it clearly inform people that they are in a tsunami hazard zone, and should go to high ground in the event of an earthquake. The hazard zone sign was most likely removed from cities because it was assumed to induce fear which would deter tourism. While its instructions may seem obvious to some, a substantial amount of people do not even know that tsunamis and earthquakes are related, or that they are in a hazard zone in the first place. The more people know, the more likely they are to survive. The less people know, the less likely they are to survive. This sign should be reincorporated into cities to clearly tell people that they are in a tsunami hazard zone, and should quickly evacuate to high ground in the event of an earthquake.

Related Patterns

Recognizable Wayfinding Chain, Information Station, Route Safety, My Personal Escape Route, Intuitive Signs, Primary Route Clarity, Assembly Area Essentials, 'How-to-Guide', Campsites

Personal Tsunami Evacuation Brochure

Primary Pattern

-Information Station

Make Tsunami Evacuation Maps, as well as other useful information for preparation and evacuation, available to the public on a printed brochure or online document.

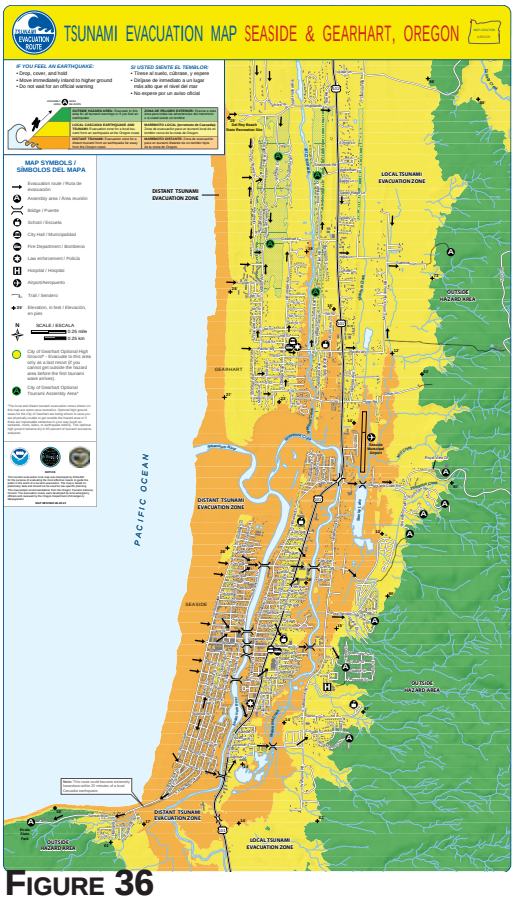


FIGURE 36

WHAT TO KNOW about tsunamis

A ***tsunami*** is a series of sea waves, usually caused by a displacement of the ocean floor by an undersea earthquake. As tsunamis enter shallow water near land, they increase in height and can cause great loss of life and property damage.

Recent research suggests that tsunamis have struck the Oregon coast on a regular basis. They can occur any time, day or night. Typical wave heights from tsunamis occurring in the Pacific Ocean over the last 500 years have been 20–65 feet at the shoreline. However, because of local conditions a few waves may have been much higher — as much as 100 feet.

We distinguish between a tsunami caused by an undersea earthquake near the Oregon coast (a **local** tsunami) and an undersea earthquake far away from the coast (a **distant** tsunami).

BE PREPARED!

Assemble **emergency kits** with at least a 3-day supply for each family member:

- Local map showing safe evacuation routes to high ground
- First-aid supplies, prescriptions and non-prescription medication
- Water bottle and filtration or treatment supplies capable of providing 1 gallon per person per day
- Non-perishable food (ready-to-eat meals, canned food, baby food, energy bars)
- Cooking and eating utensils, can opener, Sterno® or other heat source
- Matches in water-proof container or lighter
- Shelter (tent), sleeping bags, blankets
- Portable radio, NOAA weather radio, flashlight, and extra batteries
- Rain gear, sturdy footwear, extra clothing
- Personal hygiene items (toilet paper, soap, toothbrush)
- Tools and supplies (pocket knife, shut-off wrench, duct tape, gloves, whistles, plastic bags)
- Cash

How to help with tsunami awareness in your community

- Start a tsunami buddy system
- Make and distribute emergency packs
- Initiate or participate in a local preparedness program

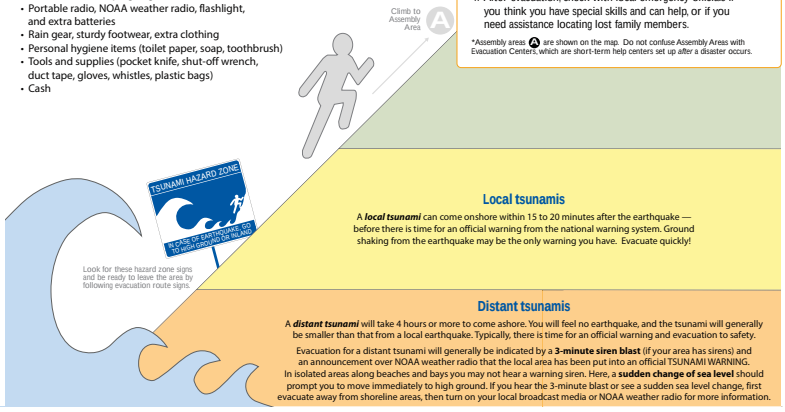
Visit **OregonTsunami.org** to find more great resources!

WHAT TO DO for both local and distant tsunamis

TSUNAMI EVACUATION ROUTE

1. Evacuate on foot, if at all possible. Follow evacuation signs and arrows to an Assembly Area.*
2. If you need help evacuating, tie something **white** (sheet or towel) to the front door knob. Make it large enough to be visible from the street. If the emergency is a distant tsunami, then help may arrive. In the event of a local tsunami, it is unlikely that anyone will help you, so make a plan and be prepared!
3. Stay away from potentially hazardous areas until you receive an ALL CLEAR from local officials. Tsunamis often follow river channels, and dangerous waves can persist for several hours. Local officials must inspect all flooded or earthquake-damaged structures before anyone can go back into them.
4. After evacuation, check with local emergency officials if you think you have special skills and can help, or if you need assistance locating lost family members.

*Assembly areas (A) are shown on the map. Do not confuse Assembly Areas with Evacuation Centers, which are short-term help centers set up *after* a disaster occurs.



One of the first things that tourists visiting a new place do, is buy a map of the city that they can use when travelling around town. These types of personal maps are helpful, because they can be marked up and referred to at anytime. Tsunami Evacuation Maps found at beach entrances help inform people of their general route, but are fixed and cannot be referenced later. Each city on the Oregon Coast has been provided with a pamphlet, that includes the city Tsunami Evacuation Map on one side, and a wealth of tsunami information and instruction on the other. These brochures are a valuable resource, but are sometimes hard to acquire. Printing them is not cheap, so many Visitor's centers are of low supply. Although some cities have a well prepared tourist industry with brochures at all hotels, just as many if not more do not. It is a continuing effort between state, county, city, and local entities to make them freely available to tourists and residents alike.

Related Patterns

Recognizable Wayfinding Chain, Know What Zone, Public-Private Partnership, Mapping Your Neighborhood, My Personal Escape Route, Intuitive Signs, Primary Route Clarity, Safety Zone Threshold, Assembly Area Essentials, 'How-to-Guide', Sense of Place

Prepare 11

URBAN MAPPING AND INFORMATION STAND

PRIMARY PATTERN

-Information Station

Design an interactive kiosk to integrate tsunami wayfinding material alongside city programs and local businesses. This will engage users and integrate the many disaster preparation efforts into the urban fabric of the city.

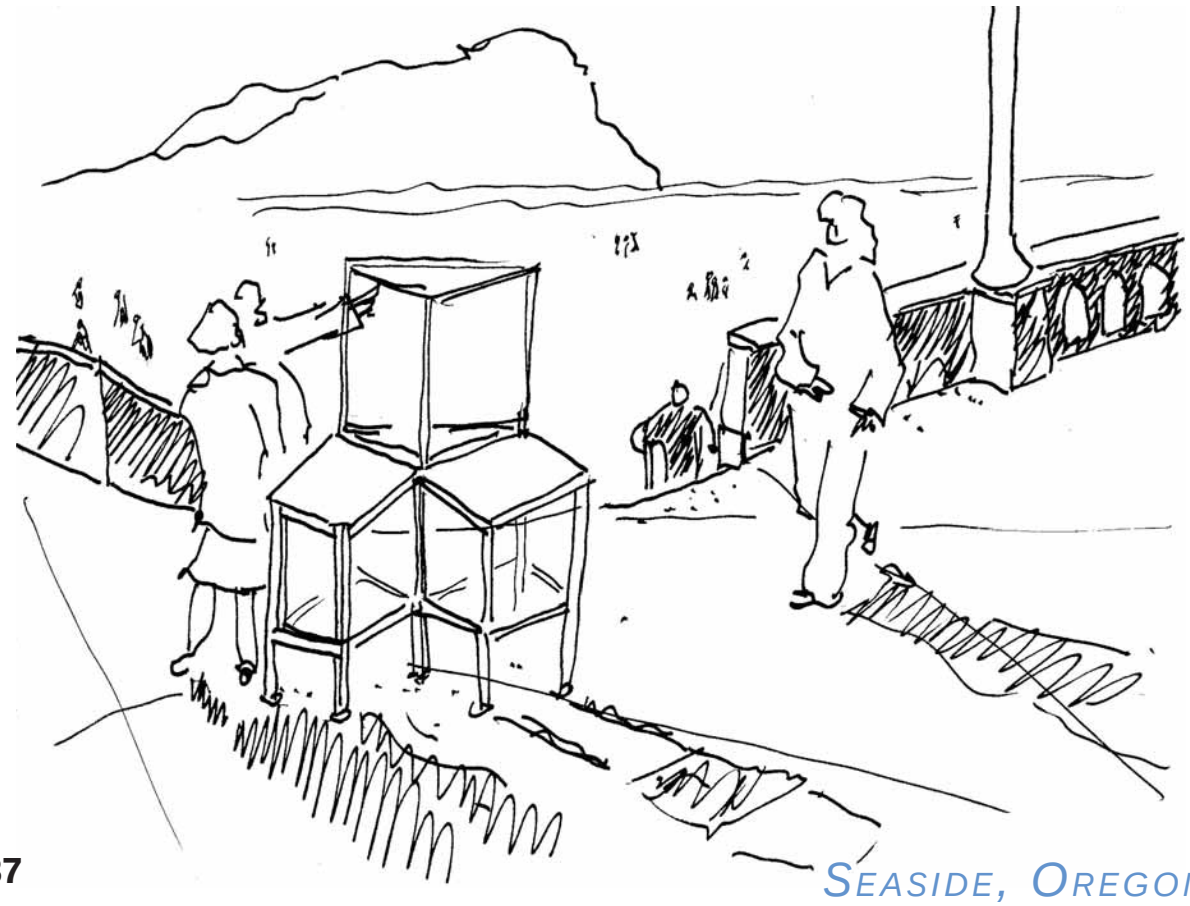


FIGURE 37

SEASIDE, OREGON

Tsunami and city information can rarely be found harmoniously together. The idea of a tsunami induces fear, which is why evacuation signage seems isolated, non existent, or hidden through sign fatigue. Seaside, which has a dense and diverse character, could design a dynamic structure that integrates tsunami information with city history, annual events, tourist features, and existing businesses. Evacuation maps could incorporate practice evacuation routes, showing local businesses along the way that would provide discounts or clues. It might include adaptable bulletin space for community awareness events and fundraisers, as well as touch screens with interactive tsunami preparation, city history, and state park wildlife videos all funded by local business advertising segments. It might be big enough to walk through, which could feel like entering into a wave, with cool diagrams, moveable panels, and sound effects for children. This individual station could be a method for enhancing tsunami preparation in a fun way, while encouraging city-wide participation.

RELATED PATTERNS

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Know What Zone, Public-Private Partnership, Mapping Your Neighborhood, My Personal Escape Route, Primary Route Clarity, Other Forms of Signage, Lights at Night, Follow the Leader, Safety Zone Threshold, 'How-to-Guide', Campsites, Sense of Place

Prepare 12

Triangular Tsunami Information Kiosk

Primary Pattern

-Information Station

Design a multi-purpose triangular kiosk that incorporates Evacuation Route Maps, tsunami wayfinding instructions, and historic information of the Cascadia Subduction Zone on one highly engaging and functional display.

Figure 38

Charrette Generated Idea

Tsunami Evacuation Maps include minimal information, which does not easily convey precise evacuation routes or give clear evacuation instructions. They are often located in places that are in the way of foot traffic, and can only be examined by a couple of people at any given time. The way that this information is conveyed, as well as the structure on which it is placed could easily be improved for every city. A triangular metal frame, could provide three faces with important tsunami related information, which could be replicated for each city, as a recognizable element for tsunami preparation between cities in Clatsop County. One side could include evacuation maps of the city and the specific location of the kiosk. The second could provide instructions and strategies for preparation, evacuation and response. The last could incorporate diagrams and text that educate people about the Cascadia fault line, and describe the effects that tsunamis have on the Pacific Northwest.

Related Patterns

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Know What Zone, Mapping Your Neighborhood, My Personal Escape Route, Intuitive Signs, Primary Route Clarity, Lights at Night, Safety Zone Threshold, 'How-to-Guide', Campsites, Sense of Place

Prepare 13

"You Are Here" Arrow Sticker

Primary Pattern

-My Personal Escape Route

Place "You Are Here" stickers in the appropriate location on Tsunami Evacuation Map Signs around the city, which is a low budget solution that greatly improves the maps legibility.

Figure 39

Cannon Beach, Oregon

It is important to be able to easily locate oneself on a map in order to determine the best route to a desired destination. A "You Are Here" symbol, is an effective strategy used in malls to help establish location in relation to the place where the user wants to go. Unlike the personal brochures, Tsunami Evacuation Maps found around the city are in a fixed location, which can not be taken around and used when needed. Therefore, it is important that users are clearly able to identify their location in order to study the route that will take them to safety. Cannon Beach created a sticker of an arrow with the words "You Are Here," and placed them on the appropriate location of each of the Tsunami Evacuation Maps found around town. Instead of printing a series of new maps, this was a low cost solution that could be implemented after the signs were fixed at beach entrances. This is an effective strategy for helping users to determine their own personal evacuation route to the designated assembly area.

Related Patterns

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Information Station, Know What Zone, Mapping Your Neighborhood, Intuitive Signs, Distance Matters, Primary Route Clarity, Safety Zone Threshold, Campsites, Sense of Place

Prepare 14

Haystack Rock Symbol Sticker

Primary Pattern

-My Personal Escape Route

Represent easily identifiable landmarks located throughout the city on Tsunami Evacuation Map Signs, in order to help people learn their evacuation routes with clear points of reference.

Figure 40

Cannon Beach, Oregon

The scale of city maps are often zoomed out to the point that it can become very difficult to figure out how to identify oneself in relation to the surrounding streets and buildings. The use of landmarks on maps, usually in the form of famous and recognizable buildings, makes the map more effective, supporting people's ability to create a cognitive map of their surroundings. Tsunami Evacuation Maps usually incorporate symbols for city hall, police and fire departments, and schools, which are useful to locals, but meaningless to most tourists who do not know where these facilities are located. Cannon Beach has a famous landmark called Haystack Rock that can be seen throughout the city, and is known by everyone, resident and tourist alike. They placed a sticker of this rock on all of the evacuation maps around the city, which improves legibility. This helps people learn their routes, because they can reference their current location in relation to easily identified landmarks.

Related Patterns

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Information Station, Know What Zone, Mapping Your Neighborhood, Intuitive Signs, Distance Matters, Primary Route Clarity, Safety Zone Threshold, Campsites, Sense of Place

Tsunami Evac. Maps for Individual Routes

Prepare 15

Primary Pattern

-My Personal Escape Route

Provide popular beach entrances and high traffic areas with Tsunami Evacuation Maps that show that specific route on a larger scale, making it more simple for users to understand their own path to safety.

Figure 41

Clatsop County

Over the years, updates and improvements to tsunami wayfinding signage elements are continually made on a city, county, and state level. As tsunami inundation and pedestrian evacuation modeling has been developed, the information shown on Tsunami Evacuation Maps has also been enhanced. One of the earliest versions of the latest set of maps showed two graphics side by side; one of the city and the other of the county coastline. A newer sign had a larger scale map of the city, which improved its graphic legibility. However, at that scale it is still difficult to plan a detailed evacuation route. Clatsop County recently developed a larger scale map, which details the specific evacuation route from the location of the map to the nearest assembly area. The main function of these maps is to not show every route and assembly area in the city, but rather to convey the precise evacuation route that will lead someone to safety. Over 60 of these maps line the Oregon Coast at key beach entrances, tourist attractions, and downtown areas.

Related Patterns

Recognizable Wayfinding Chain, Information Station, Know What Zone, Mapping Your Neighborhood, Route Safety, Intuitive Signs, Distance Matters, Primary Route Clarity, Safety Zone Threshold, Campsites, Sense of Place

Prepare 16

Defining Local Evacuation Districts

Primary Pattern

-Mapping Your Neighborhood

Single out each assembly areas within a city in order to effectively plan local preparation, evacuation, and response strategies for the surrounding community that will be evacuating to that area during the event.

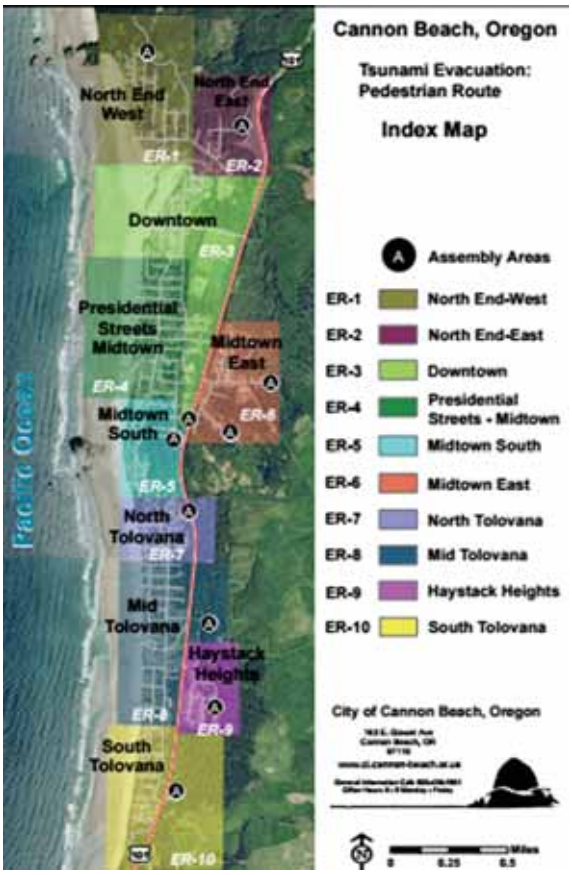


Figure 42

Cannon Beach, Oregon

Most tsunami evacuation planning is done by individual families or larger city initiatives. The reality is that smaller networks of people rely on each other for survival. Cannon Beach enacted a program where they created evacuation zones based upon 10 designated assembly areas, in order to understand the threats and opportunities for each district. They provided a larger scale evacuation map of each zone, with arrows along each road, and distributed them to the personal residents and local businesses in the area. Members of their EPREP (Emergency Preparedness) committee, each living in the different zones, support their neighborhoods to respond together, and bring the lessons they learn and strategies they find useful back to their EPREP meetings for review. This is an effective adaptive process, that does not rely on the government to complete larger comprehensive projects. Instead, they are able to continue to make positive strides by constantly scaling between efforts done on an individual family, local community, or city level.

Related Patterns

Recognizable Wayfinding Chain, Information Station, Know What Zone, Public-Private Partnership, Route Safety, My Personal Escape Route, Intuitive Signs, Primary Route Clarity, Safety Zone Threshold, Assembly Area Essentials, Campsites

Prepare 17

Bus Stop w/ Tsunami Evacuation Maps

Primary Pattern

-Information Station

Place Tsunami Evacuation Map Signs on public infrastructure along primary evacuation routes, that can easily be seen by anyone passing through the main intersections of town.

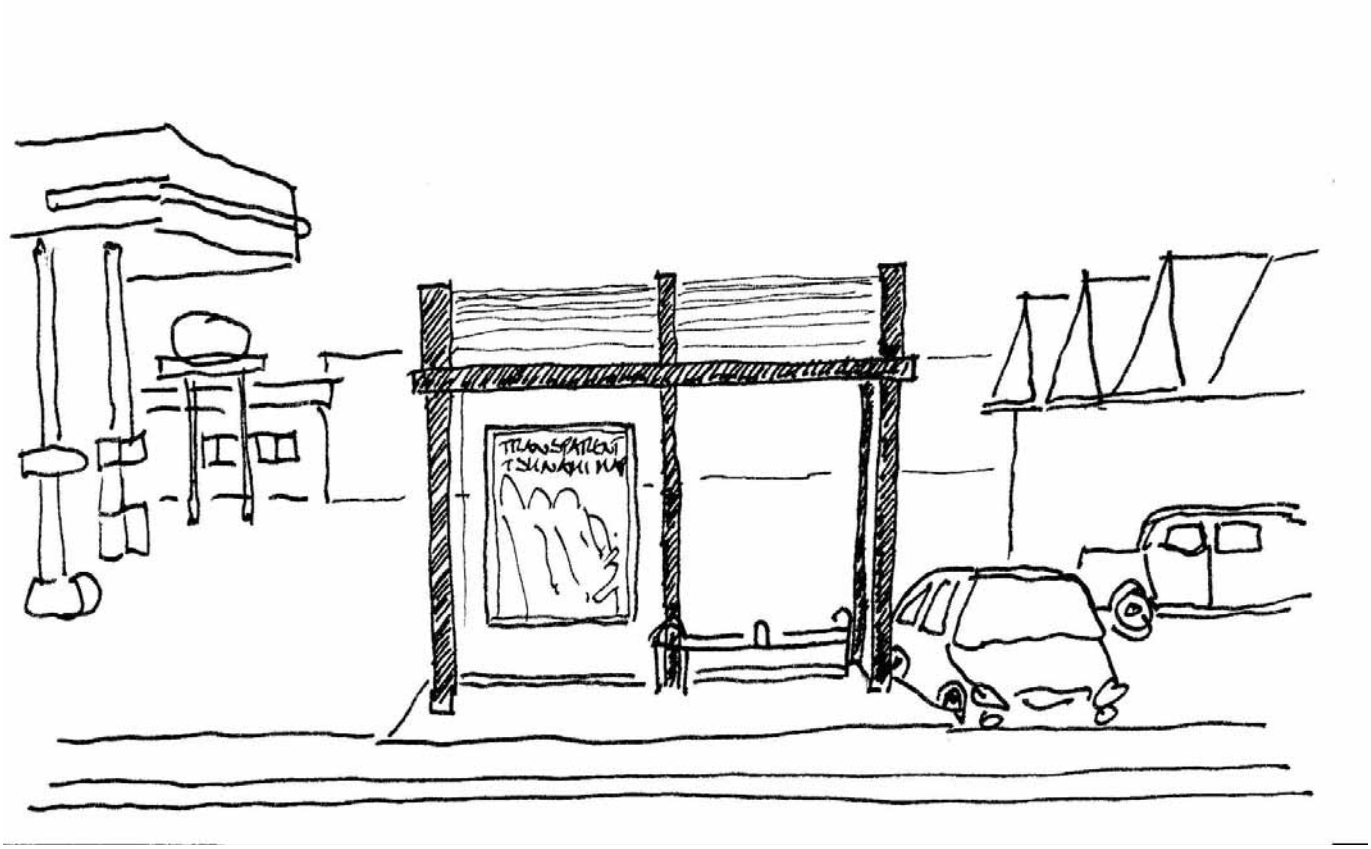


Figure 43

Warrenton, Oregon

The downtown area of Warrenton is in a location where it is difficult to determine what route leads to high ground. Along the Fort Stevens Highway, at the busy intersection of Main Ave and Harbor Street, there is a bus stop in front of the Shell gas station, across the street from the Warrenton Post Office. This metal structure is covered above, with three glass panel walls, enclosing a small metal seat for two. Currently, these glass panels are empty, providing visibility through the entire structure. A Tsunami Evacuation Map, could be placed in the enclosure, that will be examined by people while they wait for their bus. Additionally, the colorful map differentiates itself from the monochrome glass and metal structure, drawing the attention of people walking or driving through the intersection. The sign would be placed in a comfortable location that is not in the way of traffic, providing people a comfortable place to examine the map and study their route to safety.

Related Patterns

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Know What Zone, Mapping Your Neighborhood, My Personal Escape Route, Intuitive Signs, Distance Matters, Primary Route Clarity, Safety Zone Threshold, Campsites, Sense of Place

Prepare 18

Tsunami Evacuation Maps at Resting Areas

Primary Pattern

-Information Station

Place Tsunami Evacuation Map Signs adjacent to high traffic pedestrian area while incorporating a comfortable space to step aside to examine the information and learn routes.

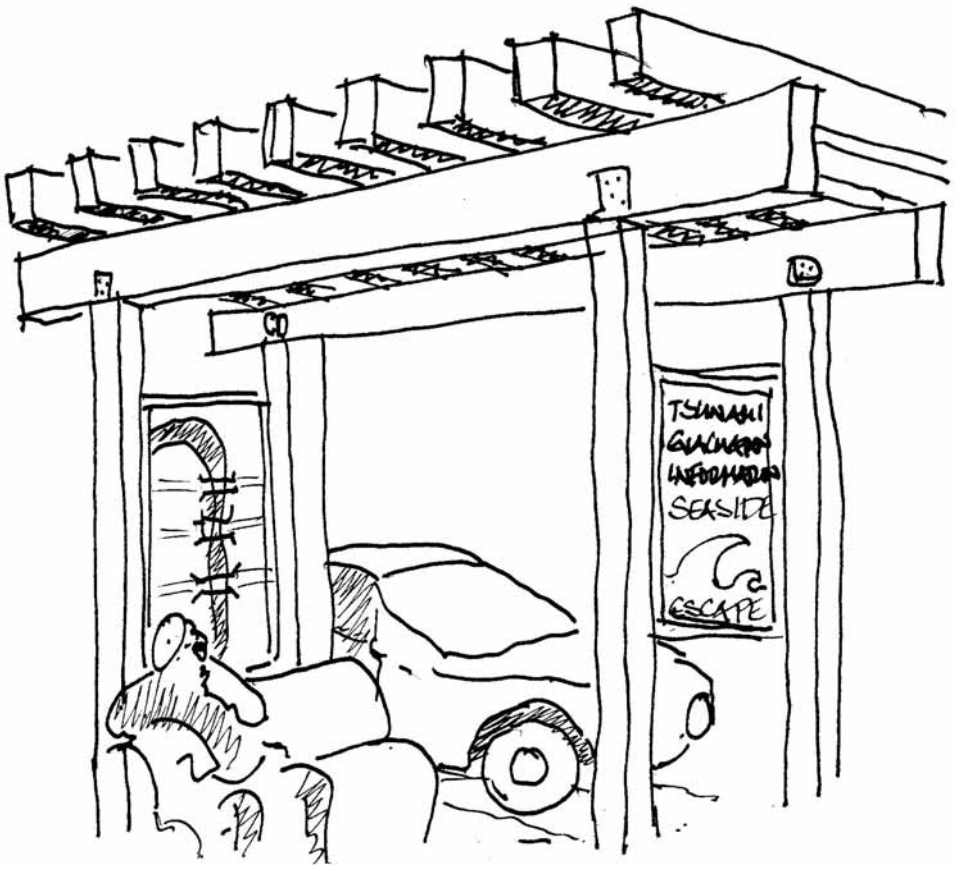


Figure 44

Seaside, Oregon

Broadway Street, the primary avenue in Seaside, runs through the heart of downtown. It is scattered with wooden structures that have dense foliage on top of them, creating a comfortable resting area. These structures include two benches facing each other which allow visitors a place to temporarily relax and get out of the hot sun. These structures provide an opportunity to place tsunami evacuation maps and other information between the two posts on either side, behind each seat. Not only will users of the covered areas be encouraged to examine the tsunami information, but the information will be visible to many pedestrians walking down the major avenue. If the resting area is not being used, interested passer-byes are given the opportunity to step away from the sidewalk, and study the maps without feeling as if they getting in the way of foot traffic.

Related Patterns

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Know What Zone, Mapping Your Neighborhood, Public-Private Partnerships, My Personal Escape Route, Intuitive Signs, Distance Matters, Primary Route Clarity, Lights at Night, Safety Zone Threshold, Campsites, Sense of Place

Prepare 19

Tsunami Evac. Maps at Public Restrooms

Primary Pattern

-Information Station

Place a Tsunami Evacuation Map Sign close to public facilities that are frequently used by visitors and tourists, so that they have the opportunity to study them when they go to, or wait for their companion to use the restroom.

Figure 45

Cannon Beach, Oregon

The city of Cannon Beach is a common tourist destination during the summer months. Close to the entrance of the town, before entering the main commercial streets, a public area incorporates the visitor's center, a small parklet, public parking, and public restrooms. Many people visiting the town, pass by this area first, and use it as a starting point for their trip. Individuals are seen waiting around, looking at information maps, going to the bathroom, or waiting for their family and friends. Because of its frequent use, the city recently placed an evacuation map on the wall of the restroom, where many people are seen waiting or walking by to enter the facility. It is in a shaded area, without being too close or far away from the entrance to the male or female bathroom, which effectively allows a shaded place for its examination by anyone that uses the facilities.

Related Patterns

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Know What Zone, Mapping Your Neighborhood, My Personal Escape Route, Intuitive Signs, Distance Matters, Primary Route Clarity, Lights at Night, Safety Zone Threshold, Campsites, Sense of Place

Prepare 20 Information at Restroom Urinals & Stalls

Primary Pattern

-Information Station

Place tsunami related information in a location where people are temporarily constrained to a bathroom urinal or stall, so that they are compelled to examine the material and become more prepared for an event.

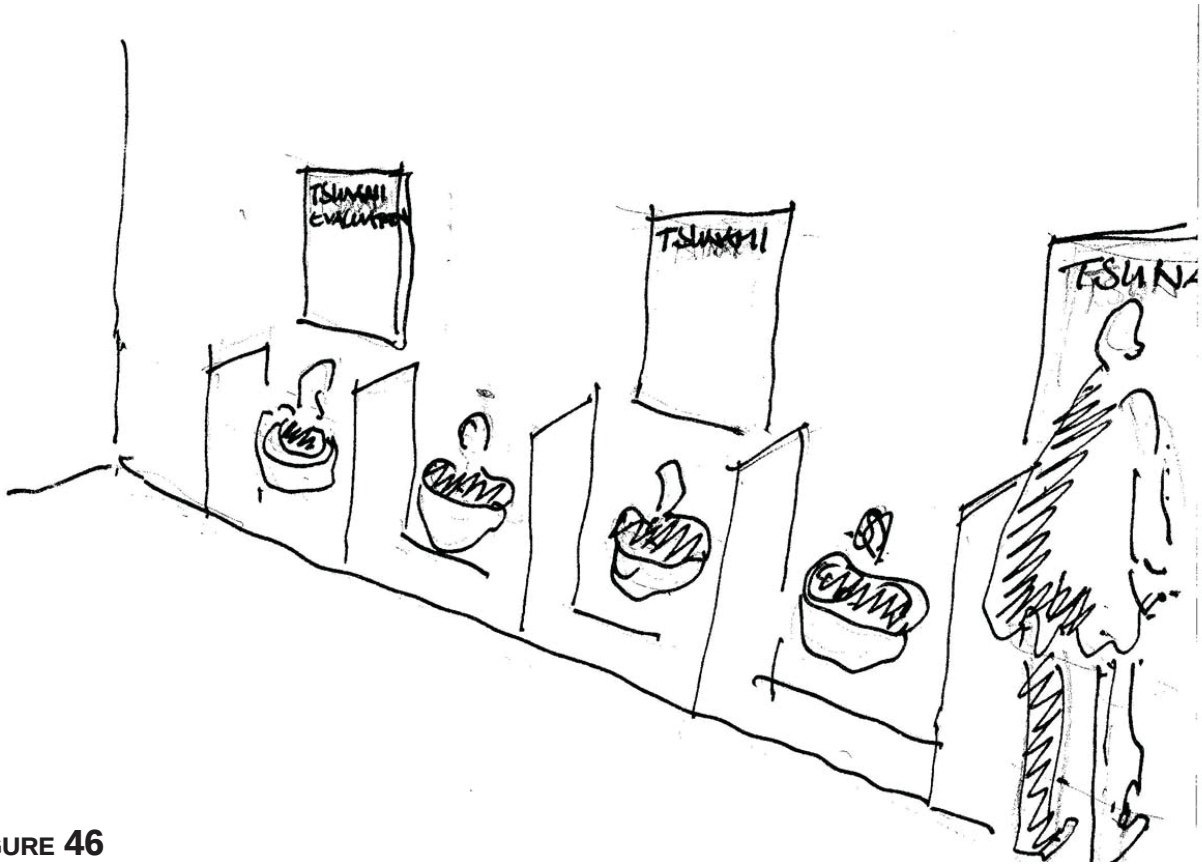


Figure 46

Many people when walking around a city may not even notice Tsunami Evacuation Map Signs, or care to examine them in greater detail. However, everyone has to use the bathroom at some point or another, and for that brief period of time, they are bound to that location. Many sporting stadiums place advertising above urinals, and some country clubs even post the daily paper for light reading. This is an opportune time to impart potentially life saving information about what to do in the event of a tsunami. By posting simple and clear instructions in front of urinals or behind stall doors in public restrooms, restaurants, and even hotels, basic tsunami information will reach a much larger group of people. If done appropriately, this method will likely spark conversation between families and friends after someone uses the bathroom, which might encourage further investigation and preparation planning. This idea was proposed by a participant of the first design charrette, as somewhat of a comical, yet effective solution for raising tsunami awareness.

Related Patterns

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Know What Zone, Public-Private Partnership, Mapping Your Neighborhood, My Personal Escape Route, Intuitive Signs, Primary Route Clarity, Other Forms of Signage, Safety Zone Threshold, Campsites, Sense of Place

Prepare 21

EMERGENCY MGMT. HOTEL COORDINATOR

PRIMARY PATTERN

-Public-Private Partnership

Establish a state, county, or city Hotel Preparedness Coordinator that is in charge of collaborating with hotels to ensure that they are equipping their high risk guests with the knowledge and resources to prepare for a tsunami event.

FIGURE 47

Most people coming to the Oregon Coast for vacation stay for multiple days, and rent rooms at a hotel/motel or vacation rental. There is no assurance that they will go to the beach or visitor's center where they can find valuable tsunami evacuation. However, they will be staying at the hotel facilities and interacting with the attendant, perhaps asking them what to do during their visit. This is the one opportunity where the city can be assured that tourists are made aware of the threat and provided with the basic instructional materials to make an evacuation plan. They can also provide some supplies that would be useful for evacuation. While the policy for different facilities and different cities varies greatly, OEM created a new position that is in charge of establishing procedures that hotels should follow when providing tsunami information and evacuation resources to their guests. Furthermore, they are in charge of coordinating with the cities and businesses to ensure that they are being put into practice.

RELATED PATTERNS

Multi-Purpose Infrastructure, Information Station, Know What Zone, Mapping Your Neighborhood, Route Safety, My Personal Escape Route, Primary Route Clarity, Lights at Night, Follow the Leader, Safety Zone Threshold, Assembly Area Essentials, 'How-to-Guide', Triage and Registration, Campsites

Prepare 22

Hotel Room Tsunami Evacuation Pack

Primary Pattern

-Public-Private Partnership

Establish regulations for hotels to provide their rooms with a tsunami evacuation kit, which would include the necessary information and supplies to prepare their guests for tsunami evacuation.

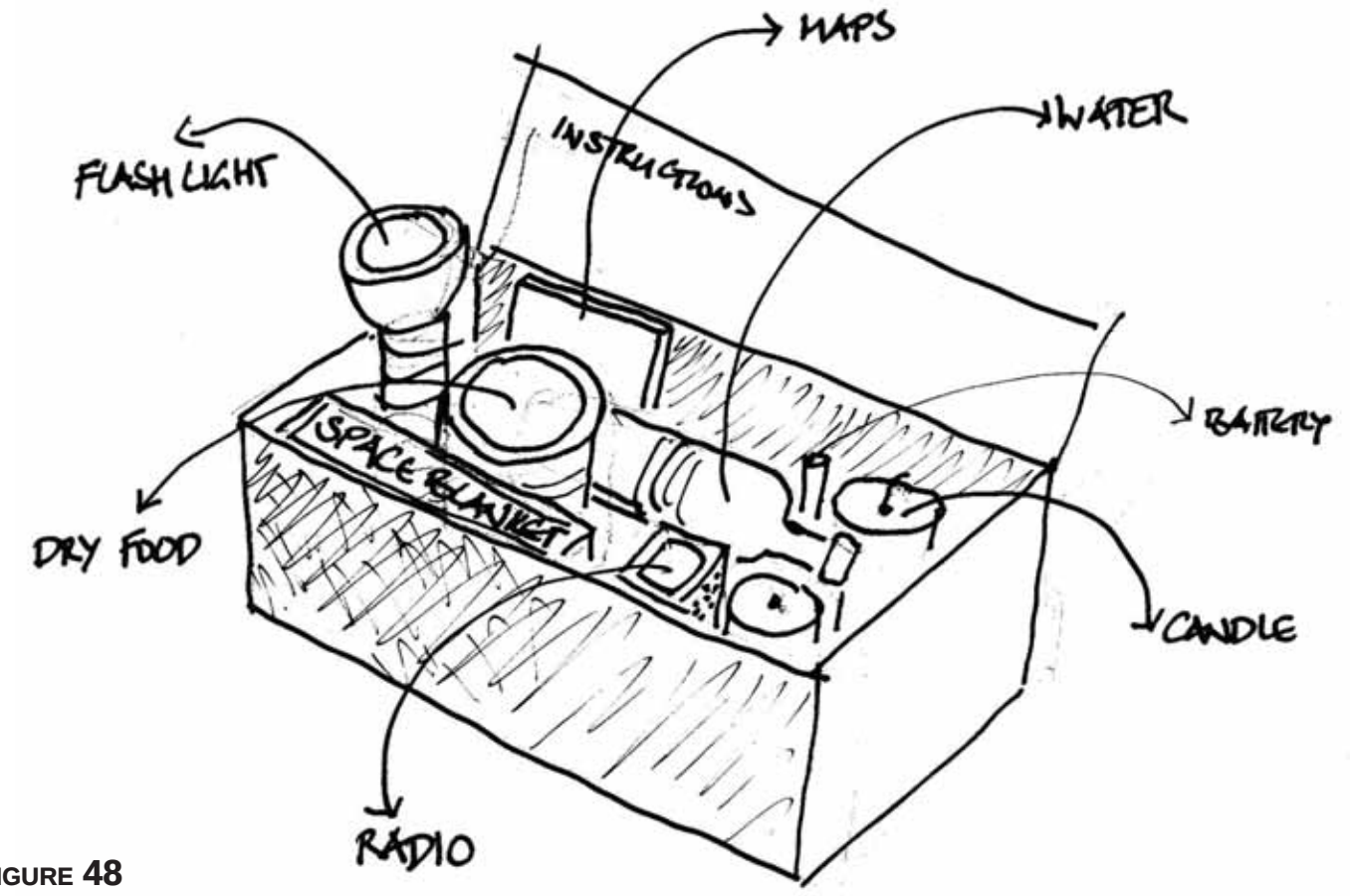


Figure 48

Although most are underprepared, permanent residents and long time vacation home owners, are given plenty of opportunity to understand the threat, create an evacuation plan, and build a survival "go bag." Unlike permanent residents, it is unrealistic to expect visitors and tourists to search the city for tsunami information, create an evacuation plan, and bring or build a survival pack. This is why it is important to support these short term inhabitants with the basic knowledge and resources for survival. Some establishments provide rooms with evacuation packs, but many do not, leaving their guests unprepared without immediately accessible pre-packed supplies. It should be mandatory to keep an evacuation pack in every hotel/motel or vacation rental, which has a universal design to cut down costs and ensure participation. They should include preparedness planning documents and evacuation route maps, as well as practical escape and survival resources.

Related Patterns

Multi-Purpose Infrastructure, Information Station, Know What Zone, Mapping Your Neighborhood, Route Safety, My Personal Escape Route, Primary Route Clarity, Lights at Night, Follow the Leader, Assembly Area Essentials, 'How-to-Guide', Triage and Registration, Campsites

TsunamiReady Certification Program

Primary Pattern

-Public-Private Partnership

Train local business managers and employees to provide important information about the tsunami threat and lead their clients to safety in the event of a tsunami evacuation.

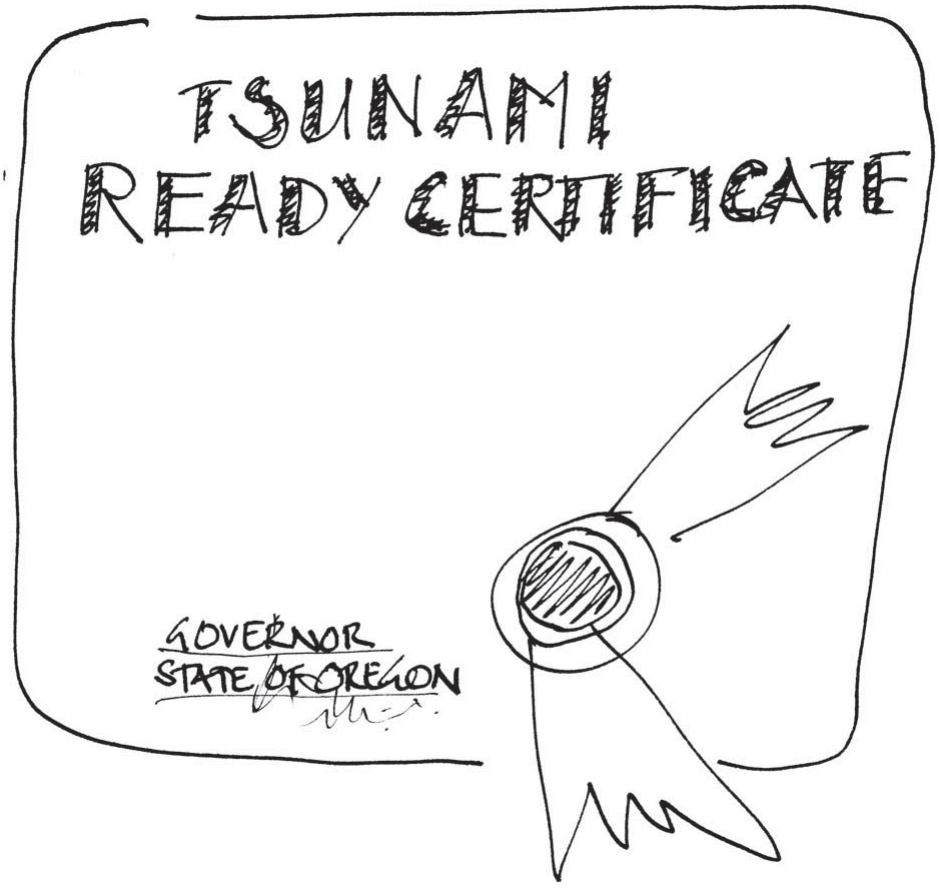


Figure 49

While a majority of permanent residents in coastal cities live close to or on high ground, many of the rental properties and local businesses are located in some of the higher risk tsunami hazard zones. These businesses, and the people that run them, profit by providing tourists and visitors with shelter, gifts, and food, and should therefore be partially responsible for the welfare of these people during their stay. In the event of a tsunami, these business owners and employees should be prepared to not only to lead their guests and clients to safety, but also keep the businesses records safe for future rebuilding. This certification program would provide local businesses with free training and resources to make them effective leaders before and during the event. By participating, these businesses would increase the community's ability to respond to the event together, and benefit economically through tax incentives and public recognition.

Related Patterns

Recognizable Wayfinding Chain, Information Station, Know What Zone, Mapping Your Neighborhood, Route Safety, My Personal Escape Route, Intuitive Signs, Primary Route Clarity, Other Forms of Signage, Follow the Leader, , Assembly Area Essentials, 'How-to-Guide', Triage and Registration, Campsites

3.4.2 DURING: EVACUATION PROJECTS

24. Tsunami Disaster Evacuation Leaders
25. Google Maps Tsunami Evacuation Route App
26. Cannon Beach: Independent Posts for Tsunami Wayfinding
27. Seaside: Blue Tsunami Sign Posts
28. Cannon Beach: Pedestrian Evacuation Route Signs
29. Phuket, Thailand: Distance Markers on Tsunami Evac. Route Signs
30. New Zealand and Japan: Road Paint Evacuation Route Signs
31. Warrenton: Metal Wave on Street Signs
32. Seaside: Solar Blinking Lights Around Tsunami Evac. Route Signs
33. Warrenton: Solar Blue Lights on top of Tsunami Sign Post
34. Seaside: Central Chain of Reflective Markers
35. Warrenton: Boundary Edge Lighting on Evacuation Routes
36. Warrenton: Highlight Critical Evacuation Route Turns
37. Seaside: Prevent Following Unsafe Evacuation Routes
38. Seaside: Seismic Structural Bridge Retrofit
39. Cannon Beach: Earthquake Safe Pedestrian Evacuation Bridge
40. Seaside: Pedestrian Evacuation Rope Bridge
41. Relocate Schools to High Ground
42. Cannon Beach: Underground Electric Grid
43. Indonesian: Vernacular Strategy for Vertical Evacuation
44. Warrenton: Tsunami Vertical Evacuation Berm

Tsunami Disaster Evacuation Leaders

Primary Pattern

-Follow The Leader

Empower local residents and business owners in different areas within the city to provide evacuation leadership and guidance to the people in their local community during a disastrous event.

Figure 50

While evacuation route signs are essential elements of tsunami evacuation, many people tend to follow others in high stress survival situations, a phenomenon known as groupthink. This known reaction during a catastrophe, makes it critical that people within the city are capable of guiding people to safety. These evacuation leaders could be trained city officials, CERT and local volunteers, or local business employees. They might keep a supply pack on hand, that would include easily identifiable reflective vests, evacuation route maps and instructions, a flashlight, whistle, and medical supplies. It is also important that these people know understand their responsibilities, which is to help guide as many people to safety, and not fail to perform their duty by trying to be a hero.

Related Patterns

Recognizable Wayfinding Chain, Information Station, Public-Private Partnership, Mapping Your Neighborhood, Route Safety, My Personal Escape Route, Intuitive Signs, Primary Route Clarity, Other Forms of Signage, Assembly Area Essentials, 'How-to-Guide', Triage and Registration, Campsites

Google Maps Tsunami Evacuation Route App

Primary Pattern

-My Personal Escape Route

Develop an cell phone app or map plugin that can teach people about what to do in the event of a tsunami, and guide evacuees along their specific route to safety.

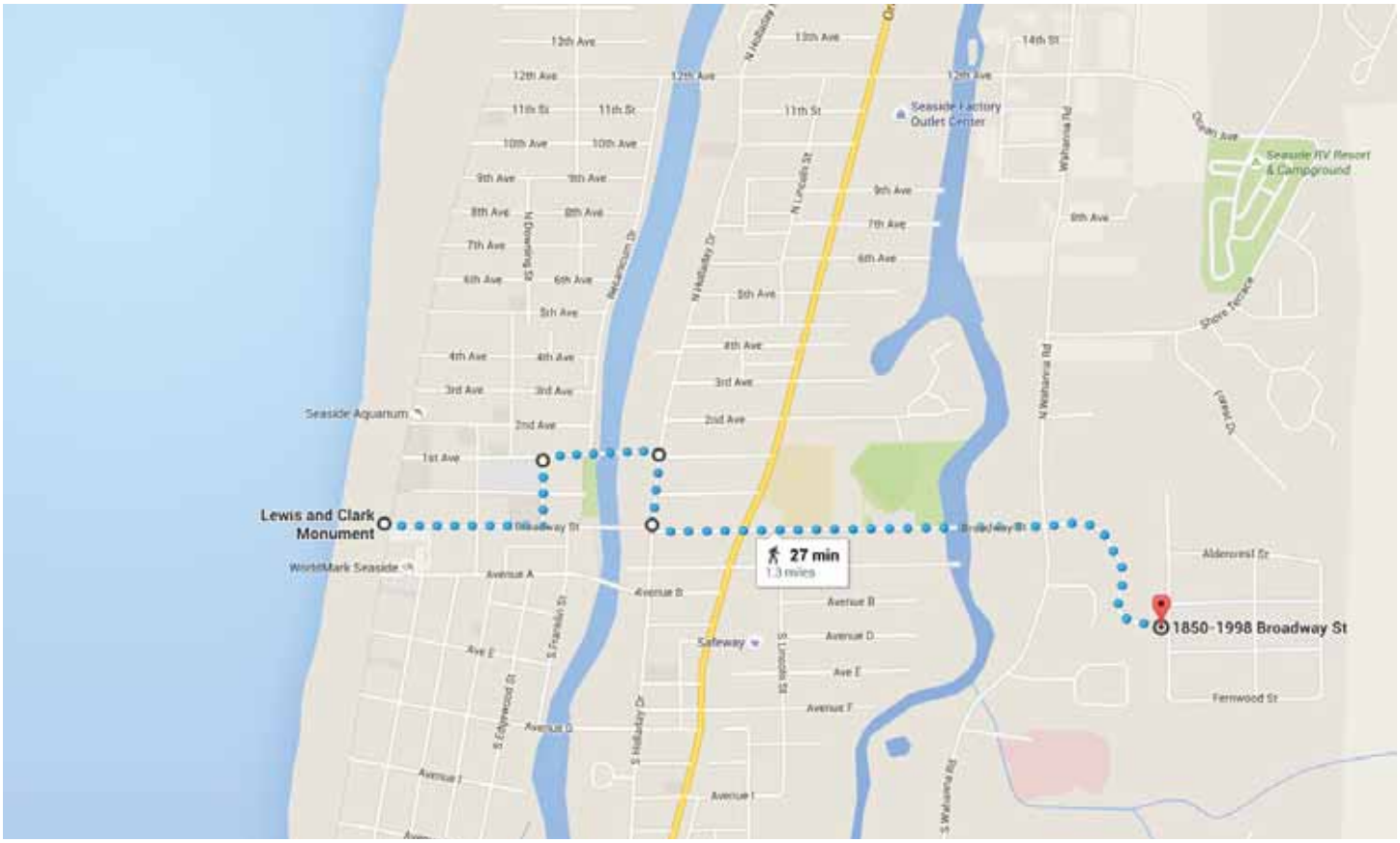


Figure 51

Seaside, Oregon

Google Maps is a internet application that can provide step-by-step directions for pedestrian, vehicle, public transit, and air transit travel from anywhere to anywhere, with up to date timing and travel costs. It is so heavily relied upon, that without service, many would find themselves lost. Although some evacuation programs exist, nothing comes close to the simplicity of the interface used by Google Maps. This commonly used application could develop a tsunami evacuation plugin that could be used to teach people about the event, and be used for directions during an evacuation. With the assumption that the earthquake shock will prevent data service, there will have to be creative solutions that constantly update the evacuation route from current location to nearest assembly, so that it can be accessed offline. This app could also incorporate other important information such as tsunami warning signals, evacuation strategies, and strategies for response site survival.

Related Patterns

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Information Station, Know What Zone, Public-Private Partnership, Mapping Your Neighborhood, Route Safety, Intuitive Signs, Primary Route Clarity, Other Forms of Signage, Safety Zone Threshold, Campsites

Evac. 26 INDEPENDENT POSTS FOR TSUNAMI WAYFINDING

PRIMARY PATTERN

-Intuitive Signs

Establish a seismically structured post that is dedicated to tsunami evacuation wayfinding, so that the signs and their instructions withstand the effects of the earthquake, and are clearly distinguishable from common street signs.

FIGURE 52

Tsunami evacuation maps, route, and assembly area signs are two-dimensional metal signs located on the side of walls or wooden street posts. Some stand alone, while others are placed with stop signs. No special features are incorporated in a way that make them more prominent. People that have vacation homes on the coast readily admit to never seeing a tsunami hazard zone sign before it being brought to their attention, while tourists have commonly been observed passing by an evacuation map without noticing. In order to bring these elements to people's attention, they should be placed on an attractive and structurally engineered posts, which will help separate the included information from common city signage. Posts might be made of metal with a larger foundation, have route signs and distance markers, occasionally include maps, incorporate lighting, and have some sort of artistic design.

RELATED PATTERNS

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Information Station, Know What Zone, Public-Private Partnership, Mapping Your Neighborhood, Route Safety, Intuitive Signs, Primary Route Clarity, Other Forms of Signage, Safety Zone Threshold, Campsites

Blue Tsunami Sign Posts

Paint posts that hold tsunami related signs blue in order to draw people attention to attached Tsunami Evacuation Route Sign, while helping to differentiate themselves from other common street signs.

Figure 53 *Charrette Generated Idea*

Tsunami Evacuation Route Signs are commonly placed on 4 x 4 wooden posts below stop signs or other street signs. Furthermore, they are rectangular signs that are painted blue, which is similar to common informational signs. It is important that these route signs are differentiated from other signs, and are clearly visible to evacuees. During the community design charrette, one of the participants suggested painting the post blue. This unique post, would help individualize the attached sign, and be more noticeable to people walking around the city, while also becoming more unmistakable to evacuees during an event. The post could potentially be painted entirely blue, or incorporate more of a special wave design. This strategy is an intriguing way of highlighting these signs and making them a more significant part of the urban fabric of a city.

Related Patterns

Recognizable Wayfinding Chain, Information Station, Know What Zone, My Personal Escape Route, Intuitive Signs, The Space Between, Primary Route Clarity

Evac. 28

Pedestrian Evacuation Route Signs

Primary Pattern

-Route Safety

Include a symbol on route signs that reiterates and emphasizes to people that the use of vehicles is not permitted, and that all routes are mandatorily designated for pedestrian evacuation.

Figure 54

Cannon Beach, Oregon

One of the biggest threats to successful evacuation is to attempt to escape with a vehicle. The amount of destruction caused by the earthquake will make most of the roads undrivable. But the main concern is that the amount of other people trying to use the same road by car and foot will create bottlenecks, traffic jams, and route blockages. The state mandates that in every situation evacuation should be done by foot, but this is still relatively unknown. After signs were made and placed, Cannon Beach decided to attach a pedestrian sign below the evacuation route sign to remind people to evacuate by foot. While it is crucial to include this message, the pedestrian sign is not included with all of the route signs, making it unclear whether they are connected, or whether certain routes are meant for pedestrians, while others for vehicles. A future round of signs could include the pedestrian symbol next to the arrow, clearly informing people to evacuate on foot.

Related Patterns

Recognizable Wayfinding Chain, Information Station, Know What Zone, Mapping Your Neighborhood, My Personal Escape Route, Intuitive Signs, Primary Route Clarity

Distance Markers on Evac. Route Signs

Primary Pattern

-Distance Matters

Enhance existing evacuation route signs with distance markers which inform evacuees how far they must travel, while assuring them that they are moving in the right direction as sequential sign distances decrease.

Figure 55

Phuket, Thailand

When people are travelling on a path, whether it be on the highway or scenic trail, they pass signs that provide distances to particular location. This helps them estimate travel times, and understand how far away they are from their destination. Thailand has utilized this strategy on their tsunami evacuation route signs, which is a simple way to provide more detailed direction. Not only will evacuees be able to use these milage markers to pace themselves, but also to reassure them that they are headed in the right direction as the distances decrease on consecutive signs. Another benefit of providing distances is that it will help to create an accurate system for documenting the placement of route signs. In order to make installation more adaptable, a smaller sign with the distance could be attached below the Evacuation Route Sign, so that they do not have to be fabricated specifically for that location.

Related Patterns

Recognizable Wayfinding Chain, Know What Zone, Mapping Your Neighborhood, My Personal Escape Route, Intuitive Signs, The Space Between, Primary Route Clarity, Other Forms of Signage, Lights at Night, Safety Zone Threshold

Road Paint Evac. Route Signs

Primary Pattern

-Other Forms of Signage

Reinforce traditional Tsunami Evacuation Route Signs with paint in the road that can highlight evacuation routes as a durable form of signage that will remain intact after the earthquake.

Figure 56A / 56B

RT:New Zealand; LF:Japan

Tsunami evacuation wayfinding signage is limited to two dimensional metal signs. Common traffic wayfinding systems, use road paint to establish lanes, enforce stops, indicate speed, or provide instruction. While road paint for tsunami signage may not be seem an appropriate solution for some cities, different projects in New Zealand and Japan have successfully implemented these types of signs. In Wellington, New Zealand, they have adapted the blue wave symbol, and created an effective road sign that is painted into the ground. It includes an arrow above a wave with the text “Tsunami Safe Zone,” and the distance to that safe zone. The Japanese road sign uses different colors and design, but incorporates similar directives. This type of road paint is more noticeable to people before and during an event. They can be placed in between signs to enhance route connectivity, and are more likely withstand from destructive impact of the earthquake.

Related Patterns

Recognizable Wayfinding Chain, Know What Zone, Mapping Your Neighborhood, My Personal Escape Route, Intuitive Signs, The Space Between, Distance Matters, Primary Route Clarity, Lights at Night, Safety Zone Threshold

Evac. 31 Metal Wave Street Sign Attachment

Primary Pattern

-Other Forms of Signage

Place a small metal wave above street signs that points in the appropriate direction along primary evacuation routes, reminding people that they are in the Tsunami Hazard Zone and acting as a redundant form of evacuation wayfinding.

Figure 57

Warrenton, Oregon

Tsunami Evacuation Route Signs are either rectangular or circular shapes, that are similar in form to normal street signs. They are commonly placed too far apart, and can sometimes be missed when turning off of a secondary street to the primary route. The blue wave symbol could be designed into a thin metal plate and placed above common street signs, pointing the correct direction along primary evacuation routes. These signs would be more frequent than 2D Tsunami Evacuation Route Signs, establishing a continuous chain along evacuation routes. They would more easily indicate the appropriate direction when turning off of a secondary street, and be a redundant form of signage if the Evacuation Route Sign were to fail. If designed well, they could become playful way to enhance tsunami awareness and promote the learning of evacuation routes.

Related Patterns

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Know What Zone, Mapping Your Neighborhood, My Personal Escape Route, Intuitive Signs, The Space Between, Primary Route Clarity, Safety Zone Threshold

Blue Solar Lights in Evac. Route Signs

Primary Pattern

-Lights At Night

Design a solar lighting strategy for Evacuation Route Signs that will make them easier to spot at night, and illuminate the information as evacuees pass by them.

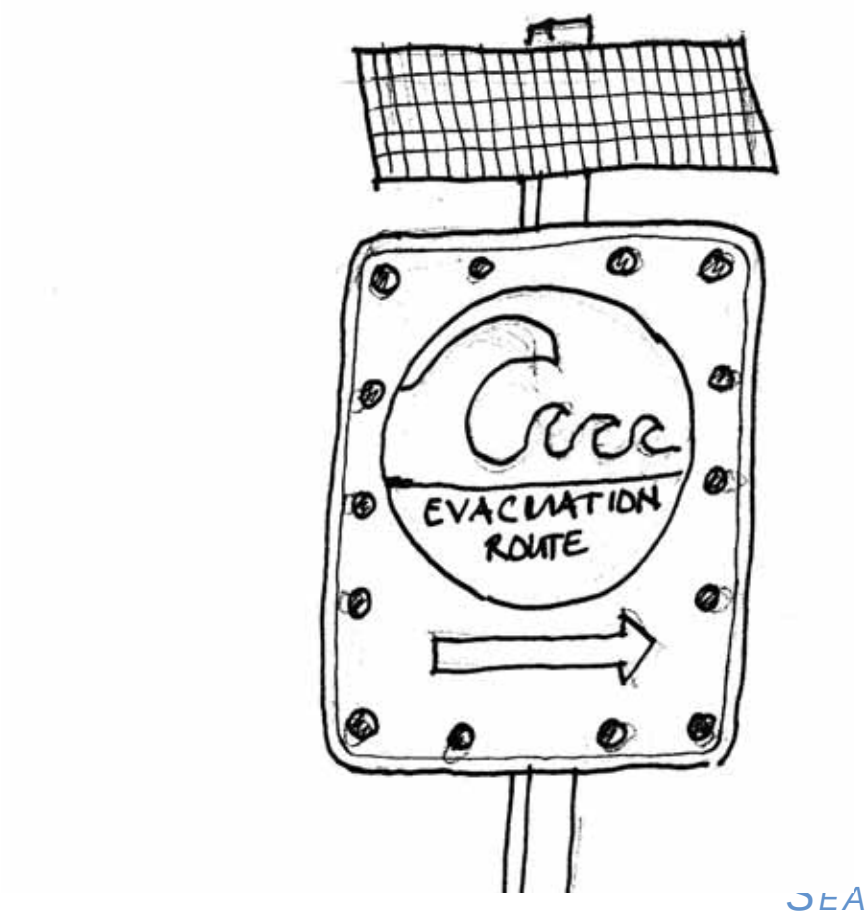


Figure 58

Seaside, Oregon

A strategy used by cities to make stop signs at busy intersections more visible is to place small flashing lights around the perimeter of the sign. It would be too expensive to run power lines underground to all these signs, and too cumbersome to do so above ground, making small individually powered solar panels a practical, inexpensive, and sustainable solution. Tsunami evacuation route signs in the city of Seaside could benefit from this strategy. Solar powered lights are independent from the city grid, making the destruction of the earthquake less of a threat. The small blue lights would go around the edge, and could either flash or remain still, illuminating the information, and being visible from farther away. Depending on the cost and priority of their instillation, certain signs that represent vital directives might use this strategy to assure that they can be seen during a night evacuation.

Related Patterns

Recognizable Wayfinding Chain, Know What Zone, Route Safety, My Personal Escape Route, Intuitive Signs, The Space Between, Primary Route Clarity, Other Forms of Signage

Evac. 33

Solar Blue Light on top Tsunami Sign Post

Primary Pattern

-Lights At Night

Attach a simple blue light on top of posts that have evacuation route signs, which might not illuminate the sign itself, but will be visible from a significant distance during a night evacuation.

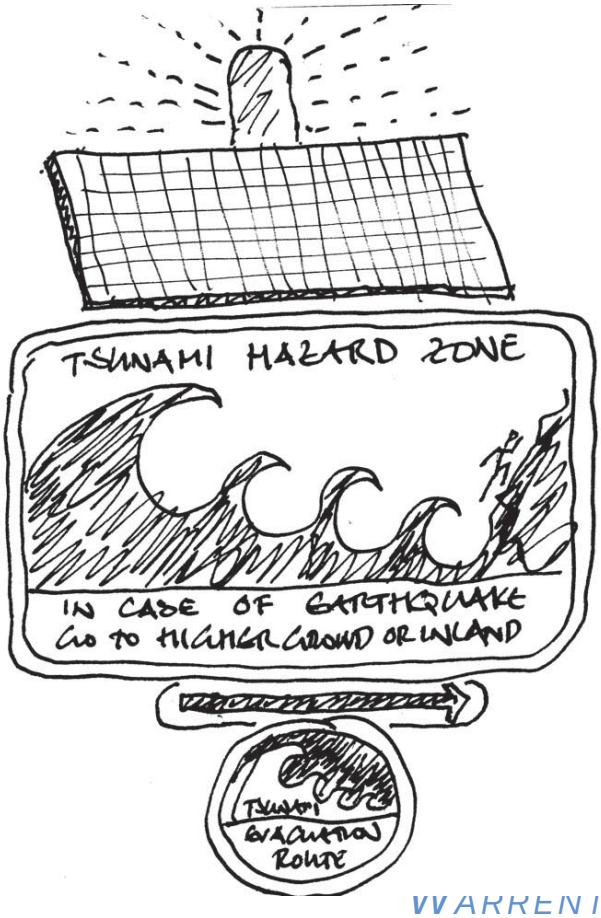


Figure 59

Warrenton, Oregon

It is believed that the earthquake will destroy city's power lines. If the event occurs on a night nearing new moon, there will be no natural light, making for extreme limited visibility. Reflective signs will remain hidden without flashlights, especially from greater distances. A simple blue light placed above posts with tsunami evacuation route signs would make these essential wayfinding elements detectable from great distances. By placing a cover on one side, the light would only be clearly visible from the correct direction, preventing evacuees from following the light in the wrong direction. A solar panel installation would keep the light functional, independent of any power loss of the city grid or failure of a larger system that powered multiple signs. Compared to other solutions, these lights would be simple and inexpensive, while providing clarity of routes during a night evacuation.

Related Patterns

Recognizable Wayfinding Chain, Know What Zone, Route Safety, My Personal Escape Route, Intuitive Signs, The Space Between, Primary Route Clarity, Other Forms of Signage

Evac. 34

Central Chain of Reflective Markers

Primary Pattern

-Lights at Night

Implement reflective road markers as an alternative form of signage for night evacuation, that will illuminate the center of the primary evacuation route leading to safety.

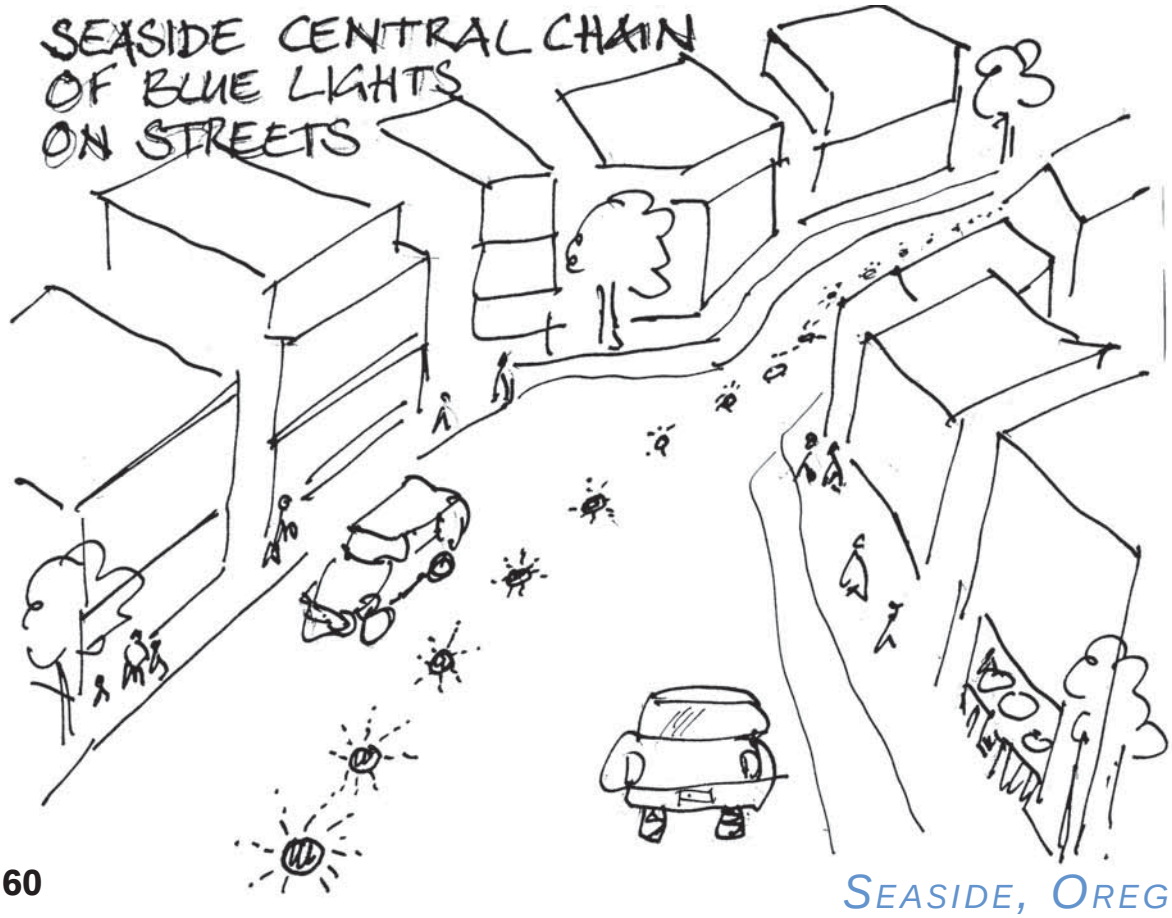


Figure 60

Seaside, Oregon

Vehicles travelling at night require headlights to illuminate raised reflective road markers, which help establish the lines separating lanes from oncoming traffic. These markers are known in Oregon as turtles, and without them, driving at night without using brights can become very difficult. They are an inexpensive and effective way of keeping roads safe at night for vehicles, but would also be a valuable element for evacuation routes. The markers could reflect blue lights when headed towards safety, and red when moving in the wrong direction. At places where secondary streets turn onto primary streets, there might be a row of 5 - 10 markers on the street that should not be followed for evacuation. These markers would establish a more continuous chain of direction indicators, that could support the more detailed information on the less frequent Evacuation Route Signs.

Related Patterns

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Know What Zone, Mapping Your Neighborhood, Route Safety, My Personal Escape Route, Intuitive Signs, The Space Between, Primary Route Clarity, Other Forms of Signage

Boundary Edge Lighting on Evacuation Routes

Primary Pattern

-Lights at Night

Apply blue lights on the boundary of dark streets, which can help to illuminate the route during an evacuation, while also providing everyday safety measures for people driving at night.

Figure 61

Warrenton, Oregon

Skyline Blvd. is an extremely windy road in Oakland, CA with two traffic lanes headed in either direction, separated by a large median. It becomes so dark at night, that it was a hazard to drivers. In order to make this street safer, they placed lights on either side of the two lanes, spaced approximately 10 feet apart. These lights turn on at night, and create a clear edge boundary that helps prevent drivers from steering off the road. This strategy could be used for illuminating the edge boundary of tsunami evacuation routes. This solution would require solar power for small sections of lights, making it more expensive and less reliable. However, they illuminate the path without any external light needed for reflection, and can creatively be placed to emphasize important turns, prevent wrong turns, connect secondary streets to the primary route, and highlight the moment safe ground is reached. With more advanced technology, they could potentially flash, modify color, or adjust for brightness.

Related Patterns

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Know What Zone, Mapping Your Neighborhood, Route Safety, My Personal Escape Route, Intuitive Signs, The Space Between, Primary Route Clarity, Other Forms of Signage

Evac. 36

HIGHLIGHTING CRITICAL EVACUATION ROUTE TURNS

PRIMARY PATTERN
-Primary Route Clarity

Highlight critical moments along evacuation routes when there are multiple options that may appear to go to high ground, but only one path that leads to safety.

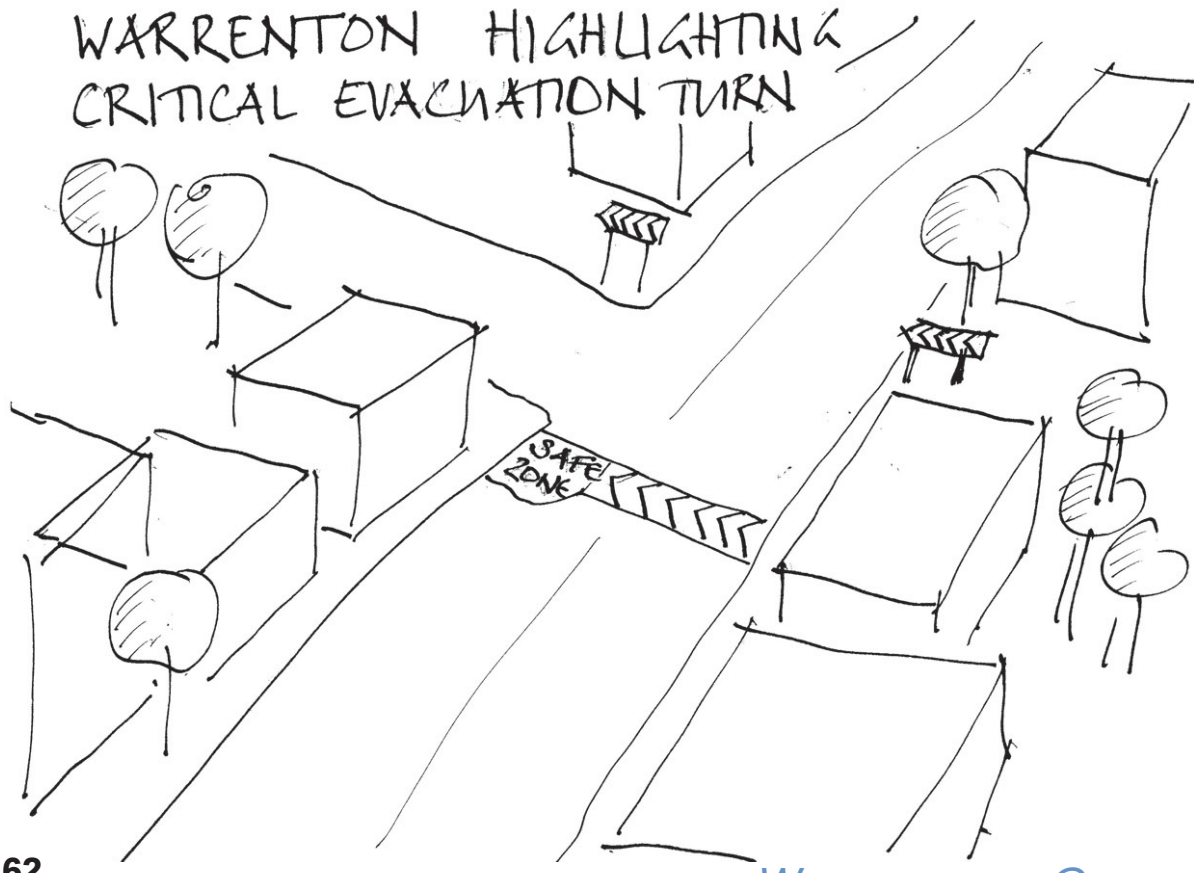


FIGURE 62

WARRENTON, OREGON

Many cities and routes have a critical turn that is needed to be made in order to reach high ground. However, some of those turns seem less intuitive than others, making them the most dangerous part of the route. In Cannon Beach, the primary route leading from downtown heads south on Hemlock Street, before turning east on Sunset Blvd. While continuing south on Hemlock seems like the natural choice to reach high ground, turning on Sunset Boulevard is the correct route to safe ground. Clear and visible tsunami evacuation route signs should be supplemented with painted blue arrows in the road pointing east on Sunset Blvd. These arrows could become more elaborate by turning the corner from either side of Hemlock onto Sunset. It is important to enhance the signage at these critical turns in order to prevent evacuees from following their intuition, and wasting valuable time headed in the wrong direction.

RELATED PATTERNS

Recognizable Wayfinding Chain, Know What Zone, Mapping Your Neighborhood, Route Safety, My Personal Escape Route, Intuitive Signs, Other Forms of Signage, Lights at Night

Evac. 37 Prevent Use of Unsafe Evacuation Routes

Primary Pattern

-Route Safety

Implement prohibitive signs that will prevent evacuees from wasting precious moments by heading towards a bridge that will be impassable after being destroyed by the earthquake.

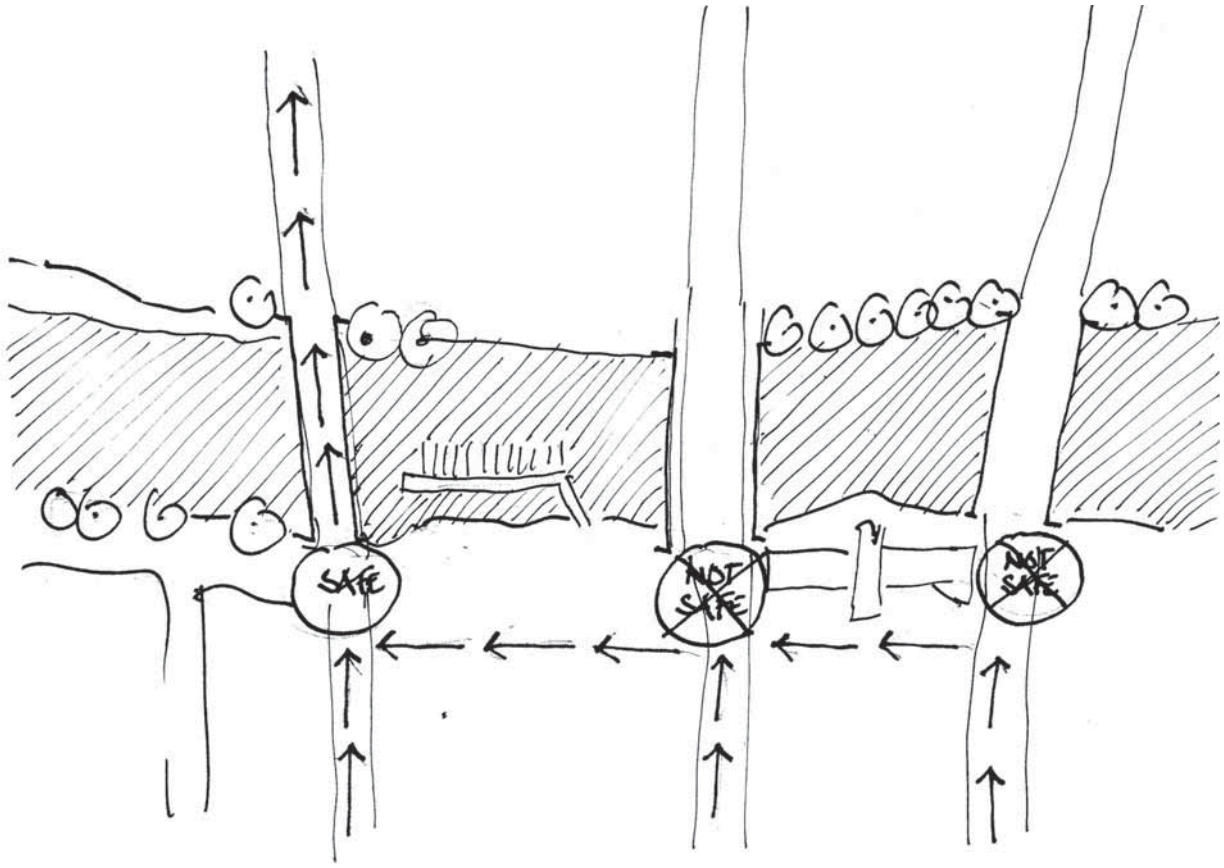


Figure 63

Seaside, Oregon

There are many bridges in coastal towns that will likely fall due to the effects of an earthquake. Most cities can still provide evacuation routes, even when the bridge leads closer to high ground. However, in places like Seaside, the Necanicum River and Neawanna Creek run through the city, making bridges a required passing for evacuation. From downtown, three bridges cross the Necanicum in close proximity on 1st Street, Broadway Street, and Avenue A. However, the tsunami evacuation map indicates that people should deviate from those streets and go to the 1st street bridge, which was structurally retrofitted to withstand the earthquake. It is important not only to implement consistent signage that guide evacuees north towards 1st Street, but also to prevent them from wasting time on following an impassable route. A new type of sign at the Broadway Street and Avenue A bridges might indicate that it is not an evacuation route, either through a red cross over the common sign or some other

Related Patterns

Recognizable Wayfinding Chain, Mapping Your Neighborhood, My Personal Escape Route, Intuitive Signs, Primary Route Clarity, Other Forms of Signage, Alternative Evacuation

Seismic Structural Bridge Retrofit

Evac. 38

Primary Pattern

-Route Safety

Seismically retrofit bridges that would be destroyed due to the earthquake, so that people are not trapped in an inundation area with no ability to cross a body of water to reach high ground.

Figure 64

Seaside, Oregon

Small rivers or creek that block direct access to high ground, require a bridge in order to pass. In the event of an 8.0 - 9.0 magnitude earthquake, it is likely that even relatively strong bridges will collapse. For places isolated from high ground, it is critical that there is a way to quickly cross, other than swimming. One solution is to either build a new bridge, or retrofit the existing bridge so that they are seismically safe. This type of public project is critical to providing safe evacuation routes, but the substantial cost makes it a difficult to accomplish. In Seaside, the Necanicum river divides the major downtown area from high ground. A large group of the population would be stuck on the wrong side of the river, with no other solution than to travel many miles to another assembly site, or try to swim across the river. The city decided to spend hundreds of thousands of dollars to make structural retrofits, which should be commended as an exemplary effort for putting public safety first.

Related Patterns

Recognizable Wayfinding Chain, Public-Private Partnership, Mapping Your Neighborhood, Primary Route Clarity, Other Forms of Signage, Alternative Evacuation

Evac. 39 Earthquake Safe Pedestrian Bridge

Primary Pattern

-Route Safety

Construct a pedestrian evacuation bridge that would be structurally engineered to survive the effect of the earthquake, providing a safe route over the body of water to escape the hazard zone before the incoming tsunami wave.

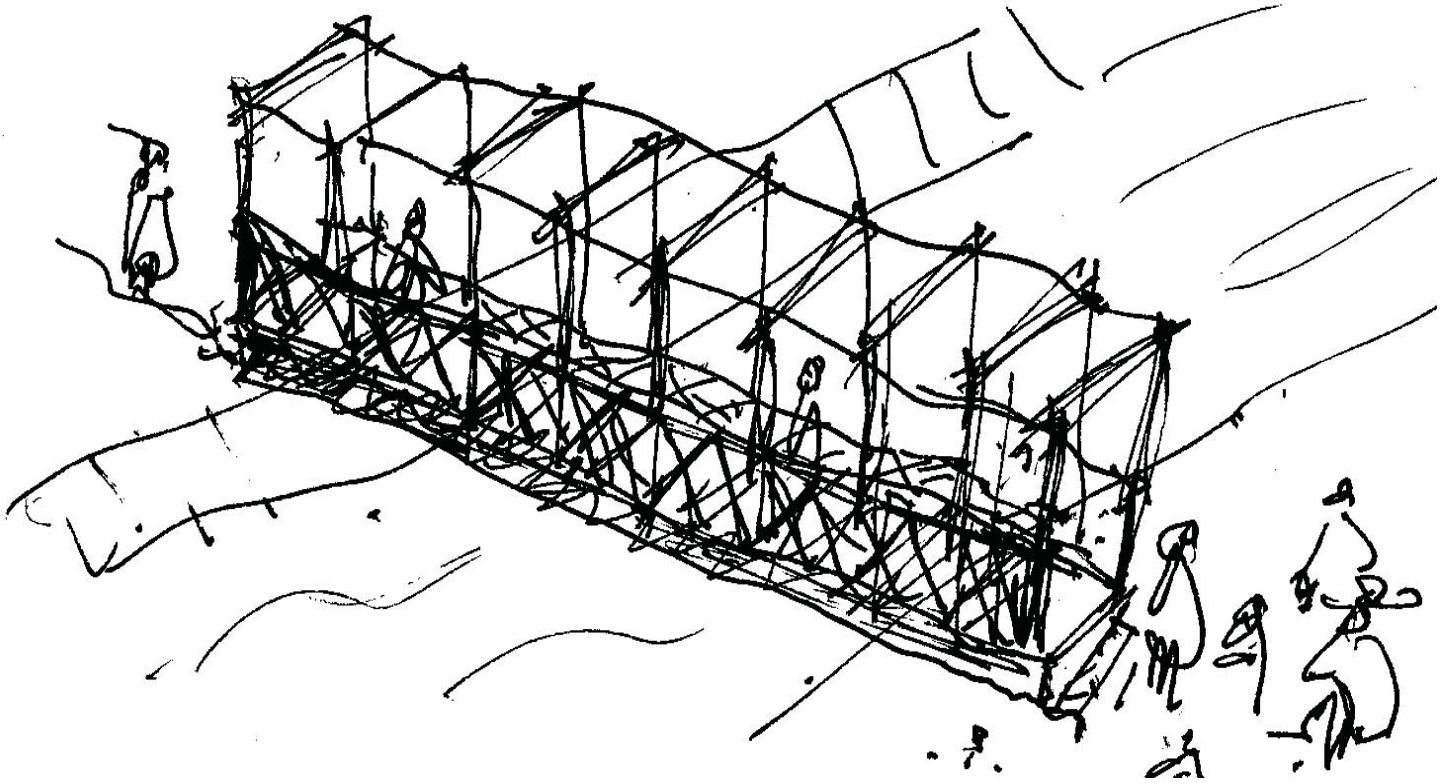


Figure 65

Cannon Beach, Oregon

In the event of an earthquake, the Fir Street Bridge in Cannon Beach will be destroyed, cutting off the shortest route to safety from the downtown population. Instead, the routes lead many miles in the opposite direction, making evacuation for the vulnerable tourist population much more difficult. The dedicated preparedness officials and volunteers proposed building a “Throw Away” pedestrian evacuation bridge. This term was used because it would be built to withstand the effects of an earthquake, providing people enough time to evacuate before the tsunami, but not engineered to withstand the force of the wave. While this is not an inexpensive project, it is a realistic solution to one of the most pressing issues preventing successful evacuation. This bridge could also be useful everyday by separating foot traffic from vehicle traffic when entering the city.

Related Patterns

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Public-Private Partnership, Mapping Your Neighborhood, My Personal Escape Route, Primary Route Clarity, Other Forms of Signage, Alternative Evacuation, Sense of Place

Evac. 40 Pedestrian Evac. Rope Bridge

Primary Pattern

-Route Safety

Construct an inexpensive pedestrian rope bridge that can withstand the effects of an earthquake, which is an inexpensive alternative for providing evacuees a safe crossing over the river and out of the inundation area.

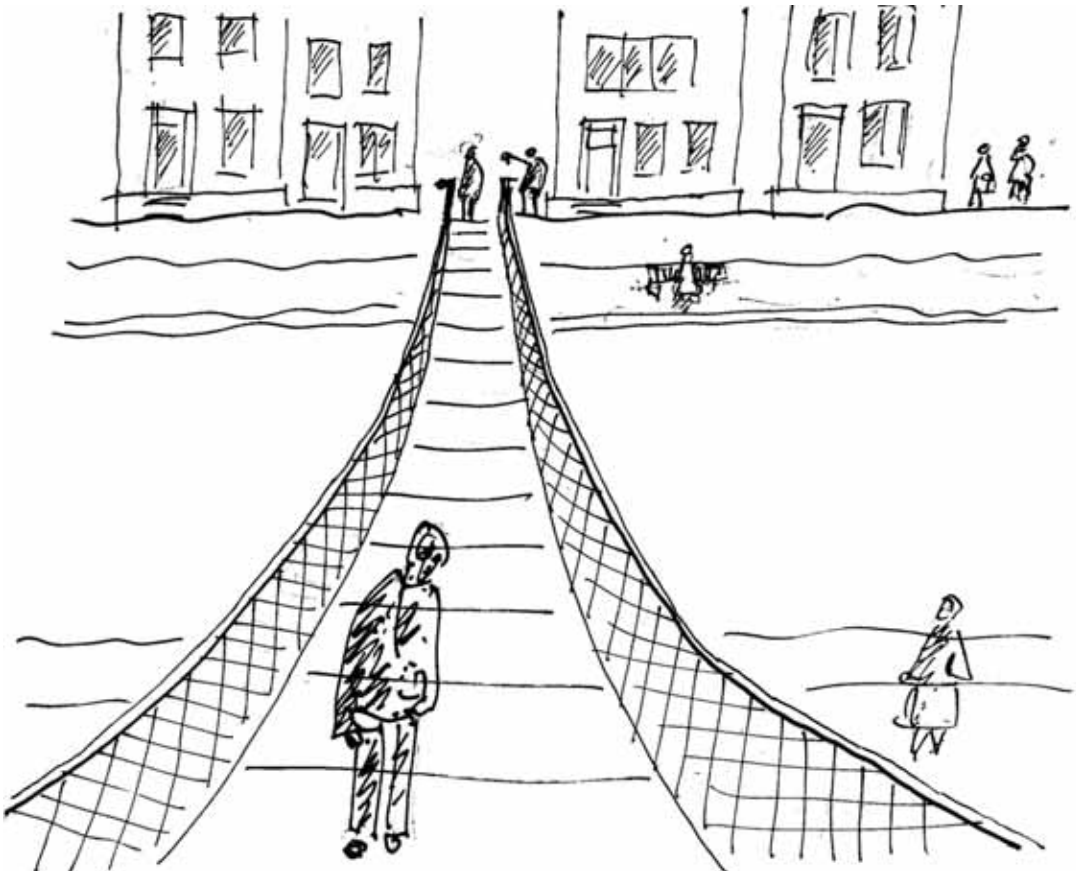


Figure 66

Seaside, Oregon

Building new bridges or retrofitting old ones is an expensive public project that would require a lot of tax dollars. A project of that magnitude would likely take money away from other important tsunami preparedness efforts. However, there needs to be some solution to crossing over the water, which opens the door for different cost-effective solutions in the short or long term. One possibility would be to build a rope bridge that would be more resistant to the effects of the earthquake, and much cheaper than a more permanent bridge. This bridge would have to be designed with reliable structural integrity; being stable from excessive swaying and having safe wooden panels for crossing. A major concern with this concept would be the ability to quickly transfer mass groups of people over the river safely. Rope bridges are a fun method of crossing rivers or valleys, which provides an opportunity to raise awareness with the tourist population in Seaside who would be drawn to using it when walking around the city.

Related Patterns

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Public-Private Partnership, Mapping Your Neighborhood, My Personal Escape Route, Primary Route Clarity, Other Forms of Signage, Alternative Evacuation, Sense of Place

Relocate Schools to High Ground

Primary Pattern

-Relocate to High Ground

Relocate schools to out of high-risk tsunami hazard zones closer to high ground, to give kids a better chance of evacuating to the assembly areas before tsunami inundation.

Figure 67
Kadanowaki Elementary School,, Ishinomaki, Japan

Children are an extremely important part of the community and must be given the best chance of surviving a disaster. Although it is a natural assumption to think they are less capable of evacuating, schools tend to hold multiple practice evacuations and teach the students what to do in an event, so they actually may be more prepared than the average citizen. Nonetheless, schools should be located on, or close to higher ground. In the cities of Seaside and Warrenton, the schools are much closer to high ground, but in Cannon Beach, the old elementary school was in one of the most dangerous areas in the city. The school was abandoned, and the student were relocated to Seaside. Due to the extra distance they would have to travel everyday, and that they would be separated from their families, the decision was opposed by some of the parents. However, the city decided that having their children exposed to this type of risk was not worth these conveniences, and voted to make the move to safer ground in Seaside.

Related Patterns

Know What Zone, Mapping Your Neighborhood, Route Safety, My Personal Escape Route, Distance Matters, Follow the Leader, Alternative Evacuation, Safety Zone Threshold, Campsites

Underground Electric Grid

Evac. 42

Primary Pattern

-Route Safety

Mitigate the potential hazards caused by the major earthquake, such as fallen power lines that would prevent timely evacuation, and even cause routes to be impassable.

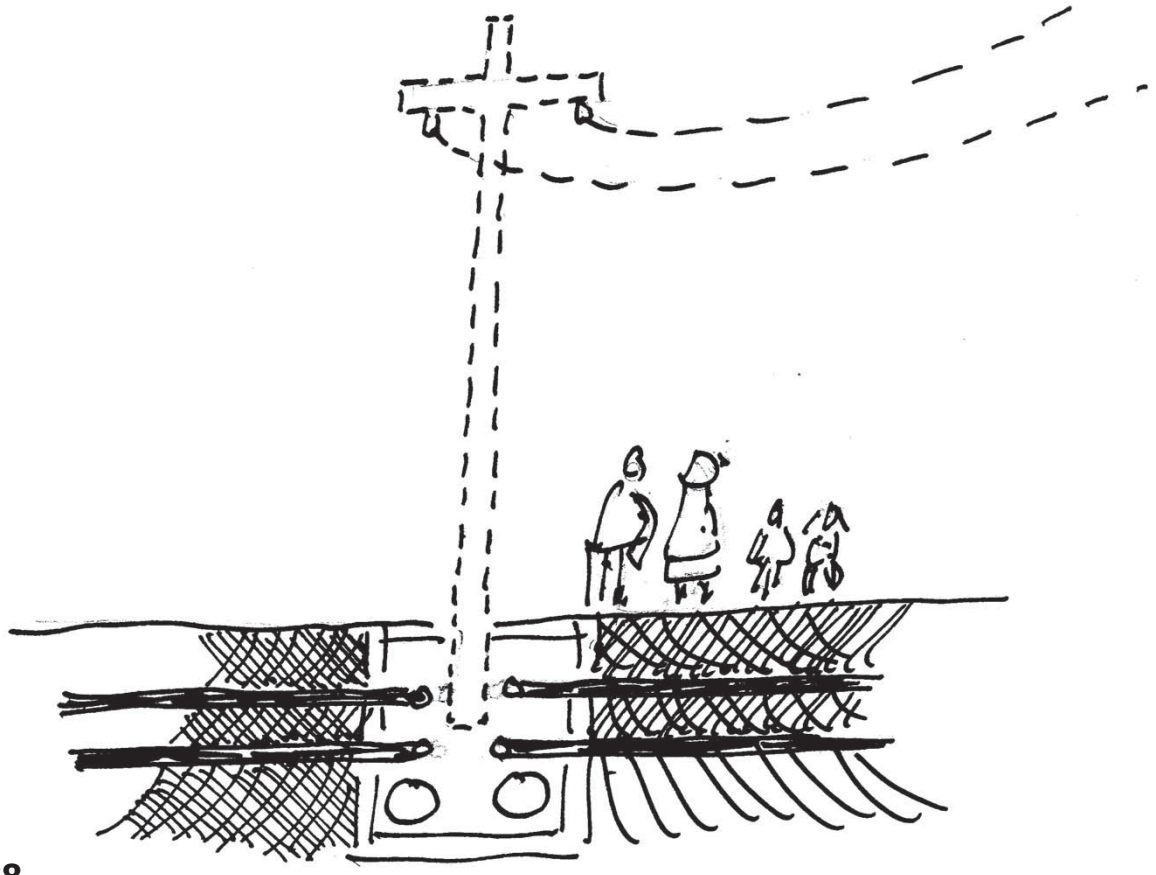


Figure 68

Cannon Beach, Oregon

Evacuation routes are along primary streets in cities that have a variety of adjacent built elements that present a potential hazard if they were to fall from the effects of the earthquake. One significant threat are downed power lines that might not remain active, but will certainly block routes and impede evacuation. Furthermore, these power lines will slow down the relief and rebuilding efforts after the event. While it is expensive, many cities around the country have put the electric grid underground, which improves the street quality and creates better views for the community. Cannon Beach has power lines above ground, and might be able to use public tax dollars to remove these unattractive elements, while improving the safety of tsunami evacuation routes. This type of solution illustrates how creative strategies can find money for public infrastructure projects that improve the quality of a city and making them more TsunamiReady.

Related Patterns

Multi-Purpose Infrastructure, Public-Private Partnership, Mapping Your Neighborhood, Primary Route Clarity, Lights at Night

Evac. 43

VERNACULAR STRATEGY FOR VERTICAL EVACUATION

PRIMARY PATTERN

-Alternative Evacuation

Utilize palm trees or other sturdy natural elements commonly found in the area in order evacuate, in case there is not enough time or no safe route to high ground before the oncoming wave arrives.

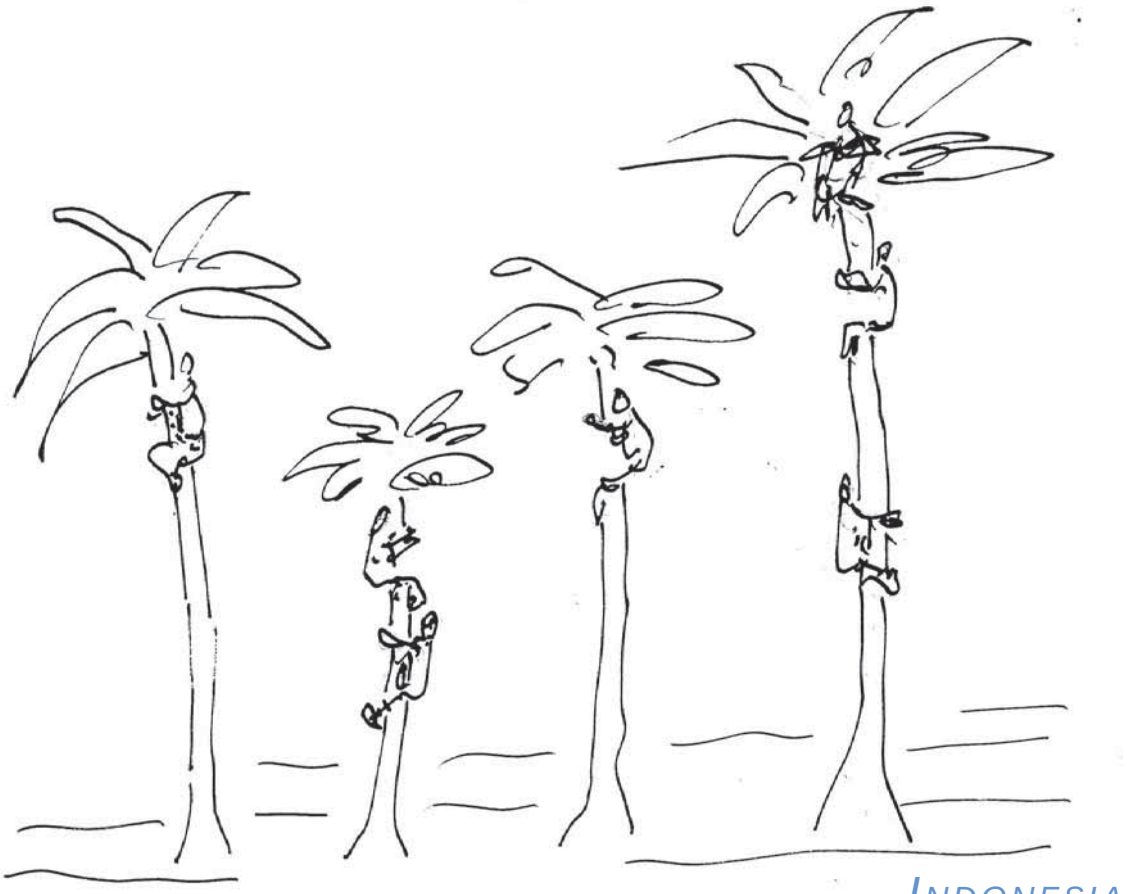


FIGURE 69

INDONESIA

While there seem to be no palm trees on the Oregon coast, these natural elements have strong, vertical trunks which have been used to escape the tsunami wave. In India and other countries affected by the 2004 Indonesian Ocean Tsunami, people used palm trees as a last minute resort for evacuation. Since then, people have been encouraged to learn how to quickly climb palm trees so that they are ready to escape in a moments notice. Furthermore, more palm trees are supposedly being planted or moved to areas near the ocean, as a natural defense to future distant tsunami events. While this may not be effective on the coast of Oregon, it demonstrates that there are other solutions to vertical evacuation besides getting to high ground, or building a evacuation tower.

RELATED PATTERNS

Multi-Purpose Infrastructure, Know What Zone, Public-Private Partnership, Mapping Your Neighborhood, Route Safety, My Personal Escape Route, Distance Matters, Follow the Leader, Safety Zone Threshold, Sense of Place

Tsunami Vertical Evacuation Berm

Primary Pattern

-Alternative Evacuation

Build up smaller hills as man made berms that provide safe assembly sites for instances where evacuation routes to higher ground is either too far away or unsafe.

Figure 70

Warrenton, Oregon

Warrenton has an interesting topography that alters the way the tsunami wave will impact the city. Because of the slow pitched hill adjacent to the Pacific Ocean, and the primary residences being located on an estuary at the mouth of the Columbia river, the amount of elevation gain needed to reach safety is not as great as in other cities. While there is less of an elevation gain, and potentially a little more time for evacuation, there is still a group of people that have a near impossible distance to travel to reach high ground. This area is further at risk because it has a sizeable elderly community. There is a small hill nearby that is just on the cusp of being safe from the largest magnitude earthquake Although it is privately owned land, the hill is much closer to this area, making at a more realistic destination for survival. If it is determined that this is a viable option, it could be built up higher, and reinforced to make sure the land does not liquefy during the earthquake.

Related Patterns

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Mapping Your Neighborhood, Relocate to High Ground, Route Safety, My Personal Escape Route, Distance Matters, Primary Route Clarity, Lights at Night, Safety Zone Threshold, Assembly Area Essentials, Campsites, Sense of Place

Tsunami Vertical Evacuation Tower

Evac. 45

Primary Pattern

-Alternative Evacuation

Construct a well designed and structurally engineered tower that can be used for escape in areas where evacuation routes to natural high ground is either too far away or unsafe.

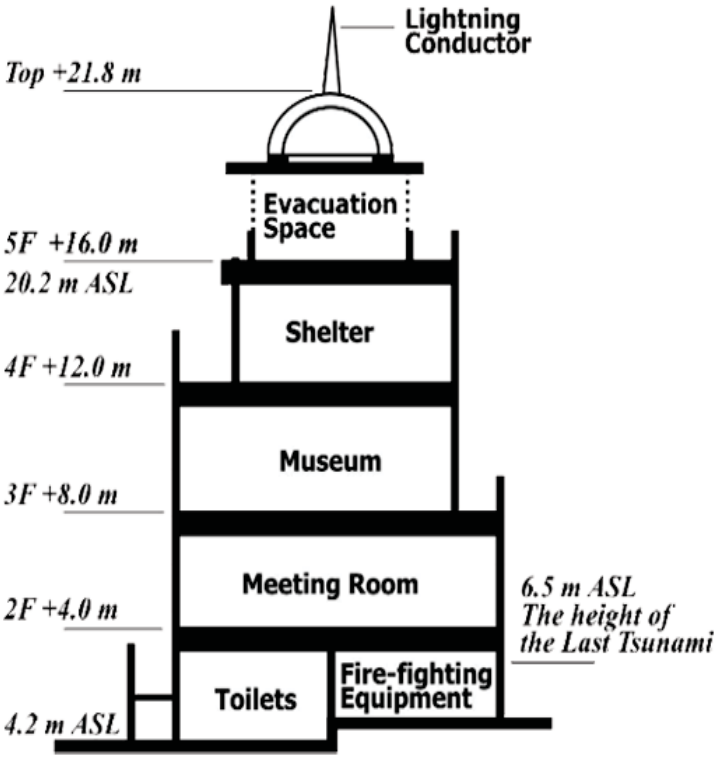


Figure 71A

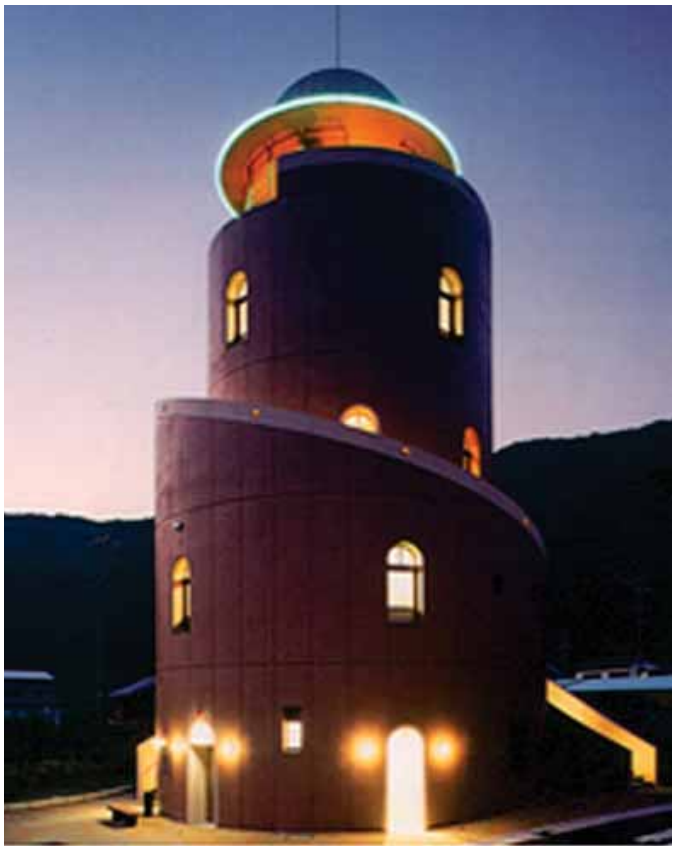


Figure 71B

Nishiki, Japan

Japanese cities are very experienced with earthquakes and tsunamis, and have developed vertical evacuation structures in areas that are decided unsafe to evacuate. While some of these structures are simple parking and metal structures, the Nishiki Tower is an, “impressive five-story, 22 meters tall reinforced concrete structure resembling a lighthouse. Founded on a 4 meter deep layer of sand and gravel, the tower is supported on concrete piles extending 6 meters below grade. It was designed to withstand the impact of a 10-ton ship at a velocity of 10 meters/sec. For day-to-day use, it features public restrooms, a meeting room, firefighting equipment, storage space, and 73 square meters of refuge space for evacuees.” This example shows that the structure can become an attractive icon of the city that holds practical everyday function, while also providing a safe and timely alternative

Related Patterns

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Know What Zone, Public-Private Partnership, Mapping Your Neighborhood, Relocate to High Ground, Route Safety, My Personal Escape Route, Distance Matters, Primary Route Clarity, Lights at Night, Campsites, Sense of Place, Multi-Purpose Cache Site

TsunamiReady Vertical Evacuation Tower

Primary Pattern

-Alternative Evacuation

Construct a vertical evacuation tower for significant at-risk populations, that will become a prominent city feature, holding important public institutions and emergency management organizations.

Figure 72

Seaside, Oregon

The downtown area in the city of Seaside is in a high risk hazard zone that will require some luck if people are going to be able to travel 1.5-2 miles, over two bodies of water. This presents an opportunity to build an vertical evacuation tower that serves many purposes. It must be tall enough and strong enough withstand the earthquake and tsunami, while accounting for supporting the weight and providing enough space for the possible number of evacuees. This tower could become a center for tsunami research and emergency management for the entire west coast, providing space for major tsunami preparedness and research organizations. The structure could also house city hall and the fire/police departments, making it much easier for the city to rebuild if they survive the event. Lastly, this structure could provide amazing views of the coast, and be seen from afar, making it an iconic attraction for tourists to the city of Seaside.

Related Patterns

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Know What Zone, Public-Private Partnership, Mapping Your Neighborhood, Relocate to High Ground, Route Safety, My Personal Escape Route, Distance Matters, Primary Route Clarity, Other Forms of Signage, Lights at Night, Safety Zone Threshold, Assembly Area Essentials, 'How-to-Guide', Triage and Registration, Campsites, Sense of Place, Multi-Purpose Cache Site

3.4.3 After

45. Nishiki, Japan: Tsunami Vertical Evacuation Tower
46. Seaside: TsunamiReady Vertical Evacuation Tower
47. Tsunami Disaster Response Leaders
48. Warrenton: Assembly Area Beacon of Light
49. Wellington, New Zealand: Tsunami Safe Zone Road Paint Sign
50. Cannon Beach: Assumed Safe Elevation Sign
51. Cannon Beach: Guiding Response Site Progression
52. Warrenton: Soccer Field and Cemetery Assembly Areas
53. Seaside: Road Paint Circle at Assembly Area
54. Seaside: Assembly Area Park Features
55. Warrenton: Structure for Registration and Triage
56. Organizing Campsites with the Rule of 3
57. Warrenton: Camping Grounds Campsites
58. Seaside: Vacation Rental Storage Agreement
59. Seaside: Safe House Retrofit Exchange
60. Cannon Beach: Cache Site Campsites
61. Cannon Beach: Cache Site Barrel Program
62. Cannon Beach: Cache Site Security
63. Cannon Beach: "How-To-Guide" Lock Box
64. Warrenton: Assembly Area Community Garden
65. Cannon Beach: Cache Site Public Concerts

Tsunami Disaster Response Leaders

Response 47

Primary Pattern

-Assembly Area Essentials

Designate multiple local residents living near a particular assembly area, and train them to guide survivors, organize campsites, utilize available resources, and construct shelters.

Figure 73

Seaside, Oregon

Post-disaster survival is a complicated endeavour with many problems to consider. Not only will the construction of shelters and distribution of resources need to be carefully organized, but people will also be in need of guidance and support from the moment they reach safety up until outside aid arrives. A robust plan for each site will be more effective if executed by trained members of the surrounding community. These people should actively participate in the planning process and help maintain the sites supplies, equipping them with the knowledge and skills to enact the plan accordingly. Furthermore, collaboration between neighbors before the event will foster a resilient community, that is more capable of enduring the hardships of disaster recovery. There is an underlying concern that these types of campsites tend to rapidly degrade into lawlessness. Even if this is primarily based out of fear, not fact or experience; it makes leadership a crucial element of maintaining order and ensuring survival.

Related Patterns

Information Station, Public-Private Partnership, Mapping Your Neighborhood, Other Forms of Signage, Follow the Leader, Safety Zone Threshold, 'How-to Guide', Triage and Registration, Campsites

Response 48

Assembly Area Beacon of Light

Primary Pattern

-Lights at Night

Provide a very bright light at the assembly area in case the disaster occurs in the middle of the night, which will illuminate the area, and can be seen by evacuees from far away.

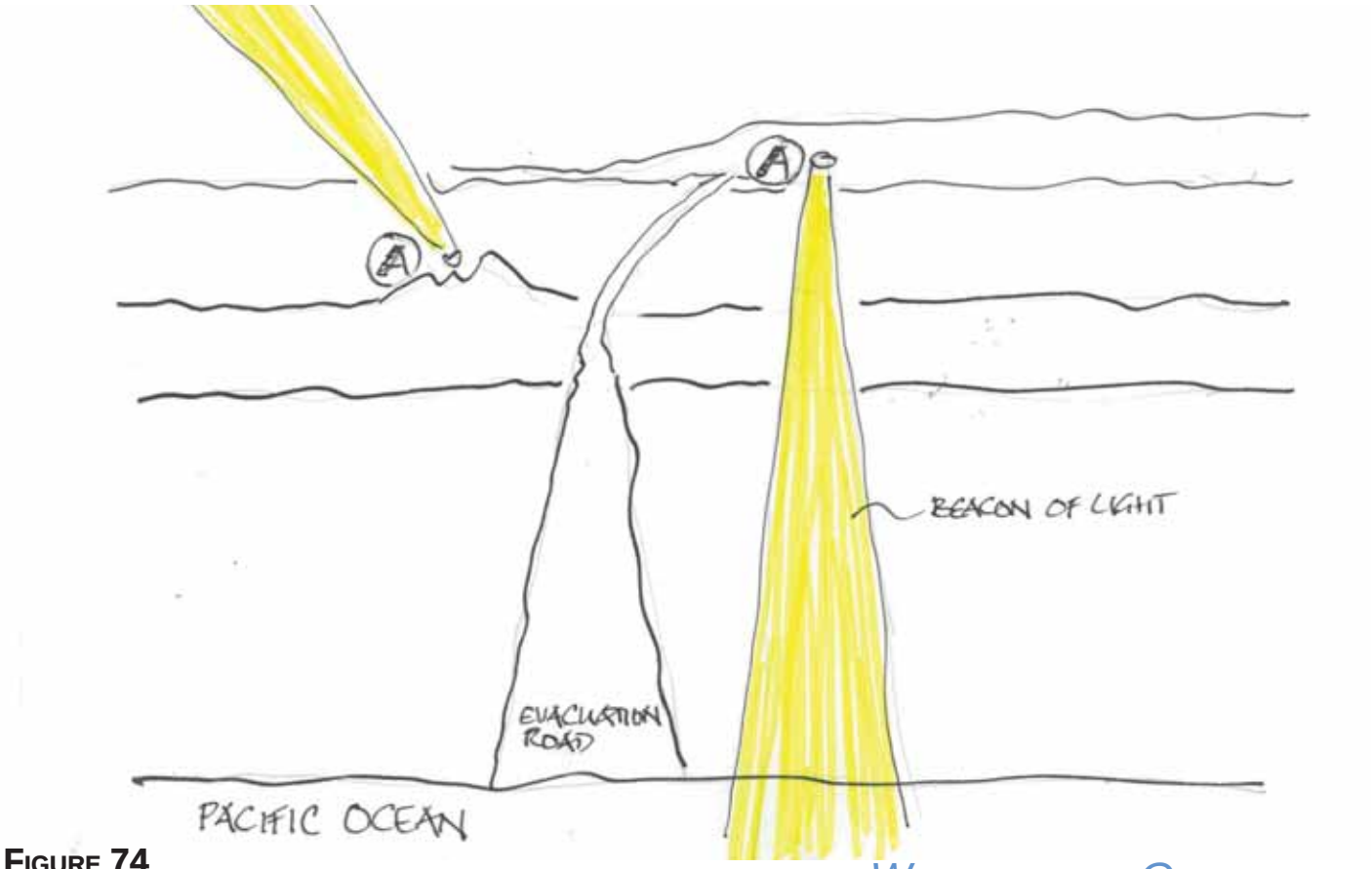


Figure 74

Warrenton, Oregon

When following evacuation routes to safety, assembly areas are not clearly visible upon approach. Even when you know where the site is based off of the map, there is little that draws people to the area, and clearly presents itself as the final destination. Similar to a race, when the finish line is in site, runners try to finish strong. In Warrenton, a primary evacuation route from the downtown area, that would have multiple schools leading to the site, leads to an unassuming assembly site. The site sits on top of a steep hill that turns off of 9th street onto Juniper Ave, and provides an opportunity for a bright light at the site to be seen from the bottom of the hill. This light would assure evacuees that they are close and encourage them finish the journey. Furthermore, this beacon would provide light to the assembly area, establishing a sense of place and supporting the survivors ability to use the site at night.

Related Patterns

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Know What Zone, My Personal Escape Route, Intuitive Signs, The Space Between, Distance Matters, Other Forms of Signage, Safety Zone Threshold, Assembly Area Essentials, Triage and Registration, Campsites, Sense of Place

Tsunami Safe Zone Road Paint Signs

Primary Pattern

-Safety Zone Threshold

Highlight the significant moment along evacuation routes when safety is reached, informing people that they are no longer in the hazard zone, while also helping to raise awareness and recognition of tsunami safe zones.

Figure 75

Wellington, New Zealand

The assumed safe elevation line is often located significant distance before the actual assembly area. There are no signs that tell people when they are step out of the hazard zone, making the Assembly Area Sign the only sign indicating of safe ground. Alleviating the psychological stress of being in danger, before reaching the actual assembly area, can help evacuees begin to react to their environment as they arrive. This advantage holds significant potential to increase the initial efficiency of assembly and the long term success of response sites. The city of Wellington, New Zealand painted blue strips that include the word “Tsunami Safe Zone,” which literally informs people when they are no longer in danger, so that they can stop evacuating, and begin responding. Furthermore, these strips of paint clearly inform people of where the safety zone threshold exists, helping people to learn their evacuation route, and remember where to go during an event.

Related Patterns

Recognizable Wayfinding Chain, Know What Zone, Mapping Your Neighborhood, My Personal Escape Route, Intuitive Signs, Primary Route Clarity, Other Forms of Signage, Assembly Area Essentials, Triage and Registration, Campsites, Sense of Place

Response 50

Assumed Safe Elevation Sign

Primary Pattern

-Safety Zone Threshold

Acknowledge the that the pronounced safe elevation from tsunami inundation unpredictable, and demarcate the safety zone threshold as an assumption, rather than an absolute conclusion.

Figure 76

Cannon Beach, Oregon

Cannon Beach decided that they wanted to provide a sign along evacuation routes at the safety zone threshold. The sign they designed is similar to the other tsunami related signs, so that it fits well into the wayfinding signage chain. One major change was to use the color green, which is a theme they are using to indicate safe ground, where the color blue represents a tsunami hazard zone. This is a potentially clear way of making distinctions between danger and safety, but would have to be implemented on Assembly Area Signs as well to remain consistent. One thing they were concerned about was making a physical sign that states, “Safe!” These levels are based off of complex and accurate computer models, but cannot perfectly predict the disaster’s impact. Therefore, they cleverly used the words, “Assumed Safe Elevation.” This removes some of the legal risk of telling people they are safe at one specific point, because that would be impossible to guarantee.

Related Patterns

Recognizable Wayfinding Chain, Know What Zone, Mapping Your Neighborhood, My Personal Escape Route, Intuitive Signs, Primary Route Clarity, Assembly Area Essentials, Triage and Registration, Campsites, Sense of Place

GUIDING RESPONSE SITE PROGRESSION

PRIMARY PATTERN

-Campsites

Guide evacuees through the different stages of response efforts of reaching safe ground, coordinating at initial assembly areas, settling into the designated response site.

FIGURE 77

CANNON BEACH, OREGON

Some of the more well thought out post-disaster plans establish a progression of the different response stages. It is important to consider the differences between the spaces, elements, and actions needed to inform people that they are safe, instruct them of the plan, provide medical support, categorize needs, distribute supplies, and construct shelters, all while maintaining organization and leadership throughout. Expecting response leaders to efficiently control these tasks is unrealistic if a large mass of people are gathered in front of an Assembly Area sign on the side of a road. If a Cache Site,= or series of Safe Houses are planned to support people, they need separation and connection from the initial assembly point. There also needs to be a place where leadership of the larger site is centralized. This will ensure that people always know where to go for support, while also making the management of shelters and allocation of resources more efficient.

RELATED PATTERNS

Recognizable Wayfinding Chain, Information Station, Public-Private Partnership, Mapping Your Neighborhood, My Personal Escape Route, Intuitive Signs, Follow the Leader, Safety Zone Threshold, Assembly Area Essentials, 'How-to-Guide', Triage and Registration, Sense of Place

Response 52

Soccer Field and Cemetery Assembly

Primary Pattern

-Assembly Area Essentials

Place assembly areas or response sites near locations that are frequently used by residents and visitors of the city, so that people can establish a cognitive map of the destination with respect to their place in the city.

Figure 78

Warrenton, Oregon

Commonly used public spaces and urban features tend to be known by everyone living in the city, as well as by some of the visitors. If assembly areas are placed at these common areas, it becomes easier for people to create a cognitive evacuation map. The destination is not some obscure location, but rather a place they have been many times before. One of the most effective strategies Warrenton has implemented is to place assembly areas in these types of locations. Two specific assembly areas are at their Ocean View Cemetery and Soccer Complex. Compared to other assembly areas in the city, these open areas are not particularly equipped with the natural features or built structures for campsites. However, the first part of survival is evacuating quickly to the designated assembly area, which makes these types of distinct features significant as an intuitive destination that can more easily be found during an event.

Related Patterns

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Mapping Your Neighborhood, Relocate to High Ground, My Personal Escape Route, Primary Route Clarity, Safety Zone Threshold, Assembly Area Essentials, Campsites, Sense of Place, Multi-Purpose Cache Site

Response 53

Assembly Area Road Paint Circle

Primary Pattern

-Assembly Area Essentials

Implement a recognizable painted assembly area road sign that supplements the Assembly Areas Sign by clearly informing evacuees that they have arrived in the correct location.

Figure 79

Seaside, Oregon

Assembly area signs are limited in their ability to establish place. Instead, the natural and built features surrounding the sign impact the site's defining character an assembly area. Although most assembly areas are temporary places for people to gather before moving on to designated campsites, they will still be used for initial assembly and organization. Therefore, it is important that they have a sense of place, rather than being a 2D sign on the side of a road. In Seaside, some of the assembly areas are located at the corners of roads in quiet residential neighborhoods. Assembly Area signs are absent, even though their existence would do little establish a clear site for assembly. A possible solution that would subtly create a more well defined space, while also being a more noticeable and differentiated sign, would be a blue circular road paint sign with the letter A. Almost as if something to stand on, it can become the center for gathering if no other established space is readily available.

Related Patterns

Recognizable Wayfinding Chain, Know What Zone, Mapping Your Neighborhood, My Personal Escape Route, Intuitive Signs, Primary Route Clarity, Other Forms of Signage, Campsites, Sense of Place

Response 54

Assembly Area Park Features

Primary Pattern

-Assembly Area Essentials

Enhance assembly areas with essential functions such as light, seating, and shelter, so that evacuees have a place to use immediately upon arrival, while also becoming a central station for organizing campsites.

Figure 80

Charrette Generated Idea

Even if there are separate plans to set up camp in safe houses or cache site, assembly areas are still going to need to support survivors for a significant amount of time before settling into the designated response site. Before setting up camp, people need to be accounted for, treated, and informed of the plan. This all becomes easier in a pleasant space that provides lighting, seating, and shelter; rather using ambiguous area with nothing but a sign. An assembly site in Seaside is placed on a small patch of land that could easily be designed as a park, with terraced areas for seating, a small structure, and lighting; making it a recognizable destination for evacuation. These functions would support assembly, and provide places for response site leaders to register survivors and administer first aid. Furthermore, this area could be relied on as the central hub for organizing the response sites until the arrival of outside aid.

Related Patterns

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Public-Private Partnership, Mapping Your Neighborhood, My Personal Escape Route, Intuitive Signs, Primary Route Clarity, Triage and Registration, Campsites, Sense of Place

Response 55

REGISTRATION AND TRIAGE STRUCTURE

PRIMARY PATTERN

-Triage and Registration

Construct a small shelter with seating at assembly areas, that can serve as a station for registering people into the site and administering medicine to injured survivors

FIGURE 81

WARRENTON, OREGON

Before setting up long term response sites, it is important to conduct triage and registration for survivors. This practice will establish a count of who is there and what resources or skills they have to contribute. It will also provide an opportunity to assess injuries and medical concerns that will need immediate attention versus those that can wait. Lastly, it is an effective method for controlling the flow of people into campsites, and later assigning them tasks. This type of evaluation becomes problematic if someone is expected to go around and try to interview people, rather than being conducted in a dedicated area. A covered structure with seating and tables can serve this purpose, while also becoming the central location that people can go to for assistance. Depending on the amount of estimated evacuees and other campsite amenities, this structure may have one picnic table with benches or might shelter a larger area to protect injured survivors.

RELATED PATTERNS

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Information Station, Public-Private Partnership, My Personal Escape Route, Intuitive Signs, Follow the Leader, Assembly Area Essentials, 'How-to-Guide', Campsites, Sense of Place

Response 56

Organizing Campsites with the Rule of 3

Primary Pattern

-Campsites

Plan disaster response sites on the rule of 3; a principle that people can generally last up to 3 hours without shelter, 3 days without water, and 3 weeks without food.

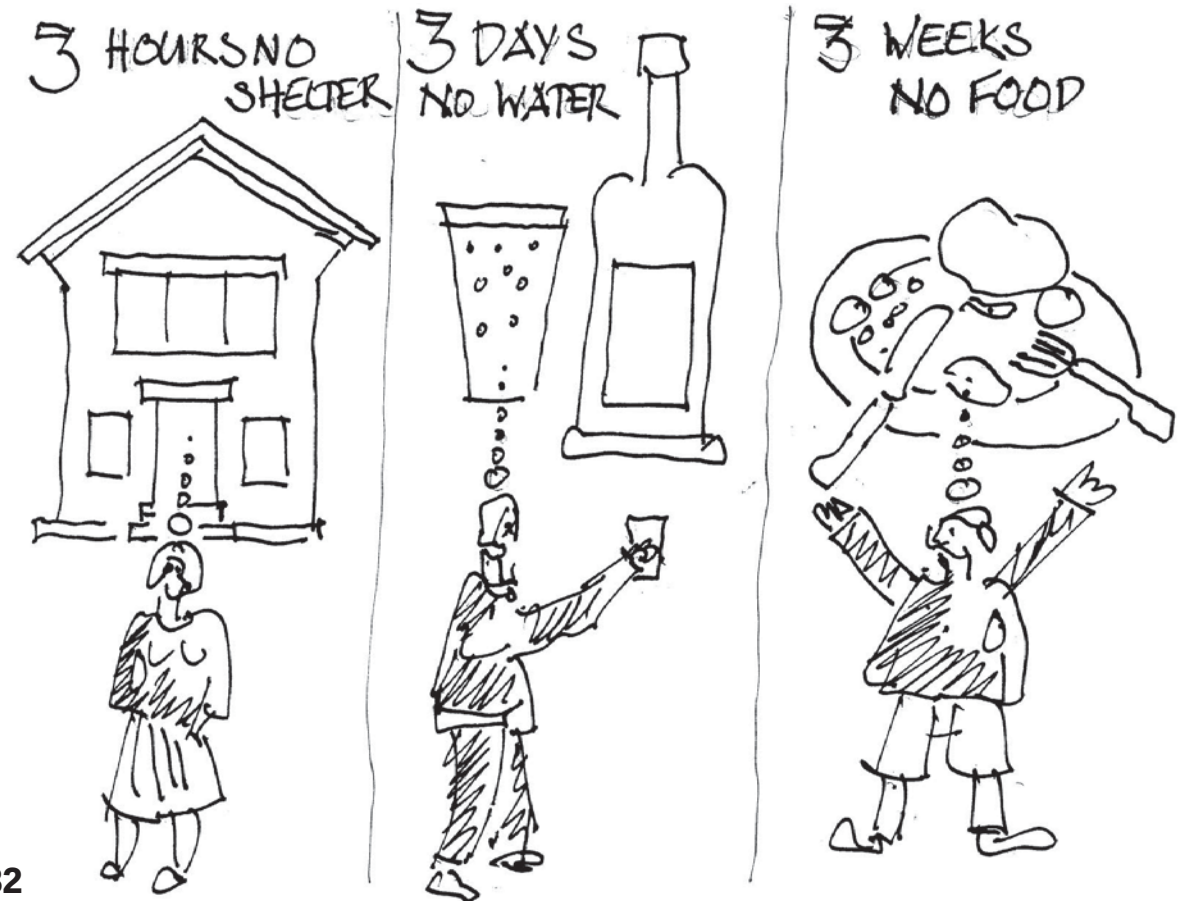


Figure 82

It is natural when creating a post-disaster survival plan to spend considerable effort on food supply. This may be in part because we are accustomed to having a roof over our heads and running water. The truth is that people can survive up to 3 weeks without food, but only 3 days without water, and 3 hours without shelter in harsh weather conditions. Water and electric lines are assumed to be down, so while all sites should store enough food, it is important to address water, shelter, and electricity concerns when planning response sites and spending limited funding. The type of campsite facility and its location in the natural environment will dictate which needs are more demanding. For instance, Safe Houses do not need to address shelter, but should consider implementing water wells and back up generators. Cache Sites should be placed in areas nearby water sources with natural protection from the elements, so more money can be spent on creating shelter and stocking supplies.

Related Patterns

Public-Private Partnership, Mapping Your Neighborhood, Follow the Leader, Assembly Area Essentials, 'How-to-Guide', Triage and Registration, Campsites, Sense of Place, Multi-Purpose Cache Sites

Response 57 Camping Grounds Campsites

New Pattern
-Campground Campsite

Strategically locate response sites at public or private campgrounds that are used by visitors throughout the year, effectively eliminating the need to set up expensive programs for a one time event.

Figure 83

Warrenton, Oregon

Most assembly areas are based on where high ground is in relation to different populated areas within the tsunami hazard zone. While their location is not random, they are usually determined after the routes have been decided. This means that they are often remote and unknown. However, the city of Warrenton has done an excellent job of strategically placing their assembly areas at popular public destinations. In particular, one assembly area is located at the KOA campground. This facility is already prepared to support survivors with plenty of cabins, campsite spaces, and lodging as well as the useful amenities such as on site electricity, propane, and water. Campgrounds are a spectacular campsite solution because they remain in use everyday, requiring little additional funding and upkeep to operate after a disastrous event. This effective project has generated a new Survival Language Pattern called “Campground Campsite.”

Related Patterns

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Public-Private Partnership, Mapping Your Neighborhood, Relocate to High Ground, My Personal Escape Route, Primary Route Clarity, Safety Zone Threshold, Assembly Area Essentials, ‘How-to-Guide’, Triage and Registration, Campsites, Sense of Place, Multi-Purpose Cache Site

Response 58

VACATION RENTAL STORAGE AGREEMENT

PRIMARY PATTERN

-Safe House Campsite

Provide incentives for owners of vacation homes located near response sites to store valuable resources and supplies for survivors at post-disaster response sites.

FIGURE 84

SEASIDE, OREGON

Coastal cities have many vacation homes used sparingly by the owners, that are either vacant most of the year, or are rented out to guests. Properties that are not used as a primary residence, hold a significant financial burden. They are either not used as frequently enough, or have a difficult time renting year round, making the investment in such properties less attractive. These types of homes, which are located on safe ground and near assembly areas, present an opportunity to store additional supplies and resources for campsites. In order to get the owners of these properties to volunteer their home as a safe house or storage facility, the city of Seaside and others may want to consider entering into an arrangement that provides tax benefits or other incentives. These types of programs can promote participation in disaster preparedness, increase the collaboration between permanent and temporary residents, and provide additional structures that are dedicated to post-disaster response.

RELATED PATTERNS

Multi-Purpose Infrastructure, Public-Private Partnership, Mapping Your Neighborhood, Relocate to High Ground, Follow the Leader, Assembly Area Essentials, 'How-to-Guide', Triage and Registration, Campsites

SAFE HOUSE RETROFIT EXCHANGE

Response 59

PRIMARY PATTERN

-Safe House Campsite

Structurally retrofit homes located near assembly areas in order to assure they will remain standing after an earthquake, in exchange for people offering their residence as a Safe House response site.

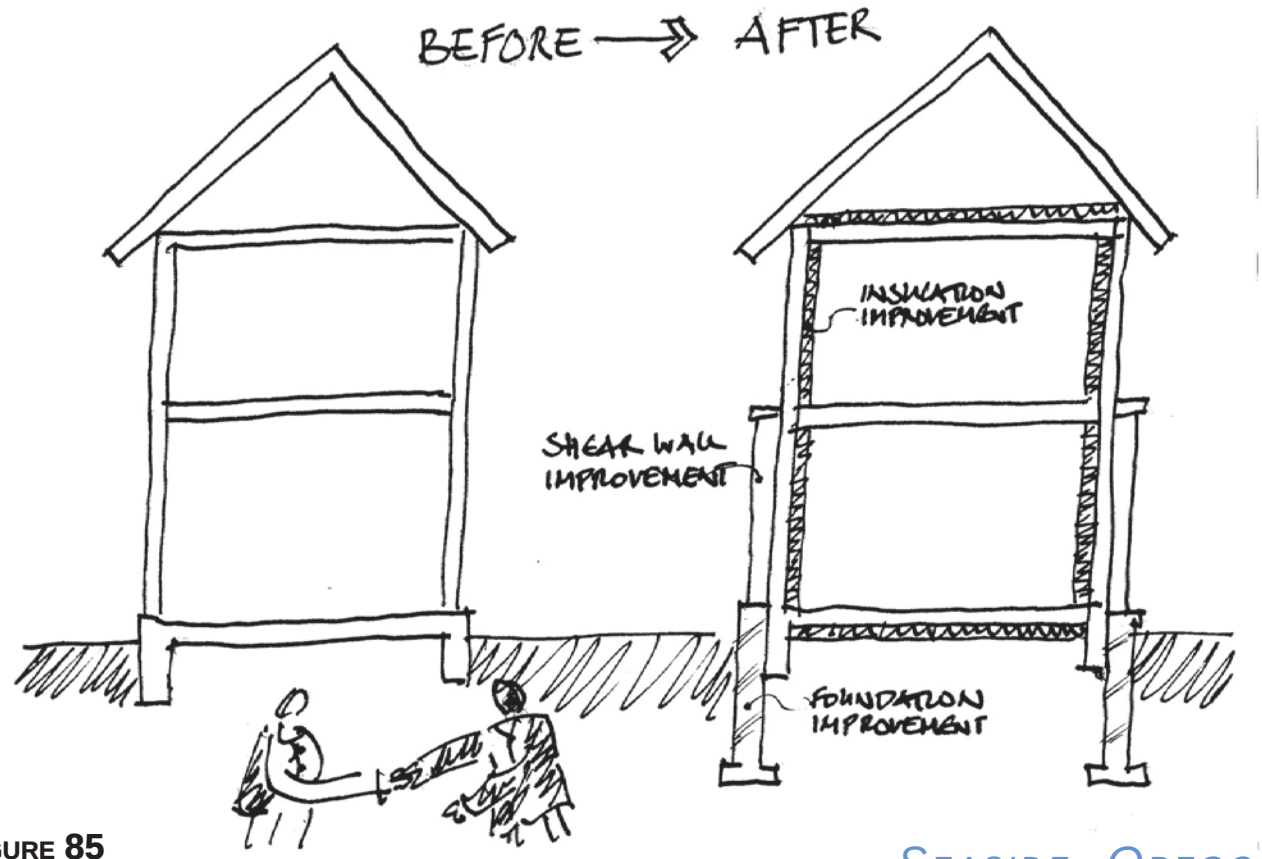


FIGURE 85

SEASIDE, OREGON

Residential neighborhoods have the ability to play a significant role for tsunami response. Homes provide shelter, a place to store goods, and residents who are prepared to lead during an event. Wood frame homes are more capable of withstanding an earthquake, but are usually of an older generation that may not have enough structural integrity. Furthermore, they are privately owned, and the government has no right to mandate that people offer their homes as shelter. Therefore, it is critical to make sure the dedicated homes will be standing after the earthquake. The city of Seaside relies heavily on Safe Houses for response sites, and may want to consider offering partial or comprehensive funding for structural retrofits to residents, in exchange for their willingness to volunteer their homes. This will ensure that more Safe Houses and their supplies are accessible, while increasing the willingness for residents to participate in the post-disaster planning process.

RELATED PATTERNS

Multi-Purpose Infrastructure, Public-Private Partnership, Mapping Your Neighborhood, Relocate to High Ground, Route Safety, Follow the Leader, Assembly Area Essentials, 'How-to-Guide', Triage and Registration, Campsites

Response 60 Cache Site Campsites

Primary Pattern
-Cache Campsite

Develop a partnership between city officials, disaster organizations, local businesses, and residents in order to develop cache site programs near designated assembly areas, that can store the necessary resources for survival.

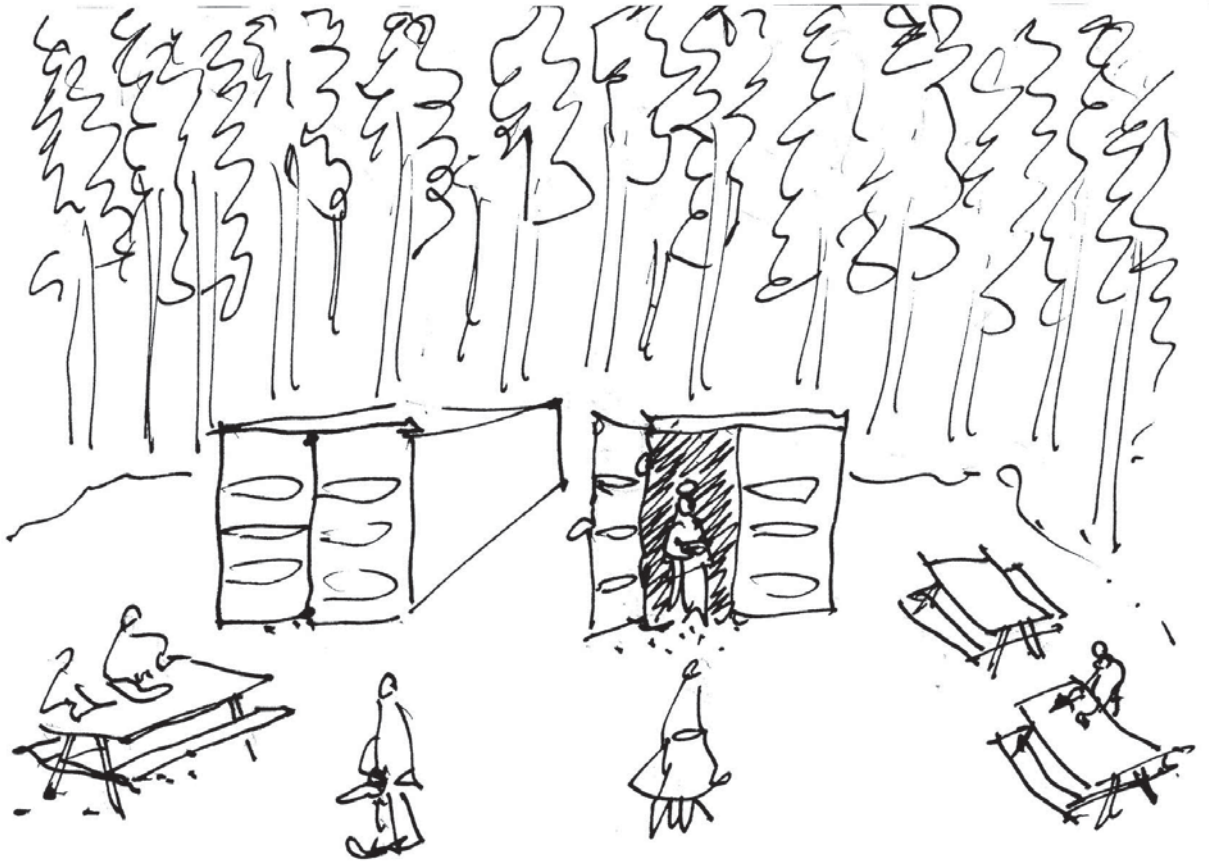


Figure 86

Cannon Beach, Oregon

The city of Cannon Beach has divided their city into a series of evacuation zones, and decided upon three primary districts to have Cache Sites that will be used to support survivors. They are public/private enterprises that take a significant amount of funding, participation, and upkeep in order to be functional. Each site is help run by members of their EPREP team who live close to the site, and are dedicated to their neighborhood. While all three have storage containers or shelters that house campsite resources and supplies, one particular Cache Site has recently had structural pads constructed, which will hold water and gas tanks. Other things that the city has considered are methods for sanitation and waste, supplies to clear debris, and equipment to contact the other sites and the outside world. Developing cache sites is no small task, but it creates an opportunity to promote public participation and collaboration, which begins to establish a resilient community prepared to respond to the disaster together.

Related Patterns

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Information Station, Public-Private Partnership, Mapping Your Neighborhood, Relocate to High Ground, Route Safety, My Personal Escape Route, Lights at Night, Follow the Leader, Safety Zone Threshold, Assembly Area Essentials, 'How-to-Guide', Triage and Registration, Campsites, Sense of Place, Multi-Purpose Cache Site

Response 61

CACHE SITE BARREL PROGRAM

PRIMARY PATTERN

-Cache Campsite

Enact a program that offers local residents and businesses the opportunity to store a barrel of their personal resources and valuable items in a secured location, so that they can be accessed after the disastrous event.

FIGURE 87

CANNON BEACH, OREGON

Providing enough resources and supplies at campsites for everybody that would arrive at an assembly area is nearly an impossible task. Hopefully, many of the permanent residents are prepared with Go Bags that they will be able to evacuate with, having enough supplies to support themselves. One solution to store additional resources on safe ground is the Cache Container Program in Cannon Beach. Anyone can buy a 55, 30, or 5 gallon barrel, and pay a marginal yearly rental fee to store personal items in a secured space. They help advise people on how to best organize their barrels with essential supplies, as well as provide multiple times each year that they can be accessed to update food and medicine. The secured containers are stocked with additional resources that will support the tourists and visitors who will arrive on site with nothing. While public participation in this program is still growing, the city is hopeful that these response sites will be more prepared to support post-disaster survival.

RELATED PATTERNS

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Information Station, Public-Private Partnership, Mapping Your Neighborhood, Relocate to High Ground, Route Safety, My Personal Escape Route, Lights at Night, Follow the Leader, Safety Zone Threshold, Assembly Area Essentials, 'How-to-Guide', Triage and Registration, Campsites, Sense of Place, Multi-Purpose Cache Site

Response 62

Cache Site Security Concerns

Primary Pattern

-"How-to-Guide"

Protect the valuable resources at post-disaster response sites through different security measures, while making sure they can be accessed by evacuees if no response leader arrives to open the container.

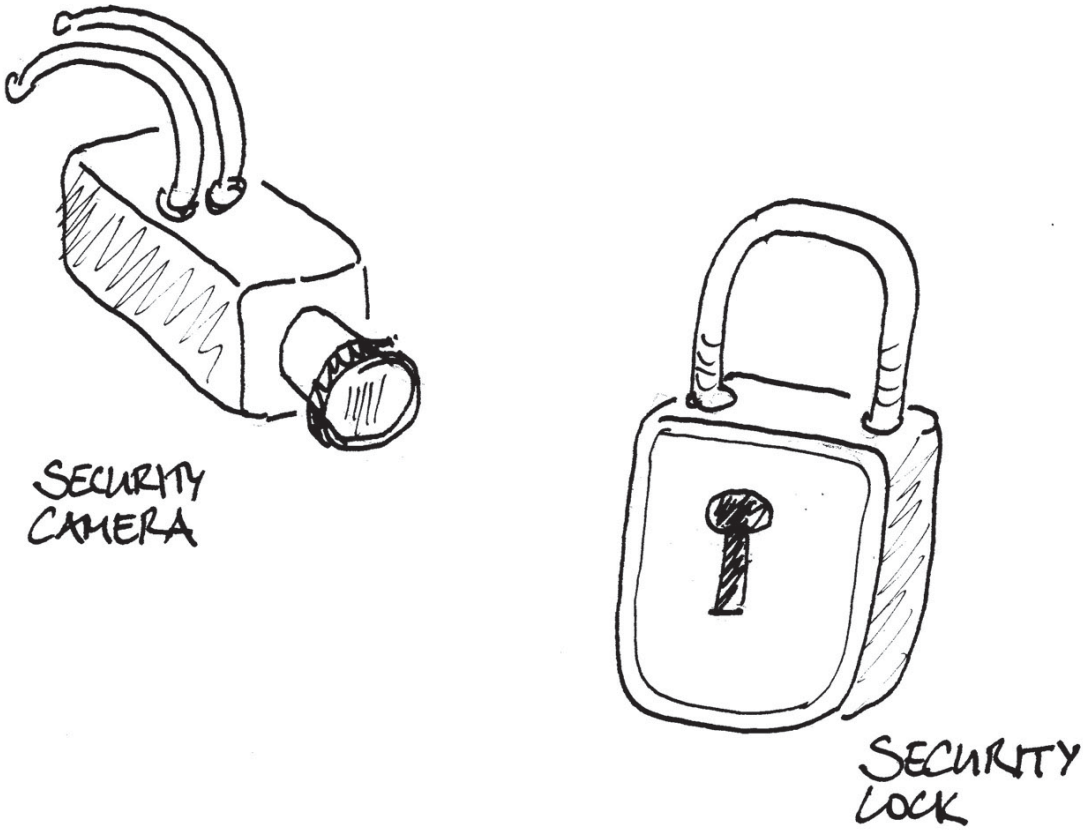


Figure 88

Cannon Beach, Oregon

The pilot Cache Container program in Cannon Beach met a setback when their storage container was broken into and barrels were taken apart, with most of the medicine and valuable stolen. They believe the thieves mistook the word "Cache' for Cash," but the event made them realize that these stockpiles needed to be secured and protected. Containers now have unbreakable locks and security cameras to protect themselves. However, they can only be accessed by a key, making it imperative that someone with that key arrives on site, or everything will be trapped with no way to break in. This made them reach out to more local residents to participate in the effort, and provide them with keys to unlock the container. This type of action enhances the trust, communication, and collaboration between neighbors. While it was an unintended outcome, it helped achieve the goal of creating a more resilient and interdependent

Related Patterns

Information Station, Public-Private Partnership, Mapping Your Neighborhood, Route Safety, Lights at Night, Assembly Area Essentials, Campsites, Sense of Place, Multi-Purpose Cache Site

"How-To-Guide" Lock Box

Primary Pattern

-"How-to-Guide"

Store an instruction manual in a locked box that survivors can use to organize response sites and utilize the available resources, in the event that no designated response leader arrive to execute the plan.

Figure 89

Cannon Beach, Oregon

While it is unlikely that no trained leader will arrive at an assembly area, it is important that evacuees have a document that helps guide campsite organization, access locked resources, and set up shelters. The creation of this "How-to-Guide" is a crucial step that will provide a forum for the Response Leaders to document, layout, and practice the response plan. Because it is meant for a user to read for the very first time, it will not make any assumptions, and therefore make for a much more thorough and precise plan. The primary issue is how to provide evacuees with this document after the event, while not making it available to thieves. One possible solution is to create a breakable locked box that will sound an alarm, so that it is secured. The alarm might run off the electric grid, and therefore not sound when the earthquake destroys power lines. Or it could be turned off from inside the locked container, providing enough police response time before thieves have time to read the document and break into the container.

Related Patterns

Information Station, Public-Private Partnership, Mapping Your Neighborhood, Route Safety, Other Forms of Signage, Follow the Leader, Assembly Area Essentials, Triage and Registration, Campsites

Response 64

ASSEMBLY AREA COMMUNITY GARDEN

PRIMARY PATTERN

-Multi-Purpose Cache Site

Develop community gardens on unused land near assembly areas, which will promote social collaboration, increase site education, and provide valuable produce as sustenance for survivors.

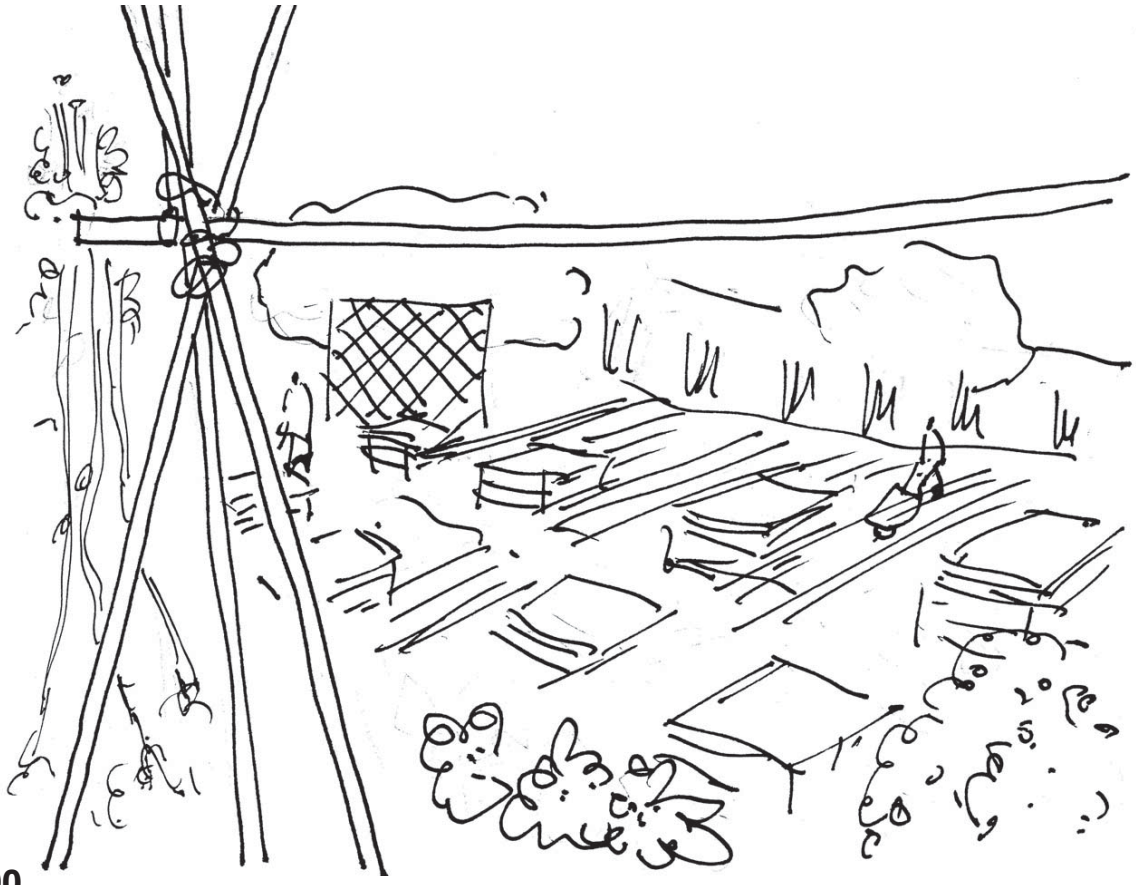


FIGURE 90

WARRENTON, OREGON

Although most assembly areas in Warrenton are strategically placed at public facilities, the site that the downtown population and schools will use is not so well defined. There are no storage facilities, and the few surrounding homes quickly retreat into the tsunami hazard zone. Unfortunately, the large plot of land that would support evacuees seems to be privately owned land. However, if the owner has no immediate plan for the land, they could temporarily donate it for a community garden until they decide to sell or develop. This garden could grow produce for sale, and even host a monthly farmers market. Ideally it would be run by engaged community members and the children at the nearby public school, providing a chance for social collaboration and education. As a positive consequence, this type of creative solution increases awareness of the assembly area, grows valuable resources for survivors, and increases public participation on that important tsunami response site.

RELATED PATTERNS

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Information Station, Know What Zone Public-Private Partnership, Mapping Your Neighborhood, Relocate to High Ground, My Personal Escape Route, Primary Route Clarity, Other Forms of Signage, Safety Zone Threshold, Assembly Area Essentials, 'How-to-Guide', Campsites, Sense of Place

Response 65 Cache Site Concerts and Events

Primary Pattern

-Multi-Purpose Cache Site

Hold outdoor concert events at cache sites with large plots of land, that can help to fund the site's development, while increasing public awareness of the location and education of the response plan.

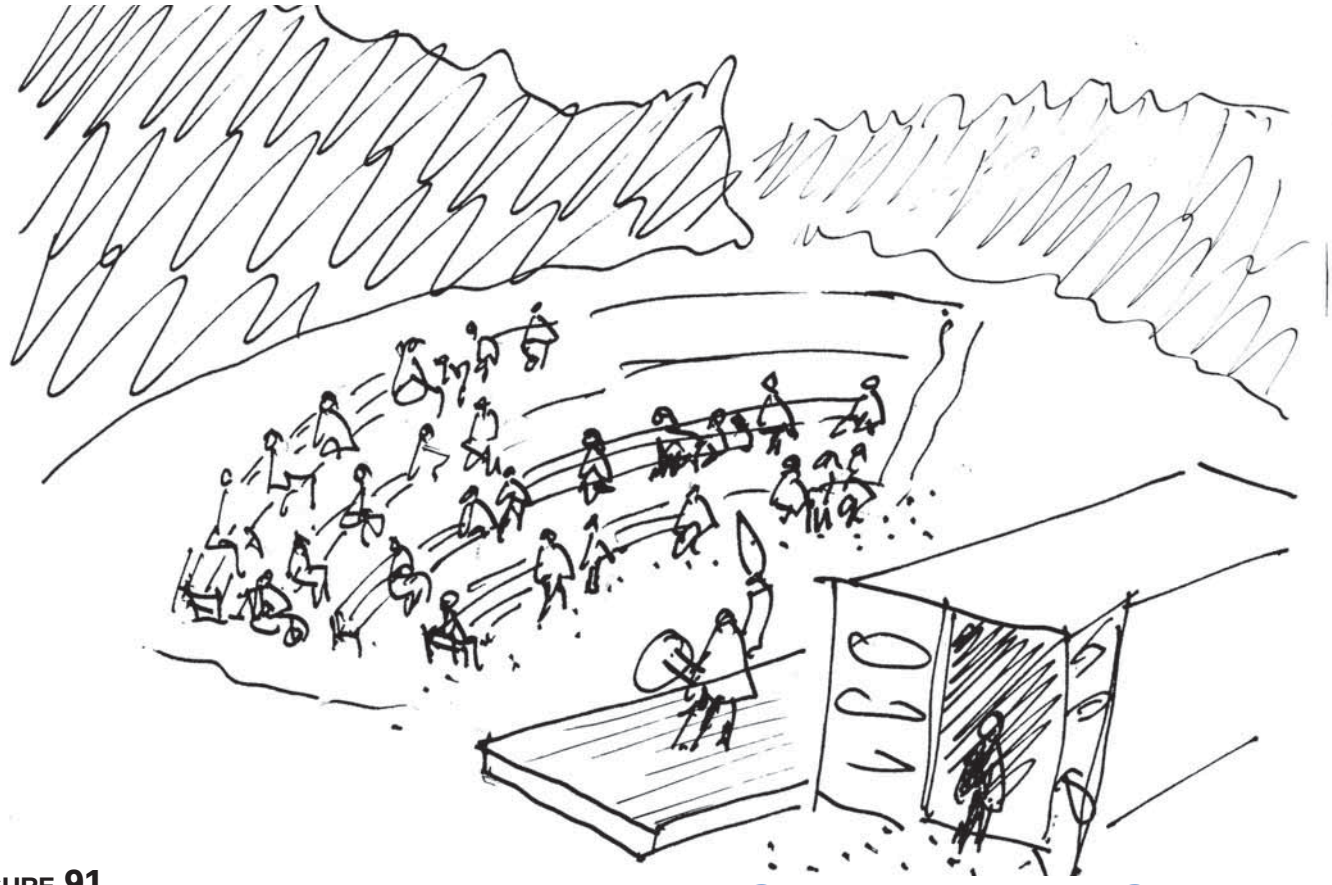


Figure 91

Cannon Beach, Oregon

Assembly areas and response sites are often in remote locations, unused by the community in daily life. This is concerning because it decreases security and provides less opportunity for upkeep. Additionally, few people will know where to evacuate, and knowledge of how to best use the sites will be limited to those that created them. It is important to find ways to increase daily use of these sites to make them more functional. The southern Cache Site in Cannon Beach has generous unused land that could be developed into an amphitheater, that would also be useful for setting up camp after the event. Concerts and social events could incorporate a nominal fee that could go to the development and upkeep of the site, as well as other TsunamiReady programs and wayfinding infrastructure for the city. The increased use of the site would educate more people about its location, preparing users to not only learn the evacuation routes, but also how to best utilize the site's amenities and resources.

Related Patterns

Multi-Purpose Infrastructure, Recognizable Wayfinding Chain, Information Station, Know What Zone Public-Private Partnership, Mapping Your Neighborhood, Relocate to High Ground, My Personal Escape Route, Primary Route Clarity, Other Forms of Signage, Safety Zone Threshold, Assembly Area Essentials, 'How-to-Guide', Campsites, Sense of Place

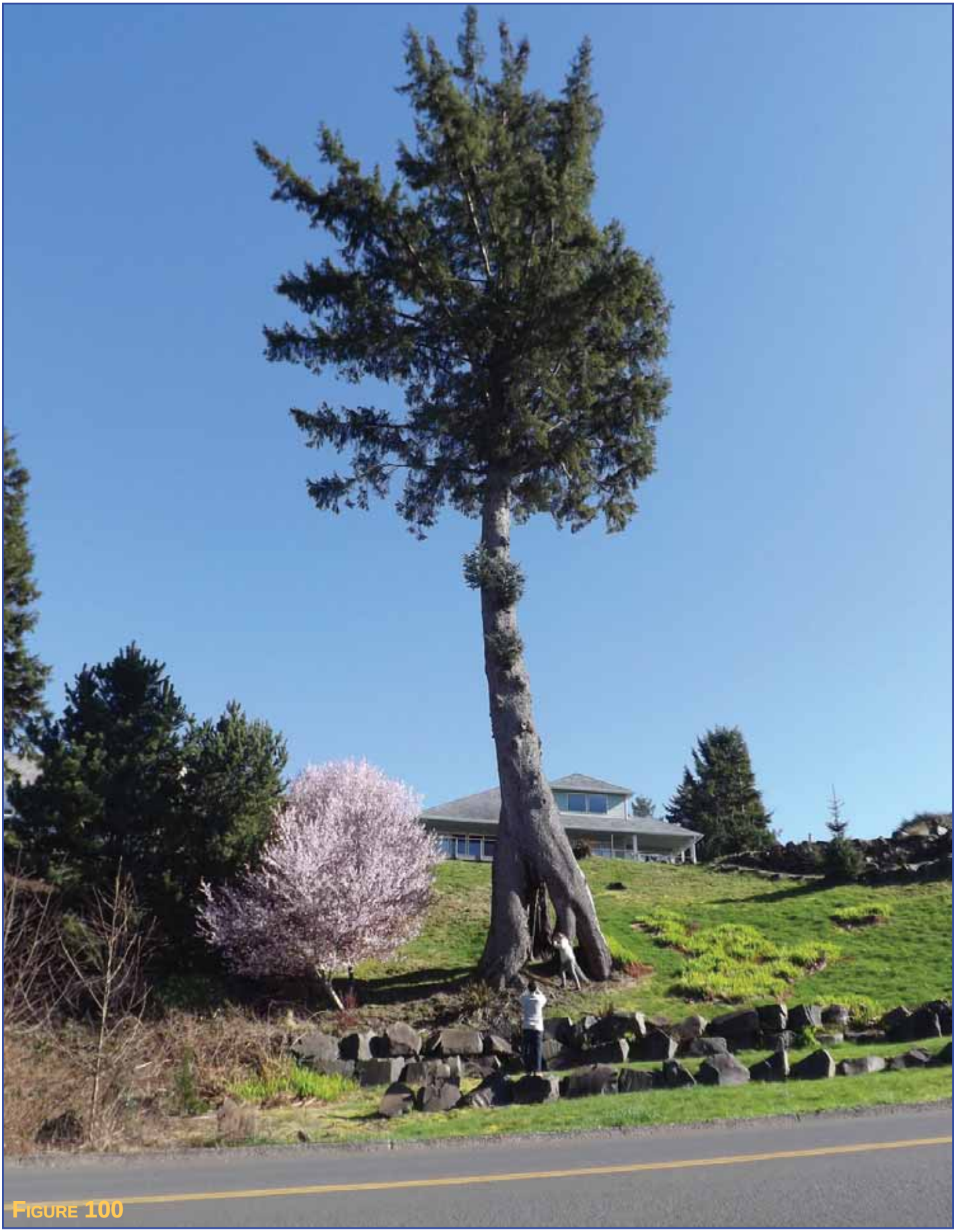


FIGURE 100

FIGURE 102

4. The Sign Suite

4.1 Wayfinding and Signage4.2
Tsunami Wayfinding Chain of Signs
4.3 Tsunami Wayfinding Signs

4.1 Wayfinding and Signage

In his book, “Wayfinding Behavior: Cognitive Mapping and Other Spatial Processes,” Reginald Golledge defines wayfinding as, “the process of determining and following a path or route between an origin and a destination. It is a purposive, directed and motivated activity.” (Golledge 1999) A travel plan is the initial action of defining the route, which established a path made up of a sequential series of segments and turns. The legibility, or ease in which these routes can be followed, relies upon the directive cues and external references which dictate the rate at which the path and its surrounding environment can be learned. The repeated following of routes, supports the ability to establish cognitive maps, where the mind breaks down the route into one-dimensional linked segments that rely upon physical elements to help identify location along a mental map. A more identifiable destination allows the mind to better imagine the relationship of distance and direction from different moments along route. (Golledge 1999)

Wayfinding relies heavily upon information graphics in the form of signs to provide route legibility. The book “Signage Design Manual,” written by Edo Smitshuijzen, details the process of designing a signage project from start to finish, highlighting important considerations along the way. The book illustrates that an effective signage design and implementation into the built environment relies upon a wider variety of factors including purpose, design, placement, upkeep, and systems. (Smitshuijzen 2007)

When beginning the process of designing a signage system, it is important to first consider the different types of information that signs convey. Four categories of signs can be used to define the signs purpose: orientation, instruction, direction, and destination identification. Information graphic design is the visualization of knowledge in such a way that it helps people to quickly understand content. Major factors that influence an effective sign are its color, shape, text, symbols, and size. Specific colors and shapes naturally indicate a particular action. Sign placement into the environment is another key element of implementing a usable signage system. According to Smitshuijzen, there are two spatial aspects to consider when placing signs. The first is the sign’s directional position along the route, and the second is the elevation where the sign is placed. In the process of implementing a signage system, important factors such as method of fabrication, mounting, and maintenance of signs should be considered. A comprehensible signage manual should be produced that describes details on all the sign types. This document can be used by those involved in making updates to the system, and should contain accurate data on the locations, specifications, and sign types. (Smitshuijzen 2007)

4.2 Tsunami Wayfinding Chain of Signs

Although there are many different types of physical and non-physical ways to help guide people along evacuation routes, the most straight-forward and common method is 2D signage. The existing tsunami evacuation wayfinding system is in Oregon coastal cities is primarily made up of 3 fundamental signs that address the preparation, evacuation, and response stages. Tsunami Evacuation Map Signs educate people of evacuation route and assembly area locations before an event. Tsunami Evacuation Route Signs guide people up and out to safety during an event. Assembly Area Signs indicate to evacuees that they have arrived at the destination after the event.

These 3 fundamental sign types represent the minimal amount of information needed to help people survive a tsunami event. However, the designs and placements in each city are different, and some important pieces of information are missing from the wayfinding signage chain. This makes it difficult to create a system that is effective, especially when the signs need to remain usable for many years. It would be beneficial to establish a set of universal signs that can be used for each city. These signs would therefore be recognizable up and down the coast, making the learning of evacuation routes and general awareness of the threat not an individual city effort, but rather a larger county goal. If these signs could be agreed upon, it would become much easier and cheaper to fabricate, locate, document, and maintain the signs over time.

We recommend that the following sign designs in this chapter become the common tsunami signs for cities in Clatsop County and other coastal communities. We have left out the Tsunami Evacuation Map Sign, because we believe that the newest version Clatsop County has implemented based DOGAMI evacuation route modeling, is effective. It should be continued to be used to indicate specific routes up and down the coast, as well as provided on a smaller city scale for personal brochures and as a downloadable file online. Although we spent a lot time considering whether to redesigns logos and colors, we decided as a group and through the input of people at the charrette, that the blue themed wave has become an effective symbol of this movement, and should remain part of all the sign suite. Therefore, we did our best to improve the signs graphic legibility and information, as well as designed two new signs that we believe are important elements of the tsunami wayfinding chain of signs. While we exercised many different sign designs, we have recommended four primary designs that we believe are the most effective, and included some of the other possibilities or attachments at the end of the section for reference.

4.3 Tsunami Wayfinding Signs

1. TSUNAMI HAZARD ZONE SIGN:

The writing included on this sign is critical information that is not clearly and visibly stated in large print anywhere else in the city itself. The new design is relatively unchanged from the original sign, which for some reason have been removed from most areas within the cities, and adapted for highways. The writing has changed slightly, so that the earthquake and evacuation lines are distinct from one another. We have also explored color options, because we believe that red or yellow are more cautionary than blue. However, one of the reasons that this sign may have been removed is that it was scary, so we want to make sure and provide this important information, without making it too alarming. Signs with added color are included at the end of this chapter.

2. TSUNAMI EVACUATION ROUTE SIGN:

This particular sign is based on the signs found in Cannon Beach, many of which have new pedestrian signs attached to them. We wanted to develop this idea into the sign itself, so that all new printed signs would clearly indicate pedestrian evacuation, without confusing the relationship between the two signs. We decided to incorporate other ideas from around the world where distance markers are included on signs. However, instead of printing it on each sign, which would make every sign have to be different and strictly printed based off an accurate location, we designed a smaller attachment sign that can be fabricated after the evacuation route sign is placed in a certain location, and the distance is measured to safety. We believe that this information helps people while evacuating as distance is an teller of time and the decreasing numbers assures evacuation in the correct direction. Lastly, the distance sign attachment would help the city create a manual that documents the location of every sign in the city, so that maintaining or changing signs will become much easier in the future.

3. TSUNAMI ASSUMED SAFE ELEVATION:

The purpose of this sign is to clearly inform people when they are crossing out of the hazard zone to safety. We originally called this the safety zone threshold, but were inspired by Cannon Beach to change the wording to Assumed Safe Elevation, which is a more accurate of what the decided point on evacuation routes truly is. We believe this sign would be best paired with a line in the road that feels more like crossing over a threshold, where this would include the important information telling evacuees that they have reached the assumed safe elevation, and should continue to proceed to the assembly area. We also included an encircled “S”, which like the “A,” is a symbol that can begin to represent safety on tsunami evacuation maps or in other types of tsunami related documents.

4. ASSEMBLY AREA SIGN:

This assembly area sign is a relative change from a couple of different signs found in different cities along the coast. The encircled A, represent the A that is found on the maps and potentially printed into the ground, making graphic link between different elements on the chain. The people holding hands is a positive symbol of safety, versus the person running from danger. Lastly, we wanted to incorporate larger words for Assembly Area, so that they become the primary element on the sign. While this is one of the more basic versions of this sign, we have included some other possible designs for the sign itself, as well as a more detailed set of instructions that could be attached.

5. ASSEMBLY AREA INSTRUCTION ATTACHMENT:
While tsunami related signs need to be simple, legible, and clear, we believe that they need to incorporate other useful information that empowers users. There is no additional information on Assembly Area Signs that help users begin to organize themselves. We believe that incorporating an attached sign, with a list of simple instructions would be beneficial to survivors, who would otherwise stand around waiting for someone to take charge. While many disaster planners might know what to do because they were involved with the planning process, it is fair to assume that many of the people arriving on site will need leadership and direction. Therefore, this sign would help people take positive actions, rather than waiting around or doing something that would not be beneficial to themselves or the group.

OTHER POTENTIAL DESIGNS:

6. TSUNAMI HAZARD ZONE SIGNS:
These two signs incorporate the colors red and yellow into the words Tsunami Hazard Zone. Red is an obvious color for getting people's attention as a type of warning message. Yellow is the international color for tsunami, which may be more recognizable to foreigners. Furthermore, it is more cautionary, which is the purpose of this sign.

7. TSUNAMI EVACUATION ROUTE SIGNS:
These two signs are no different than the earlier designs, except that they demonstrate what the signs look like when using different direction. One thing to consider, is when turning left, whether or not to change the place of the pedestrian. We decided to flip the arrow and person, so that there is no confusion about which direction to turn.

8. TSUNAMI SAFETY ZONE THRESHOLD SIGNS:
This was an earlier version of the Assumed Safe Elevation Sign. The words Safety Zone Threshold speaks to the crossing between two zones. The words below are then meant to tell people that they have reached high ground and should continue on to the assembly site. While we believe this sign is effective, there seems to be too many words, which is not an effective strategy for designing signs that are meant to guide people along a route.

9. TSUNAMI ASSEMBLY AREA SIGNS
We also want to elaborate on the idea that these assembly areas are temporary places for gathering, which is an attractive element of the signs found in Warrenton. A possible design would be to include the writing, "Temporary Tsunami Assembly Area." The word tsunami, strengthens the connection to the other signs, while the word temporary, indicates that the area should be used for initial assembly, rather than a long term response site.

10. FUN TSUNAMI EVACUATION SIGNS
These designs are a reflection of the MOOO joke that Cannon Beach uses during their evacuation drills. One possible idea for engaging people to prepare for an event, if done appropriately, is humor.

1. Tsunami Hazard Zone Sign:

Figure 103

2. Tsunami Evacuation Route Sign:

Figure 104

3. Tsunami Assumed Safe Elevation:

Figure 105

4. Assembly Area Sign:

Figure 106

5. Assembly Area Instruction Attachment

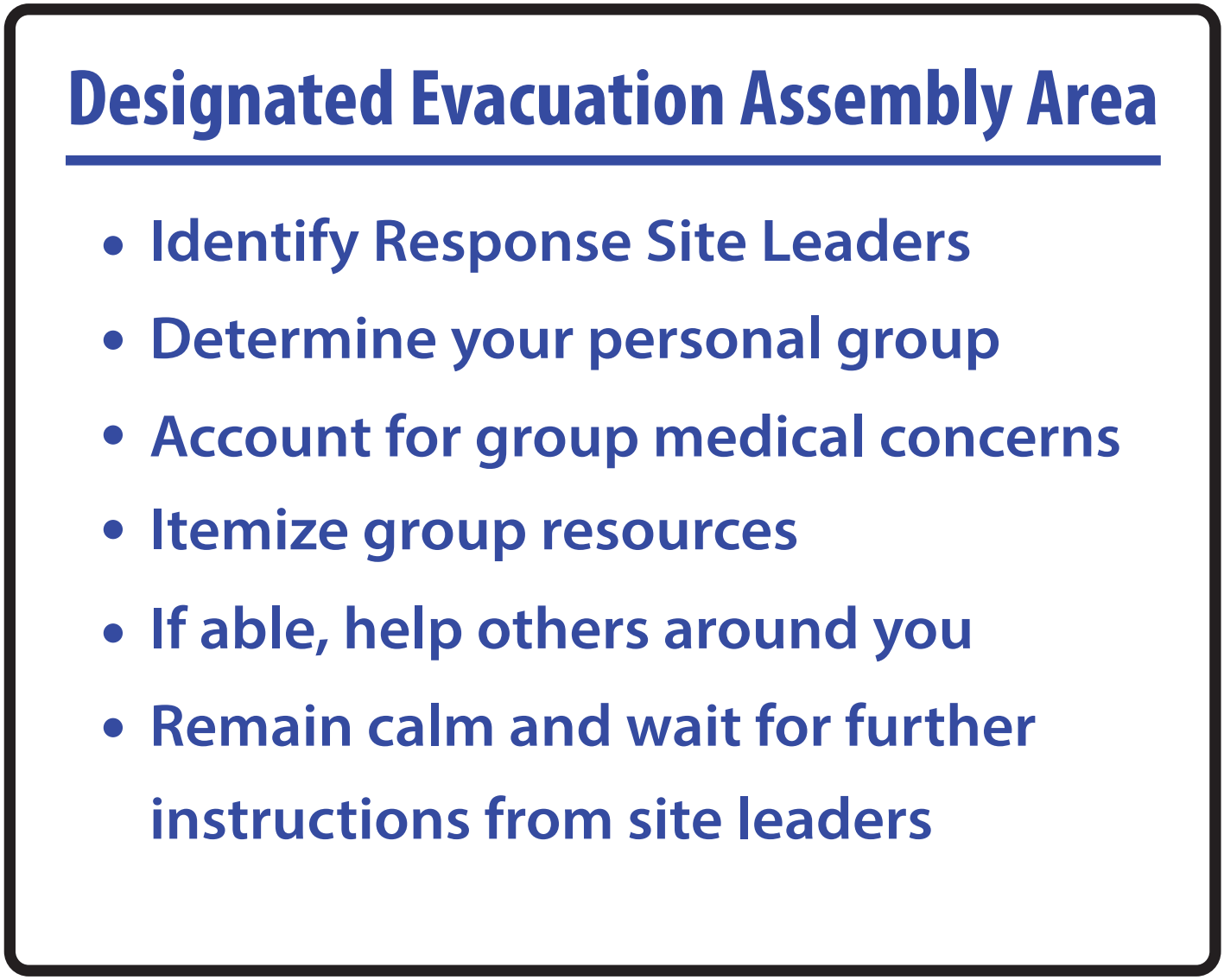


Figure 107

6. Tsunami Hazard Zone Signs:

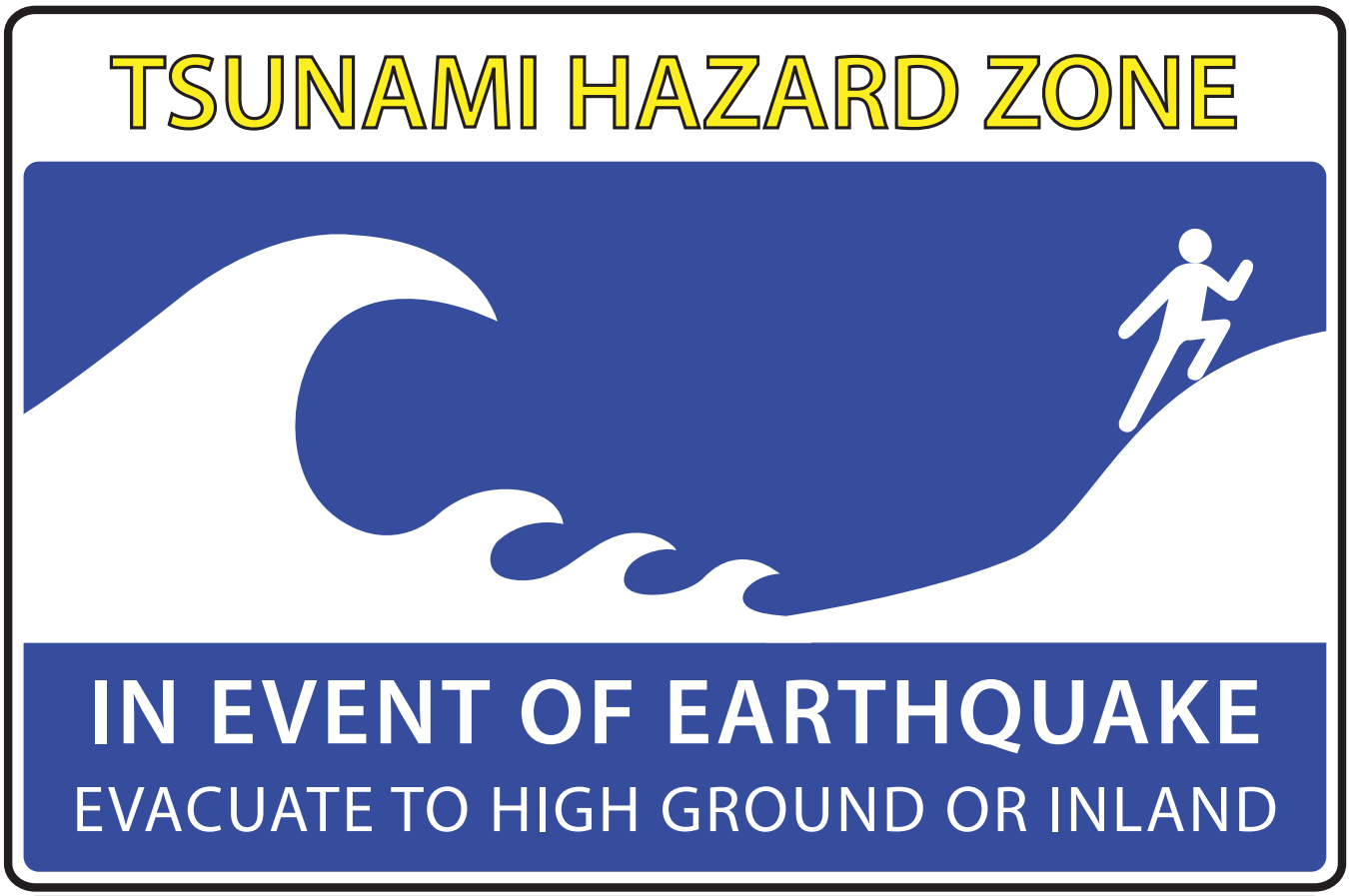


Figure 108

7. Tsunami Evacuation Route Signs:

Figure 109

7. Tsunami Evacuation Route Signs:

Figure 110

8. Tsunami Safety Zone Threshold Signs:

Figure 111

9. Tsunami Assembly Area Signs

Figure 112

10. Fun Tsunami Assembly Area Signs

Figure 113

10. Fun Tsunami Assembly Area Signs

Figure 114

FIGURE 115

5. Project Language Design Application- Wayfinding Chains

5.1 INTRODUCTION

To develop a project language in a real world application, it is essential to cater to a series of projects for an individual evacuation route. One of the biggest challenges in the application of a wayfinding chain is the variety of scales needed to create complete systems for an entire city. For instance, evacuation routes exist on every street within the city, so implementing paint in the ground with a new lighting strategy would be expensive applied universally. This can prevent the successful implementation of wayfinding chains. By focusing on primary routes first, rather than a unified city-wide planning and implementation strategy of only a few patterns, more robust wayfinding chains can be created. This cuts down on costs by preventing non-universal solutions from being implemented throughout the entire city. The system can be used, evaluated, and changed in order to determine which projects should be replicated from those that are superfluous. This strategy also allows for local participation in its development by creating a menu option for stakeholders; thus increasing the chances for communal acceptance. Furthermore, it leaves room for piecemeal growth and adaptability, which support a more resilient TsunamiReady system.

This chapter covers the design application of the Project Language Wayfinding Chains for Seaside and Warrenton from the developed Project Language shown in Chapter 3. Project languages develop when particular places are selected and patterns are applied in ways that create specific or sometimes general solutions (as in the case of signage). Typically, these solutions are specific and are only meant for the location they are designed. For Tsunami Evacuation Wayfinding, we found that applying patterns in a wayfinding chain resulted in the most robust evacuation routes. In this section, we show how two Project Language Wayfinding Chains can manifest in two very different locations along the Oregon coast.

The Seaside chain embodies the urban chain typology that would be necessary in more densely populated areas. It shows how a direct connection from the beach to a safety zone would play out. It also demonstrates possible alternatives when bridges are part of evacuation or a safe zone is too far away.

The Warrenton chain shows the wayfinding recipe for less dense urban areas. Low density settlement areas often have long open distances to cover with varied terrain and more complex paths to follow. This wayfinding chain explores how to interact with a sparser community, and create physical and cognitive mapping when there is less activity along primary routes.

FIGURE 116

5.2.1 Seaside Wayfinding Chain

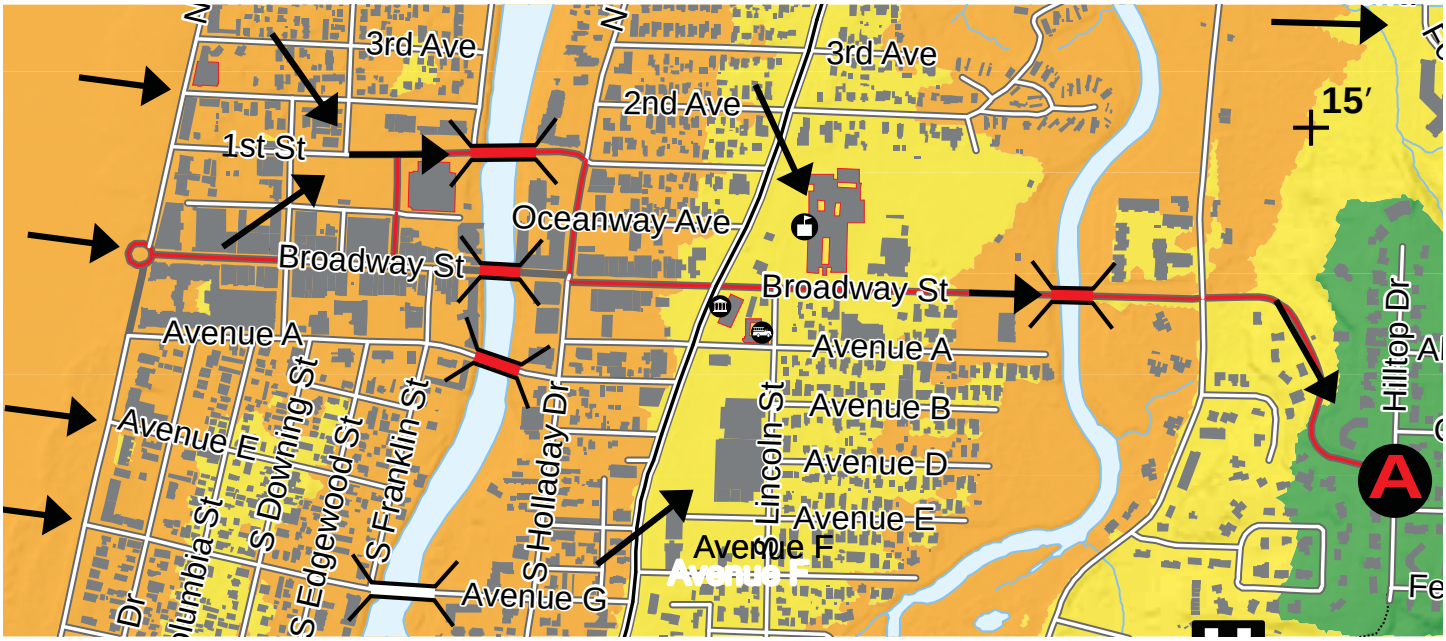


Figure 117

1. BEACH ACCESS

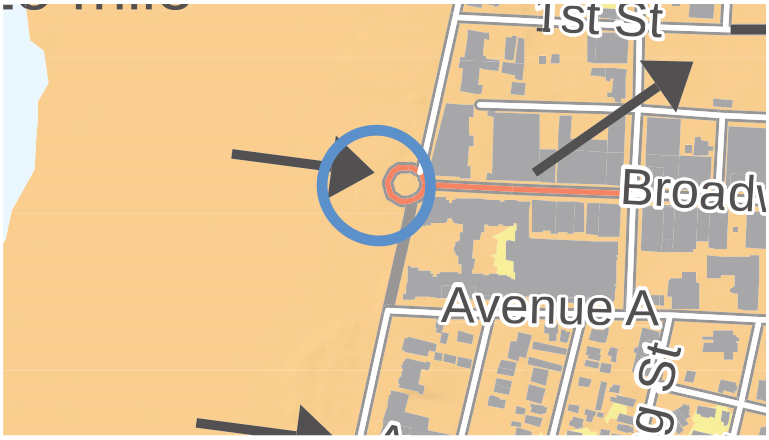


FIGURE 118

The City of Seaside's tourism industry relies heavily on beach front recreation; leaving a large number of people directly exposed to a tsunami event. Art installations are an excellent way to provide tsunami education and awareness without diminishing the recreational value of the beach. In these art components, it is important to have clear guiding signs incorporated, not only to maximize pre-event education, but also to direct people during an event. This design represents the 18 past Richter scale 9.0 earthquake/tsunami events that the West coast has experienced in the last 8,000 years, as well as the future big one. It connects to the information station on the roundabout and provides geologic, historic, and preparedness information to beachgoers. The sculptures also support regular beach use, housing a foot washing station and a fun area for kids to play and explore.

2. INFORMATION STATION

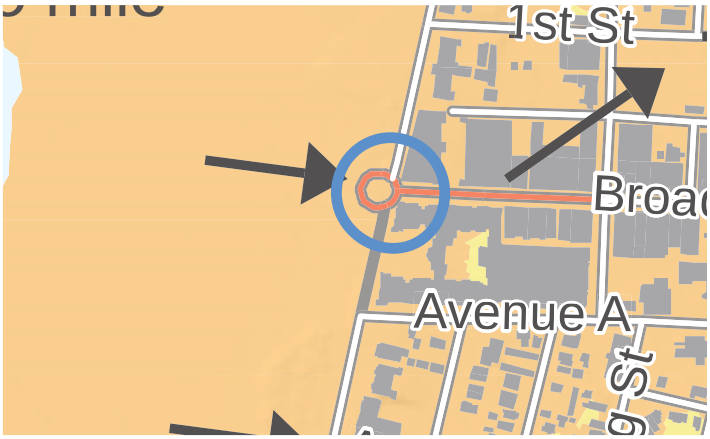


FIGURE 119

It is important to have clear guiding signs on the beach, not only to maximize pre-event education, but also to direct the many people during an event. The Seaside Information Station connects to the public art awareness project, which brings attention to the station. The goal of the station is to provide the information necessary for an tsunami evacuation after a 8-9 Richter scale earthquake. Its main focus is to provide route clarity as well as take away information and where to learn more.

3. PRIMARY ROUTE CLARITY

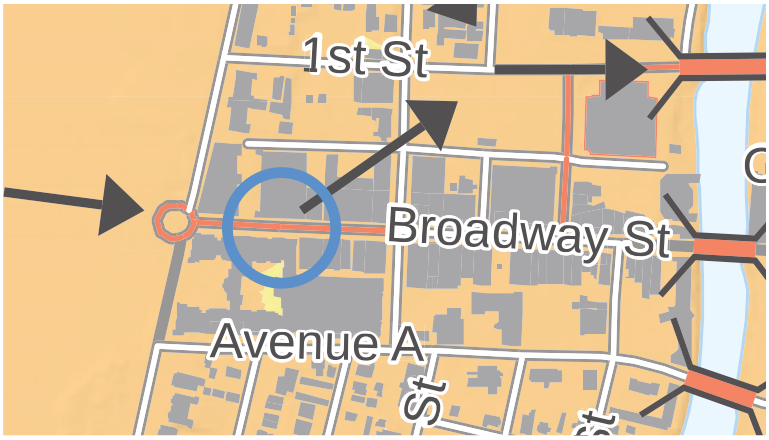


FIGURE 120

There is a distinct need for all towns on the coast to have signs that clarify evacuation routes. Part of this wayfinding clarity comes from the sign suite that the PUARL team designed (covered in Chapter 4). Signs need to communicate clearly direction, intent, and distance between people and the goal of safety. These signs need to be placed in a “breadcrumb trail” style; where the next sign is visible from the current one. Route clarity is established not only from traditional signs on posts, but also paint in the ground, lights and other color coding. In Seaside, All of these elements are applied to create route clarity in the busyness of Main street. The primary area of concern when creating route clarity in Seaside, is to link the different elements in ways that make them stand out, so they are not lost in the busyness of the street. Having elements that are prominent and repetitive allows people to make mental maps of their route, despite the activity and attractions of the main street.

4. INFORMATION PLACEMENT

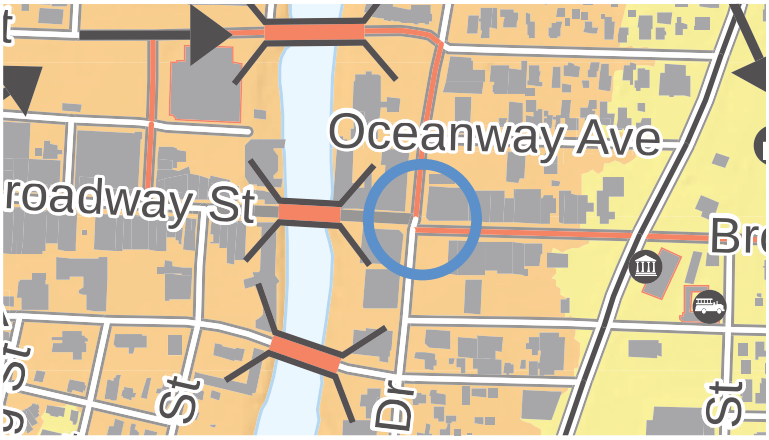


FIGURE 121

Part of route clarity for all wayfinding chains is how to command and navigate turns. In Seaside, the primary route diverges from main street to cross the reinforced bridge to the north. Upon returning to the main street, several turns need to be made. These turns are important because they need to not only direct people to turn, but they also need to not confuse people turning before the bridge.

5. BRIDGE OPTIONS

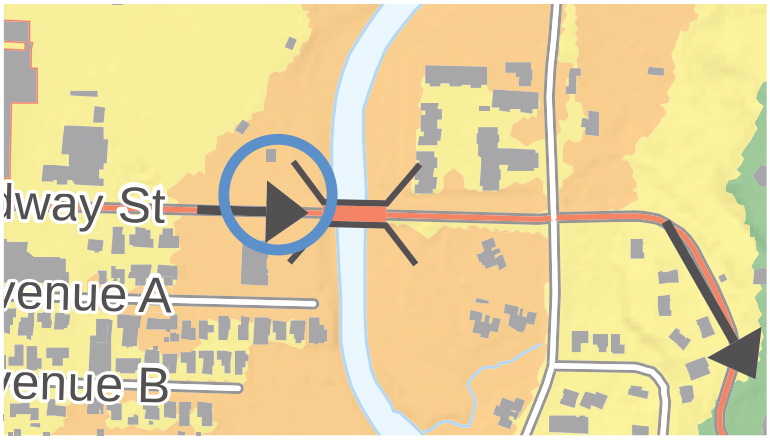


FIGURE 122

Many of the bridges throughout the coast may not survive the earthquake and subsequent flooding. In Seaside, there are several bridges along the evacuation routes where this may be the case. These bridges either need to be reinforced, or there needs to be an alternative for people to cross the river. Since there are so many bridges in Seaside, creating seismically sound pedestrian bridges would be very costly. Creating alternative and simple bridges, like rope bridges, would not only be cost effective, but also guarantee safe passage across the rivers in an event. These bridges can be incorporated into existing pedestrian trails.

6. SAFETY ZONE THRESHOLD

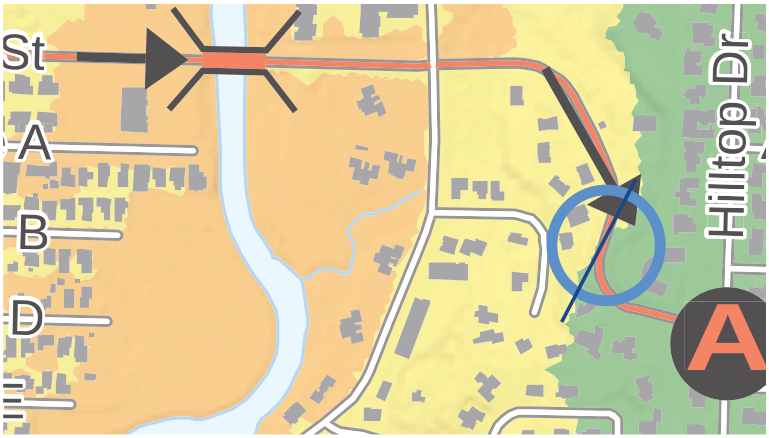


FIGURE 123

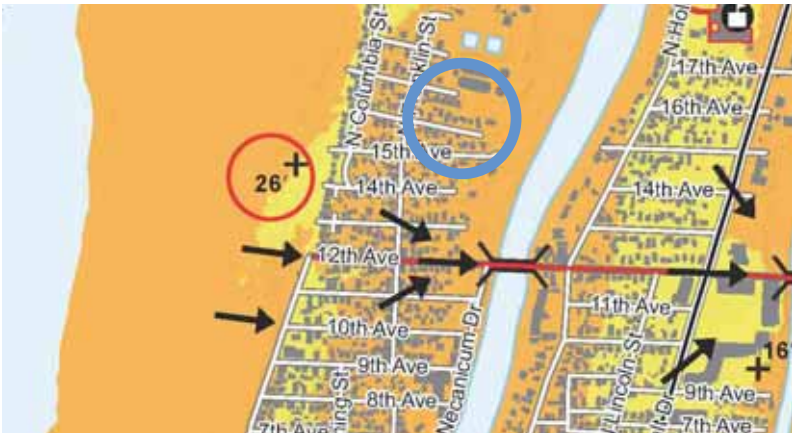
The safety zone threshold represents the transitional juncture between evacuation and response. This instantaneous moment paves the way for a long, post-disaster experience. Establishing an early path for gathering, organizing, and surviving in group situations by clearly notifying evacuees when they are safe is a critical part of any tsunami wayfinding chain. A new sign, paint in the ground, and light are all visual markers that people can see when approaching to let them know that they have almost made it to their destination. These simple designs overlap and grantee that there will be a maker after the event.

7. ASSEMBLY AREA

FIGURE 124

Like the Safety Zone Threshold, it is extremely important that there is a sense of arrival and place. The assembly area will be a key point of triage and survival after the event. There needs to be ample information on the event and how to react, as well as the resources for the evacuation leaders that will hopefully make it to the assembly areas. Multiple forms of markings are necessary including paint in the ground, signs with lights, information kiosks and continued instruction to cash site access or safe-house method of triage. The different neighborhoods of Seaside need to be active members in the planning of this triage, but these different elements are essential for the primary and secondary assembly areas.

8. EVACUATION TOWER



In many places in Seaside and other locations on the coast, it may not be viable for the majority of the population to evacuate to high ground. Partly this is due to the distance that must be covered from some neighborhoods to the safety zone. Many people, especially if they are very old, young or not in shape, will not be able to travel the distance necessary in the 15 minutes allotted. Another factor that will play into the survival of many people, is the necessity of crossing rivers or bodies of water. The majority of bridges that span these obstacles will not survive the earthquake.

In these situations, these bridges are the only thing standing between life and death; making the safe zones an unaccessible option. Other forms of evacuation, such as an occupiable berm or a vertical evacuation structure could provide a solution. Seaside has an opportunity to build a tower, similar to the Astoria tower, that would not only provide refuge, but also be beacon for the community and attraction for visitors with magnificent views of the coast. The rendering shown has the elegant Spinnaker Tower from Portsmouth England, photoshopped into the north of Seaside to show how grand this type of structure could be. A range of commercial uses could lease the space, or the facility could be dedicated to Tsunami Readiness research and application, as well as house important civic agencies such as city hall, the fire, and police departments. If these groups are left standing after an event, the rebuilding process will certainly be easier.

Another option is to renovate a public building to be TsunamiReady, and act as a evacuation tower. Major civic buildings such as the Middle School, City Hall, Fire and Rescue, and Visitor's Bureau, Recreational District and Parks, and the Public Library are all along Broadway Street between the Necanicum River and Neawanna Creek. These key components of the city structure provide a great opportunity to enhance the evacuation routes and help raise awareness of tsunami inundation and evacuation planning, as well as provide leadership during the event. It is important that this group only has to cross the creek, over a shorter distance, which provides them an easier path to safety if the bridges were to collapse.

FIGURE 125

FIGURE 126

5.3.1 Warrenton Wayfinding Chain

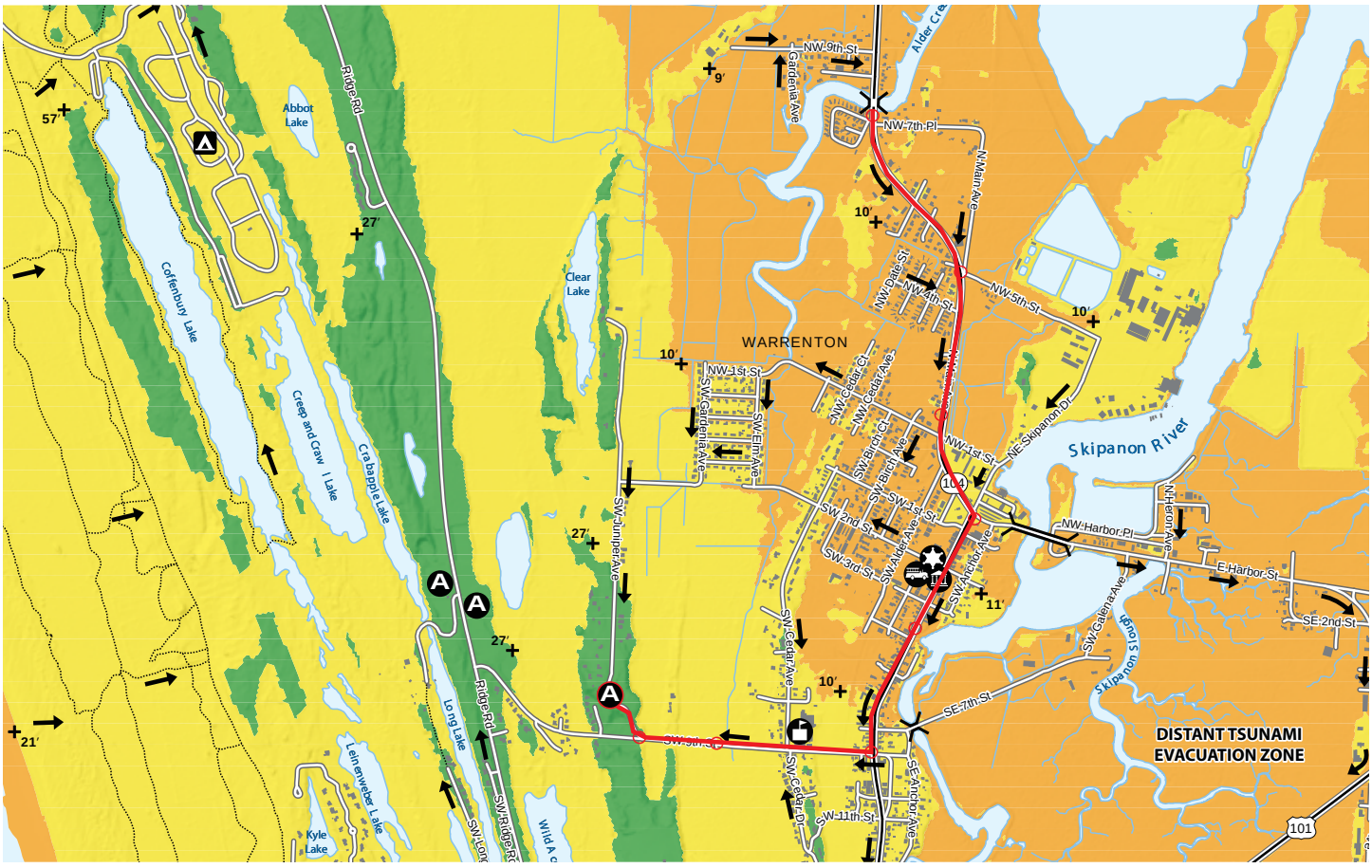


FIGURE 127

1. ALDER CREEK BRIDGE

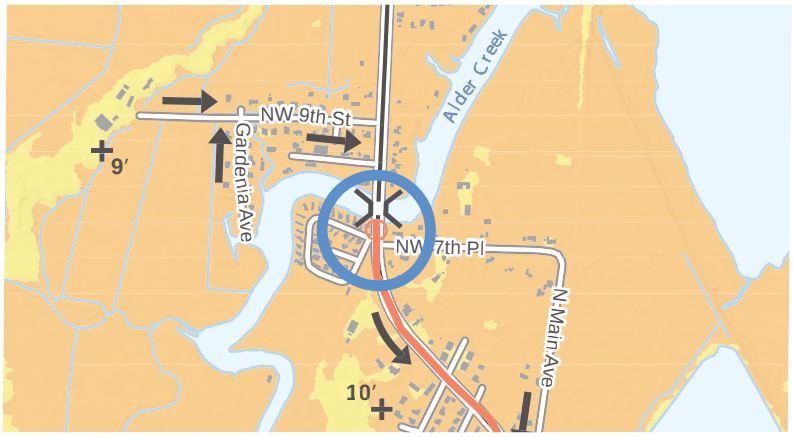


FIGURE 128

The area around this bridge consists mostly of at risk elderly population. This is especially concerning because not only will the bridge likely be destroyed by the earthquake, but it is also the furthest distance from safety. It is crucial that signage is clear and that the route to safety, whether over an upgraded bridge or in the opposite direction towards high ground, is very clearly marked so people can react quickly. Having signs with distance also will help people gage their pace and have a more robust plan on how to make it to safety in the time allotted.

2. PRIMARY ROUTE CLARITY

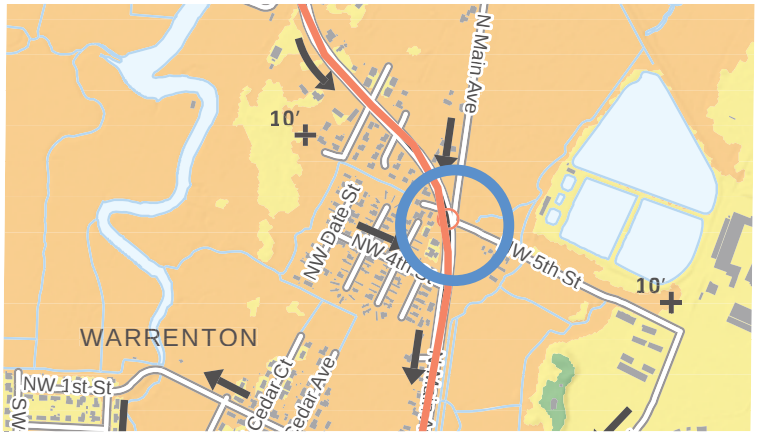


FIGURE 129

Warrenton has several lovely and well used pedestrian paths near the river. Many people may resort to these trails when the earthquake occurs, because they will likely have less hazards (like electric wires) impeding their path. It is important to create clarity of evacuation paths for people on foot. These pedestrian routes however, have little to no signage leading to high ground. In general due to its rural nature, it is extremely unclear in the city of Warrenton how to best reach a safe zone. Route clarity can be established not only from traditional signs on posts, but also paint in the ground, lights, and other color coding where pedestrians will be evacuating.

Running trails can be established in conjunction with the signs, since they denote distance and direction.

3. SPACE BETWEEN

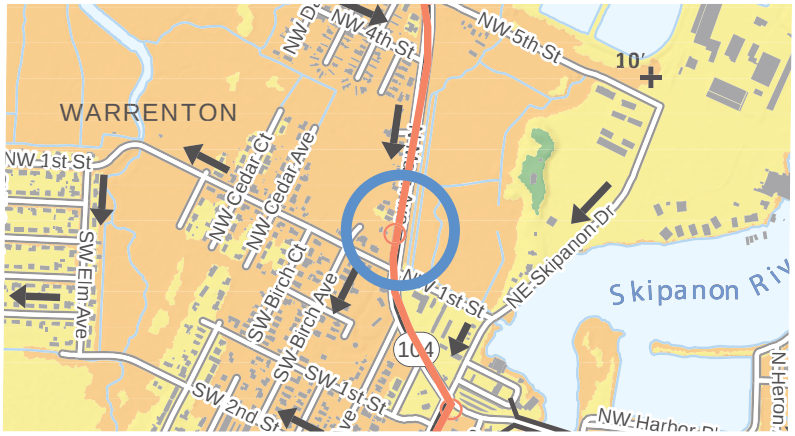


FIGURE 130

Part of helping people know that they are on the right path to safety includes being able to see the next indicator of direction when you are a short way from the previous wayfinding marker. Having elements that are prominent, repetitive, and highly visible allows people to make a mental map of their route before a tsunami event, and aid them in using it during the event.

4. INFORMATION KIOSK

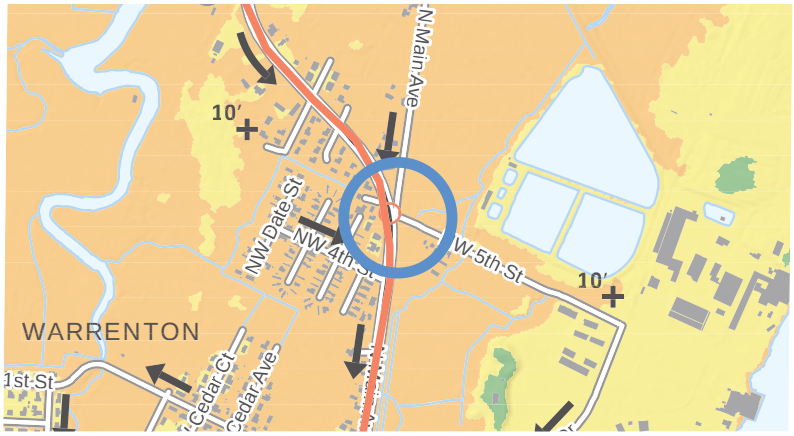


FIGURE 131

Even though the downtown area of Warrenton is less crowded, it still hosts a good amount of local and tourists activity. It is important to have clear information on escape wayfinding and the dangers of a tsunami easily accessible in this area of activity. The goal of this kiosk is to provide the information necessary for an evacuation in the clearest, most unobtrusive way while still being eye catching enough to inspire investigation.

5. BUS STOP

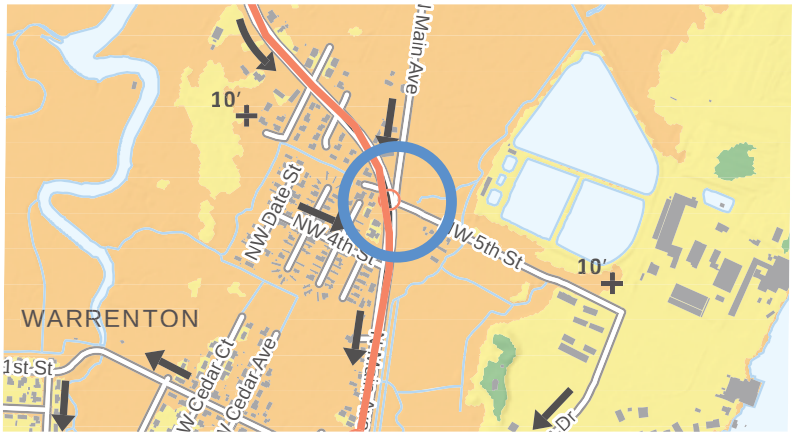


FIGURE 132

A bus stop is a great place for information to be placed where someone sitting and waiting can absorb some information for their escape route options. These commonly used places are underutilized canvases within the city. The location of this bus stop is conveniently located next to a gas station that is quite popular. This stop has the opportunity to post information on the interior and exterior of the structure to reach out to not only the bus passengers but also the gas station passer-byes.

6. SPACE BETWEEN

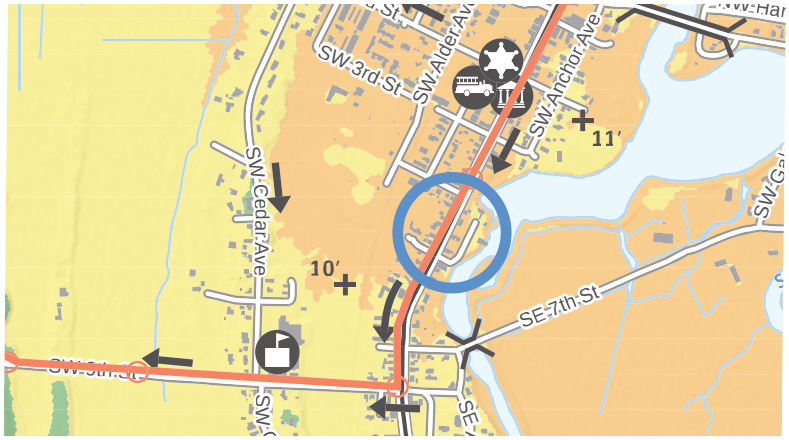


FIGURE 133

There is a distinct need for all towns on the coast to have signs that clarify evacuation routes. Part of this wayfinding clarity comes from the sign suite that the PUARL team designed (refer to Chapter 4). Signs need to communicate clearly direction, intent, and distance between people and the goal of safety. These signs need to be placed in a “breadcrumb trail” style, where the next sign is visible from the current one, especially in more urban settings. Route clarity is established not only from traditional signs on posts, but also paint in the ground, lights and other color coding when there are more complicated and dense areas to evacuate through. In Warrenton, these elements are applied to create route clarity since there is a greater distance to cover along the whole evacuation route. There are several important turns that need to be adhered to, and so the primary area of concern when creating route clarity in Warrenton is to have elements that are prominent and repetitive; allow people to make mental maps of this long route.

7. PATH TURNS

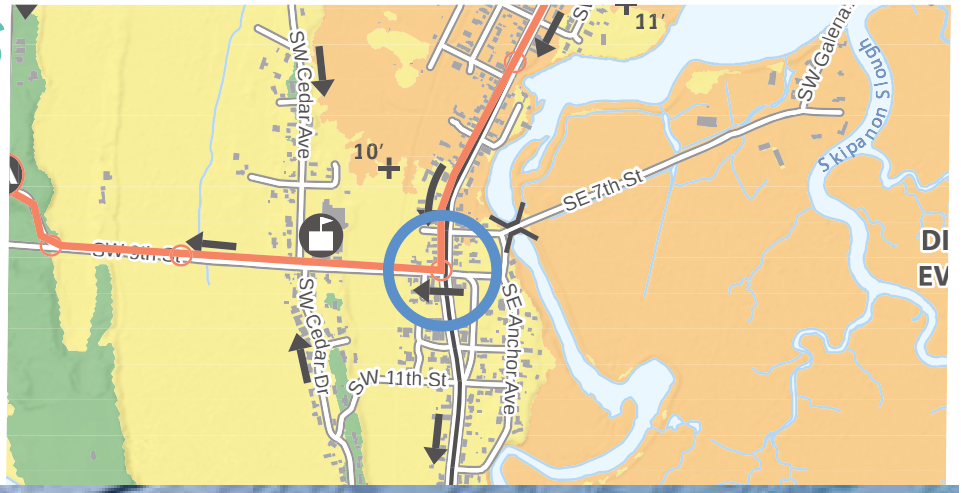


FIGURE 134

Part of route clarity for all wayfinding chains is how to command and navigate turns. In Warrenton, the primary route turns several times. These turns are important because it would be detrimental for people, when in a panic, to wander away from the evacuation route. These turns also need to have repetitive forms of signage such as paint in the ground, lights, painted posts and signs. This will help tremendously when the streets are broken and filled with debris after an event.

8. LIGHTS AT NIGHT

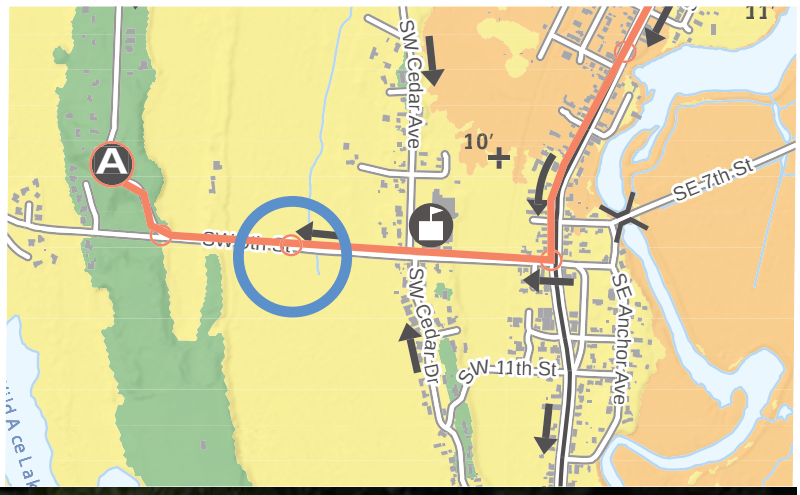


FIGURE 135

There is a 50% chance that the earthquake/tsunami event will occur at night. Clarity of routes in low light conditions is extremely important in the case of a nighttime earthquake occurrence. They need to serve as beacons that give direction and quickly clarify information. It is important also that each light is based upon its own solar power, and not linked. The power will go out during the earthquake event, so having them independent from a grid will guarantee they can still work during the event. Pairing lights with reflective paint in the ground or having lights directly in the ground will also add clarity when it is pitch black outside.

9. SAFETY ZONE THRESHOLD

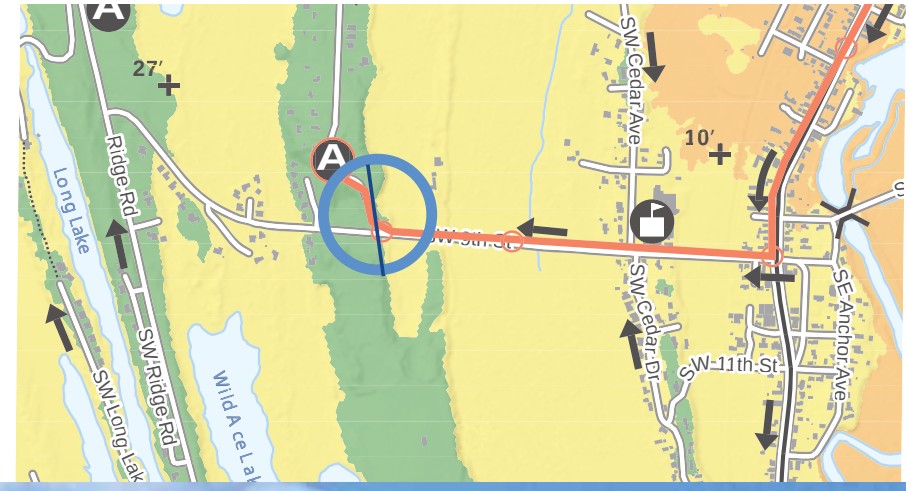


FIGURE 136

The safety zone threshold represents the transitional juncture between evacuation and response. This instantaneous moment paves the way for a long, post-disaster experience. Establishing an early path for gathering, organizing, and surviving in group isolation by clearly notifying evacuees when they are safe is a critical part of any tsunami wayfinding chain. A new sign, paint in the ground, and lighting are all visual markers that people can see when approaching to let them know that they are nearing their destination. These simple designs overlap and guarantee that there will be a marker after the event.

10. ASSEMBLY AREA

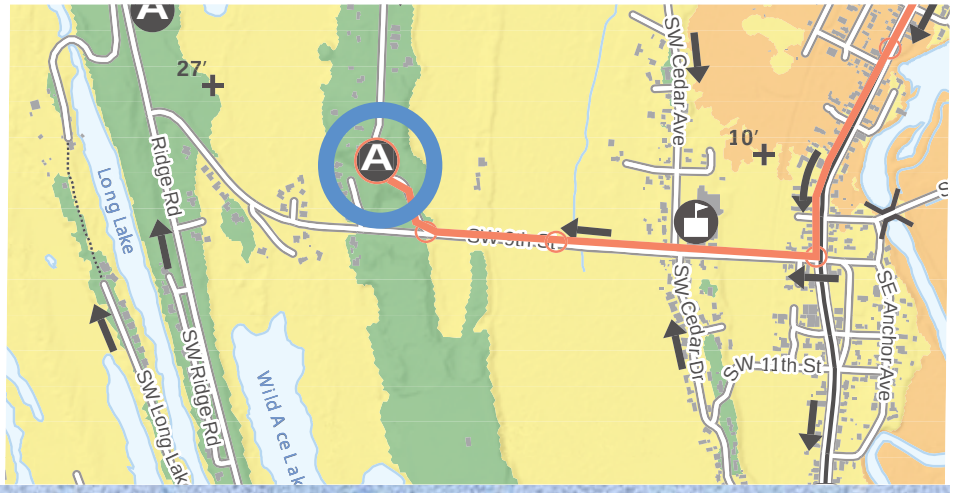


FIGURE 137

The Warrenton assembly area may be small but is still important that, as with all assembly areas, there is a sense of place and arrival. The assembly area will be a key point of triage and survival after the event. There needs to be ample information on the event and how to react as well as the resources for the evacuation leaders who will hopefully make it to the assembly areas. Multiple forms of markings are necessary including paint in the ground, signs with lights, information kiosks, and further instruction for cache site access or safe-house method of triage. The surrounding neighborhood will need to be active members in the planning of this triage as these different elements are essential for the primary and secondary assembly areas.


Fort Stevens
2
Prohibited Activities
Safeguard
Your
Valuables
OREGON SHELLFISH REGULATIONS

FIGURE 138

6. Conclusions and Recommendations

6.1 OVERALL RECOMMENDATIONS

FIGURE 139

"Up and Out 2" provides the cities of Seaside and Warrenton design proposals which promote increased clarity and usability of the Tsunami Escape Wayfinding system. The improved wayfinding chain, as well as updated signage, will facilitate greater speed and efficiency for the evacuation process, saving lives and supporting recovery from the inevitable tsunami event. In this research study and planning report, we focused our attention on wayfinding design solutions and specific applications along evacuation routes for before, during and after a severe tsunami event. We hope that we have contributed to the safety, preparation, and awareness of inhabitants and visitors in these two coastal communities.

This report focuses on developing a Project Language and specific project designs for the two neighboring coastal towns. "Up and Out 2" expands on the previous "Up and Out" study which emphasized developing a Tsunami Escape Wayfinding Survival Pattern Language for the town of Cannon Beach. The method of first creating a Pattern Language and then developing a more specific Project Language helps to apply general principles into practical applications for coastal communities.

6.2 DETAILED FINDINGS AND RECOMMENDATIONS

As a conclusion of our research and recommendation for future projects, we see several major areas that would benefit from further development. A primary universal recommendation for any area in a tsunami inundation zone is to implement the sign suite along primary and secondary routes. Although it is most beneficial to combine patterns and create robust systems, it is paramount that these wayfinding chains are established with signs at a minimum. Integrating appropriate signage is the first step to survival design development. Our other recommendations are as follows in this list which outlines the most important additional areas of work that should be tackled.

1. Work with and Continue to Develop Overall Umbrella Pattern Language
The first recommendation is to work with the current Pattern Language and expand upon it to develop an umbrella Pattern Language which gives structure to the larger theme, topic, problems, and solutions of tsunami escape wayfinding and evacuation. This larger Pattern Language needs to be developed further, possibly as a larger and more comprehensive project with professionals from various fields to cover the terrain with problems and solutions in an interdisciplinary fashion. Currently we work with the 24 Patterns that we developed in this Pattern Language so far.

2. Based on a Pattern Language establish Specific Project Languages with Design Application
The second recommendation is to establish specific Tsunami Escape Wayfinding Project Languages for each town. While, for practical reasons, we decided to use a combined Project Language for Warrenton and Seaside in this report, it might be more productive and appropriate to develop a Project Language for each particular town, addressing specific locations, aesthetics, and challenges.

3. Establish A Tsunami Evacuation Project Repository
The third recommendation is to create a repository for the sharing of project case studies between Oregon coastal cities and beyond. Sharing Project Languages and design solutions can show similarities in many cases but also differences in expression, culture, and location. This could take the form of a research project and publication, or live website and digital forum with user-generated content, augmented by live events, symposia, and charrettes.

4. Detailed Wayfinding Evacuation Projects
The fourth area of recommendation is to pursue more detailed urban design wayfinding chain projects for particular towns with specific needs and specific conditions. Wayfinding chains seem to be the most effective and efficient ways of organizing tsunami escape. More of them need to be developed, taught to people and children, and used in regular practice drills. An example of this recommendation is shown in this report in the Chapter 4 Wayfinding Chain.

5. Individual Architecture and Urban Escape Projects

A fifth area of projects should focus on issues that need solutions for very specific problems. For example, the topic of vertical evacuation could be studied and researched in detail where typical evacuation to high ground is difficult in the time available before a tsunami or there is a high density of a vulnerable population. Vertical evacuation can be accomplished in building structures and berms, as well as the two combined. Equally, the evacuation sites for gathering after a tsunami are of interest. Once people successfully have escaped the disaster and reached higher ground to Assembly Areas, the question becomes how to organize life in "island conditions" for days, possibly weeks and more.

6. Social Organization Projects For Evacuation And Survival

A sixth area of recommendations can be found in the social organization of tsunami escape and wayfinding. As the study of Cannon Beach suggests, the social organization with safe houses and private neighborhood organization seems to be as critical and important as public forms of organization by the city administration (PUARL, 2014). These organizations can crucial for rallying the support of community members to create a more robust system specific to their community.

Overall, we believe, that the work on these projects is critical for the creation of awareness of a possible major tsunami at the Oregon coast. This report assists in tackling the major issue of preparing people for successful escape in a tsunami event and the crucial organization after a tsunami in order to survive in an "island condition." As the advanced tsunami escape wayfinding and warning system in Japan shows, many more lives can be saved by being well organized and prepared for a tsunami event.

6.3 FINAL COMMENTS

The “Up and Out 2”: Tsunami Evacuation Wayfinding Research Project contains essential elements, in particular the Survival Project Language (Chapter 3), the Sign Suite (Chapter 4), and the Project Language Design Applications in two Wayfinding Chains for Seaside and Warrenton (Chapter 5). These chapters, in conjunction with the Pattern Language developed in the 2014 “Up and Out” report provide many specific examples and detailed strategies for applications.

This report will be posted on the PUARL website as information for not only all stakeholders and citizen in Seaside and Warrenton but also for concerned people in all of Oregon to use as a resource and guiding document. Concurrently the report will also be placed on the OEM website for information communication.

We want to thank all the people that helped us in this work, in particular the people in the coastal communities of Seaside and Warrenton that served as our main location of study. We are especially appreciative of the many stakeholders who participated in the Camp Rilea design charrette in May, 2015. Without the advice of these experts and citizen, we would not be able to have completed our work towards a Tsunami Wayfinding Pattern and Project Language.

“Almost all of the world’s most powerful earthquakes occur in the Ring of Fire, the volcanically and seismically volatile swath of the Pacific that runs from New Zealand up through Indonesia and Japan, across the ocean to Alaska, and down the west coast of the Americas to Chile….The Ring of Fire, it turns out, is really a ring of subduction zones. Nearly all the earthquakes in the region are caused by continental plates getting stuck on oceanic plates - as North America is stuck on Juan de Fuca - and then getting abruptly unstuck. And nearly all the volcanoes are caused by the oceanic plates sliding deep beneath the continental ones” (Schulz, 2015).

7. BIBLIOGRAPHY & REFERENCES

LITERATURE

Albers, Josef. Interaction of color: text of the original edition with revised plate section. Rev. pocket ed. New Haven: Yale University Press, 1975. Print.

Alexander, Christopher, Hajo Neis, Artemis Anninou, and Ingrid King. A New Theory of Urban Design. New York: Oxford University Press, 1987. Print.

Alexander, Christopher, Sara Ishikawa, Murray Silverstein et al. A Pattern Language : Towns, Buildings, Construction. New York: Oxford UP, 1977. Print.

Alexander, Christopher, Hansjoachim Neis, and Maggie Moore Alexander. The Battle for the Life and Beauty of the Earth: a Struggle between two World-Systems. Oxford University Press, 2012. Print.

Alexander, Christopher, Murray Silversstein, Sara Ishikawa, et al. The Oregon Experiment. Vol. 3. Oxford University Press, 1975. Print.

Alexander, Christopher. The Timeless way of Building. Vol. 1. New York: Oxford University Press, 1979. Print.

Calori, Chris, and David Vanden-Eynden. Signage and Wayfinding Design: A complete Guide to creating environmental Graphic Design Systems. John Wiley & Sons, 2015. Print.

Furukawazono, Tomoki, et al. “Survival language: a pattern language for surviving earthquakes.” Proceedings of the 20th Conference on Pattern Languages of Programs. The Hillside Group, 2013.

Golledge, Reginald G. Wayfinding Behavior: Cognitive Mapping and other spatial Processes. JHU Press, 1999. Print.

Lyle, John Tillman. Regenerative Design for sustainable Development. John Wiley & Sons, 1996. Print.

Lynch, Kevin. The Image of the City. Vol. 11. MIT press, 1960. Print.

Neis, Hajo. “From a Pattern Language to a Field of Centers and Beyond: Patterns and Centers, Innovation, Improvisation, and Creativity.” In: Peter Baumgartner and Richard Sickinger. The Workshop. PurpIsoc. Krems, 2015. Print.

McLendon, Charles B., and Mick Blackistone. Signage: graphic Communications in the built World. New York: McGraw-Hill, 1982. Print.

Smitshuijzen, Edo. Signage Design Manual. Lars Müller, 2007. Print.

Survival Language Project. Vers. 0.30 Since 2013. Faculty of Policy Management & Faculty of Environment and Information Studies. Keio University, Tokyo, Japan.

Uebele, Andreas. Signage Systems & Information Graphics: A professional Sourcebook. Thames & Hudson, 2007. Print.

WEBSITES & ONLINE PUBLICATIONS:

CREW, Cascadia Region Earthquake Workgroup, Dr. Nourse, K.. Updated Edition (2013) Cascadia Subduction Zone Earthquakes: A Magnitude 9.0 Earthquake Scenario. Retrieved April 16, 2015 from URL: http://crew.org/sites/default/files/cascadia_subduction_scenario_2013.pdf

DOGAMI, State of Oregon Department of Geology & Mineral Industries (n.d.). Oregon Tsunami Clearinghouse: Resource Library. Retrieved April 15, 2015 from URL: http://www.oregongeology.org/tsuclearinghouse/faq-tsunami.htm

FEMA, Federal Emergency Management Agency (n.d.). FEMA Tsunamis. Retrieved April 15, 2015, from URL: http://m.fema.gov/tsunamis

History of Geology, Bressan, D. (2011, March 17). Historic Tsunamis in Japan. Retrieved April 15, 2015, from URL: http://historyofgeology.fieldofscience.com/2011/03

IOC, Intergovernmental Oceanographic Commission. Revised Edition (2013). Tsunami Glossary, 2013. Paris, UNESCO. IOC Technical Series, 85. (IOC/2008/TS/85rev). Retrieved April 15, 2015 from URL: http://itic.ioc-unesco.org/images/stories/about_tsunamis/tsunami_glossary/tsunami_glossary_en_2013_web.pdf

NOAA, National Oceanic and Atmospheric Administration (n.d.). NOAA Tsunami Website.Retrieved April 17, 2015, from URL: http://www.tsunami.noaa.gov/

NPR, National Public Radio, Simmons-Duffin, S. (2011, March 18). History Of Tsunami: The Word And The Wave. Retrieved April 16, 2015 from URL: http://www.npr.org/2011/03/18/134600508

NWS, National Weather Service (last modified May 26, 2015) TsunamiReady. Retrieved April 15, 2015 from URL: http://www.tsunamiready.noaa.gov/

OEM, Oregon Office of Emergency Management (n.d.). Tsunami Information. Retrieved April 16, 2015 from URL: http://www.oregon.gov/OMD/OEM/Pages/plans_train/tsunamis.aspx

OPB, Oregon Public Broadcasting, Spitz, T. (2015, January 26). Jan.26, 1700: How Scientists Know When the Last Big Earthquake Happened Here. Retrieved April 17 from URL: http://www.opb.org/news/series/unprepared/jan-26-1700-how-scientists-know-when-the-last-big-earthquake-happened-here/

Priest G., Watzig R., & Madin I. (n.d.) Open-File Report O-15-XX: Local Tsunami Evacuation Analysis of Seaside and Gearhart, Clatsop County, Oregon. Newport & Portland, OR: DOGAMI, State of Oregon Department of Geology & Mineral Industries.

PUARL, Portland Urban Architecture Research Laboratory. Neis H, Ledbury, A. Balaji, S, Wright,p, et al). Up and Out

Schulz, K. (2015, July 15). The Really Big One. Retrieved July 15, 2015 from URL: http://www.newyorker.com/magazine/2015/07/20/the-really-big-one

Wikipedia, Free Encyclopedia (last modified June 22, 2015). 2011 Tōhoku Earthquake and Tsunami. Retrieved April 15, 2015 from URL: https://en.wikipedia.org/wiki/2011_Tohoku_earthquake_and_tsunami

Wikipedia, Free Encyclopedia (last modified June 1, 2015). Cascadia Subduction Zone. Retrieved April 15, 2015 from URL: https://en.wikipedia.org/wiki/Cascadia_subduction_zone

IMAGE REFERENCES:

Figure 1: Warrenton, Oregon. PUARL Photo
Figure 2: Cannon Beach, Oregon, PUARL Photo and Photoshop
Figure 3: Warrenton, Oregon, PUARL Photo
Figure 4: Oregon Coast
Figure 5: Weather Channel Photo: https://twitter.com/weatherchannel/status/605393118209437696/photo/1

CHAPTER 2:
Figure 6: Warrenton, Oregon, PUARL Photo
Figure 7: Warrenton, Oregon, PUARL Photo
Figure: 8: DOGAMI map: Seaside
Figure 9: Seaside Tourist Evacuation Map http://www.loafersparadise.com/seaside-oregon-vacations-beach-safety-on-the-oregon-coast.html
Figure 10: Seaside, Oregon, PUARL Photo
Figure 11: DOGAMI Seaside map with PUARL Evacuation Route
Figure 12: DOGAMI Map: Warrenton
Figure 13: Oregon Geology Hazard Zone Map http://www.oregongeology.org/sub/earthquakes/oratrisk12.htm
Figure 14:DOGAMI Warrenton map with PUARL Evacuation Route
Figure 15: Seaside, Oregon, PUARL Photo
Figure 16: Warrenton, Oregon, PUARL Photo

CHAPTER 3:
Figure 17: Warrenton, Oregon, PUARL Photo
Figure 18: Camp Rilea Design Charrette, PUARL Photo
Figure 19: Camp Rilea Design Charrette document
Figure 20: Camp Rilea Design Charrette document
Figure 21: Camp Rilea Design Charrette document
Figure 22: Camp Rilea Design Charrette, PUARL Photo
Figure 23: Camp Rilea Design Charrette, PUARL Photo
Figure 24: Camp Rilea Design Charrette, PUARL Photo
Figure 25: Warrenton, Oregon, PUARL Photo

Figure 26: Seaside, Oregon, PUARL Photo
Figure 27: PUARL generated graphic
Figure 28: Cannon Beach Design Charrette, 2014, PUARL photo
Figure 29: PUARL illustration
Figure 30: PUARL illustration
Figure 31: PUARL illustration
Figure 32: PUARL illustration
Figure 33: Cannon Beach: Race the Wave 5k Event
http://www.active.com/cannon-beach-or/running/distance-running-races/race-the-wave-5k-2014
Figure 34: PUARL illustration
Figure 35: Tsunami Evacuation Map https://commons.wikimedia.org/wiki/File:Tsunami_hazard_zone_sign.jpg
Figure 36: DOGAMI map and information
Figure 37: PUARL illustration
Figure 38: PUARL illustration
Figure 39: Cannon Beach You Are Here Stickers
Figure 40: Cannon Beach Haystack Rock Stickers
Figure 41: Warrenton, Oregon, PUARL Photo
Figure 42: Cannon Beach Tsunami Preparedness neighborhood maps
Figure 43: PUARL illustration
Figure 44: PUARL illustration
Figure 45: PUARL illustration
Figure 46: PUARL illustration
Figure 47: PUARL illustration
Figure 48: PUARL illustration
Figure 49: PUARL illustration
Figure 50: PUARL illustration
Figure 51: Google Map for Seaside
Figure 52: PUARL illustration
Figure 53: Camp Rilea Design Charrette document
Figure 54: PUARL illustration
Figure 55: Phuket, Thailand: Distance Markers on Tsunami Evac. Route Signs
http://www.nomadicnotes.com/travel-blog/phuket-after-the-tsunami/
Figure 56: New Zealand and Japan: Road Paint Evacuation Route Signs
https://airtower.wordpress.com/page/13/
http://flickrhivemind.net/Tags/tsunami,warning/Recent
Figure 57: PUARL illustration
Figure 58: PUARL illustration
Figure 59: PUARL illustration
Figure 60: PUARL illustration
Figure 61: PUARL illustration
Figure 62: PUARL illustration
Figure 63: PUARL illustration
Figure 64: Seaside, Oregon. PUARL Photo

Figure 65: PUARL illustration
Figure 66: PUARL illustration
Figure 67: Japan School After 2011 Tsunami http://mediad.publicbroadcasting.net/p/kplu/files/styles/related/public/Japan_school.jpg
Figure 68: PUARL illustration
Figure 69: PUARL illustration
Figure 70: PUARL illustration
Figure 71A: Description of Nishiki tower
https://www.asme.org/engineering-topics/articles/manufacturing-processing/tsunami-forces-debate-over-vertical-evacuation
Figure 71B:Vertical evacuation tower, Nishiki, Japan
http://us.stormsmart.org/2012/05/01/new-video-on-tsunami-vertical-evacuation-shelters/
Figure 72: PUARL illustration
Figure 73: PUARL illustration
Figure 74: PUARL illustration
Figure 75: Wellington, New Zealand: Tsunami Safe Zone Road Paint Sign
http://www.pbase.com/image/133206553
Figure 76: Cannon Beach Tsunami Preparedness test sign
Figure 77: PUARL illustration
Figure 78: PUARL illustration
Figure 79: PUARL illustration
Figure 80: Camp Rilea Design Charrette document
Figure 81: PUARL illustration
Figure 82: PUARL illustration
Figure 83: Warrenton, Oregon, PUARL Photo
Figure 84: PUARL illustration
Figure 85: PUARL illustration
Figure 86: PUARL illustration
Figure 87: PUARL illustration
Figure 88: PUARL illustration
Figure 89: PUARL illustration
Figure 90: PUARL illustration
Figure 91: PUARL illustration
Figure 92: Seaside, Oregon, PUARL Photo

CHAPTER 4:
Figure 93: PUARL generated rendering and design
Figure 94: PUARL generated sign design
Figure 95: PUARL generated sign design
Figure 96: PUARL generated sign design
Figure 97: PUARL generated sign design
Figure 98: PUARL generated sign design
Figure 99: PUARL generated sign design
Figure 100: PUARL generated sign design

Figure 101: PUARL generated sign design
Figure 102: PUARL generated sign design
Figure 103: PUARL generated sign design
Figure 104: PUARL generated sign design
Figure 105: PUARL generated sign design

CHAPTER 5:
Figure 106: Lewis and Clark Statue, Seaside, Oregon N.p., n.d. Web. https://carrid.files.wordpress.com/2013/08/lewis-and-clark-at-seaside.jpg
Figure 107: Seaside, Oregon, PUARL photo
Figure 108: DOGAMI Seaside map with PUARL Evacuation Route
Figure 109: PUARL generated rendering and design
Figure 110: PUARL generated rendering and design
Figure 111: PUARL generated rendering and design
Figure 112: PUARL generated rendering and design
Figure 113: PUARL generated rendering and design
Figure 114: PUARL generated rendering and design
Figure 115: PUARL generated rendering and design
Figure: 116: PUARL generated rendering and design
Figure 117: Warrenton, Oregon, PUARL photo
Figure 118: DOGAMI Warrenton map with PUARL Evacuation Route
Figure 119: PUARL generated rendering and design
Figure 120: PUARL generated rendering and design
Figure 121: PUARL generated rendering and design
Figure 122: PUARL generated rendering and design
Figure 123: PUARL generated rendering and design
Figure 124: PUARL generated rendering and design
Figure 125: PUARL generated rendering and design
Figure 126: PUARL generated rendering and design
Figure: 127: PUARL generated rendering and design
Figure: 128: PUARL generated rendering and design

CHAPTER 6:
Figure: 129: Warrenton, Oregon, PUARL Photo
Figure: 130: Seaside, Oregon, PUARL Photo
Figure: 131: Seaside, Oregon, PUARL Photo
Figure: 141: Seaside, Oregon, PUARL Photo

CHAPTER 8:
Figure: 142: ART By Design, Industry Forum Portland CSI Poster, 2015
Figure: 143: xChange Education Summit, EGD/XGD Education in Oregon forum, 2015
Figure: 144: PURPLSOC Conference, 2015

Figure 140

8. Appendix

FIGURE 141

8.1 PROJECT TEAM

DR. HAJO NEIS, PHD (PI)
Associate Professor, University of Oregon
Director, PUARL

The work of Associate Professor Hajo Neis examines the concepts of quality and value in architecture and urban structure. As the director of the University's architectural studies program in Portland, he teaches design studios, courses, and seminars in urban architecture and theory with an emphasis on the art of building.

Professor Neis has practiced architecture and planning in Frankfurt, Tokyo, Berkeley, and Borken (Germany). His design and oversight of the Eishin Campus, completed with the Center for Environmental Structures in Japan, received honors from the Japan Institute for Architects, the Japanese Association of Architectural Journalism, and the Prefecture of Saitama, and served as the subject of a documentary film. His work has appeared in many publications including Nikkei Architecture, Architecture and Urbanism, Progressive Architecture, Baumeister, Kenchku Bunka, Shinkenchku, and the Journal of Urban Design,as well as Christopher Alexander's The Nature of Order (Oxford University Press), Dwelling, Seeing, and Designing (D. Seamon, ed., State University of New York Press), and D. Kemmis' The Good City and the Good Life: Renewing the Sense of Community (Houghton Mifflin). He has also collaborated with the Center for Environmental Structures on a new town in Venezuela and a mixed-use urban housing project in Frankfurt, and with Thomas Kaestner on numerous competition entries selected for publication.

Throughout his career, Neis has taken on small projects—an experimental office building with two apartments in Tokyo, stepped library furniture in Berkeley—that demonstrate theoretical ideas in physical detail. He collaborated with W. Rang on "More Ethics and Less Aesthetics," selected as a finalist in the architecture competition and exhibition for the Venice Biennale 2000 and exhibited on the Biennale website. Most recently he collaborated on the design of a platform and stair, now under construction, that transform a water tower in Germany into a memorial.
Neis's yearly comprehensive thesis studio topic is titled (Re)generative Design: redesigning and rebuilding cities, towns, neighborhoods, streets, buildings and gardens, destroyed by natural disaster, and/or catastrophic human failure. Under his guidance, Neis's students have investigated architectural design solutions to myriad of disasters across the globe.

KAELI NOLTE

B. Architecture

Kaeli holds a Professional degree in Architecture and Honors Degree from the Clark Honors College from the University of Oregon. Growing up in the Rocky Mountains, Kaeli developed a passion for nature. This passion combined with her high school travels to 10, largely developing countries, caused her to become increasingly aware of how people interacted with their environment. Her passion for architecture grew from these experiences. Kaeli's Honors thesis focused specifically on architectures role in disaster relief and poverty alleviation around the world. Throughout her time at the University of Oregon, Kaeli has been involved in several groups including CASL (Center for the Advancement of Sustainable Living), HOPES (Holistic Options for Planet Earths Sustainability) and has worked as a glass technician at the University of Oregon's Craft Center, as a Exhibit Evaluator for the Museum of Natural and Cultural History, as a researcher with the Environmental Workforce Program and as a Gallery Assistant and Graphic Designer at the White Box Gallery. She currently works for Bassetti Architects.

PERRIN WRIGHT

B. Architecture

Perrin Wright holds a Professional degree in Architecture with a minor in business administration from the University of Oregon. He recently finished his fifth year of the program at the White Stag Block in Portland studying Regenerative Design. His thesis studio project attempted to support local grassroots organizations by designing complex food systems ecology in the heart of West Oakland's old industrial area. He is interested in systems thinking and discovering ways to strengthen systems through resiliency and adaptive processes. During his time in Eugene, Perrin had the opportunity to diversify his education,gaining a wide range of skills and experience. He helped publish two papers and presented their findings at a Solar Conference in North Carolina and a HVACR conference in Chicago. He was a construction team manager for a student design build project for a local middle school. Perrin's background in construction led him to tailor some of his architectural education to construction methods and management. He aspires to become a construction manager that employs innovative ways of using integrated design methods.

HANNAH PEMPUS

M. Architecture

Hannah holds a master of architecture degree with a specialization in urban architecture and urban design from the University of Oregon. She was drawn to the university's Portland program for the opportunity to study sustainable urbanism in one of the nation's model cities for the testing and implementation of progressive urban ideas. Her studies around the world, specifically, design studios in London, England and Florence, Italy while earning her bachelor of architecture degree at Miami University, were what inspired Hannah to focus her undergraduate studies on global perspectives on sustainability. Currently living in Portland, Oregon, her passions lie in creating better places and streets within the community and positively impacting the built environment. Through her volunteer work with Better Block PDX and Depave she contributes to small-scale tangible improvements to both public and private urban spaces.

SPENCER ROEDEL

B. Architecture

Spencer holds a Professional degree in Architecture and Honors Degree from the Clark Honors College from the University of Oregon. Born in Arizona, raised in Idaho, and currently living in Oregon, Spencer has a deep seeded passion for the American West. A former wildland firefighter, Spencer is intrigued by the possibility, and in many cases necessity, of re-evaluating the relationship between the built environment and the natural world. His research thesis addresses the relationship between the built environment and natural disturbances, and evaluates the necessary adaptations to integrate the built environment with wildland fire regimes, which he presented at the National Adaptation Forum in Spring of 2015. While at the University of Oregon, Spencer's strong interest in building a more sustainable world led to particular success in the study of high performance architecture. Spencer developed and assisted in implementing new curriculum as a Professor's Assistant in Environmental Control Systems, as well as being involved with the Baker Lighting Lab.

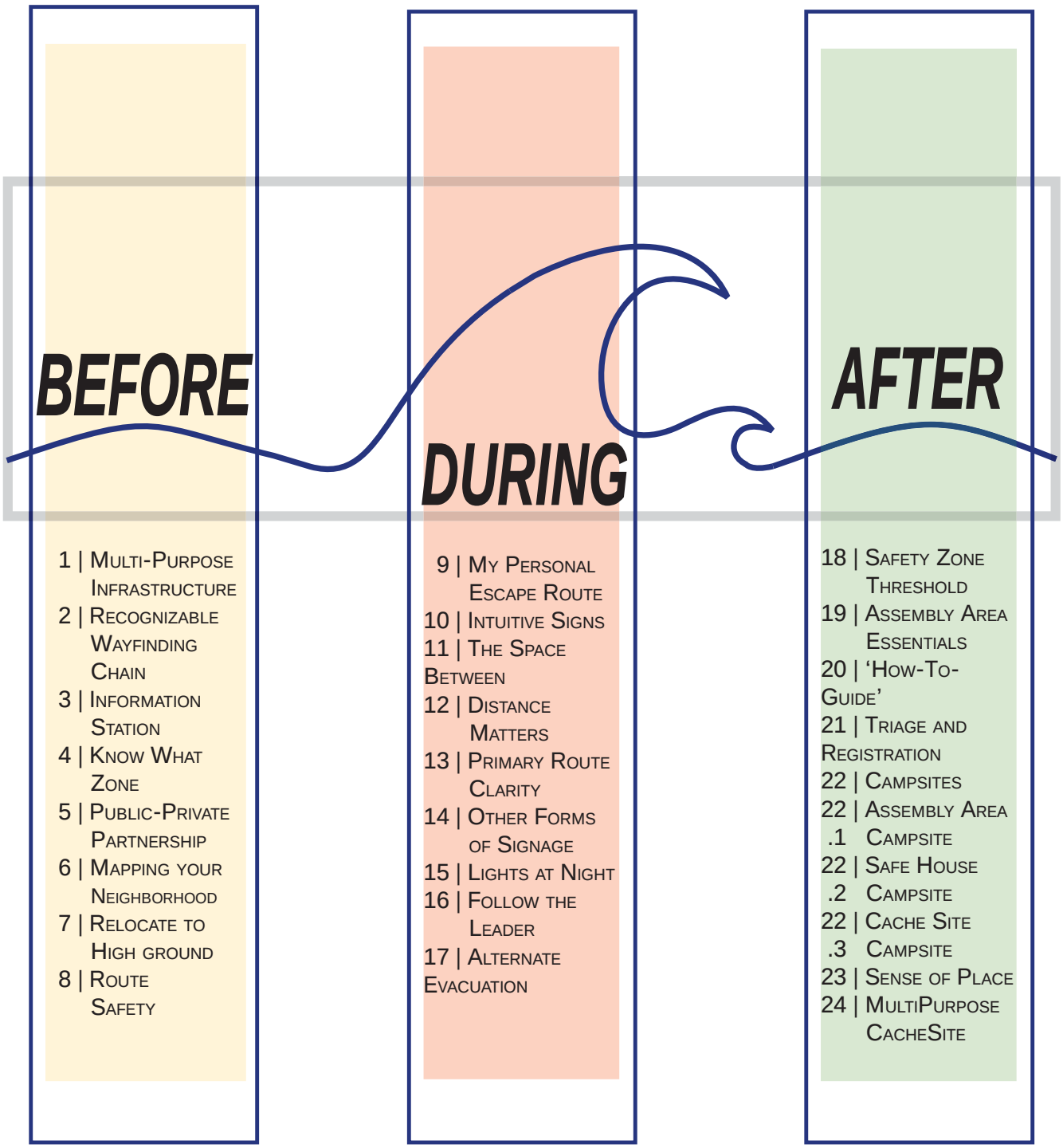
8.2 PROJECT LANGUAGE PROPOSAL LIST

1. "Blue Wave": Oregon's TsunamiReady Symbol
2. Tsunami Disaster Preparation Leaders
3. Seaside: Seawall Tsunami Wave Mural
4. Seaside: Cascadia History Wave Sculpture
5. Warrenton: 3D City Evacuation Model
6. Seaside: Scenic Park at Assembly Area
7. Cannon Beach: Race the Wave 5k Event
8. Cannon Beach: MOOOO...vvve Uphill Evacuation Drill
9. Seaside: Tsunami Hazard Zone Signs
10. Personal Tsunami Evacuation Brochure
11. Seaside: Urban Mapping and Information Stand
12. Clatsop County: Triangular Tsunami Information Kiosk
13. Cannon Beach: "You Are Here" Arrow Sticker
14. Cannon Beach: Haystack Rock Landmark Sticker
15. Clatsop County: Tsunami Evacuation Maps for Individual Routes
16. Cannon Beach: Defining Local Evacuation Districts
17. Warrenton: Tsunami Evacuation Maps at Bus Stops
18. Seaside: Tsunami Evacuation Maps at Resting Areas
19. Cannon Beach: Tsunami Evac. Maps at Public Restrooms
20. Tsunami Information at Restroom Urinals & Stalls
21. OEM: Emergency Management Hotel Coordinator
22. Hotel Room Tsunami Evacuation Pack
23. OEM: TsunamiReady Certification Program
24. Tsunami Disaster Evacuation Leaders
25. Google Maps Tsunami Evacuation Route App
26. Cannon Beach: Independent Posts for Tsunami Wayfinding
27. Seaside: Blue Tsunami Sign Posts
28. Cannon Beach: Pedestrian Evacuation Route Signs
29. Phuket, Thailand: Distance Markers on Tsunami Evac. Route Signs
30. New Zealand and Japan: Road Paint Evacuation Route Signs
31. Warrenton: Metal Wave on Street Signs (This one was added)
32. Seaside: Solar Blinking Lights Around Tsunami Evac. Route Signs
33. Warrenton: Solar Blue Lights on top of Tsunami Sign Post
34. Seaside: Central Chain of Reflective Markers on Evac. Routes
35. Warrenton: Boundary Edge Lighting on Evacuation Routes
36. Warrenton: Highlight Critical Evacuation Route Turns
37. Seaside: Prevent Following Unsafe Evacuation Routes
38. Seaside: Seismic Structural Bridge Retrofit
39. Cannon Beach: Earthquake Safe Pedestrian Evacuation Bridge
40. Seaside: Pedestrian Evacuation Rope Bridge
41. Relocate Schools to High Ground
42. Cannon Beach: Underground Electric Grid
43. Indonesian: Vernacular Strategy for Vertical Evacuation
44. Warrenton: Tsunami Vertical Evacuation Berm
45. Nishiki, Japan: Tsunami Vertical Evacuation Tower
46. Seaside: TsunamiReady Vertical Evacuation Tower
47. Tsunami Disaster Response Leaders
48. Warrenton: Assembly Area Beacon of Light
49. Wellington, New Zealand: Tsunami Safe Zone Road Paint Sign
50. Cannon Beach: Assumed Safe Elevation Sign
51. Cannon Beach: Guiding Response Site Progression
52. Warrenton: Soccer Field and Cemetery Assembly Areas
53. Seaside: Road Paint Circle at Assembly Area
54. Seaside: Assembly Area Park Features
55. Warrenton: Structure for Registration and Triage
56. Organizing Campsites with the Rule of 3
57. Warrenton: Camping Grounds Campsites
58. Seaside: Vacation Rental Storage Agreement
59. Seaside: Safe House Retrofit Exchange
60. Cannon Beach: Cache Site Campsites
61. Cannon Beach: Cache Site Barrel Program
62. Cannon Beach: Cache Site Security
63. Cannon Beach: "How-To-Guide" Lock Box
64. Cannon Beach: Cache Site Public Concerts
65. Warrenton: Assembly Area Community Garden
66. Cannon Beach: Cache Site Public Concerts

8.3 SURVIVAL LANGUAGE LINK

A SURVIVAL PATTERN LANGUAGE

A Wayfinding Escape Pattern Language for
Surviving Tsunamis and Accompanying Earthquakes



THE SURVIVAL PATTERN LANGUAGE REPORT CAN BE FOUND AT :
http://puarl.uoregon.edu/UPandOut.pdf

8.4 PRESENTATIONS OF RESEARCH

FIGURE 142

5:30pm, Tuesday, May 12
Pacific Northwest College of Art, 511 Northwest Broadway

Join us for an evening of presentations exploring the landscape of EGD/XGD education in Oregon. Faculty and students will present multidisciplinary coursework preparing students as they emerge into professional practice of wayfinding, interpretation, and placemaking. Examples include self-directed and collaborative coursework ranging from research to practical application.

Design practitioners, educators, students and makers invested in the next generation of designers are invited to join the discussion to share ideas, successes, challenges and strategies for multi-disciplined EGD learning.
RSVP through *Eventbrite*

5:30 Social - Drinks and light snacks
5:55 Introduction

6:00 Self-Directed Studies – Designing Experience
Meredith James*, Art 470, Contemporary design projects, PSU*
Carinne Urrutia, *BFA thesis "Dunce Pride," PNCA*

6:30 Wayfinding Research & Practical Applications
Paul Platosh, *PhD Scholar, "Neurocognitive Effects of Wayfinding using Optical Head Mounted Displays," OSU*
Perrin Wright, *"Up and Out: Oregon Tsunami Evacuation Wayfinding Project," Portland Urban Architecture Research Lab, UO*

7:00 Connecting People to Place
Molly McDonald, *"Talkback Hotel," Marylhurst University*
Rose Bond & Erik Hoofnagle, *"Against the Current," Animated Arts, PNCA*

7:30 Wrap-up/social

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Co-chairs
Mike Sauer & Kathy Fry
portland-chapter@segd.org
segd.org/Portland

Portand Chapter

FIGURE 143

PURPLSOC

Pursuit of Pattern Languages for Societal Change

Preliminary Programme

FIGURE 144