Macor by the Sea Tsunami Emergency Plan

I. Tsunami Hazard Definition.

A tsunami, also know as a tidal wave or seismic sea wave, is defined as a high sea wave or series of waves caused by an earthquake, submarine or coastal landslide, volcanic eruption, or other disturbance. Unlike normal ocean waves that are generated by wind, or tides resulting from the gravitational pull of the moon or sun, a tsunami is generated by the displacement of water. A tsunami can occur locally or travel hundreds of miles over open sea and cause extensive damage and severe loss of life when it encounters land.

Tsunami waves generally do not resemble normal undersea current or sea waves, because their wavelength is far longer. Rather than appearing as a breaking wave, a tsunami may instead initially resemble a rapidly rising tide, and for this reason they are often referred to as tidal waves, although the usage is not favored by the scientific community because tsunamis are not tidal in nature. Tsunamis generally consist of a series of waves, with periods ranging from minutes to hours, arriving in a so-called 'internal wave train.' Wave heights of tens of meters, thirty to forty feet or more, can be generated by large events. Although the impact of a tsunami is limited to coastal areas, their destructive power can be enormous and they can affect an entire island like Puerto Rico. The 2004 Indian Ocean tsunami was among the deadliest natural disasters in human history, with at least 230,000 people killed or missing in 14 countries bordering the Indian Ocean. This tsunami was caused by an underwater earthquake and is significant to those living in Puerto Rico as the island is seismically active and has frequent earthquakes.

II. How Serious is the Threat? According to the United States Geological Survey (USGS) many earthquakes and tsunamis have occurred in the northeastern Caribbean, where the movements of the Earth's surface plates are rapid and complicated. USGS documentation stresses that these types of events pose *serious hazards* to the 3.7 million people who live in Puerto Rico and the U.S. Virgin Islands. Simply, without going into all the geologic specifics, Puerto Rico is bordered on the north with the Puerto Rico Trench, the deepest trench and part of the Atlantic Ocean (28,373 feet deep), and to the south by the Muertos Trough, with depths up to 5,550 meters (over 18,200 feet deep). The trench and trough are significant as it is here that sections of the earth, also know as plates, are coming together, and essentially being shoved beneath one-another, with the North American plate being driven under the Antilles Arc along the trench (north), and the perpendicular thrusting of the eastern Greater Antilles Islands arc over the Venezuelan Basin crust (south). Stresses in the plates cause frequent earthquakes and, according to the USGS, because of the trench and trough, resulting earthquakes leading to tsunamis are likely to occur *very* close to the coast, with little to no warning. According to Earthquake Track, 1,664 earthquakes, level M1.5 or greater, occurred in Puerto Rico over the past 365 days. Although most were smaller, 1.8 to 3.6, others were as large as 4.8. Earthquakes of larger magnitude have been recorded with a 7.7 magnitude quake near Aguadilla 75 years ago, and an estimated 8.1 quake in the Puerto Rico Trench in 1787, ranking these near the level of the 9.0 quake that killed so many people along the Indian Ocean. In addition, because of the rapid depths and tilt of the Puerto Rico Trench

to the north of Puerto Rico, the USGS has identified great slabs of limestone, as much as 43 miles wide, that have broken off of the sides and slid into the trench. If an event of this magnitude should occur again, the resulting tsunami could be catastrophic. So the danger here in Puerto Rico is very real, and tsunami preparation must be taken *very* seriously.

III. Tsuanami Preparation.

Because of its location immediately beside the ocean, everyone living at Macor by the Sea should have and exercise their personal tsunami evacuation plan. The plan should include provisions for immediately moving from the danger zone to a safe location and food, water, hygienic and other provisions to allow the individual to survive for several days or longer until they can be rescued, as the area immediately surrounding Macor will most likely be severely damaged and untrafficable.

A. Warning. Because of the nature of the seismic plates and the trench and trough surrounding Puerto Rico, there may be little to no warning of a tsunami. Ideally the local Rincon Emergency Management Office will sound the tsunami sirens, however this has not always happened in the past, and those living at Macor should *not* base their evacuation based on the sounding of the sirens alone.

   When on or near the beach, or anywhere near ocean level, the Macor Emergency Team recommends everyone have with them a phone with a Tsunami App and Warning system loaded on it. There are several apps that can be chosen, and whichever one you do chose, become familiar with it and pay attention to the warnings given. Although this may not always alert you to an immediate event caused by a near shore earthquake or other event, it can help alert you to those happening further out to sea. Other indicators of a tsunami:

   1. Severe ground shaking from local earthquakes may cause tsunamis.
   2. As a tsuanami approaches shorelines, water may recede from the coast, exposing the ocean floor, reefs and fish.
   3. Abnormal ocean activity, a wall of water, and an approaching tsunami may create a loud “roaring” sound similar to that of a train or jet aircraft.

   If you experience any of these phenomena, do not wait for official evacuation orders. *Immediately* leave the low-lying area and relocate to higher ground.

B. Evacuation. If you receive any indicator of a tsunami, immediately evacuate the beach or any other low-lying area and move to higher ground. Because of the likelihood of near shore events here in Puerto Rico, those evacuating will have to weigh the risks of leaving the area completely to reach higher ground, or relocating to one of the Macor towers, as the incoming waves may not

allow safe movement further away. If going to one of the towers, move to at least the fourth floor, or 30-40 feet above the ocean. Higher in the tower is best. Use the stairs and *not the elevators* when moving to the higher floors as the rapid movement of water through the Macor area could shut off all electricity causing people to become stranded in the elevators and drown. Although the Macor Emergency Team cannot prescribe the best or safest place to go during a tsunami, due to the location of the event causing the tsunami and the arrival time of the wave(s), or the severity of the event and size of the resulting tsunami, individuals must consider the time and distances needed to move to higher ground. *Being caught in the waves and water can be deadly and every effort must be made to avoid this*. For near shore events, with little to no warning or reaction time, the Macor towers may be the only option and plans should be made for this, as appropriate. Because of the nature of a tsunami, those evacuating should not worry about taking beach chairs, umbrellas or other items they may have taken to the beach, but rather move *immediately* and *quickly* to the higher ground location. *Speed is essential!*

C. Emergency Supplies. Because of the nature of near shore tsunamis in Puerto Rico, it is recommended that those who are considering the option of moving to one of the Macor towers include at least five days of emergency supplies to allow time for response personnel and organizations to rescue them. Emergency supplies should include:

1. Food for a minimum of a five-day period. Since electricity will not be available, this should include canned and other non-perishable items, along with bottled water.
2. Hygenic and Medical Items and Supplies. People may be injured while evacuating from a tsunami and wound dressing materials and antibiotics are also recommended.
3. Cell Phones. Because many of the cell phone towers are located on higher ground it may be possible to use a cell phone to request assistance. These may also not work due to damages in lower lying area equipment, so planning should be made appropriately.
4. Keys to the tower doors. Because wave water may be moving across the Macor compound when evacuees reach the towers, with the resulting loss of electricity that activates the locks, those going to the beach should consider bringing with them a key to the tower doors.

D. FEMA App. The Macor Emergency Team recommends Macor occupants download the FEMA App onto their cell phones and become familiar with its contents. It includes helpful Emergency Safety Tips, Reminders, Disaster Resources and other helpful information such as how to build an emergency kit. Although the App recommends a three-day supply of non-perishable food and water, the Emergency Team recommends at least a five-day supply due to

the unique situation and distances involved with outside agencies and resources responding to a situation on the island.

E. Everyone Needs A Plan. When hosting family and friends here in Puerto Rico and at Macor by the Sea, make sure all of them are aware of the tsunami threat and are prepared accordingly. The threat is real and their lives may literally depend on your vigilance and preparedness.

The Macor by the Sea Emergency Team welcomes your comments and recommendations to improve our Emergency Plan. Feel free to contact us and help make Macor by the Sea the very best and safest environment for enjoying the many treasures of wonderful Puerto Rico.

Please provide comments on the Macor Emergency Tsunami Plan to:

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