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***SOUTHERN REGION TSUNAMI WARNING OPERATIONS FOR SR CONUS
COASTAL WFOS AND RFCS***

NOTICE: This publication is available at: <http://www.nws.noaa.gov/directives/>.

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1. Added new WC/ATWC Advisory product.
2. Updated watch/warning/advisory criteria and examples.
3. Minor wording changes throughout the Supplement.

<Signed by>

September 1, 2009

Bill Proenza

Date

Regional Director

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1. **Introduction.**

This Regional Supplement describes responsibilities and provides guidance to National Weather Service (NWS) Southern Region (SR) continental United States (CONUS) coastal Weather Forecast Offices (WFO) and River Forecast Centers (RFC) with coastal responsibility along the Gulf of Mexico and Atlantic Ocean (detailed procedures regarding the WFO San Juan tsunami warning operations program are contained in a separate Supplement).

The WFOs are responsible for planning for and taking appropriate action when there is a threat of a tsunami, including dissemination of Tsunami Watches, Warnings, and Advisories. They are also responsible for ensuring the readiness of office staff and systems through routine operational drills, coordinating community outreach activities to increase tsunami hazard awareness, and assisting in emergency preparedness for tsunami events (e.g. promotion of the TsunamiReady program). State Emergency Management Agencies (in Texas, Louisiana, Mississippi, Alabama, Georgia and Florida) have the responsibility for developing warning procedures, plans and evacuations for local communities, along with the WFOs and RFCs. Specific (localized) procedures will be included in the WFO SDM. The SR RFCs are responsible for preparing main stem river and flood forecast guidance for appropriate locations near the coastal areas that may be affected by tsunamis.

2. **Tsunami Program Procedures for the SR CONUS Coastal Weather Forecast Offices and River Forecast Centers.**

The West Coast Alaska Tsunami Warning Center (WC/ATWC) provides interim services until further notice for the Atlantic on seismic events. The Pacific Tsunami Warning Center (PTWC) is the backup office for WC/ATWC. If a seismic event occurs in the Atlantic and meets the seismic magnitude and location criteria listed in Sections 2.4.1 and 2.4.2, WC/ATWC will issue Tsunami Watches, Warnings, Advisories or informational products for the Southern and Eastern United States. The WFOs broadcast this information on NOAA Weather Radio All Hazards (NWR). Updates are provided by WFOs and RFCs to local customers and partners during and after events.

2.1. **Communications.**

a. **Advanced Weather Interactive Processing System (AWIPS).**

Both RFCs and WFOs *must* ensure all of the products listed in Sections 2.2.2.a, 2.2.2.b and 2.2.2.c. are *alarmed* in AWIPS. In addition, ensure after each AWIPS build (or crash) that the products are reconfigured to be alarmed.

b. **Contact logs.**

SR offices will likely receive numerous calls from the media, public, emergency managers, etc. during earthquake and tsunami events. Ensure that all calls initiated or received, as well as subsequent actions, are logged.

c. Emergency Phones.

Emergency office cellular and/or satellite phones should be charged and easily accessible to all staff. In addition, staff must know exactly where emergency cellular and/or satellite phones are and how to use them.

2.2 WC/ATWC Products.

The products that WC/ATWC issue (and PTWC as backup) are detailed below.

2.2.1 Tsunami Product Definitions:

Tsunami Warning - a tsunami warning is issued when a potential tsunami with significant widespread inundation is imminent or expected. Warnings alert the public that widespread, dangerous coastal flooding accompanied by powerful currents is possible and may continue for several hours after arrival of the initial wave. Warnings also alert emergency management officials to take action for the entire tsunami hazard zone. Appropriate actions to be taken by local officials may include the evacuation of low-lying coastal areas, and the repositioning of ships to deep waters when there is time to safely do so. Warnings may be updated, adjusted geographically, downgraded, or canceled.

Tsunami Watch - a tsunami watch is issued to alert emergency management officials and the public of an event which may later impact the watch area. The watch area may be upgraded to a warning or advisory - or canceled - based on updated information and analysis. Therefore, emergency management officials and the public should prepare to take action.

Tsunami Advisory - a tsunami advisory is issued due to the threat of a potential tsunami which may produce strong currents or waves dangerous to those in or near the water. Coastal regions historically prone to damage due to strong currents induced by tsunamis are at the greatest risk. The threat may continue for several hours after the arrival of the initial wave, but significant widespread inundation is not expected for areas under an advisory. Appropriate actions to be taken by local officials may include closing beaches, evacuating harbors and marinas, and the repositioning of ships to deep waters when there is time to safely do so. Advisories are normally updated to continue the advisory, expand/contract affected areas, upgrade to a warning, or cancel the advisory.

Tsunami Information Statement - a tsunami information statement is issued to inform emergency management officials and the public that an earthquake has occurred, or that a tsunami warning, watch or advisory has been issued for another section of the ocean. In most cases, information statements are issued to indicate there is no threat of a destructive tsunami and to prevent unnecessary evacuations as the earthquake may have been felt in coastal areas. An information statement may, in appropriate situations, caution about the possibility of destructive local tsunamis. Information statements may be re-issued with additional information, though normally these messages are not

updated. However, a watch, advisory or warning may be issued for the area, if necessary, after analysis and/or updated information becomes available.

2.2.2 Tsunami Text Products:

- a. Watches, Warnings, Advisories, and Cancellation Messages.
WC/ATWC issues Tsunami Watches, Tsunami Warnings, Tsunami Advisories, updates and cancellation messages under these two World Meteorological Organization (WMO) headings and AWIPS identifiers:

WEXX20 PAAQ ANCT**TSU**AT1 – Standard format product
WEXX30 PAAQ ANCT**TSU**ATE – Public friendly product

Where, TSU = Tsunami Watch, Warning, Advisory, or Cancellation product

(See Table 1 and Table 2 in Section 2.4 for the criteria of Tsunami Watches, Warnings, and Advisories).

The TSUATE product is narrative and referred to as “public friendly”, whereas the TSUAT1 product is tabular, segmented and referred to as the “standard format.” Both the “public friendly” and “standard format” TSU products are issued during watch/warning/advisory events. See Appendix F for examples.

WC/ATWC will collect and analyze data, and issue follow-up statements every 30 minutes under TSUAT1 and TSUATE during the first two hours after an event. Later in the event, the frequency of issuance may decrease, but not exceed two hours. If a tsunami is no longer expected or the danger has passed, the WC/ATWC will issue a cancellation message under the same product IDs (TSUAT1 and TSUATE). The TSU products are used for the issuance and cancellation of Tsunami Watches, Warnings, and Advisories, as well as the issuance of follow-up statements.

- b. Tsunami Information Statements.
A Tsunami Information Statement (TIB) usually is issued when the magnitude of a seismic event is above 6.0 but below watch/warning/advisory criteria. The TIB is also based on location of a seismic event – see Sections 2.4.1 and 2.4.2 for specifics. It provides pertinent information about earthquakes in the region (particularly those which may have been felt near the coast or were strong enough to attract media attention). The WMO heading and AWIPS identifiers for the Tsunami Information Statements are:

WEXX22 PAAQ ANCT**TIB**AT1 – Standard format product
WEXX32 PAAQ ANCT**TIB**ATE – Public friendly product

TIB = Tsunami Information Statement

The TIBATE product is narrative and referred to as “public friendly”, whereas the TIBAT1 product is tabular in format and referred to as the “standard format.” Both TIB products are issued during seismic events where Magnitude (M) \geq 6.0 but below watch/warning/advisory criteria.

There are no mandatory follow-up messages for the TIB products.

c. Tsunami Seismic Information Statement.

A Tsunami Seismic Information Statement (EQI) is issued to provide pertinent information about earthquakes in the region, usually when the magnitude of a seismic event is below 6.0 but above 4.0 (location dependent – See Sections 2.4.1 and 2.4.2). The WMO heading and AWIPS identifier for the Tsunami Seismic Information Statement is:

SEX60 PAAQ ANCEQIAT1

EQI = Tsunami Seismic Information Statement

There are no mandatory follow up messages for the EQI product.

2.3 WC/ATWC Dissemination.

WC/ATWC will relay the TSU, TIB and EQI tsunami products for the Atlantic by means of:

- broadcast over National Warning System (NAWAS),
- dissemination via National Airspace Data Interchange Network (NADIN2), NOAA Weather Wire Service (NWWS), Line223 (NWS Circuit and AWIPS feed), email, digital pagers, Quake Data Distribution System (QDDS), and WC/ATWC web site,
- telephone contact with the Naval Meteorological and Oceanographic Center (NMOC),
- telephone contact with the Pacific Tsunami Warning Center (PTWC),
- telephone contact with the National Earthquake Information Center (NEIC), and
- telephone contact with the U. S. State Department Operations Center when appropriate.

2.4 Procedural Thresholds.

If an earthquake is detected in the Atlantic area or the Gulf of Mexico, the WC/ATWC will issue a Tsunami Watch, Tsunami Warning, Tsunami Advisory or Information product using the thresholds in Sections 2.4.1 and 2.4.2. Table 1 and Table 2 depict the criteria for the issuance of tsunami-related products.

2.4.1 Events Near the Atlantic Coast or Gulf of Mexico.

See Appendix G for a graphical representation of these criteria and the WC/ATWC Area of Responsibility (AOR).

Table 1:
Determination of Product to be Issued by Earthquake Magnitude and Area of Occurrence

Magnitude	Area	Product	Product ID
4.0 - 4.9	Within 150km of coast	Tsunami <u>Seismic</u> Information Statement	ANCEQIAT1
5.0 - 5.9	Gulf of Mexico or within approximately 500km of the Atlantic coast	Tsunami <u>Seismic</u> Information Statement	ANCEQIAT1
6.0 - 6.4	Gulf of Mexico or within approximately 500km of the Atlantic coast	Tsunami Information Statement	ANCTIBAT1 and ANCTIBATE
6.0+	Inland	Tsunami Information Statement	ANCTIBAT1 and ANCTIBATE
6.5 - 7.5	Atlantic coast	Fixed warning (250km)*	ANCTSUAT1 and ANCTSUATE
7.6 - 7.8	Atlantic coast	Fixed warning (500km)** - Fixed Advisory (500-1000km)**	ANCTSUAT1 and ANCTSUATE
>7.8	Atlantic coast	Warning (1000km)*** – Watch***	ANCTSUAT1 and ANCTSUATE
>= 6.5	Gulf of Mexico	Fixed warning for Gulf Coast	ANCTSUAT1 and ANCTSUATE

Note: “Atlantic coast” includes the coasts of eastern Canada.

* Fixed warning (250 km) indicates that a Tsunami Warning will be issued to the next breakpoint (see section 2.5) beyond 250km in both directions along the coast. No watch will be issued, and the warning area will not be expanded unless conditions warrant.

** Fixed warning (500km) indicates that a Tsunami Warning will be issued to the next breakpoint (see Section 2.5) beyond 500km in both directions along the coast. **Advisory (500-1000km) indicates that an advisory will be issued from the end of the warning to the first breakpoint beyond 1000km in both directions along the coast. No watch will be issued, and the warning/advisory area will not be expanded unless conditions warrant.

*** Warning (1000km) indicates that a Tsunami Warning will be issued to the next breakpoint (see Section 2.5) beyond 1000km in both directions along the coast. *** Watch indicates that a Tsunami Watch will be issued to the rest of the U.S. and Canadian Atlantic coast (not including the Gulf of Mexico). The watch will be converted to a warning or advisory, or cancelled based on observed tsunami effects and forecast models.

2.4.2 Other Atlantic Basin Regions.

**Table 2:
Determination of Product to be Issued by Earthquake Magnitude and Area of Occurrence**

Magnitude	Area	Threat Level	Product
6.0-7.5 7.0-7.5	Caribbean Sea Other Atlantic regions	No Danger	ANCTIBAT1 and ANCTIBATE
> 7.5	Atlantic basin (No potential danger to Area of Responsibility)	No Danger	ANCTIBAT1 and ANCTIBATE
> 7.5	Atlantic basin (Potential danger to Area of Responsibility)	Estimated time of arrival dependent: Potential danger	ANCTIBAT1 and ANCTIBATE or ANCTSUA1 and ANCTSUA2

'Atlantic basin' in Table 2 above refers to the area within the Atlantic basin that is not within WC/ATWC's prescribed AOR. It is generally about 500km off the coast. See Appendix G for a graphical representation of this criteria and the WC/ATWC AOR.

2.5 Break Points.

In the Tsunami Watch/Warning/Advisory product, breakpoints along the coast are used to define the areal extent of the threat. Below are the designated breakpoints used by the WC/ATWC for the Southern and Eastern U.S.:

Brownsville, TX	Bonita Beach, FL	Duck, NC
Baffin Bay, TX	Flamingo, FL	Chesapeake Bay, Smith Pt., VA
Port O'Connor, TX	Ocean Reef, FL	Cape Henlopen, DE
High Island, TX	Jupiter Inlet, FL	Sandy Hook, NJ
Morgan City, LA	Flagler Beach, FL	Watch Hill, RI
MS/AL Border	Altamaha Sound, GA	Merrimack River, MA
Destin, FL	South Santee River, SC	Stonington, ME
Suwannee River, FL	Surf City, NC	US/Canada Border

Whenever the boundary of a watch, warning, or advisory extends beyond a particular break point, the watch, warning, or advisory will include the next breakpoint.

3. WFO Procedures.

Coastal WFOs in the affected area of a Tsunami Watch, Warning, or Advisory will follow the procedures below. Critical actions by the WFOs are necessary for public and partner notification. A checklist to be utilized during a tsunami event is provided in Appendix A.

3.1 NOAA Weather Radio All Hazards (NWR) Activation.

a. When a Tsunami Watch or Tsunami Warning is issued for your area:

- 1) Activate NWR. When a Tsunami Watch or Tsunami Warning has been issued by WC/ATWC for your area, affected coastal WFOs will:
 - A. *immediately* activate the Emergency Alert System (EAS) and
 - B. tone alert (both 1050HZ and SAME [Specific Area Message Encoding]) the NWR Console Replacement System (CRS) for all affected NWR coastal transmitters and
 - C. broadcast the tsunami information on NWR.

Sample broadcast templates are provided in Appendix B (for a Tsunami Watch) or Appendix C (for a Tsunami Warning). Use information in the TSUAT1 product to fill in the appropriate template and then use it as a broadcast script.

Note: *Only tone alert via NWR* the proper EAS codes and read from the broadcast template script (located in Appendix B and C). Specifically, do ***not*** issue a TSW, TSA, CEM, CFW product from AWIPS.

- 2) Issue EAS Codes Via NWR.
Currently, all coastal WFOs do not use the same EAS codes for Tsunami Watches/Warnings/Advisories due to local agreements with partners. Therefore, your SDM will note which EAS code your office should use to activate NWR. One of the following three EAS codes should be used for tsunami EAS dissemination on CRS:

- (a) Civil Emergency Message (CEM), or
- (b) Coastal Hazards Message (CFW), or
- (c) Tsunami Warning message (TSW) / Tsunami Watch message (TSA).

The EAS code your office uses for Tsunami Watches and Warnings must be collaborated with your partners to ensure their systems are configured to receive those EAS codes.

Also note in your SDM which transmitters should be activated for tsunami information.

- 3) Issue Special Weather Statements for Updates.
If a Tsunami Warning and/or Tsunami Watch is issued by WC/ATWC for your County Warning Area (CWA), WFOs should issue Special Weather

Statements (SPS) every 30 minutes via AWIPS and broadcast over NWR. Similar to Hurricane Local Statements, these SPSs are intended to provide timely updates to customers and partners while the Tsunami Watch/Warning is in effect and WC/ATWC collects and analyzes data. In most cases, the SPS will reemphasize the information in the WC/ATWC products while adding additional local impact information such as flooding and any messages relayed by emergency managers, if available. When a Tsunami Watch or Warning is cancelled, use the SPS to relay this information. Broadcast the SPSs on NWR.

- b. When a Tsunami Advisory is issued for your area:
Upon receipt of a tsunami advisory from the WC/ATWC, WFOs may broadcast this information over NWR, based upon local customer requirements. Then, every 30 minutes afterwards, WFOs should issue Special Weather Statements (from AWIPS and also broadcast over NWR). Similar to Hurricane Local Statements, these SPSs are intended to provide timely updates to customers and partners while the tsunami advisory is in effect and WC/ATWC collects, reviews, and diagnoses data. In most cases, the SPS will reemphasize the information in the WC/ATWC products while adding local impact information such as flooding and any messages relayed by emergency managers, if available. When a tsunami advisory is cancelled, use the SPS to relay this information. Broadcast the SPSs on NWR.
- c. When a Tsunami Information Statement (TIB) or Tsunami Seismic Information Statement (EQI) is Issued for Your Area:
If the WC/ATWC issues a TIB or EQI product for your area, a tsunami is unlikely.

TIBs or EQIs do not need to be disseminated over NWR. However, an earthquake that is felt may result in an increase in the number of phone calls or activities at an office. Therefore, at forecaster discretion, either a Public Information Statement (PNS) product or a Special Weather Statement (SPS) product may be issued from AWIPS and/or disseminated on NWR to help minimize media/public concerns. A PNS may be more appropriate for earthquakes that are not felt by many in your CWA. For widespread felt earthquakes across a CWA, the number of calls in the office will increase to where an SPS may be more appropriate. The PNS or SPS will reemphasize the information in the TIB or EQI product.
- d. When the Tsunami Watch, Warning, or Advisory is Cancelled:
If the WC/ATWC cancels the Tsunami Watch, Warning, or Advisory for your area, broadcast the information on NWR using the template in Appendix E. Additionally, a Cancellation Checklist is provided on page A-2 that lists tasks to be completed when a Tsunami Watch, Warning, or Advisory has been cancelled.

A WFO's local policy to tone alert NWR cancellation messages must be collaborated with your partners. Note in your SDM if your office will tone alert NWR for cancelled Tsunami Watches, Warnings, or Advisories. As a reminder, use the SPS to relay information that a Tsunami Watch, Warning, or Advisory was cancelled. Broadcast the SPSs on NWR.

3.2 Felt Earthquakes.

Anytime an earthquake is felt, WFOs may issue an Earthquake Report (EQR) to inform surrounding offices and the public (see Directive 10-518, Section 4 for details on the EQR).

WFOs (and the public) may inform the National Earthquake Information Center (NEIC) and the United States Geological Survey (USGS) of a felt earthquake by filling out an Earthquake Report online at the USGS website:

<http://earthquake.usgs.gov/eqcenter/dyfi/>

If a strong earthquake creates numerous media and public inquiries, issuing an SPS may be prudent.

4. Dissemination Tests for WFOs and RFCs.

Monthly dissemination tests will be conducted for tsunami products by WC/ATWC to ensure products are received by the NWS and its partners. WC/ATWC will disseminate a test TIB and/or test TSU product roughly once a month to WFOs, RFCs, the FAA and Federal and State emergency managers.

4.1 Tsunami Acknowledgement Message.

After receipt of the WC/ATWC tsunami test product(s) [normally the TSUAT1 product], WFOs and RFCs will respond immediately by disseminating a Tsunami Acknowledgement Message (TMA) from AWIPS, as specified below. The TMA product is received back at WC/ATWC to validate operation of the communication system.

Because some customers can receive the TMA, it is important to add "**This is only a test.**" to the body of the product.

Example of a TMA message sent to WC/ATWC:

SEUS42 KJAX 231410
TMAJAX

This is only a test. (add)

WEXX20 PAAQ RCVD AT **231305**

(this is the time you received the product, not the time this test message is transmitted)

\$\$

Important Note: The TMA product is NOT to be sent during actual events; it's only disseminated during monthly tests.

5. Procedures Used to Notify Southern Region Headquarters and the RFCs.

- a. To Southern Region Headquarters (SRH) from WFO Melbourne. Anytime WC/ATWC issues a TSU or TIB product for Southern Region's area or the Atlantic Basin, WFO Melbourne will notify SRH by calling the Southern Region Regional Operations Center (ROC) at 817-978-1100, ext 147. Leave a message if no one answers and an SRH employee will be paged.

If communications at WFO Melbourne are inoperative, WFO Tampa will call SRH.

- b. To Southeast River Forecast Center (SERFC) from WFO Melbourne. WFO Melbourne will notify the SERFC when a Tsunami Watch, Warning, or Advisory has been issued for the Alabama, Georgia or Florida coasts. If an event occurs after normal business hours, the Hydrologist-In-Charge (HIC) or Development and Operations Hydrologist (DOH) should be contacted at home. If they cannot be contacted, the after-hours contact list should be used until someone is contacted.

If communications at WFO Melbourne are inoperative, WFO Tampa will call SERFC.

- c. To Lower Mississippi River Forecast Center from WFO New Orleans. In the event a Tsunami Watch, Warning, or Advisory has been issued for Louisiana or Mississippi, WFO New Orleans will notify the Lower Mississippi River Forecast Center (LMRFC). If an event occurs after normal business hours, WFO New Orleans will contact LMRFC personnel using the same after-hours contact procedures as in a major flood event. The LMRFC call list will provide the appropriate numbers and order of priority to ensure that an RFC forecaster is contacted. Upon receipt of a call, LMRFC forecasters will use established office procedures to notify management of a tsunami.

If communications at WFO New Orleans are inoperative, WFO Mobile will call LMRFC.

- d. To West Gulf River Forecast Center (WGRFC) from WFO Houston.
WFO Houston will notify the WGRFC HIC/DOH to notify them when a Tsunami Watch, Warning, or Advisory has been issued for the Texas coast. If an event occurs after normal business hours, the HIC or DOH should be contacted at home. If they cannot be contacted, the after-hours contact list should be used until someone is contacted.

If communications at WFO Houston are inoperative, WFO Lake Charles will call WGRFC.

6. Drills.

Because earthquakes do not occur regularly, completion of drills are critical to maintaining operational proficiency. SR CONUS coastal WFOs should conduct at least one annual drill related to tsunami program procedures, and will notify the SRH Tsunami Program Leader when the drill is completed by the staff members.

Appendix A:

Sample WFO Checklist to use when a Tsunami Watch, Warning or Advisory is issued by WC/ATWC for Your Area.

TSUNAMI WATCH / WARNING / ADVISORY
(circle one)

Criteria: By direction of the West Coast / Alaska Tsunami Warning Center.

Issued: Date _____ Time _____

Valid until: Date _____ Time _____

Initials of Warning Coordinator _____

Area Affected _____

**Time
Completed/Initial
s**

WATCH / WARNING CHECKLIST

_____/_____

Put the watch or warning information immediately on NWR as follows:

- Get a CRS/NWR Broadcast Template from Appendix B (for a Tsunami Watch) or Appendix C (for a Tsunami Warning) or Appendix D (for a Tsunami Advisory) .
- Fill in the blanks on the template. That is what you will read on CRS.
- Use the following EAS code _____ (defined locally in your SDM)
- Follow the proper procedures to broadcast the message for CRS.
- Write on the template the time your message was initially broadcast on NWR.

_____/_____

If other weather warnings are in effect during the tsunami event, after a short period of time that the tsunami message has played alone, play the additional warning messages in the interest of protecting lives and property. Keep CRS programming at an absolute minimum. This should all be programmed to happen automatically if you recorded the message correctly on CRS.

_____/_____

Issue an SPS product every 30 minutes and broadcast on NWR. The SPS product should provide updates and/or local information (see Section 3.1.a.3 for details).

_____/_____

Consider any additional actions that may enhance community response to this watch/warning. These may include additional phone calls to local emergency managers, law enforcement, fire departments, etc, where impact may be particularly damaging. Record all of these actions.

- _____/_____
Continue to record updates from WC/ATWC to CRS and also SPSs issued from your local office.
- _____/_____
Log all additional incidents or actions that pertain to this event. Any verification information received should be recorded as well.
- _____/_____
Contact the MIC and WCM if they are not on station. Also contact the RFC (if applicable).

**Time
Completed**

CANCELLATION CHECKLIST

- _____/_____
Put the cancellation on NWR as follows:
- Get a Cancellation Broadcast Template from Appendix E.
 - Fill in the blanks. This is what you will read on CRS.
 - Follow the proper procedures to broadcast the message for CRS.
 - Write the time your cancellation message was initially broadcast on the template.
 - Remove the message after about 1 hour.
- _____/_____
Retain all records of this event and place on the WCM's desk.
- _____/_____
Notify the MIC or the WCM if they are not on station.
- _____/_____
Gather pertinent documents and review evacuation/safety procedures if the office is threatened by the tsunami.

Appendix B:

CRS/NWR Broadcast Template for Tsunami Watch

Upon receipt of a **Tsunami Watch** product (TSUAT1) from the WC/ATWC that includes all or a portion of your area, print this form and fill it out based on information included in the tsunami watch product. Use the proper procedures to get the message below disseminated via CRS/NWR. Be sure to select the appropriate coastal transmitters that the Tsunami Watch will play on. Attach this form to the Tsunami Watch checklist. Here is the message to fill out and read:

"The National Weather Service has issued a TSUNAMI WATCH for coastal areas in _____ (specify area), from _____ to _____, at _____ AM / PM _____ (time zone). A large earthquake, with a preliminary magnitude of _____, has been detected approximately _____ miles _____ (direction) of _____ (location).

Though it remains uncertain if a tsunami will impact the TSUNAMI WATCH area, the arrival times for the initial tsunami wave are estimated for the following locations:

- _____ (LOCATION) _____ AM / PM _____ (time zone).
- _____ (LOCATION) _____ AM / PM _____ (time zone).
- _____ (LOCATION) _____ AM / PM _____ (time zone).
- _____ (LOCATION) _____ AM / PM _____ (time zone).

Include the following italicized section if this information appears in the watch product:

A tsunami has been generated which could impact coastal areas of (list your area here). Observed tsunami wave heights from this earthquake have been

_____ (FEET) at _____ (LOCATION) and _____ (FEET) at _____ (LOCATION) around _____ (AM / PM _____ (time zone).

Once again, a TSUNAMI WATCH is in effect from _____ (location) to _____ in _____ (specify area) at _____ AM / PM _____ (time zone).

A TSUNAMI WATCH means that the risk of a tsunami has increased, but its occurrence and timing are still uncertain.

If you are in the TSUNAMI WATCH area, stay posted on this potential hazard and be alert for instructions from local emergency officials. Your National Weather Service Office in (your location) will continue to monitor the situation, and will provide updates on NOAA Weather Radio every hour or sooner as conditions warrant."

Appendix C: CRS/NWR Broadcast Template for Tsunami Warning

Upon receipt of a **Tsunami Warning** product (TSUAT1) from the WC/ATWC that includes all or a portion of your area, print this form and fill it out based on information included in the Tsunami Warning product. Use the proper procedures to get the message below disseminated via CRS/NWR. Be sure to select the appropriate coastal transmitters that the Tsunami Warning will play on. Attach this form to the Tsunami Warning checklist. Here is the message to fill out and read:

"The National Weather Service has issued a TSUNAMI WARNING for coastal areas in _____ (specify area), from _____ to _____, at _____ AM / PM _____ (time zone). A large earthquake, with a preliminary magnitude of _____, has been detected approximately _____ miles _____ (direction) of _____ (location).

The arrival times for the initial tsunami waves are estimated for the following locations:

_____ (LOCATION) _____ AM / PM _____ (time zone).
 _____ (LOCATION) _____ AM / PM _____ (time zone).
 _____ (LOCATION) _____ AM / PM _____ (time zone).
 _____ (LOCATION) _____ AM / PM _____ (time zone).

Include the following italicized section if this information appears in the warning product:

A tsunami has been generated which could impact coastal areas of (list your area here). Observed tsunami wave heights from this earthquake have been _____ (FEET) at _____ (LOCATION) and _____ (FEET) at _____ (LOCATION) around _____ (AM / PM _____ (time zone).

Once again, a TSUNAMI WARNING is in effect from _____ (location) to _____ in _____ (specify area) at _____ AM / PM _____ (time zone).

A TSUNAMI WARNING means that a tsunami is (circle one): occurring, imminent or highly likely.

Tsunamis are a series of waves generated by an undersea earthquake. This series of waves could be dangerous for several hours after the initial tsunami flood wave arrives.

If you are in the TSUNAMI WARNING area, stay alert for instructions from local emergency officials. Anyone on or near the beach in the TSUNAMI WARNING area should move to higher ground. Your National Weather Service Office in (your location) will continue to monitor the situation and will provide updates on NOAA Weather Radio every hour or sooner as conditions warrant."

Note: The warning coordinator can add information (call to action statements, etc...) to the last paragraph above, from the "EVALUATION" portion of WC/ATWC's tsunami warning product if he/she deems it appropriate.

Appendix D CRS/NWR Broadcast Template for Tsunami Advisory

Upon receipt of a **Tsunami Advisory** product (TSUAT1) from the WC/ATWC that includes all or a portion of your area, print this form and fill it out based on information included in the Tsunami Advisory product. Use the proper procedures to get the message below disseminated via CRS/NWR. Be sure to select the appropriate coastal transmitters that the Tsunami Advisory will play on. Attach this form to the Tsunami Advisory checklist. Here is the message to fill out and read:

"The National Weather Service has issued a TSUNAMI ADVISORY for coastal areas in _____ (specify area), from _____ to _____, at _____ AM / PM _____ (time zone). A large earthquake, with a preliminary magnitude of _____, has been detected approximately _____ miles _____ (direction) of _____ (location).

The arrival times for the initial tsunami waves are estimated for the following locations:

_____(LOCATION) _____ AM / PM _____ (time zone).
_____(LOCATION) _____ AM / PM _____ (time zone).
_____(LOCATION) _____ AM / PM _____ (time zone).
_____(LOCATION) _____ AM / PM _____ (time zone).

Include the following italicized section if this information appears in the advisory product:

A tsunami has been generated which could impact coastal areas of (list your area here). Observed tsunami wave heights from this earthquake have been

_____ (FEET) at _____(LOCATION) and _____ (FEET) at _____ (LOCATION) around _____ (AM / PM _____ (time zone).

Once again, a TSUNAMI ADVISORY is in effect from _____ (location) to _____ in _____ (specify area) at _____ AM / PM _____ (time zone).

A TSUNAMI ADVISORY means that a tsunami capable of producing strong currents or waves dangerous to persons in or very near the water is imminent or expected.

If you are in the TSUNAMI ADVISORY area, stay alert for instructions from local emergency officials. Persons in the TSUNAMI ADVISORY area should move out of the water, off the beach and out of harbors and marinas. Your National Weather Service Office in (your location) will continue to monitor the situation and will provide updates on NOAA Weather Radio every hour or sooner as conditions warrant."

Note: The warning coordinator can add information (call to action statements, etc...) to the last paragraph above, from the "EVALUATION" portion of WC/ATWC's tsunami warning product if he/she deems it appropriate.

Appendix E
CRS/NWR Broadcast Template for Tsunami Cancellation

Upon receipt of a Tsunami Watch/Warning/Advisory **Cancellation** product (TSUAT1) from the WC/ATWC for all or portions of your area, print this form and fill it out based on information included in the cancellation product. Use the proper procedures to get the message below disseminated via CRS/NWR. Be sure to select the appropriate coastal transmitters that the tsunami cancellation information will play on. Attach this form to the Tsunami Watch/Warning/Advisory checklist. Here is the message to fill out and read:

"The National Weather Service has Canceled the TSUNAMI (WATCH / WARNING/ ADVISORY) for coastal areas in _____ (specify area), from _____ (location) to _____, at _____ AM / PM _____ time zone. The Tsunami Warning Center has determined that the tsunami danger for _____ (specify area) no longer exists.

Include the following italicized section if this information appears in the cancellation product :

A regional tsunami was generated from a magnitude _____ earthquake, approximately _____ miles _____ (direction) of _____. Observed tsunami wave heights from this earthquake were _____ (FEET) at _____ (LOCATION) and _____ (FEET) at _____ (LOCATION).

Once again, the TSUNAMI (WATCH / WARNING/ ADVISORY) has been Canceled for coastal areas in _____ (specify area), from _____ (location) to _____, at _____ AM / PM _____ time zone. The Tsunami Warning Center has determined that no tsunami danger exists for _____ (specify area). Some coastal areas may experience small sea level changes. As local surf conditions can vary widely, the all clear determination must be made by local authorities. This is the final statement on this situation that will be broadcast by your National Weather Service Office in _____ (specify location). Our normal NOAA Weather Radio broadcast cycle will resume shortly."

Appendix F: Product Examples from WC/ATWC

**Example of a standard format Tsunami Watch/Warning/Advisory (TSUAT1 product)
issued by WC/ATWC:**

WEXX20 PAAQ 312057
TSUAT1

BULLETIN

TEST...TSUNAMI MESSAGE NUMBER 1...TEST
NWS WEST COAST/ALASKA TSUNAMI WARNING CENTER PALMER AK
457 PM AST SAT JAN 31 2009

...THIS MESSAGE IS FOR TEST PURPOSES TO SHOW AN EXAMPLE
WEXX20 MESSAGE WITH VTEC...

...A TEST TSUNAMI WARNING IS IN EFFECT FOR PUERTO RICO AND THE
VIRGIN ISLANDS...

...THIS MESSAGE IS INFORMATION ONLY FOR COASTAL AREAS OF
TEXAS - LOUISIANA - MISSISSIPPI - ALABAMA - FLORIDA -
GEORGIA - SOUTH CAROLINA - NORTH CAROLINA - VIRGINIA -
MARYLAND - DELAWARE - NEW JERSEY - NEW YORK - CONNECTICUT -
RHODE ISLAND - MASSACHUSETTS - NEW HAMPSHIRE - MAINE - NEW
BRUNSWICK - NOVA SCOTIA - NEWFOUNDLAND AND LABRADOR FROM
BROWNSVILLE TEXAS TO CAPE CHIDLEY LABRADOR...

RECOMMENDED ACTIONS

IT IS NOT KNOWN - REPEAT NOT KNOWN - IF A TSUNAMI EXISTS BUT A
TSUNAMI MAY HAVE BEEN GENERATED. PERSONS IN LOW-LYING COASTAL
AREAS SHOULD BE ALERT TO INSTRUCTIONS FROM THEIR LOCAL EMERGENCY
OFFICIALS. EVACUATIONS ARE ONLY ORDERED BY EMERGENCY RESPONSE
AGENCIES.

- PERSONS IN TSUNAMI WARNING COASTAL AREAS SHOULD MOVE INLAND TO
HIGHER GROUND.

THIS MESSAGE IS BASED MAINLY ON EARTHQUAKE DATA. AS MORE
INFORMATION BECOMES AVAILABLE THE WARNING AREAS WILL BE REFINED.

PRELIMINARY EARTHQUAKE PARAMETERS

MAGNITUDE - 6.6
TIME - 1550 EST JAN 31 2009
1650 AST JAN 31 2009
2050 UTC JAN 31 2009
LOCATION - 19.0 NORTH 65.0 WEST
65 MILES/105 KM NE OF FAJARDO PUERTO RICO
80 MILES/129 KM NE OF SAN JUAN PUERTO RICO
DEPTH - 6 MILES/10 KM

THE PACIFIC TSUNAMI WARNING CENTER IN EWA BEACH HAWAII WILL
ISSUE MESSAGES FOR AREAS IN THE CARIBBEAN OUTSIDE PUERTO RICO
AND THE VIRGIN ISLANDS.

TSUNAMI WARNINGS MEAN THAT A TSUNAMI WITH SIGNIFICANT WIDESPREAD
INUNDATION IS IMMINENT OR EXPECTED. WARNINGS INDICATE THAT

WIDESPREAD DANGEROUS COASTAL FLOODING ACCOMPANIED BY POWERFUL CURRENTS IS POSSIBLE AND MAY CONTINUE FOR SEVERAL HOURS AFTER THE INITIAL WAVE ARRIVAL.

THIS MESSAGE WILL BE UPDATED IN 30 MINUTES OR SOONER IF THE SITUATION WARRANTS. THE TSUNAMI MESSAGE WILL REMAIN IN EFFECT UNTIL FURTHER NOTICE. REFER TO THE INTERNET SITE WCATWC.ARH.NOAA.GOV FOR MORE INFORMATION.

AMZ712-715-725-735-742-745-PRZ001>003-005-007-008-010-011-
VIZ001-002-312157-
/X.NEW.PAAQ.TS.W.0066.090131T2057Z-000000T0000Z/
COASTAL AREAS OF PUERTO RICO AND THE VIRGIN ISLANDS.
457 PM AST SAT JAN 31 2009

...A TEST TSUNAMI WARNING IS IN EFFECT FOR PUERTO RICO AND THE VIRGIN ISLANDS...

TSUNAMI WARNINGS MEAN THAT A TSUNAMI WITH SIGNIFICANT WIDESPREAD INUNDATION IS IMMINENT OR EXPECTED. TSUNAMIS ARE A SERIES OF WAVES POTENTIALLY DANGEROUS SEVERAL HOURS AFTER INITIAL ARRIVAL TIME. ESTIMATED TIMES OF INITIAL WAVE ARRIVAL FOR SELECTED SITES IN THE WARNING ARE PROVIDED BELOW.

SAN JUAN-PR 1707 AST JAN 31 MAYAGUEZ-PR 1726 AST JAN 31
CHRISTIANSTED-VI 1718 AST JAN 31 CHARLOT AMALI-VI 1731 AST JAN 31
FOR ARRIVAL TIMES AT ADDITIONAL LOCATIONS SEE
WCATWC.ARH.NOAA.GOV

THIS IS A TEST MESSAGE. DO NOT TAKE ACTION BASED ON THIS TEST MESSAGE.

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Appendix F - Continued: Product Examples from WC/ATWC

**Example of a “Public Friendly” Tsunami Watch/Warning/Advisory (TSUATE product)
issued by WC/ATWC:**

WEXX30 PAAQ 131000
TSUATE

BULLETIN
PUBLIC TSUNAMI MESSAGE NUMBER 2
NWS WEST COAST/ALASKA TSUNAMI WARNING CENTER PALMER AK
600 AM AST SUN JAN 13 2008

...THIS MESSAGE IS FOR TEST PURPOSES TO SHOW AN EXAMPLE
WEXX30 MESSAGE...

...A TEST TSUNAMI WARNING IS IN EFFECT FOR PUERTO RICO AND THE
VIRGIN ISLANDS...

...A TEST TSUNAMI ADVISORY IS IN EFFECT FOR THE NORTH CAROLINA -
VIRGINIA - MARYLAND - DELAWARE - NEW JERSEY - NEW YORK -
CONNECTICUT - RHODE ISLAND - MASSACHUSETTS - NEW HAMPSHIRE
- MAINE - NEW BRUNSWICK - NOVA SCOTIA AND NEWFOUNDLAND
COASTAL AREAS FROM DUCK NORTH CAROLINA TO LA MANCHE
NEWFOUNDLAND...

...THIS MESSAGE IS INFORMATION ONLY FOR U.S. AND CANADIAN
ATLANTIC AND GULF OF MEXICO COASTAL REGIONS NOT INCLUDED IN
THE AREAS LISTED ABOVE...

A TSUNAMI WARNING MEANS... ALL COASTAL RESIDENTS IN THE WARNING
AREA WHO ARE NEAR THE BEACH OR IN LOW-LYING REGIONS SHOULD MOVE
IMMEDIATELY INLAND TO HIGHER GROUND AND AWAY FROM ALL HARBORS AND
INLETS INCLUDING THOSE SHELTERED DIRECTLY FROM THE SEA. THOSE
FEELING THE EARTH SHAKE... SEEING UNUSUAL WAVE ACTION... OR THE
WATER LEVEL RISING OR RECEDING MAY HAVE ONLY A FEW MINUTES BEFORE
THE TSUNAMI ARRIVAL AND SHOULD MOVE IMMEDIATELY. HOMES AND
SMALL BUILDINGS ARE NOT DESIGNED TO WITHSTAND TSUNAMI IMPACTS.
DO NOT STAY IN THESE STRUCTURES.

ALL RESIDENTS WITHIN THE WARNED AREA SHOULD BE ALERT FOR
INSTRUCTIONS BROADCAST FROM THEIR LOCAL CIVIL AUTHORITIES.
A TSUNAMI HAS BEEN RECORDED.

A TSUNAMI ADVISORY MEANS THAT A TSUNAMI CAPABLE OF PRODUCING
STRONG CURRENTS OR WAVES DANGEROUS TO PERSONS IN OR VERY NEAR
THE WATER IS IMMINENT OR EXPECTED. SIGNIFICANT WIDESPREAD
INUNDATION IS NOT EXPECTED FOR AREAS UNDER AN ADVISORY.
CURRENTS MAY BE HAZARDOUS TO SWIMMERS... BOATS... AND COASTAL
STRUCTURES AND MAY CONTINUE FOR SEVERAL HOURS AFTER THE
INITIAL WAVE ARRIVAL.

AT 555 AM ATLANTIC STANDARD TIME ON JANUARY 13 AN EARTHQUAKE WITH
PRELIMINARY MAGNITUDE 8.2 OCCURRED 130 MILES/209 KM NORTHWEST OF
MAYAGUEZ PUERTO RICO.
THIS EARTHQUAKE HAS GENERATED A TSUNAMI WHICH COULD CAUSE DAMAGE

TO REGIONS IN A WARNING OR ADVISORY. THE WAVES WILL FIRST REACH SAN JUAN PUERTO RICO AT 620 AM AST ON JANUARY 13. ESTIMATED TSUNAMI ARRIVAL TIMES AND MAPS ALONG WITH SAFETY RULES AND OTHER INFORMATION CAN BE FOUND ON THE WEB SITE WCATWC.ARH.NOAA.GOV.

A TSUNAMI HAS BEEN OBSERVED AT THE FOLLOWING SITES

LOCATION	LAT	LON	TIME	AMPL
SAN JUAN - PR	18.5N	66.1W	1045UTC	2.0M/6.6FT

TIME - TIME OF MEASUREMENT
 AMPL - TSUNAMI AMPLITUDES ARE MEASURED RELATIVE TO NORMAL SEA LEVEL.
 IT IS ...NOT... CREST-TO-TROUGH WAVE HEIGHT.
 VALUES ARE GIVEN IN BOTH METERS(M) AND FEET(FT).

TSUNAMIS CAN BE DANGEROUS WAVES THAT ARE NOT SURVIVABLE. WAVE HEIGHTS ARE AMPLIFIED BY IRREGULAR SHORELINE AND ARE DIFFICULT TO FORECAST. TSUNAMIS OFTEN APPEAR AS A STRONG SURGE AND MAY BE PRECEDED BY A RECEDING WATER LEVEL. MARINERS IN WATER DEEPER THAN 600 FEET SHOULD NOT BE AFFECTED BY A TSUNAMI. WAVE HEIGHTS WILL INCREASE RAPIDLY AS WATER SHALLOWS. TSUNAMIS ARE A SERIES OF OCEAN WAVES WHICH CAN BE DANGEROUS FOR SEVERAL HOURS AFTER THE INITIAL WAVE ARRIVAL. DO NOT RETURN TO EVACUATED AREAS UNTIL AN ALL CLEAR IS GIVEN BY LOCAL CIVIL AUTHORITIES.

THE PACIFIC TSUNAMI WARNING CENTER IN EWA BEACH HAWAII WILL ISSUE MESSAGES FOR AREAS IN THE CARIBBEAN OUTSIDE PUERTO RICO AND THE VIRGIN ISLANDS.

MESSAGES WILL BE ISSUED EVERY 30 MINUTES OR MORE FREQUENTLY IF THE SITUATION WARRANTS. THE TSUNAMI ALERT WILL REMAIN IN EFFECT UNTIL FURTHER NOTICE. FOR FURTHER INFORMATION STAY TUNED TO NOAA WEATHER RADIO... YOUR LOCAL TV OR RADIO STATIONS... OR SEE THE WEB SITE WCATWC.ARH.NOAA.GOV.

THIS IS A TEST MESSAGE. DO NOT TAKE ACTION BASED ON THIS TEST MESSAGE.

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Appendix F - Continued: Product Examples from WC/ATWC

**Example of a standard format Tsunami Information Statement (TIBAT1 product) issued
by WC/ATWC:**

WEXX22 PAAQ 131012
TIBAT1

TSUNAMI INFORMATION STATEMENT NUMBER 1
NWS WEST COAST/ALASKA TSUNAMI WARNING CENTER PALMER AK
512 AM EST SUN JAN 13 2008

...THIS MESSAGE IS FOR TEST PURPOSES TO SHOW AN EXAMPLE
WEXX22 MESSAGE...

...THIS TEST TSUNAMI INFORMATION STATEMENT IS FOR PUERTO RICO/
THE VIRGIN ISLANDS/ THE U.S. ATLANTIC AND GULF OF
MEXICO STATES/ AND EASTERN CANADIAN PROVINCES...

NO - REPEAT NO - WARNING... WATCH OR ADVISORY IS IN EFFECT FOR
THESE AREAS.

EVALUATION

BASED ON EARTHQUAKE DATA AND HISTORIC TSUNAMI RECORDS THE
EARTHQUAKE WAS NOT SUFFICIENT TO GENERATE A TSUNAMI DAMAGING TO
PUERTO RICO/ THE VIRGIN ISLANDS/ THE U.S. ATLANTIC AND GULF
OF MEXICO COASTS/ AND EASTERN CANADA.

HOWEVER - EARTHQUAKES OF THIS SIZE SOMETIMES GENERATE
TSUNAMIS THAT CAN BE DESTRUCTIVE ALONG COASTS LOCATED IN THE
REGION OF THE EARTHQUAKE EPICENTER. AUTHORITIES IN THE REGION
SHOULD BE AWARE OF THIS POSSIBILITY AND TAKE APPROPRIATE ACTION.

PRELIMINARY EARTHQUAKE PARAMETERS

MAGNITUDE - 7.4
TIME - 0505 EST JAN 13 2008
0405 CST JAN 13 2008
1005 UTC JAN 13 2008
LOCATION - 38.8 NORTH 10.9 WEST
- NORTH ATLANTIC OCEAN
DEPTH - 21 MILES/33 KM

THE PACIFIC TSUNAMI WARNING CENTER IN EWA BEACH HAWAII WILL
ISSUE MESSAGES FOR AREAS IN THE CARIBBEAN OUTSIDE PUERTO RICO
AND THE VIRGIN ISLANDS.

THIS WILL BE THE ONLY STATEMENT ISSUED FOR THIS EVENT BY THE
WEST COAST/ALASKA TSUNAMI WARNING CENTER UNLESS ADDITIONAL
INFORMATION BECOMES AVAILABLE. REFER TO THE INTERNET SITE
WCATWC.ARH.NOAA.GOV FOR MORE INFORMATION.

THIS IS A TEST MESSAGE. DO NOT TAKE ACTION BASED ON THIS TEST
MESSAGE.

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Appendix F - Continued: Product Examples from WC/ATWC

Example of a Tsunami Seismic Information Statement (EQIAT1 product) issued by WC/ATWC:

SEXX60 PAAQ 131018
EQIAT1

TSUNAMI SEISMIC INFORMATION STATEMENT
NWS WEST COAST/ALASKA TSUNAMI WARNING CENTER PALMER AK
518 AM EST SUN JAN 13 2008

...THIS MESSAGE IS FOR TEST PURPOSES TO SHOW AN EXAMPLE
SEXX60 MESSAGE...

...THIS IS A TEST INFORMATION STATEMENT...

EVALUATION

AN EARTHQUAKE HAS OCCURRED WITH A MAGNITUDE SUCH THAT A TSUNAMI
WILL NOT BE GENERATED. THIS WILL BE THE ONLY WCATWC MESSAGE
ISSUED FOR THIS EVENT.

PRELIMINARY EARTHQUAKE PARAMETERS

MAGNITUDE - 5.4
TIME - 0510 EST JAN 13 2008
0410 CST JAN 13 2008
1010 UTC JAN 13 2008
LOCATION - 42.1 NORTH 70.5 WEST
50 MILES/80 KM NE OF PROVIDENCE RHODE ISLAND
35 MILES/56 KM SE OF BOSTON MASSACHUSETTS
DEPTH - 21 MILES/33 KM

THE LOCATION AND MAGNITUDE ARE BASED ON PRELIMINARY INFORMATION.
FURTHER INFORMATION WILL BE ISSUED BY THE UNITED STATES
GEOLOGICAL SURVEY - EARTHQUAKE.USGS.GOV - OR THE APPROPRIATE
REGIONAL SEISMIC NETWORK.

THIS IS A TEST MESSAGE. DO NOT TAKE ACTION BASED ON THIS TEST
MESSAGE.

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WCATWC Regional boundaries in the Atlantic basin.

