Southern California 2011 Behavioral Response Study - Marine Mammal Monitoring Support

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LONG-TERM GOALS

The Behavioral Response Studies are intended to collect information which will enable the Navy to minimize negative impact on marine mammals related to sonar and other sources of anthropogenic sound in the marine environment from Navy training operations.

The Whale Identification, Logging and Display (WILD) software is intended to be a solution which provides the situational awareness needed to conduct controlled exposure experiments safely while thoroughly documenting the events and context in which they occur. It must also support typical marine mammal density survey operations. The long term goals for WILD system upgrades and modifications have been based on recommendations made from use on the MED 09 and SOCAL 10 sea trials.

WILD must be a flexible, easy to use software solution that records, integrates and displays visual and acoustic observations of marine mammals, research vessels, sonobuoy locations, and other contextual information relevant to the experiments and their analysis. WILD must also support typical survey, focal follow, and mitigation operations. WILD must have little or no software licensing costs to the user community.

OBJECTIVES

The objective of the SSC Pacific support for SOCAL 11 included three tasks as follows:

Task 1: Participation in planning meetings

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Task 2: WILD logger enhancements
Task 3: WILD Mapper configuration and enhancements
Task 4: Sea Trial support
Task 5: Post cruise analysis and reporting
Task 6: Conference presentations and WILD demonstrations

APPROACH

The continuing development of WILD includes the use of industry standard programming languages and methedologies which result in compiled, easily installed, royalty free software. Planned upgrades and modifications to the WILD software were made based on lessons-learned from visual observers on the SOCAL-10 cruise and communication with observers who would be working on SOCAL 10.

The key individuals included Chris Kyburg and Rowena Carlson.

WORK COMPLETED

Hardware:

- A new VHF antenna was purchased/installed on CRC RHIB Ziphid to improve AIS transmission capability. A VHF splitter was purchased/installed on vessel Truth to allow use of much larger VHF antenna to improve AIS reception range in WILD.

- A new Wi-Fi router was purchased/installed to improve communication bandwidth for the WILD system and data transfer to and from new centrally managed, RAID capable mass storage device (SEA Inc. purchased DROBO network attached storage device).

- The new Wi-Fi router was also used to support consolidated 3G modem access to the internet for all science/engineering researchers.

Software:

- The WILD Logger software module was upgraded based on lessons-learned and recommendations from visual observers. The underlying database was modified to allow for storage of all parameters needed to recalculate animal positions for thorough documentation of the observation and its context.

- The WILD Logger and Mapper software were modified to allow separate logging and rendering of non-animal observations and events including other vessels, buoys, all acoustic source actions, prey mapper actions, CTD/XBT deployments etc. A new tab was added to the WILD logger to support the logging of non-animal observations.

- A new tab was added to the WILD logger to support Group Behavioral Sampling. The system was put through preliminary testing with delphinus, grampus and tursiops during Leg II. This effort was above and beyond the SSC Pacific Scope Of Work, and is only a preliminary proof of concept which will require further effort if it is to be fully integrated into WILD.

- New archiving methodologies were developed and tested successfully which greatly simplify data aggregation for each leg of the BRS.

- ArcGIS software was upgraded to Version 10.0.

At-sea support

Chris Kyburg provided at-sea support during the 12 day period of the Scouting Leg, Week 2 of Leg I, and Leg II aboard vessel Truth. Rowena Carlson provided support during the first week of Leg I, also aboard the vessel Truth.

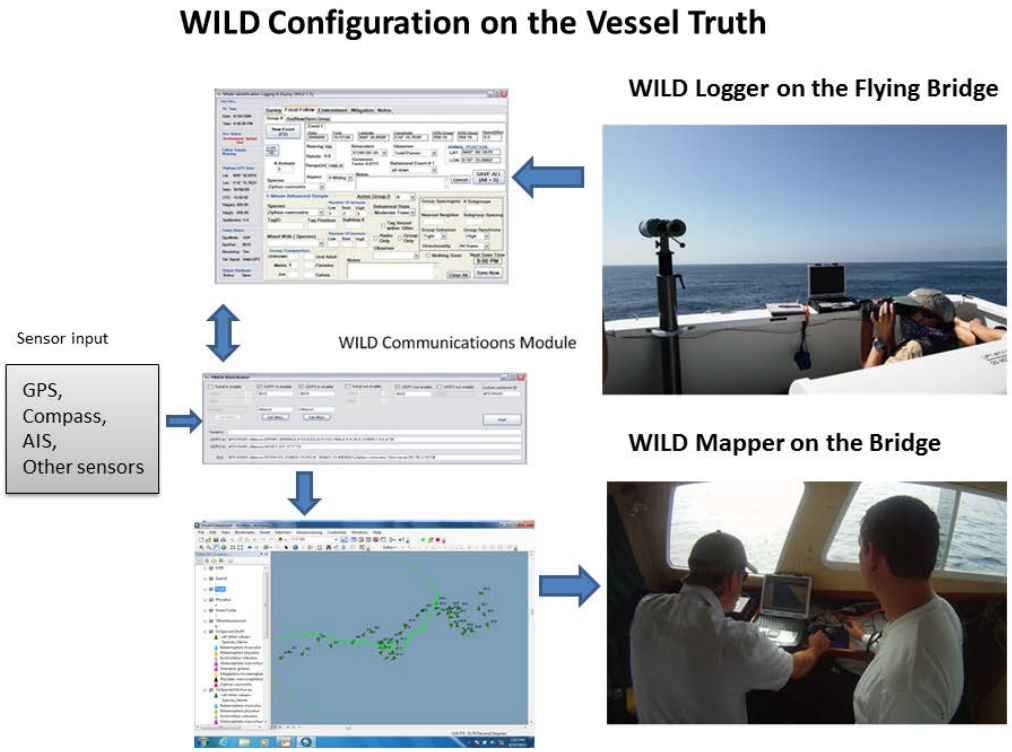

Figure 1. Conceptual diagram of the WILD system aboard the primary platform, the vessel Truth. Both the WILD Logger and Mapper systems were used on the flying bridge (top right) and the Mapper was used as the primary tactical decision tool on the ship's bridge (lower right).

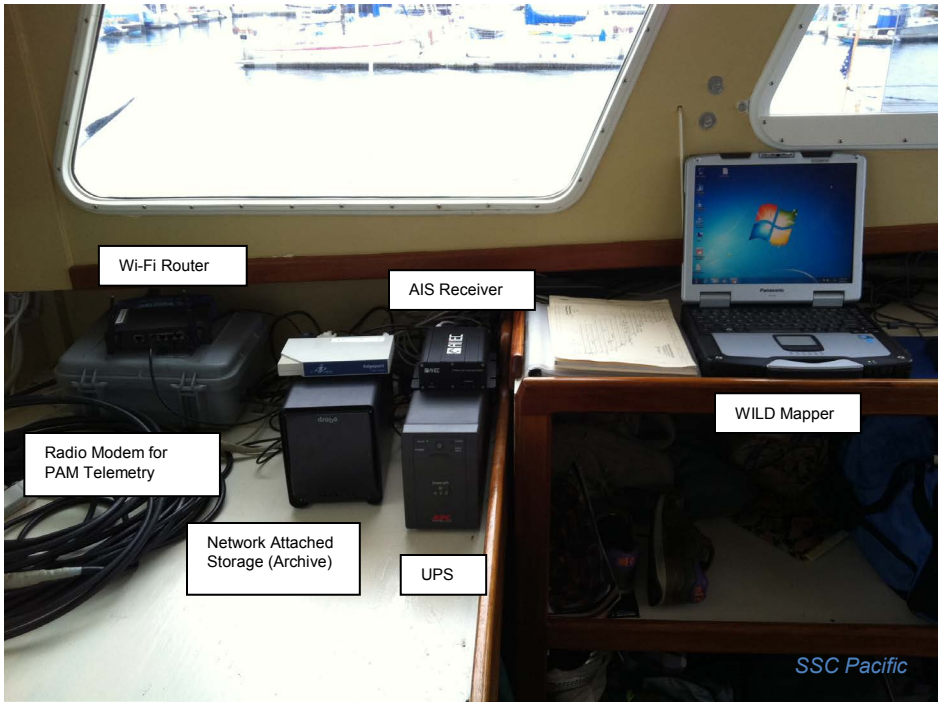

Figure 2. WILD system setup aboard the primary vessel, Truth.

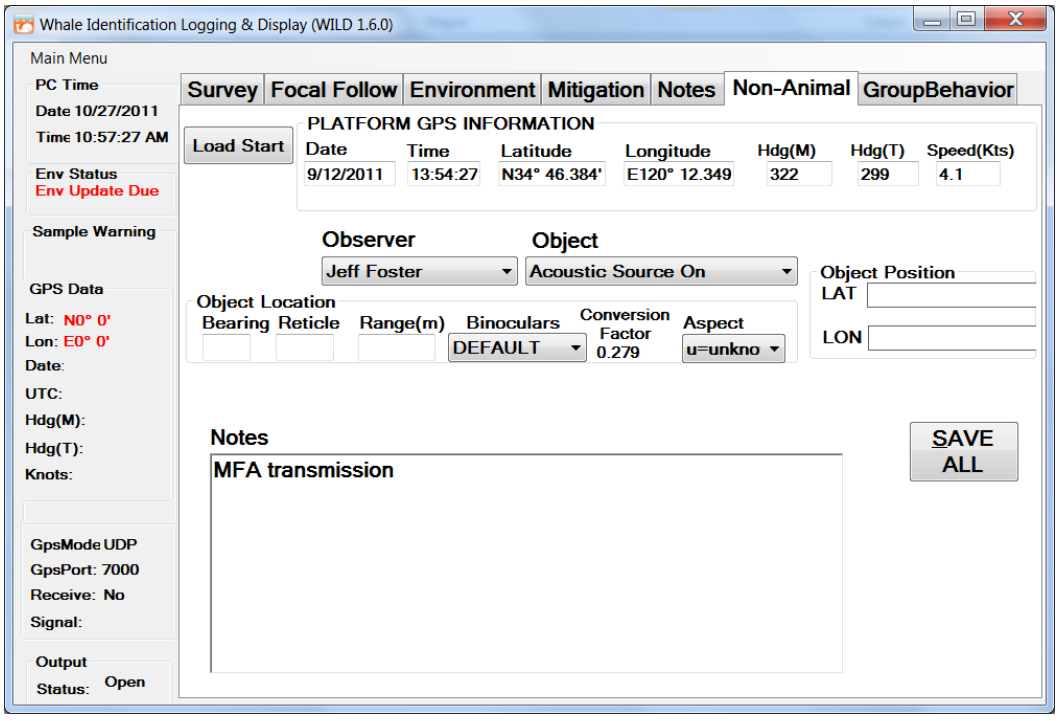

Figure 3. Non-Animal Observation tab within the WILD Logger program demonstrating the recording of the position and start of a playback sequence. The drop-down menu under "Object" is used to select the non-animal observation required.

Group Behavior Sampling protocol was developed by the researchers (Fleur Visser provided the primary input). Modifications to WILD were developed based on the protocol needs and organized based on the concept of persistent, semi-persistant and transient data (Chris Kyburg lead the implementation). Persistant data only needs to be entered once and does not need to be updated for each successive observation. The new Group Behavioral Sampling capability of WILD was tested on Tursiops and Grampus towards the end of the second leg. Preliminary testing of the Group Behavior Sampling tab within WILD was successful both within the Logger as well as the Mapper systems though analysis of the data is still underway.

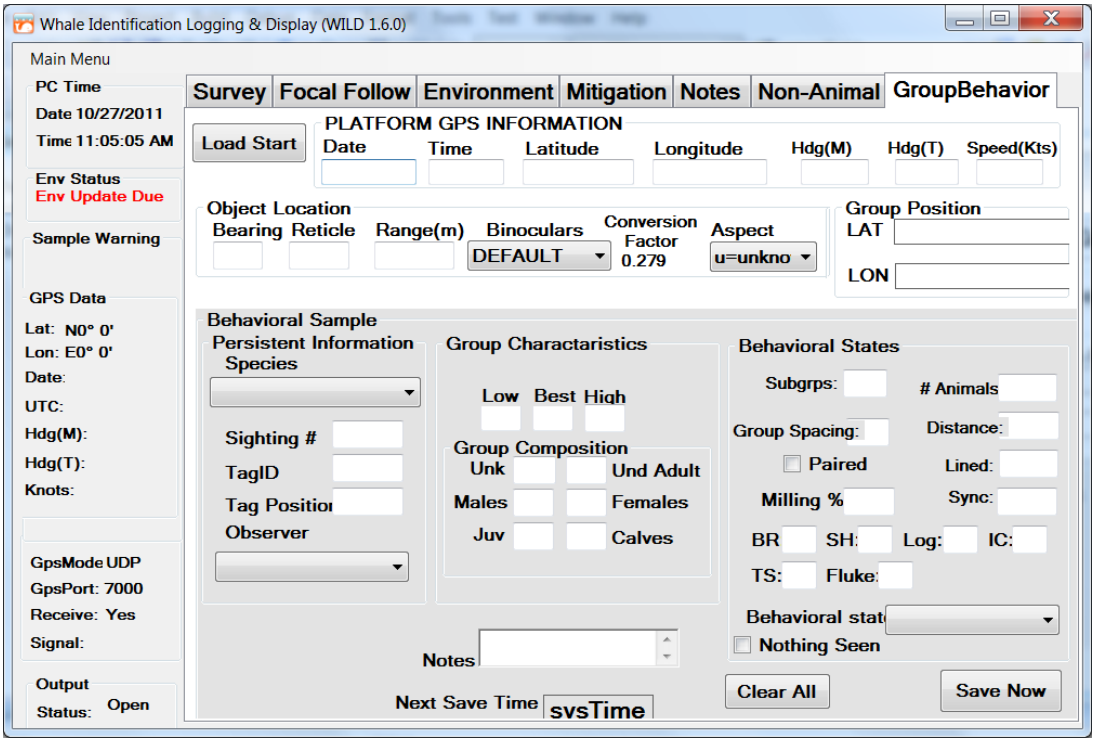

Figure 4. Layout of the Group Sampling Tab within the WILD Logger application. Persistant data is on the left and transient data is on the right hand side of the screen.

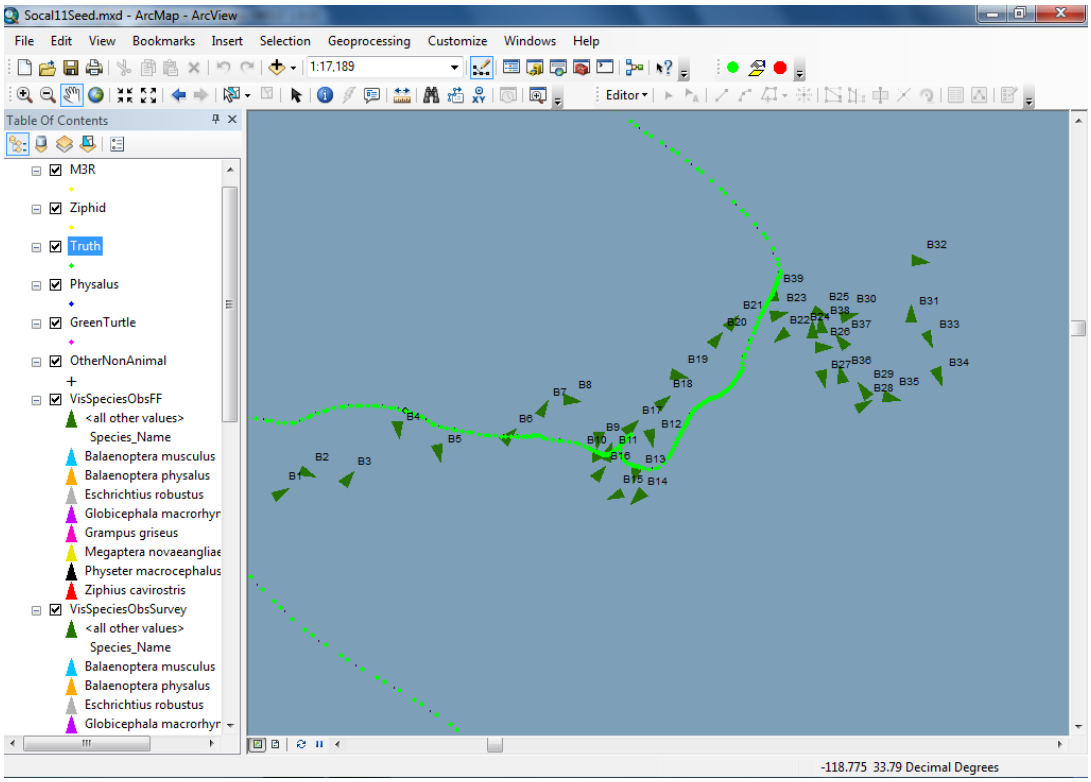

Figure 5. The display of the WILD Mapper while performing a Group Behavioral Sampling event.

RESULTS

Scouting Leg.

Chris Kyburg provided mobilization and installation support prior to the Scouting Leg and two operational legs. Chris was able to complete development of a telemetric system for use between the passive acoustic system (PAM) and WILD during the scouting leg using borrowed and used equipment. This effort was above and beyond the SSC Pacific Scope of Work, but was considered an important capability to take into the field if it could be done with existing equipment and minimal effort. Chris also assisted the chief scientist in planning and implementing the new data archive format. Chris participated as a visual observer as needed.

While at sea, Chris was able to work with the NMFS passive acoustics team to make modifications within the WILD software to support a generalized passive acoustic NMEA sentence. At sea tests were performed to the telemetry system in order to validate the capability for the operational legs of the BRS. This capability was not used in SOCAL-11 due to power and space limitations on the PAM platforms used on Legs I and II.

Leg I.

Both Chris and Rowena provided GIS display support to the chief scientist for situational awareness during playback situations, and provided plots, data base files, and GIS files for the archive as required. A total of 9 Controlled Exposure Experiments (CEEs) were conducted during Leg I of the sea trials. Both Chris and Rowena also assisted as visual observers and data loggers.

The WILD real time mapping system proved indispensable as the tactical decision aid during the lead up to a play back.

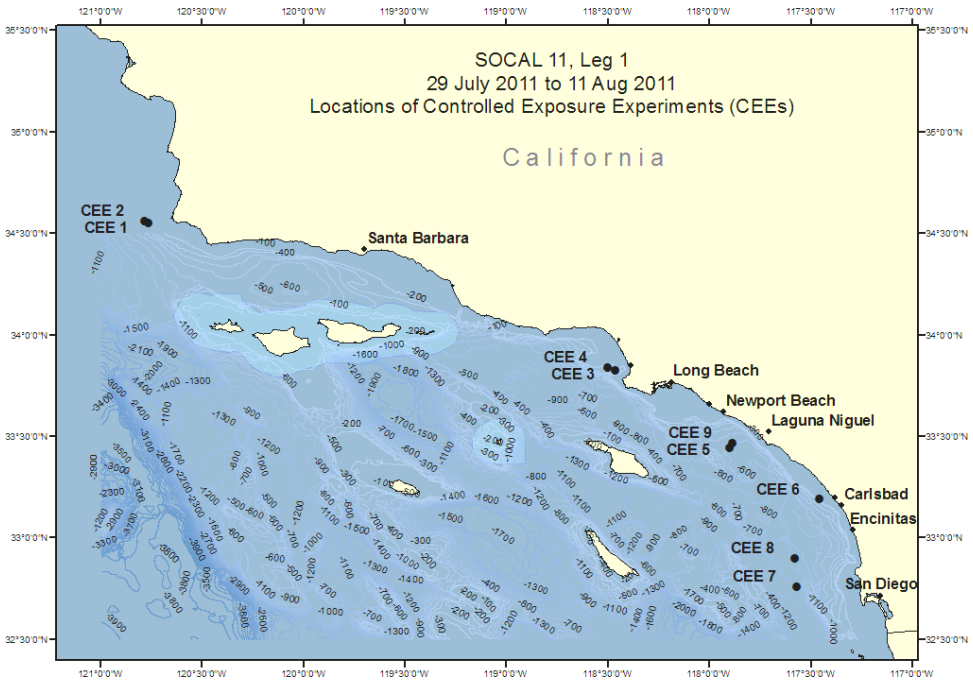

Figure 6. Locations of the 9 CEEs performed on Leg 1 of the SOCAL-11 BRS.

Leg II.

Chris worked with Fleur Visser (Group Behavior scientist) and Brandon Southall (Chief Scientist) on the layout and functionality of the Group Behavior Sampling tab within WILD. A total of 4 CEEs were performed on Leg 2 of the sea trials as illustrated in Figure 7. In addition there were three tests of the Group Behavioral Sampling, one using the original behavioral sampling capability provided in the WILD logger as part of the Focal Follow Tab, and two tests using the new Group Behavioral Sampling Tab developed at sea (see Figure 5 above).

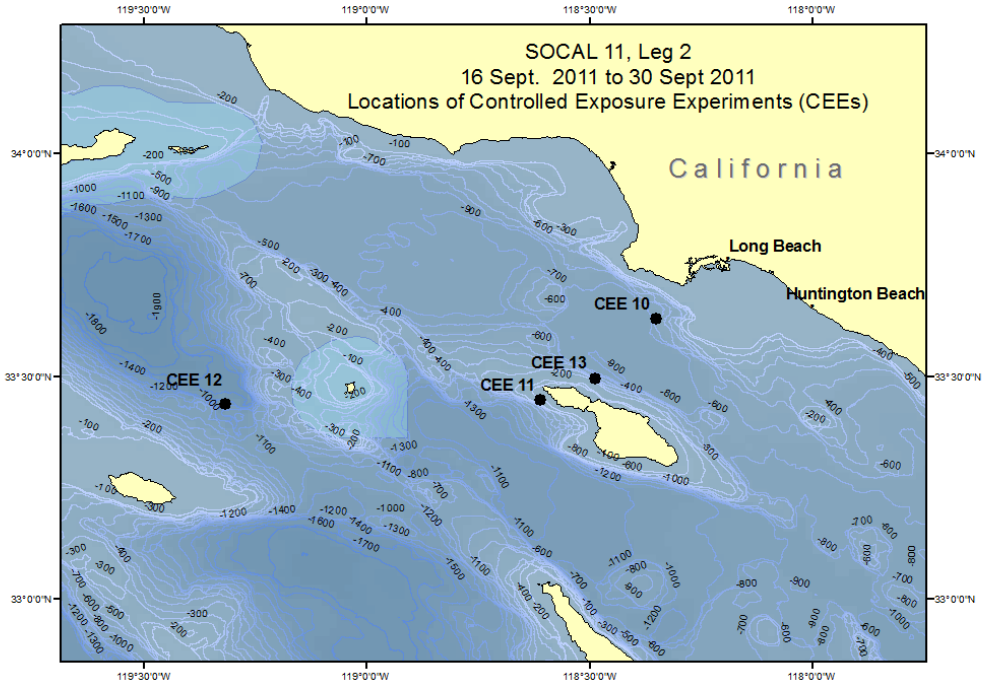

Figure 7. Locations of the four CEEs performed on Leg 2 of the SOCAL-11 BRS.

WILD was successfully upgraded and deployed on SOCAL-11. The major new capabilities demonstrated during this cruise included integration of non-animal logging tab and a Group Behavior Sampling tab and associated changes to the WILD Mapper display. The non-animal tab greatly improved both the quality of data obtained for all non-animal related data as well as improving the quality of animal observation data by clearly separating the two functions for the observers. WILD was used successfully to record visual sightings as well as provide essential support for situational awareness before, during and after a playback as shown in the example in Figures 8.

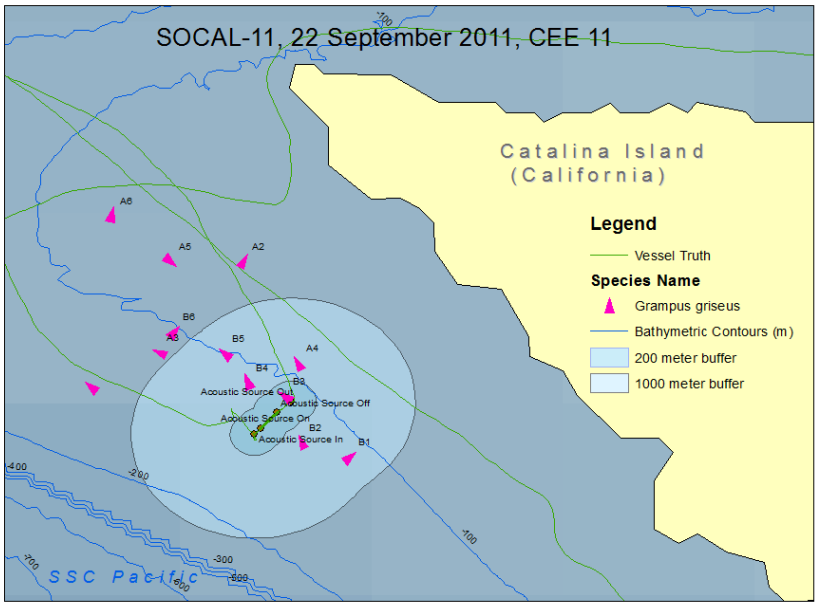

Figure 8. Example of the configuration for one of the 13 CEEs performed during the SOCAL-11 BRS.

Conference presentations and WILD demonstrations
An abstract for WILD was accepted for a poster session ot the upcoming 19th biannual Society for Marine Mammology meeting.

A poster describing WILD was presented at the SSC Pacific Tech Board June 2011 and selected as one of the top 10. As a result, the WILD poster will be presented at the SSC Pacific Supervisor's Council Meeting February 2012.

IMPACT/APPLICATIONS

The WILD system provided a layered and flexible approach to providing the situational awareness required for SOCAL 11 scouting, survey, tagging and playback operations. The GIS Mapper was used to assist in positioning the primary vessel deploying the acoustic source to enable a successful playbacks within the parameters of the cruise permits and protocols. The automated recording of all positional data during a playback provided documentation of permit compliance.

WILD also provided the capability for real time or post exercise analysis that integrated data obtained from all dynamic measurements. It has the proven capability to integrate a range of static and dynamic data. It has been shown that WILD is capable of being installed and used successfully on a variety of vessels. Due to the innovative development of the WILD NMEA distributor, a range of systems outputting spatial data can be integrated, recorded and the output displayed on the GIS Mapper.

Further development is required to finalize the WILD system for wider distribution and use. The capabilities of the WILD system are mature enough to do so in a cost effective manner.

TRANSITIONS

The NOAA Science Advisory Board is considering standardizing on WILD software for their marine mammal and turtle surveys.

RELATED PROJECTS

WILD is also used on quarterly marine mammals surveys of San Diego Bay as funded by Command Navy Region, Southwest

PUBLICATIONS

Software Tools for Visual and Acoustic Real-Time Tracking of Marine Mammals: Whale Identification and Logging Display (WILD), D'Amico, A., Kyburg, C., Carlson, R., SSC Pacific Technical Document TD-3242, Nov 2010.

PATENTS

None.