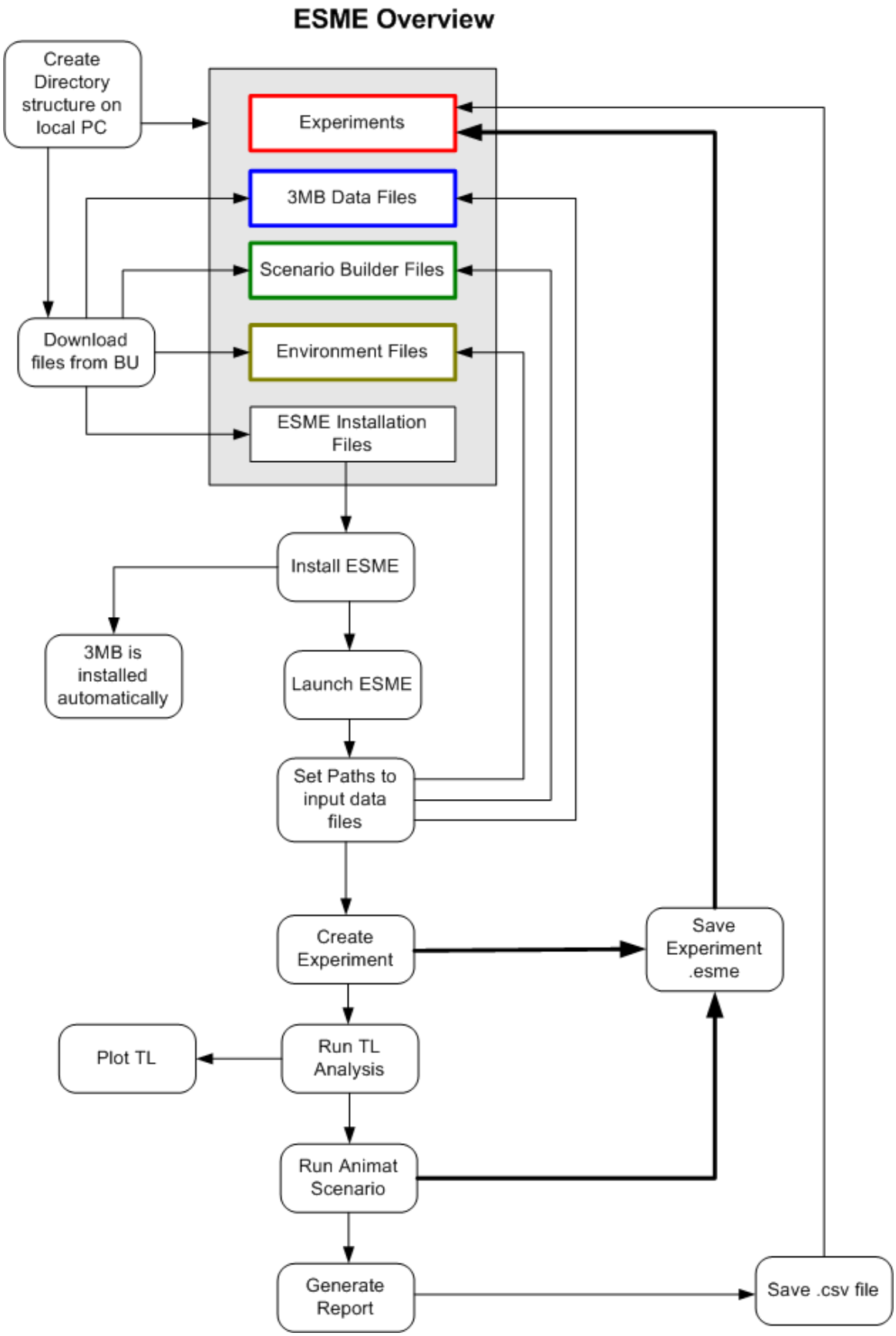
ESME Workbench 2010

Effects of Sound on the Marine Environment

User Guide

Phase 2, Iteration 1
November 17, 2010


ESME Overview
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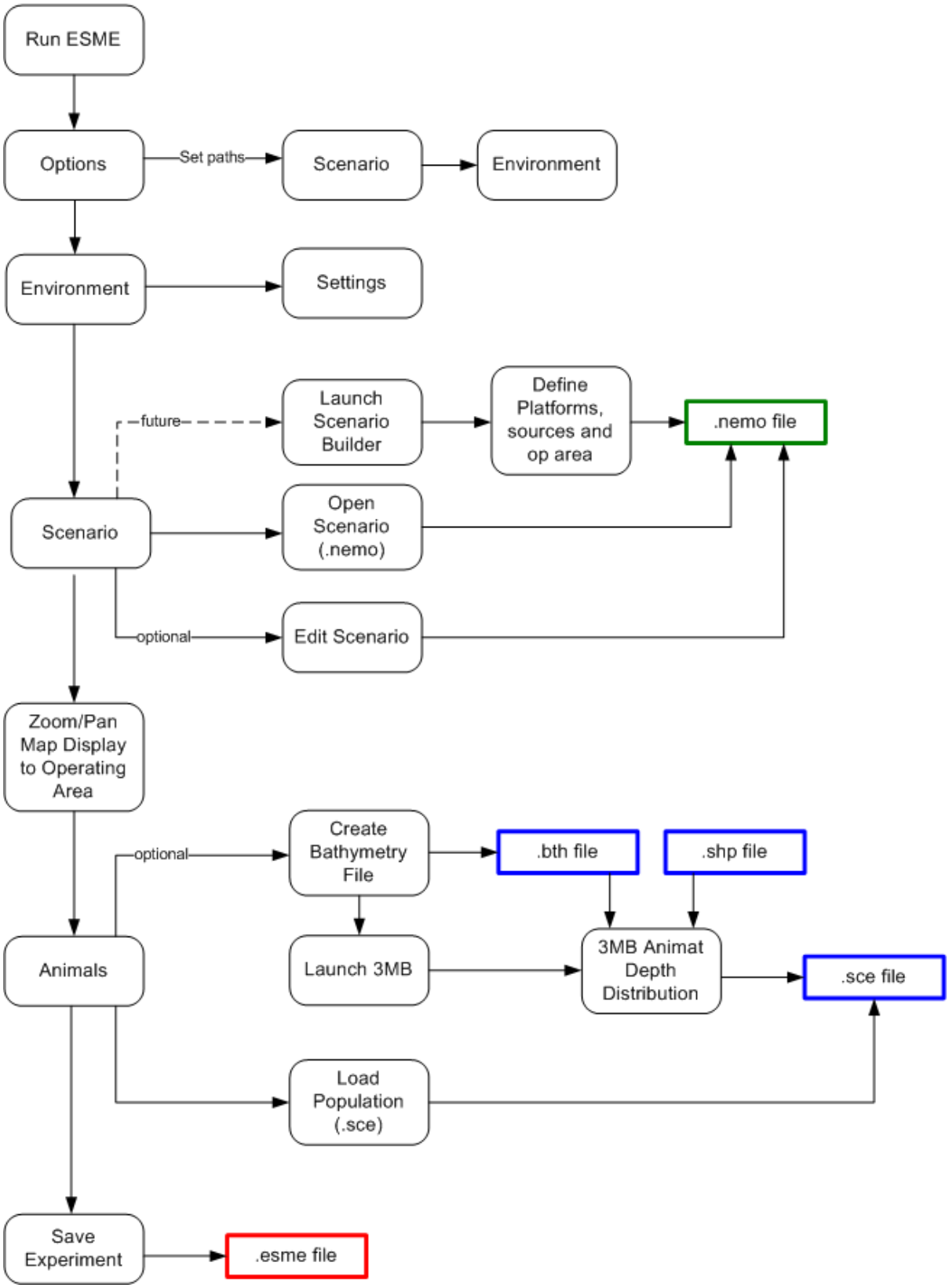
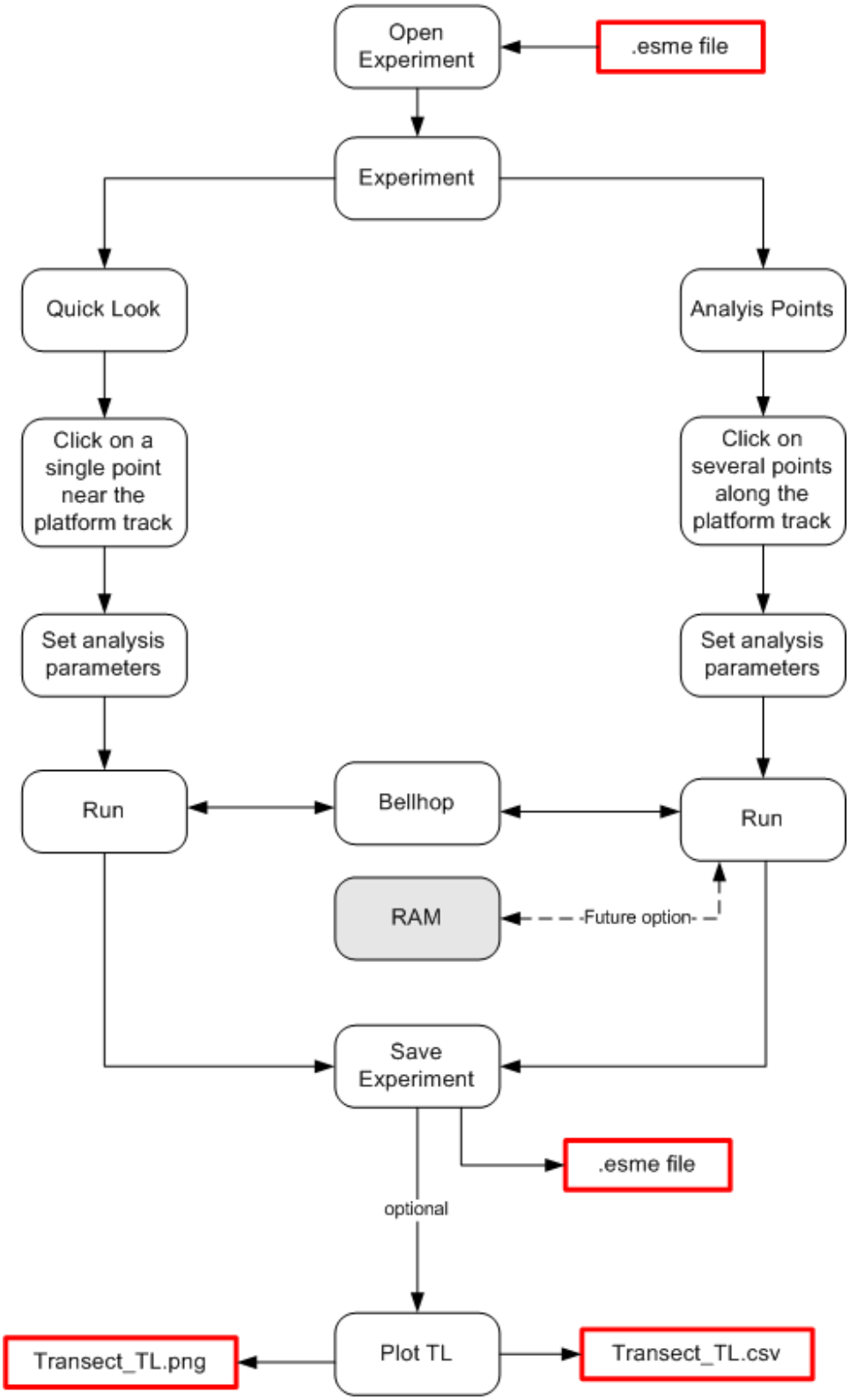
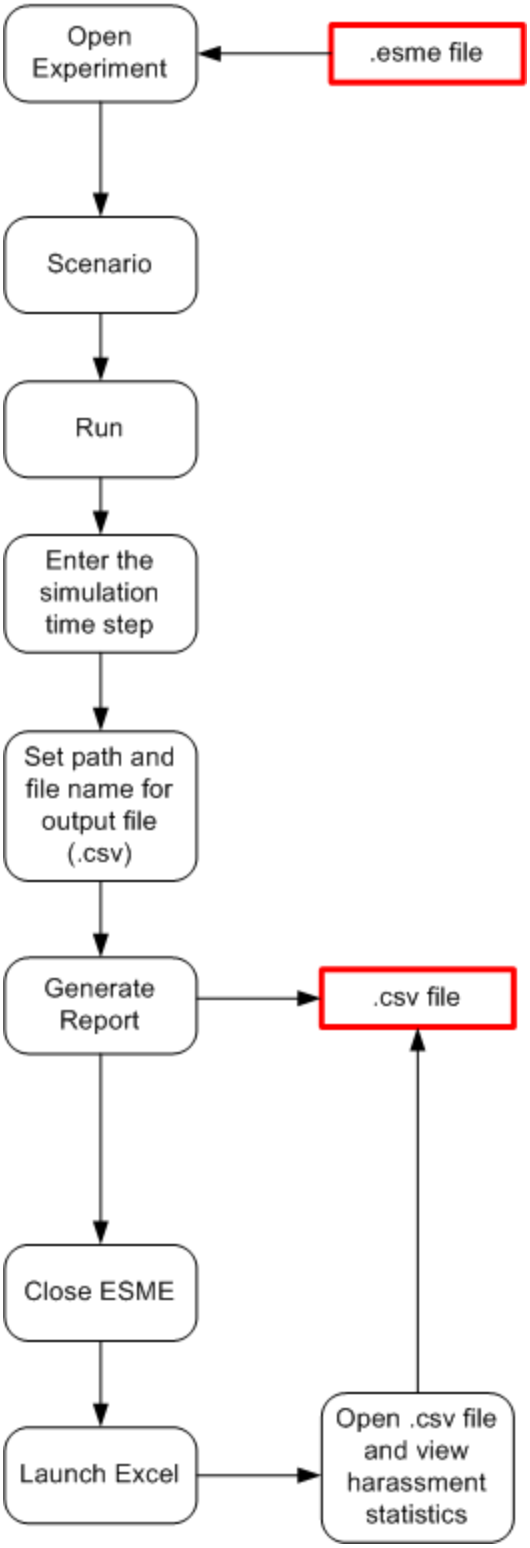
Create an Experiment



Run TL Analysis



Run Animat Scenario



ESME Installation

System Requirements: Windows 7 operating system

Uninstall the previous version of ESME workbench

Create the following directories on the local computer:

- ESME_program_files
  - This will store the installation setup file and most of the program files to run ESME
- Environment_data_files
  - This will store the environment files necessary to run experiments in any version of ESME.
- Scenario_Builder.
  - This will store the scenario builder executable file (.jar) and all the subdirectories associated with scenario builder.
- 3MB_data_files
  - This will store the population distribution (.sce) files generated by 3MB.
- ESME_experiments
  - This will store the *.esme file for each specific experiment run in the ESME workbench. The *.esme file contains the paths to the input data files and the location of analysis points in the experiment.
  - Folders will also be created in the same directory as the *.esme file which contain the output files (*.tlr) from the transmission loss (TL) calculations. (These folders are hidden.)
  - Transect TL data files (.csv) and plots (.png) can be saved here.
  - The results of the scenario analysis (.csv file) can also be saved here.

NOTE: This basic directory structure is not required but it is recommended to keep the input/output and program files organized when running and/or update the ESME Workbench. Likewise, the directories do not have to have these specific names, but these names will be used throughout this document.

Download the ESME installation and data files from the Boston University (BU) website.

http://esme.bu.edu/team/

Download the ESME_Envionmental_Data.zip file and unzip it within the Environment_data_files directory, described above.

Download the Scenario Builder 1.5.508.zip file and unzip it within the Scenario_Builder directory, described above.

Open the “Phase 2 Iteration 1” directory on the BU server.

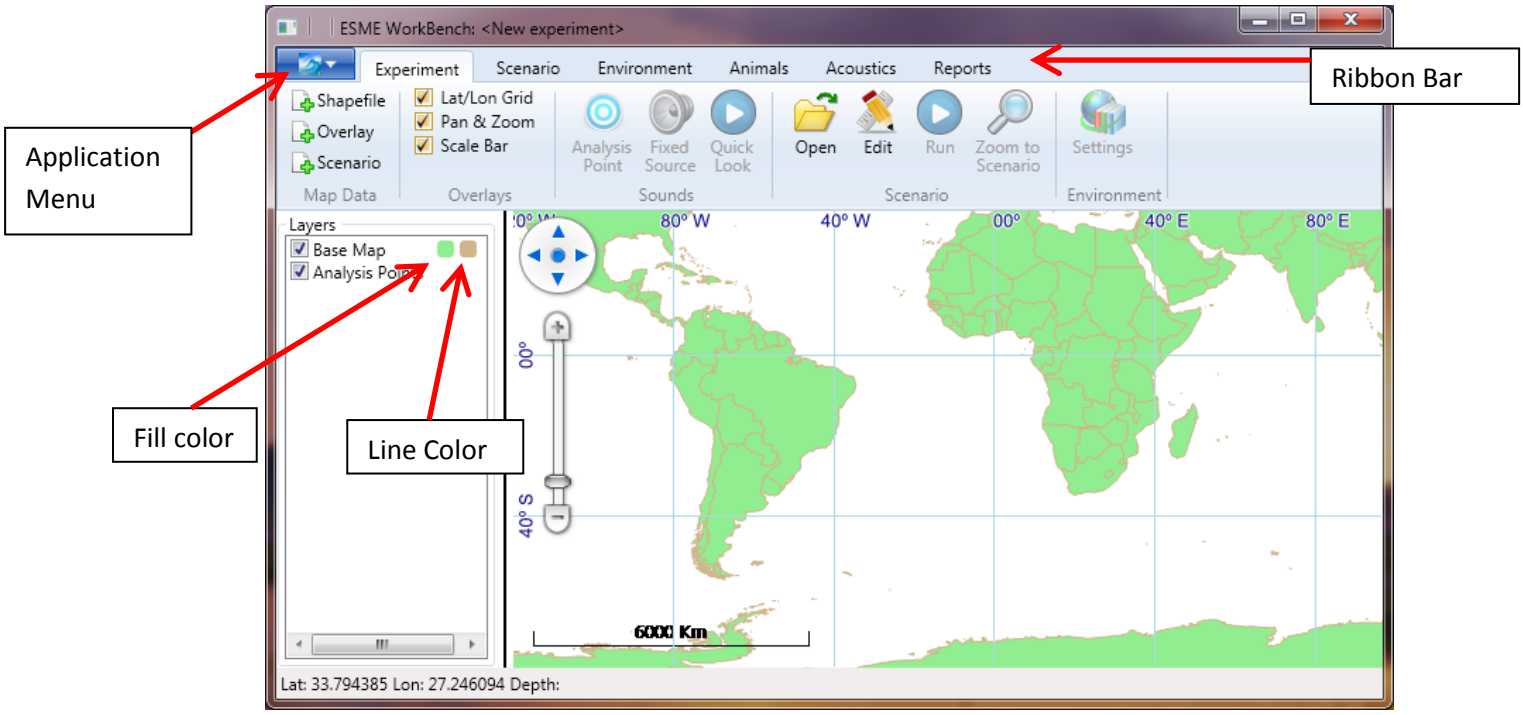
Save the installation setup file (ESME WorkBench Setup.msi) in the ESME_program_files directory, described above.

Download jax3species.zip file and unzip it within the 3MB_data_files directory, described above. This folder contains a file called jax3species_bathybounded.sce which will be used in the following example.

Navigate to ESME_program_files directory and run ESME WorkBench Setup.msi. Set the program installation directory to ESME_program_files.

Start ESME Workbench

Double click on the ESME workbench 2010 shortcut to start ESME.



The ribbon bar across the top of the screen contains the applications menus (far left) and six tabs.

- The **Experiment** tab contains 5 sections: Map Data, Overlays, Sounds, Scenario and Environment.
- The **Scenario** and **Environment** tabs are optional because the same tools are in the Experiment Tab.
- The **Animals** tab contains tools for creating and loading animats.
- The **Acoustics** and **Reports** tabs are not used in this version of ESME.

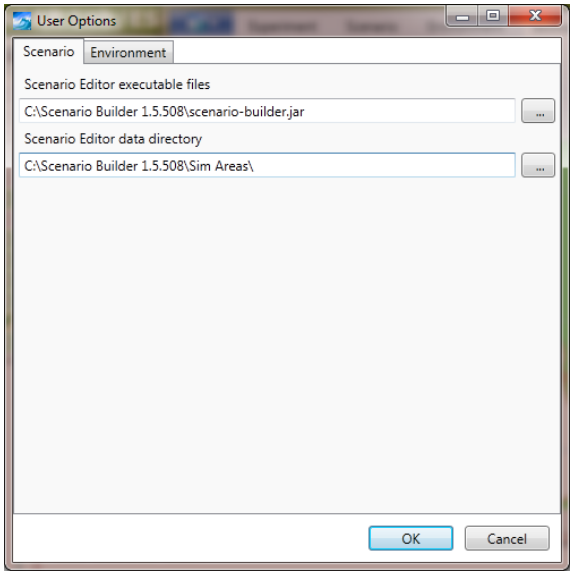
Note: Some areas of the menu bar or layer display pane may be blacked out. They will usually clear up by moving the mouse over the black areas.

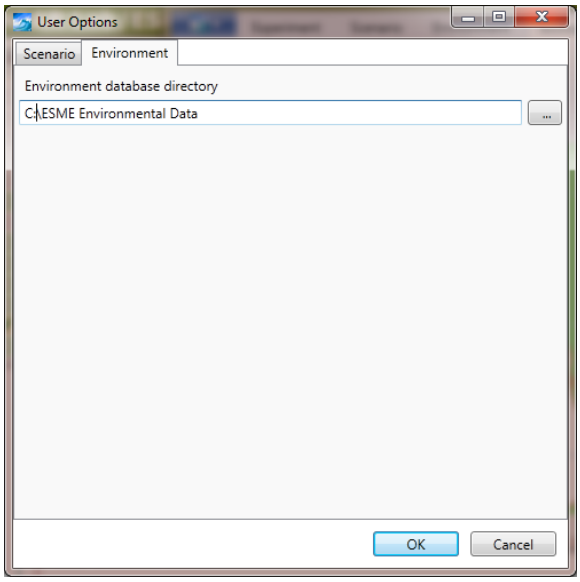
The layers box contains two layers, which can be made invisible by removing the check mark. (There are no analysis points to display yet.) Base map shows two square color boxes: the first color is the fill color & the second color is the outline color. Either color can be changed by right-clicking on the color box.

Set up and save an experiment

This section provides step-by-step instructions to create an experiment in the Atlantic ocean near Jacksonville, FL. It will use a .nemo file that was already created in Scenario Builder, and a .sce file previously created in 3MB. Both files were downloaded from the BU server in the previous section.

Open the applications menu and select "Options". A window opens up with two tabs: Scenario and Environment. Set the paths to the input data files as follows:





Scenario tab

Set the Scenario Editor Executable File to scenario-builder.jar in the ESME_data_files\Scenario Builder 1.5.508 folder.

Set the Scenario Editor data directory to the Sim Area folder in the ESME_data_files\Scenario Builder 1.5.508 folder.

Environment tab

Set the Environment database directory to the\ESME_data_files\ESME Environmental Data folder. This folder contains the bathymetry, bottom properties, and sound speed profiles.

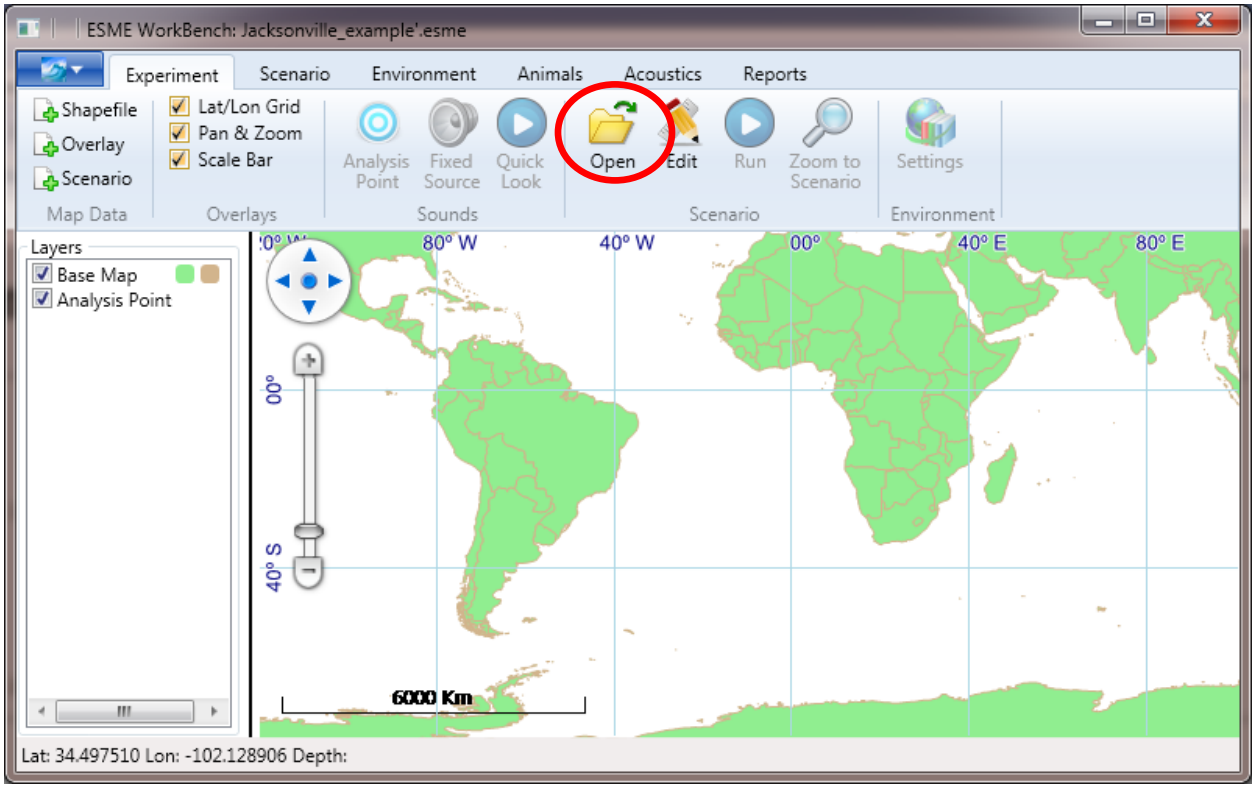
Click OK

Save the experiment:

In the application menu, select "Save File As" and navigate to the Experiments directory (created earlier). Enter a file name, e.g. Jacksonville_example.esme, and click "Save". The filename now appears at the top of the ESME Workbench window.

Load a scenario file from the Atlantic Ocean near Jacksonville, FL:

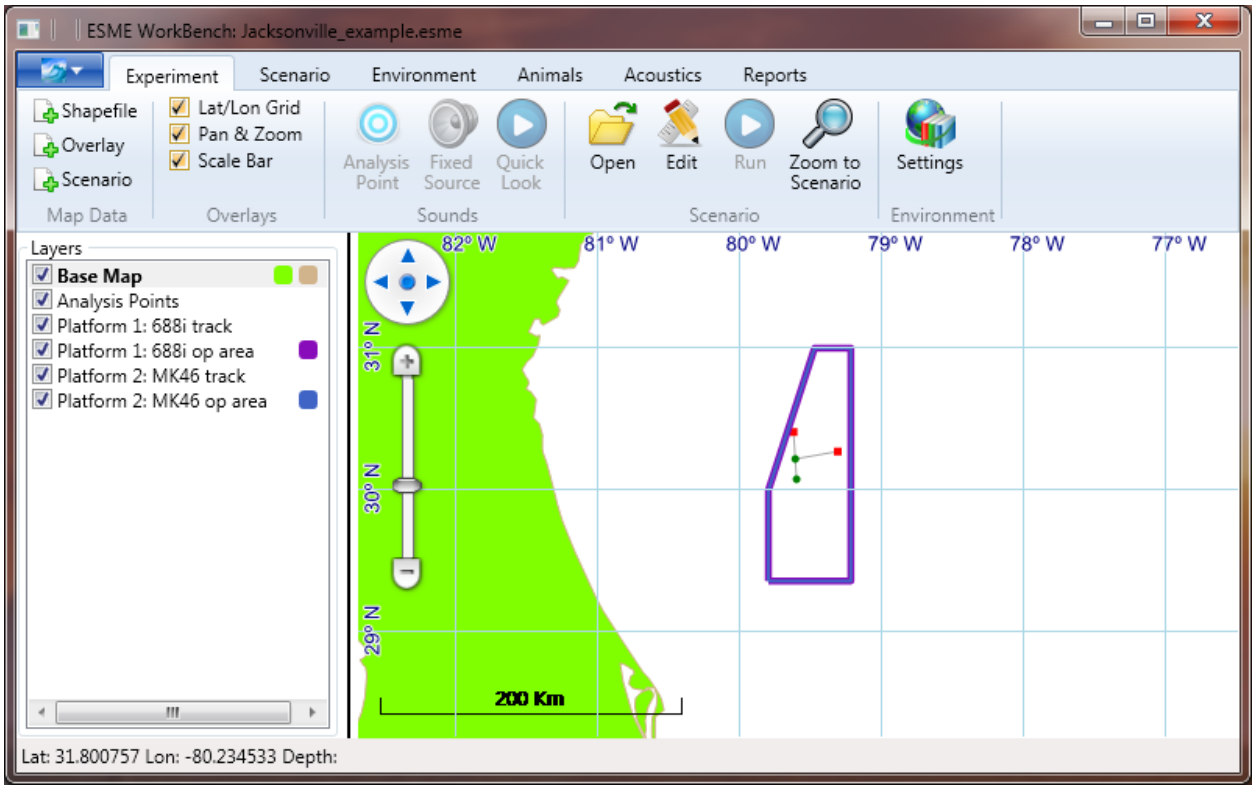
Click "Open" in the Scenario section of the Experiment tab.



Select the JAX Small.nemo file in the \ESME_data_files\Scenario Builder.5.508\Jacksonville folder.

This file was created with the Scenario Builder and contains all of the sound source and animal density information for a simple scenario.

The map layers for two operating areas and ship tracks appear on the screen east of Florida. Zoom and/or pan to see the ship tracks as shown below.



The operation areas are shown as overlapping purple and blue polygons. (In this example, the operating area for both platforms is the same). The display for each operating area can be turned on/off by checking/un-checking the box next to the "Platform 1: 688i op area" or "Platform 2: MK46 op area" in the Layers box to the left of the map.

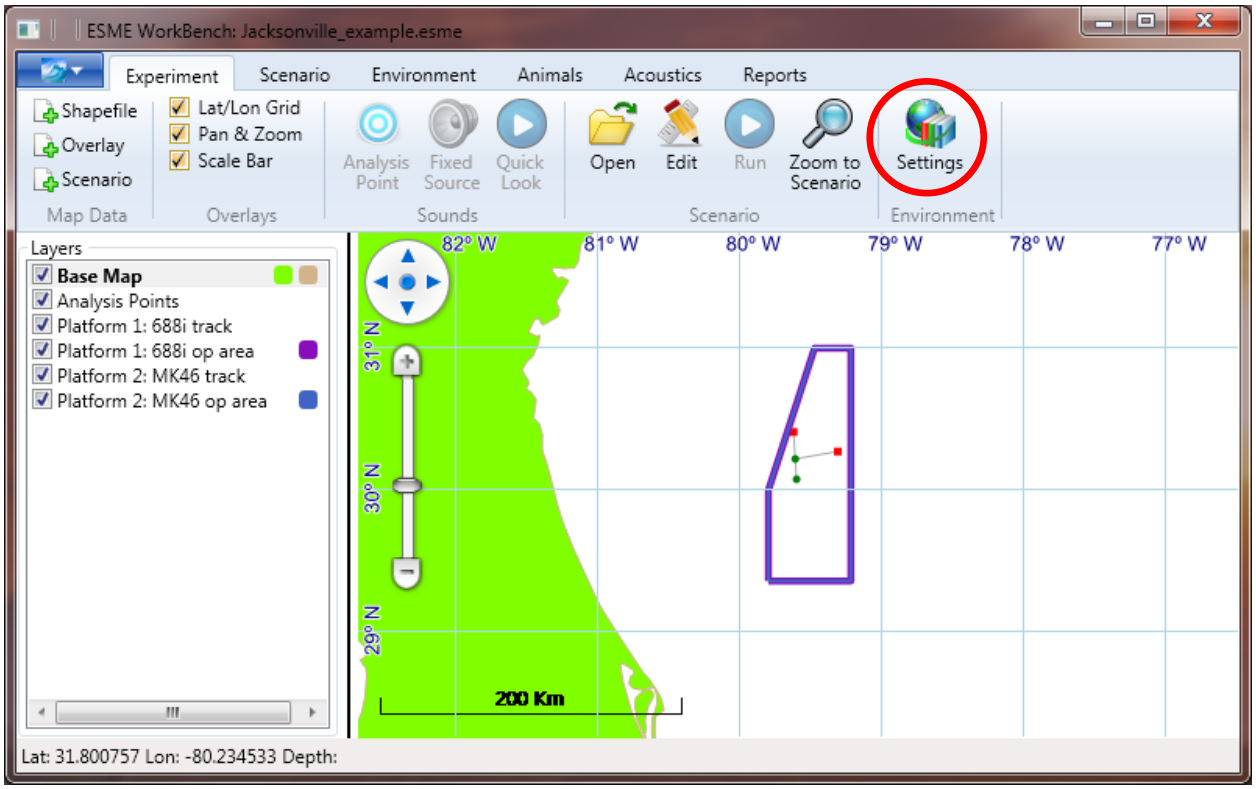
The 688i track (Platform 1) runs along the gray line from South to North; beginning at the green circle and ending at the red square. Likewise, the MK46 track (Platform 2) runs along a horizontal gray line in a NE direction. The display for each track can be turned on/off by checking/un-checking the box next to the "Platform 1: 688i track" or "Platform 2: MK46 track" in the Layers box to the left of the map.

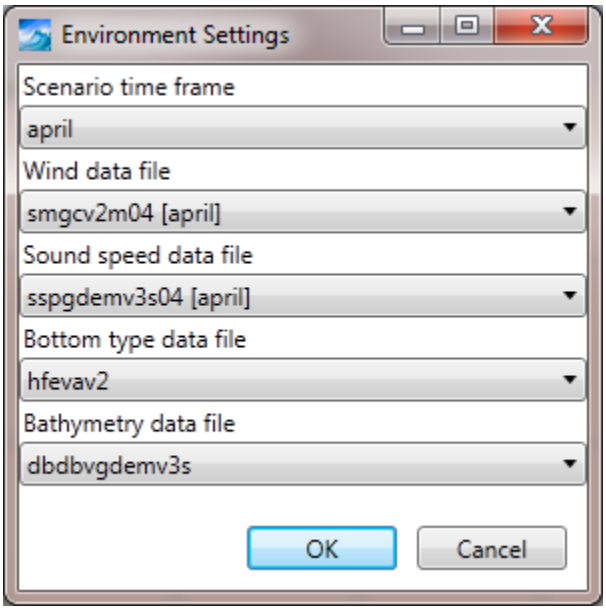
Note: Turning the map display for a track on/off does not impact the sources used in the TL calculations. The operating area and track displays only provide a guide when selecting analysis points for the TL calculations.

Save the experiment using either Control-S, or "Save Experiment" in the Application Menu.

Define the environment Settings:

Click on "Settings" in the Environment section of the Experiment tab as shown below





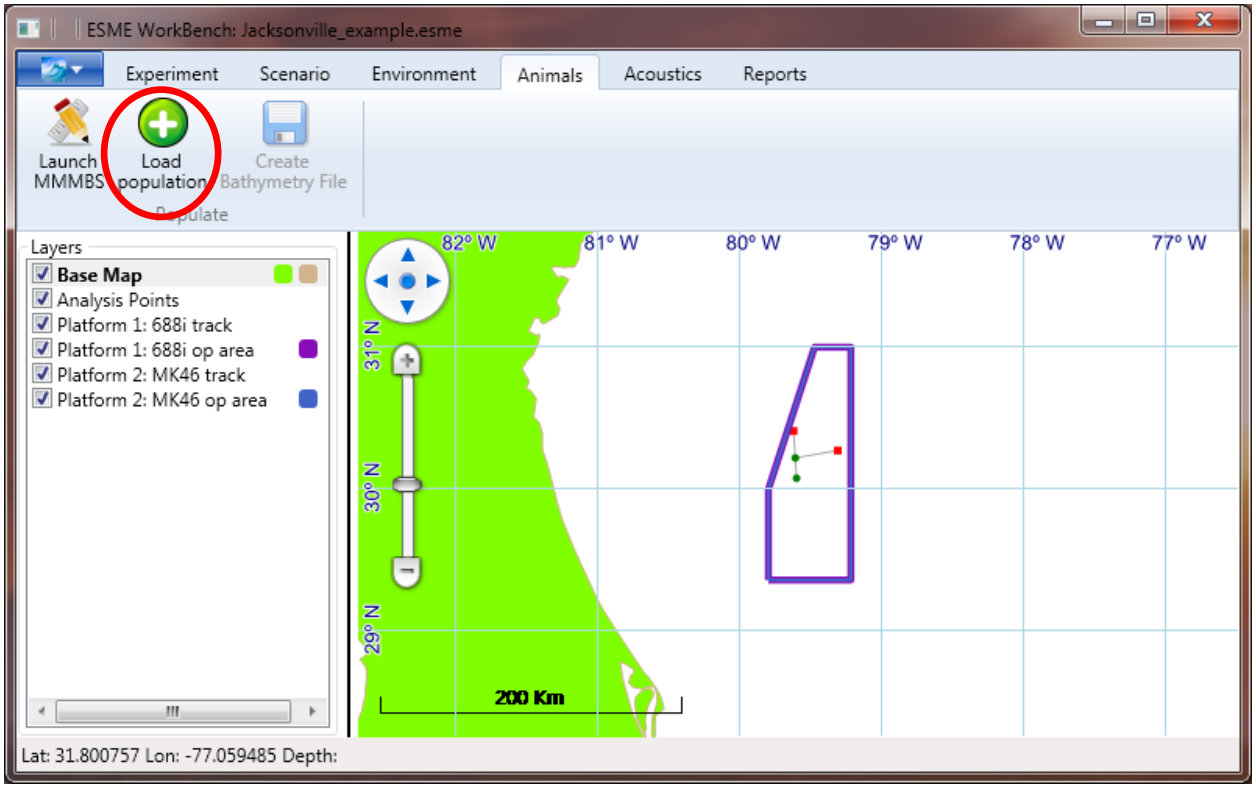
Select the environment settings from each of the drop-down lists. This example will use the default settings.

Click OK.

Save the experiment using either Control-S, or “Save Experiment” in the Application Menu.

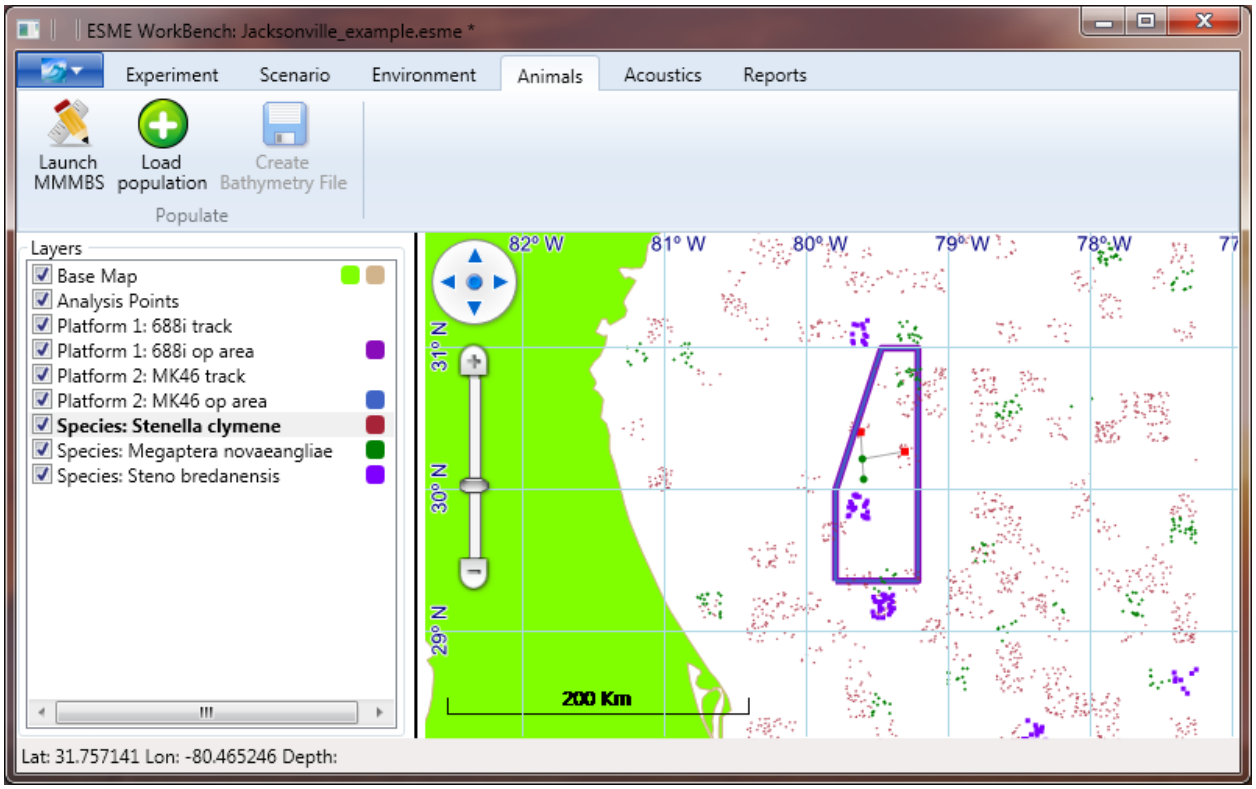
Load an animal population from 3MB:

Click on the Animals tab, and then click on Load Population as shown below.



Set the path to the jax3species_bathybounded.sce file in the \ESME_data_files folder. This file was created with 3MB and contains the marine mammal locations.

The random placements of 3 animat species appear on the map and are listed in the Layers box as shown below.



The display for each species can be turned on/off by checking/un-checking the box next to the species names in the Layers box to the left of the map.

The color and shape of the animat markers are assigned randomly for each species. The color, shape and size of the markers can be edited by right-clicking on the square to the right of the species name in the Layers box.

Save the experiment using either Control-S, or “Save Experiment” in the Application Menu.

Close the experiment. Select “Close Experiment” from the application menu in the upper left corner of the ESME window. The map window zooms out to the world map, and the Platform tracks and operating areas are removed from the display layers.

Run a TL Analysis

Open the experiment that was just created in the previous section:

Select “Open Experiment” from the application menu in the upper left corner of the ESME window

Navigate to the \ESME_experiments folder, click on the Jacksonville_example.esme file and click “Open”.

The map window zooms back to the last view that was used before the experiment was saved. The Platform tracks and operating areas are again visible as display layers. All the file path settings for the input data files are restored, and ESME workbench is ready to run an analysis.

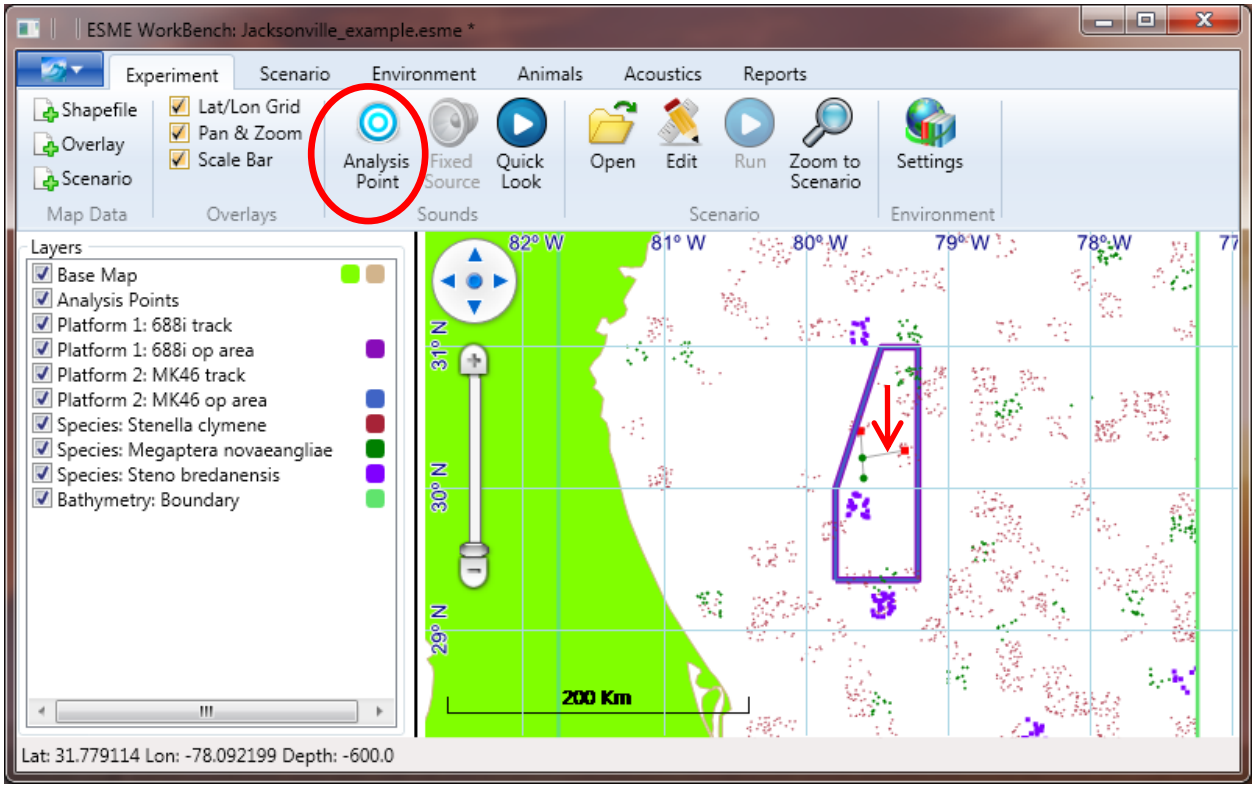
Run a TL calculation at an Analysis Point:

Click on the Experiment tab

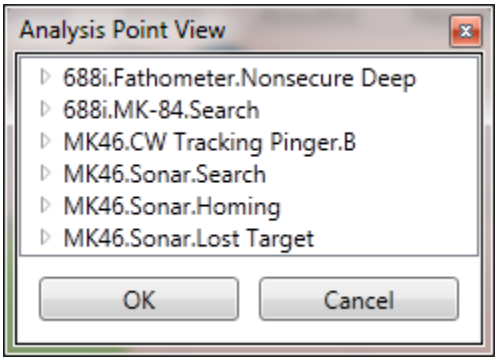
Click on the Settings button in the Environment section of the Experiment tab. No changes are needed, but this window must be opened and closed to activate the Analysis Point or Quick Look buttons. This is a known bug to be fixed in future version. (Quick Look is not active in this release.)

Click on the Analysis Point button in the Sounds section of the Experiment tab. The mouse cursor now turns into a cross hair.

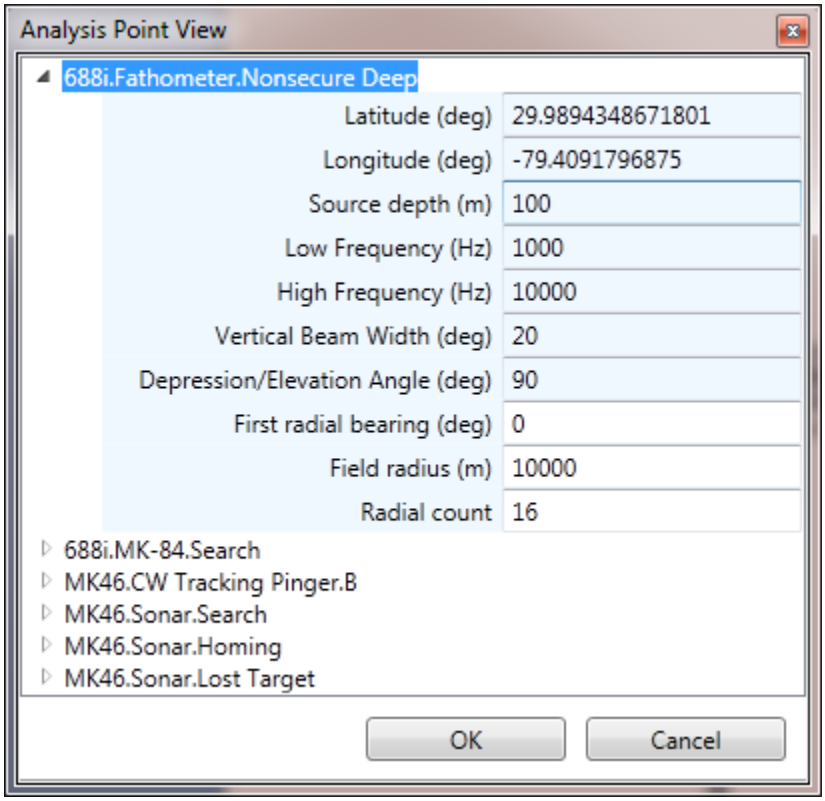
In the map window, click on a point near the end of the MK46 track (red square at the end of the gray horizontal line) as shown below.



The Analysis Point View window opens up showing each of the modes for each platform in the experiment as shown below.



Double-click on the "688i.Fathometer.Nonsecure Deep" mode of the 688i platform to see the source settings that will be used.



Settings that are in white may be edited. For this example, source settings will not be edited.

All of the modes for all of the platforms will be run at these coordinates. Future versions of ESME Workbench will allow more flexibility in selecting the active modes.

Double-Clicking on other modes will open their settings.

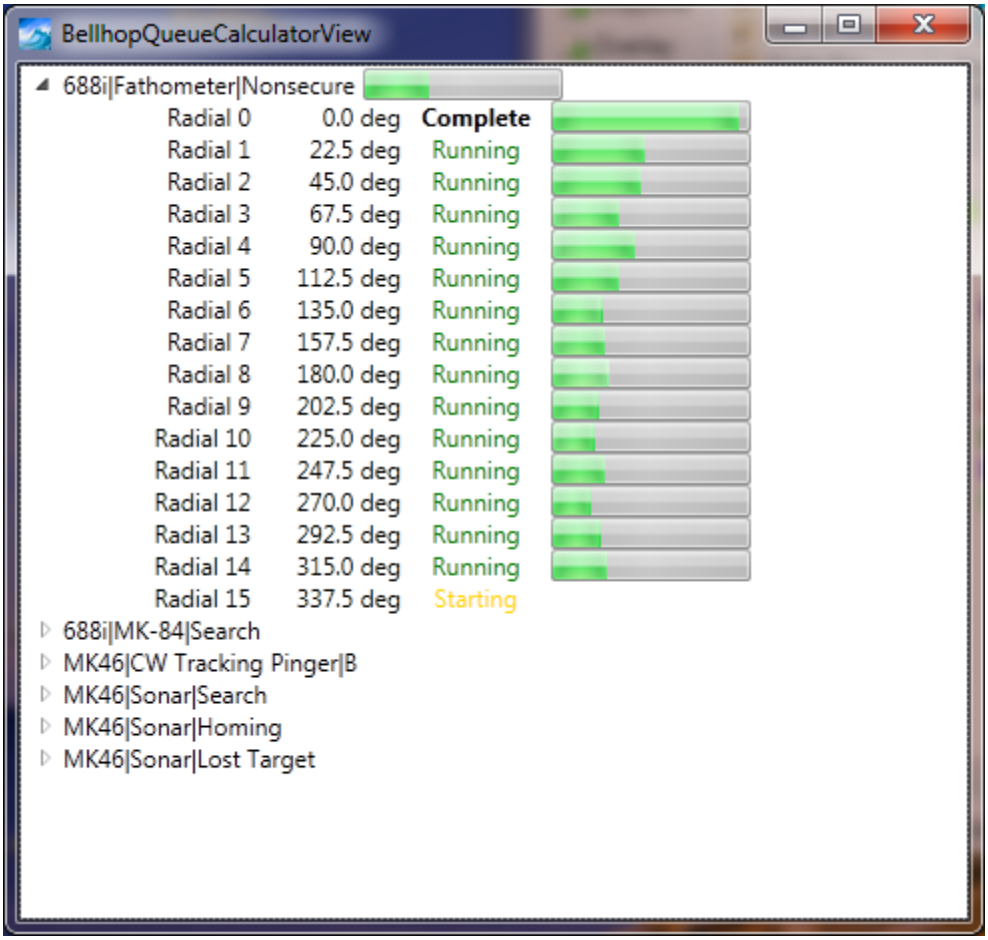
Double-Clicking on an open mode name will minimize the list of options for that mode.

Click “OK” to begin the TL calculations.

The Bellhop Queue Calculator View window opens.

The Queue window shows the TL calculation status of each of the modes.

Double-Click on the first mode to see the TL calculation status of each radial.

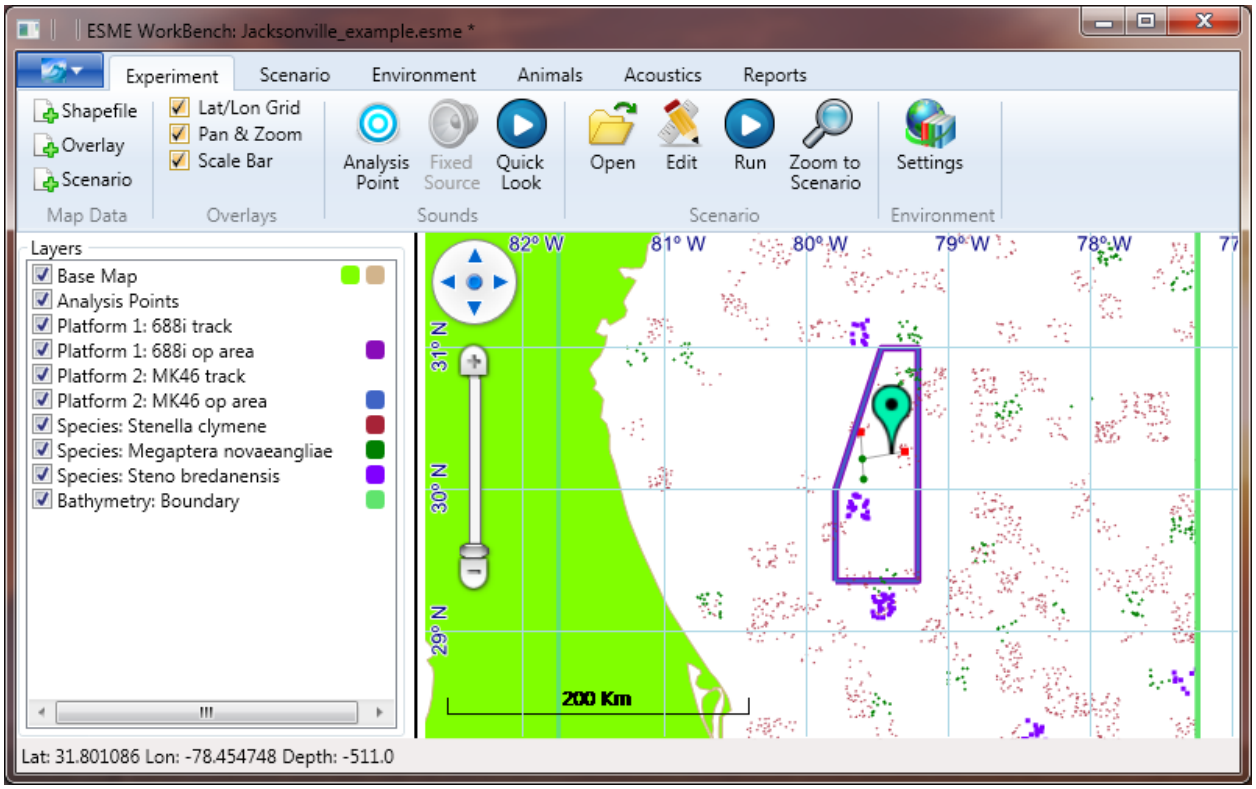


The mode name will disappear from the list when its TL calculations are finished.

The Queue window will close automatically when all of the calculations are finished.

Note: Do not close the Bellhop Queue Calculator window while the calculations are running. This will stop the calculations and cause ESME to become unstable. ESME will shut down when attempting to run another Quick Look calculation, unless ESME is restarted.

When the analysis is completed, the map window will show a green marker at the location of the sources, as shown below.

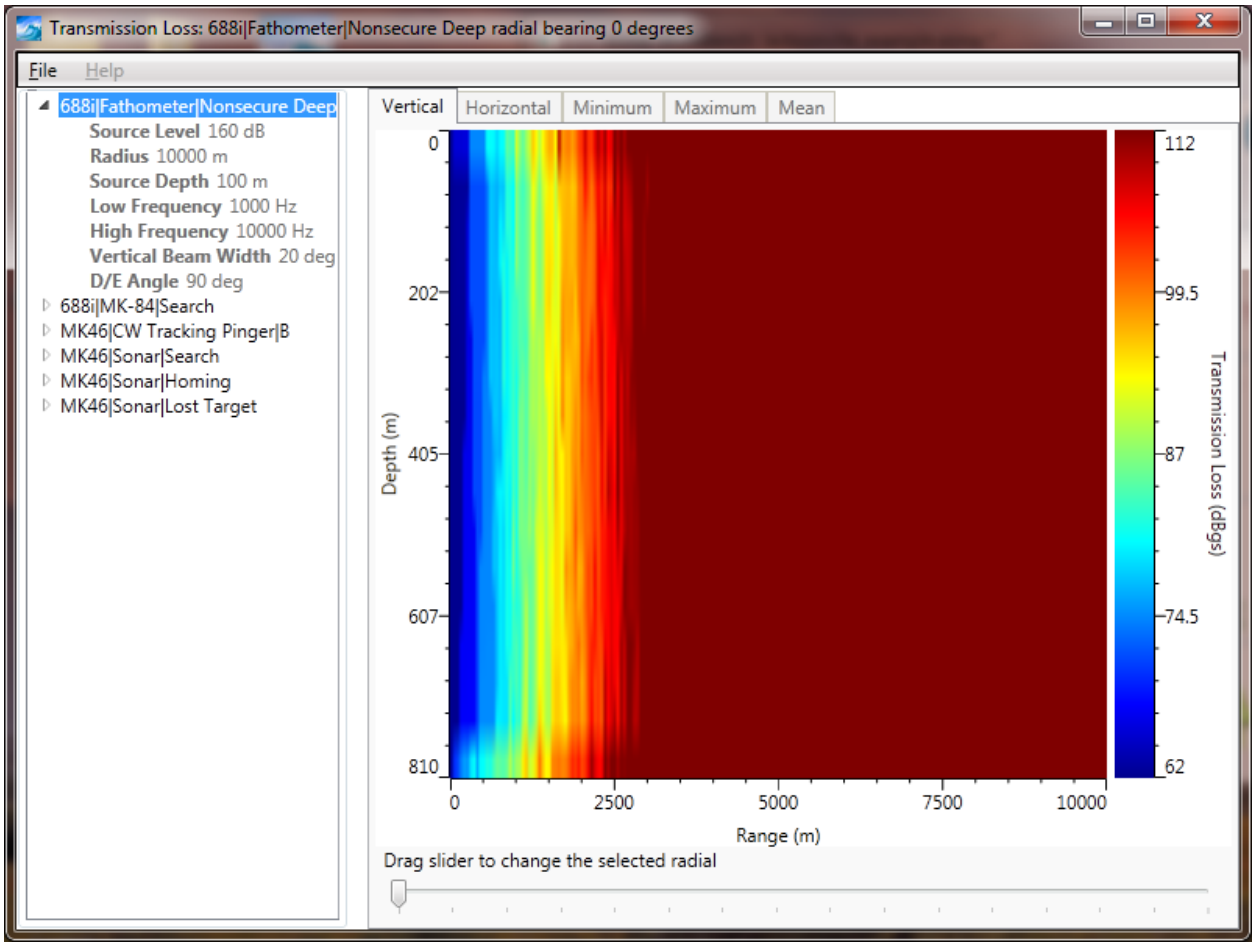


Save the experiment using either Control-S, or “Save Experiment” in the Application Menu.

Plot the TL

Right click on the quick look analysis point (the green marker on the map), and select “View…”.

A window opens showing a vertical plot of the TL for the first radial of the first mode, as shown below.



The TL for the other radials can be selected by dragging the slider at the bottom of the window to one of the 16 markers. The radial bearing is displayed at the top of the window.

The color bar is scaled automatically for each transect.

Other modes can be selected in the left pane of the window, and the vertical TL plots for each radial can be viewed in a similar manner.

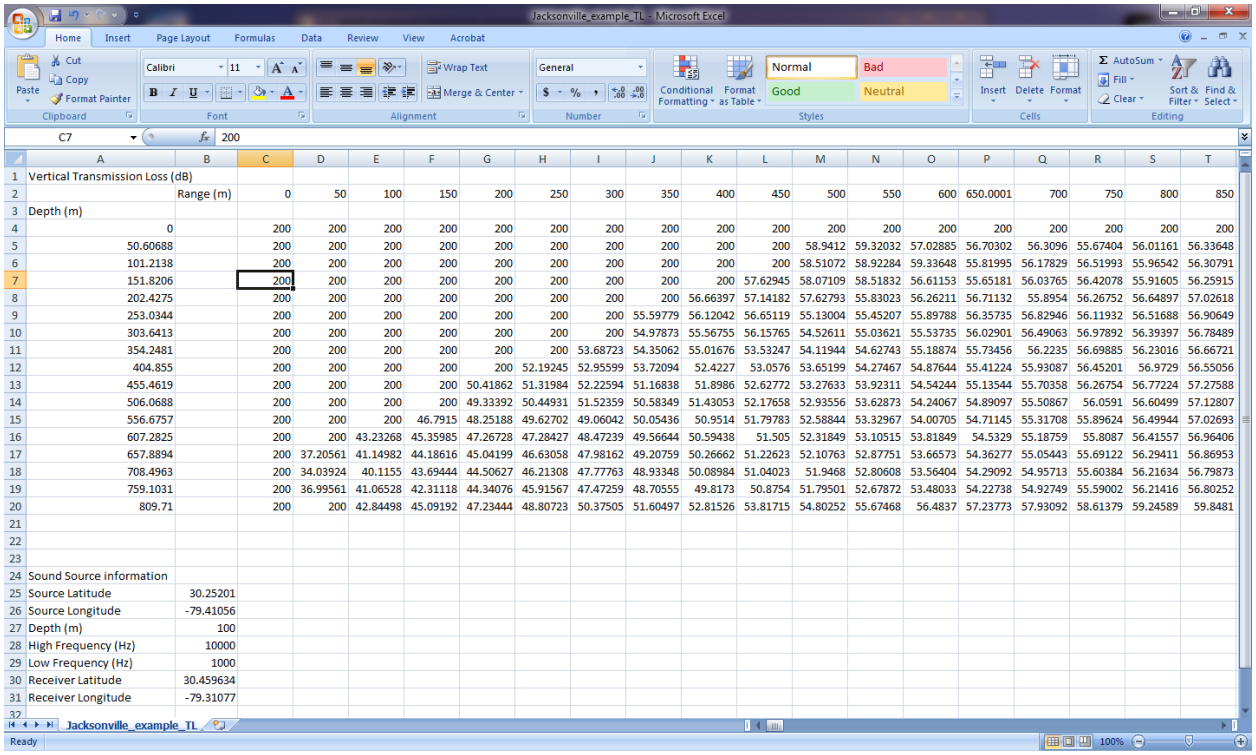
The source parameters can be viewed by clicking on the triangle to the left of the mode name.

The Horizontal, Minimum, Maximum and Mean tabs are not active in the current version of ESME.

To save the plot, click File, “Save As” or Ctrl-S. The default format is .png.

The TL values at each range and depth can be exported to a .csv file, by clicking File, “Export to csv” or Ctrl-E.

An example of the output file is shown below.

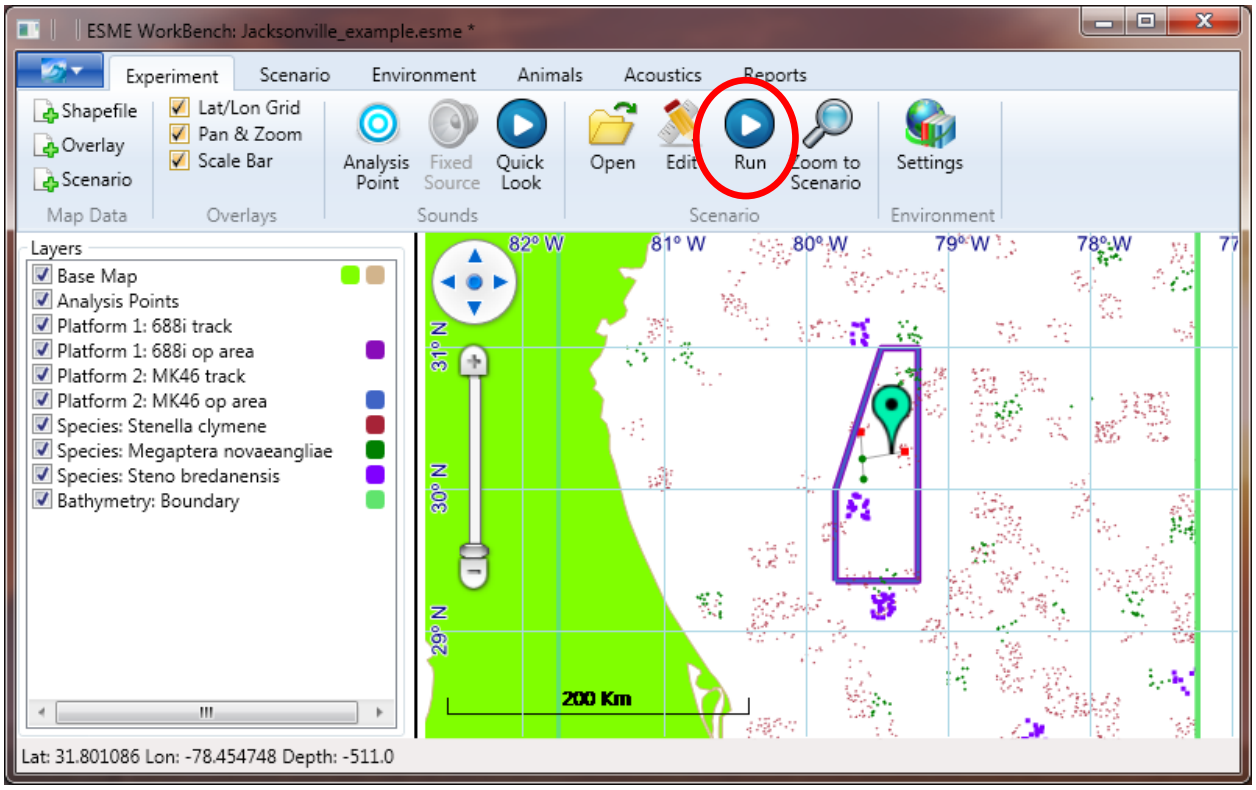


Jacksonville_example_TL - Microsoft Excel

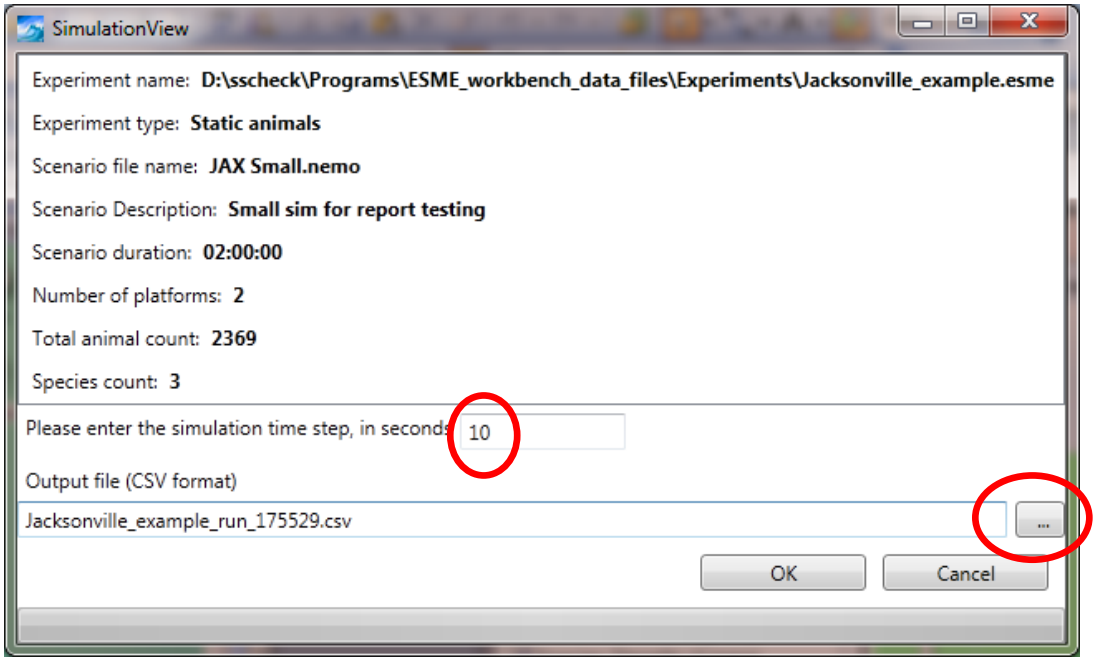
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	Vertical Transmission Loss (dB)																			
2		Range (m)	0	50	100	150	200	250	300	350	400	450	500	550	600	650.0001	700	750	800	850
3	Depth (m)																			
4	0		200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
5	50.60688		200	200	200	200	200	200	200	200	200	200	58.9412	59.32032	57.02885	56.70302	56.3096	55.67404	56.01161	56.33648
6	101.2138		200	200	200	200	200	200	200	200	200	200	58.51072	58.92284	59.33648	55.81995	56.17829	56.51993	55.96542	56.30791
7	151.8206		200	200	200	200	200	200	200	200	200	57.62945	58.07109	58.51832	56.61153	55.65181	56.03765	56.42078	55.91605	56.25915
8	202.4275		200	200	200	200	200	200	200	200	56.66397	57.14182	57.62793	55.83023	56.26211	56.71132	55.8954	56.26752	56.64897	57.02618
9	253.0344		200	200	200	200	200	200	200	55.59779	56.12042	56.65119	55.13004	55.45207	55.89788	56.35735	56.82946	56.11932	56.51688	56.90649
10	303.6413		200	200	200	200	200	200	200	54.97873	55.56755	56.15765	54.52611	55.03621	55.53735	56.02901	56.49063	56.97892	56.39397	56.78489
11	354.2481		200	200	200	200	200	200	53.68723	54.35062	55.01676	53.53247	54.11944	54.62743	55.18874	55.73456	56.2235	56.69885	56.23016	56.66721
12	404.855		200	200	200	200	200	52.19245	52.95599	53.72094	52.4227	53.0576	53.65199	54.27467	54.87644	55.41224	55.93087	56.45201	56.9729	56.55056
13	455.4619		200	200	200	200	50.41862	51.31984	52.22594	51.16838	51.8986	52.62772	53.27633	53.92311	54.54244	55.13544	55.70358	56.26754	56.77224	57.27588
14	506.0688		200	200	200	200	49.33392	50.44931	51.52359	50.58349	51.43053	52.17658	52.93556	53.62873	54.24067	54.89097	55.50867	56.0591	56.60499	57.12807
15	556.6757		200	200	200	46.7915	48.25188	49.62702	49.06042	50.05436	50.9514	51.79783	52.58844	53.32967	54.00705	54.71145	55.31708	55.89624	56.49944	57.02693
16	607.2825		200	200	43.23268	45.35985	47.26728	47.28427	48.47239	49.56644	50.59438	51.505	52.31849	53.10515	53.81849	54.5329	55.18759	55.8087	56.41557	56.96406
17	657.8894		200	37.20561	41.14982	44.18616	45.04199	46.63058	47.98162	49.20759	50.26662	51.22623	52.10763	52.87751	53.66573	54.36277	55.05443	55.69122	56.29411	56.86953
18	708.4963		200	34.03924	40.1155	43.69444	44.50627	46.21308	47.77763	48.93348	50.08984	51.04023	51.9468	52.80608	53.56404	54.29092	54.95713	55.60384	56.21634	56.79873
19	759.1031		200	36.99561	41.06528	42.31118	44.34076	45.91567	47.47259	48.70555	49.8173	50.8754	51.79501	52.67872	53.48033	54.22738	54.92749	55.59002	56.21416	56.80252
20	809.71		200	200	42.84498	45.09192	47.23444	48.80723	50.37505	51.60497	52.81526	53.81715	54.80252	55.67468	56.4837	57.23773	57.93092	58.61379	59.24589	59.8481
21																				
22																				
23																				
24	Sound Source information																			
25	Source Latitude	30.25201																		
26	Source Longitude	-79.41056																		
27	Depth (m)	100																		
28	High Frequency (Hz)	10000																		
29	Low Frequency (Hz)	1000																		
30	Receiver Latitude	30.459634																		
31	Receiver Longitude	-79.31077																		
32																				

Run an Animat Scenario

Click on the "Run" button in the Scenario section of the Experiment tab, as shown below.



The Simulation View window opens, as shown below.



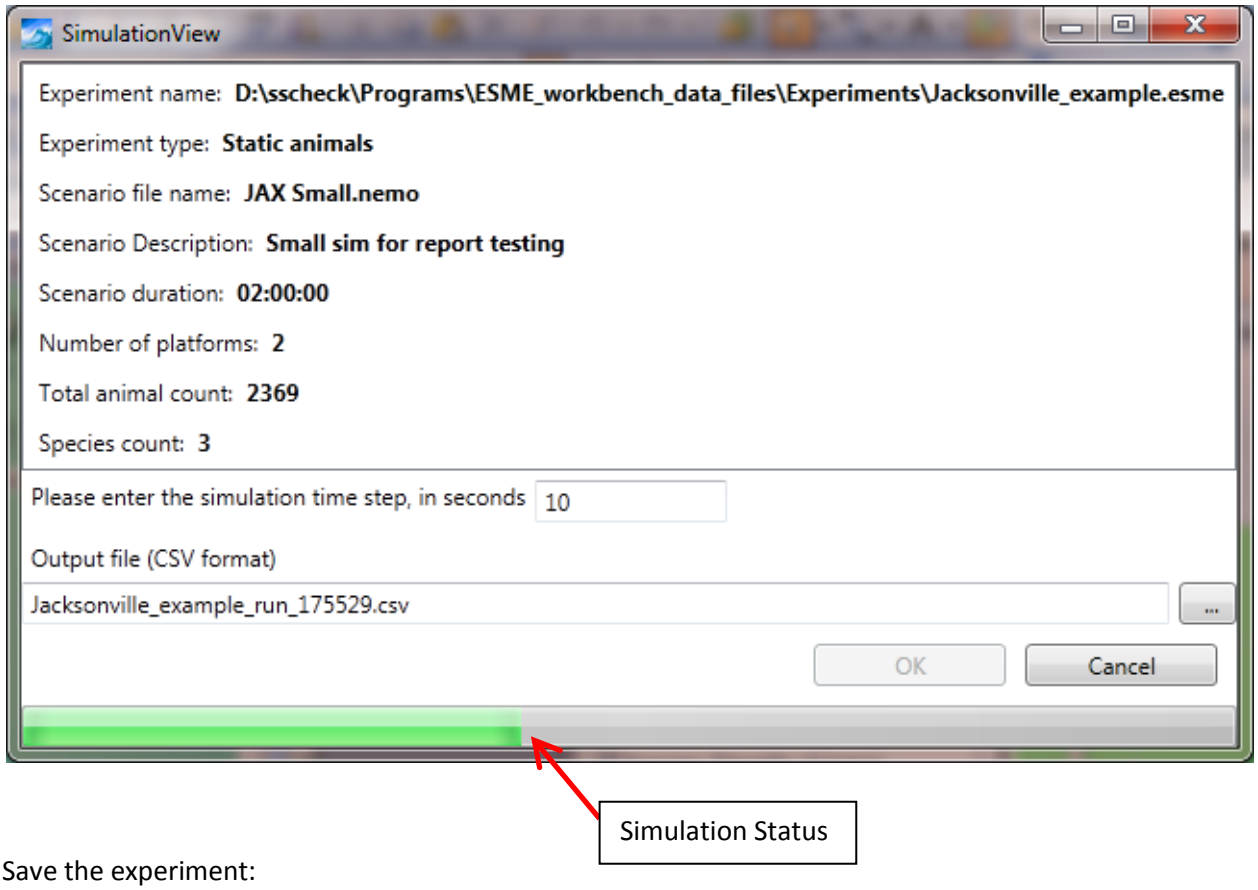
Set the simulation time step to 10.

The filename is populated automatically. (The run number may not be the same as the one shown here.)

Click on the "…" button in the lower right corner, and set the path for the output file to the experiments directory. (Otherwise, the default directory is the ESME program directory.)

Click OK.

A green status bar begins to fill up along the bottom of the window, as the analysis runs, as shown below.



Save the experiment:

Save the experiment using either Control-S, or the Application Menu.

Close the experiment

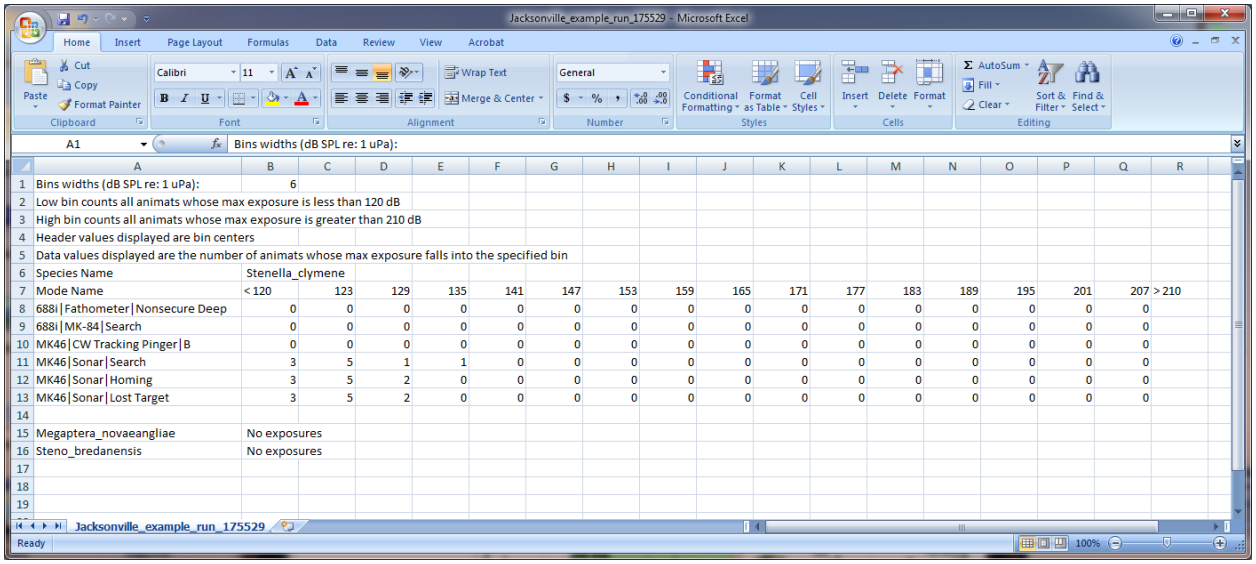
Select "Close Experiment" from the application menu in the upper left corner of the ESME window. The map window zooms out to the world map, and the Platform tracks and operating areas are removed from the display layers.

Exit ESME. Select "EXIT" from the from the application menu in the upper left corner of the ESME window.

View the results of the animat simulation

Open the .csv file.

Open Excel and then open the .csv file, and view the results, as shown below.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	Bins widths (dB SPL re: 1 uPa):	6																
2	Low bin counts all animats whose max exposure is less than 120 dB																	
3	High bin counts all animats whose max exposure is greater than 210 dB																	
4	Header values displayed are bin centers																	
5	Data values displayed are the number of animats whose max exposure falls into the specified bin																	
6	Species Name	Stenella_clymene																
7	Mode Name	< 120	123	129	135	141	147	153	159	165	171	177	183	189	195	201	207	> 210
8	688i|Fathometer|Nonsecure Deep	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9	688i|MK-84|Search	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
10	MK46|CW Tracking Pinger|B	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
11	MK46|Sonar|Search	3	5	1	1	0	0	0	0	0	0	0	0	0	0	0	0	
12	MK46|Sonar|Homing	3	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	
13	MK46|Sonar|Lost Target	3	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	
14																		
15	Megaptera_novaeangliae	No exposures																
16	Steno_bredanensis	No exposures																
17																		
18																		
19																		