1. Introduction

The USACE's Spatial Data Branch has developed the eCoastal Toolbox and it was created as a comprehensive set of applications that enable stakeholders in management decisions to explore the broad spatial and temporal impacts of potential management actions. In the USACE, these tools have emerged as necessary components for effective planning and prediction of regional and local coastal processes. A GIS with specialized applications was developed to provide baseline information for regions including hydrographic and topographic data, shoreline position, aerial and oblique photography, georeferenced imagery, dredging records, nautical charts, and other data regarding regional utilities, infrastructure, and land use. Customized GIS applications were developed to retrieve pertinent hydrologic information, to extract dredging information from district databases via reporting tools, and to create bathymetric profiles and volume changes.

The eCoastal ArcMap toolbars support eCoastal desktop applications, and these individual toolbars collectively form the eCoastal Toolbox. The eCoastal Toolbox is distributed as part of the eGIS program of USACE, Mobile District Spatial Data Branch. The eCoastal Toolbox is designed to assist all GIS users in data analysis and access to the geodatabase through user-friendly tools and forms available in the ArcGIS ArcMap application.

2. Standard Data Viewer Toolbar Functions

	**Toolbar: eCoastal Data Viewer** **Tool: Database Connections** Function: This form allows a user to select a connection to the GIS Management Database. Additionally, references for spatial and non-spatial servers are established here. A working "scratch" location must also be set here to allow for a working directory on a user's local computer.		**Toolbar: eCoastal Data Viewer** **Tool: Data Picker** Function: Data indexed in the GIS Management Database can be easily accessed using the Data Picker tool. This GUI interface allows users of all user levels the ability to quickly search available layers and directly add items to the Table of Contents in ArcMap without prior knowledge of the Spatial Data Standards to browse the geodatabase with little introduction to the system architecture.
	**Toolbar: eCoastal Data Viewer** **Tool: Zoom To Layer** Function: Allows a user to quickly zoom to the extents of the layer in the table of contents selected by the user. The Zoom to Layer tool on the eGIS Data Viewer toolbar is different than the standard 'Zoom to Layer' function as it honors the spatial extent of the definition query used in the Layer file.		**Toolbar: eCoastal Data Viewer** **Tool: Create Map Layout** Function: Allows a user to quickly and efficiently create a map layout suitable for printing and or plotting. This tool simplifies map printing by providing a user the option to select a printing device and then select a paper size. Pre-defined map scales are also available for choosing. Each change updates the map layout.
	**Toolbar: eCoastal Data Viewer** **Tool: Find By Attribute**		**Toolbar: eCoastal Data Viewer** **Tool: Sort Layers**

	Function: Allows a user to search attributes contained in a vector feature layer by selecting from a list of distinct attribute values queried from the selected layer. Double-clicking on a value from the search list locates to the first feature by that value.		Function: Allows a user to sort all the layers in the table of contents alphabetically.
	**Toolbar: eCoastal Data Viewer** **Tool: Move Layers Up** Function: Allows a user to move any selected layers to the top of the table of contents.		**Toolbar: eCoastal Data Viewer** **Tool: Move Layers Down** Function: Allows a user to move any selected layers to the bottom of the table of contents.
	**Toolbar: eCoastal Data Viewer** **Tool: Delete Multiple Fields** Function: Allows a user to select a shape file on their computer. Once selected, a list of attribute fields is created from the shape file for final selection. All selected fields in the shape file are then deleted.		**Toolbar: eCoastal Data Viewer** **Tool: Add X,Y Coordinates** Function: Automatically creates and populates an X and Y value column(s) in the attribute table of a selected vector layer using the coordinate system of the Data Frame properties. The Add XY tool is useful if a vector point layer was created using a "heads-up digitizing" technique or if a point data layer was acquired with no XY coordinates defined in the attribute table.
	**Toolbar: eCoastal Data Viewer** **Tool: Import Excel as Points** Function: This tool imports from a selected Excel spreadsheet a worksheet that contains columns of data that can be queried as X and Y point data. The tool imports the data and creates a point feature layer into the map. Additional columns of data in the spreadsheet may be selected and will be included in the feature layer as attribute data.		**Toolbar: eCoastal Data Viewer** **Tool: Export to Text File** Function: Allows users to easily export the feature attributes of a feature map layer to an ASCII comma-delimited text file. The tool can also be used to export the XY vertices of a polygon or polyline feature class to a text file. Additionally if the feature class is 3D, the Z value of the geometry is also included.
	**Toolbar: eCoastal Data Viewer** **Tool: Polygon Area Tool** Function: Allows users to calculate the area, perimeter, and centroid of all or only the selected features of a polygon feature layer. The tool will also calculate area and perimeter for data that is in a WGS84 geographic coordinate system.		**Toolbar: eCoastal Data Viewer** **Tool: Graphics to Features** Function: This tool allows users to convert graphic elements (polygon, polyline, or point types) in the map to permanent feature classes of the same type of geometry.
	**Toolbar: eCoastal Data Viewer** **Tool: Bounding Polygon Tool**		**Toolbar: eCoastal Data Viewer** **Tool: Compare Tool**

	Function: Bounding polygons are used to define the extent of surfaces to be calculated with the Spatial Analyst extension. This tool allows the user to create a boundary based on a feature point selection, and it creates a polygon graphic that surrounds the feature selection. The bounding polygon is a convex hull polygon.		Function: The main function of this tool, although not the only function, is to search the specified feature class for duplicate geometry. Any duplicate features are marked as duplicate with a Duplicate column that is added to the feature attribute table.
	**Toolbar: eCoastal Data Viewer** **Tool: Make PointZ Shape** Function: Allows a user to select an ASCII comma-delimited text file that contains as minimum X, Y, and Z values that typically represent a location and an elevation. The resultant point shape file is z-aware, meaning it has 3D geometry.		**Toolbar: eCoastal Data Viewer** **Tool: Make PolylineZ Shape** Function: Allows a user to select an ASCII comma-delimited text file that contains as minimum X, Y, and Z values that typically represent a location and an elevation. The X and Y values are used to create the polyline vertices. The resultant shape file is z-aware, meaning it has 3D geometry.

Table 1 - Standard Toolbar Functions

3. Data Viewer Tools

The Data Viewer tools have been created to assist GIS users in data analysis and access to the geodatabase through the ArcGIS ArcMap interface. The ArcGIS Desktop applications are developed using ArcObjects. When you use an application, such as ArcMap, most of the time you are simply looking at or working with ArcObjects. The graphical user interface in each custom eCoastal application is developed using the same objects, such that in each application you will find the interface contains toolbars, menus, commands, and tools that have the same look and feel. The eCoastal Toolbox is distributed as an install package for the ArcGIS environment. Created in a modular design, users can choose which tools to load in their toolbar. In general, the tools provide a simple interface to common GIS tasks; such as locating data stored in the geodatabase, building attribute queries or designing a map layout.

3.1 Data Viewer Toolbar

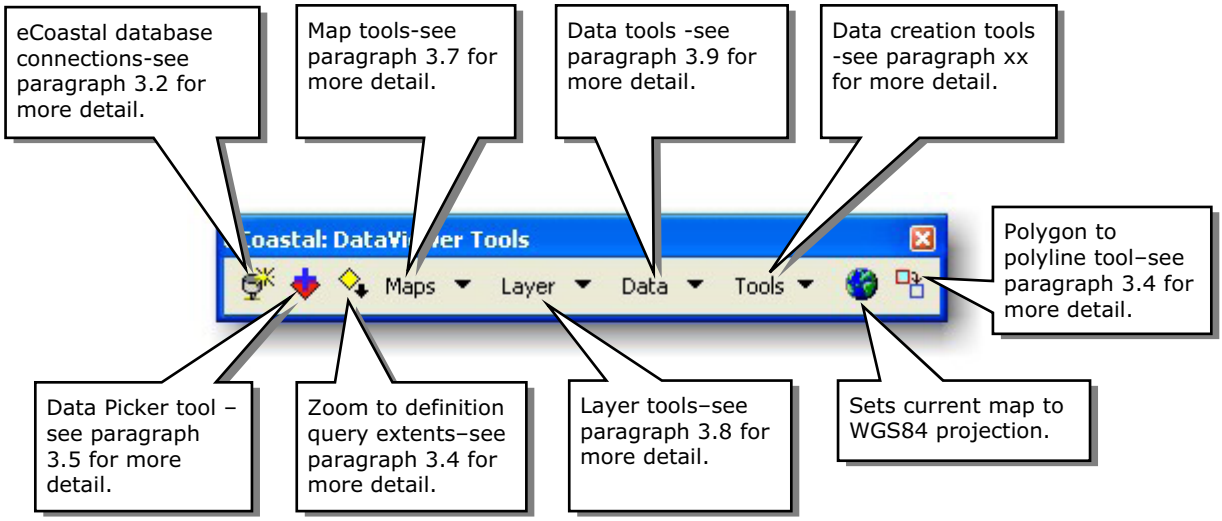


Figure 1 - Data Viewer Toolbar

3.2 eCoastal Configuration

In order to effectively utilize the eCoastal tools the proper database connection must be established, and also, other working network and local paths must be established. This is illustrated in Figure 2.

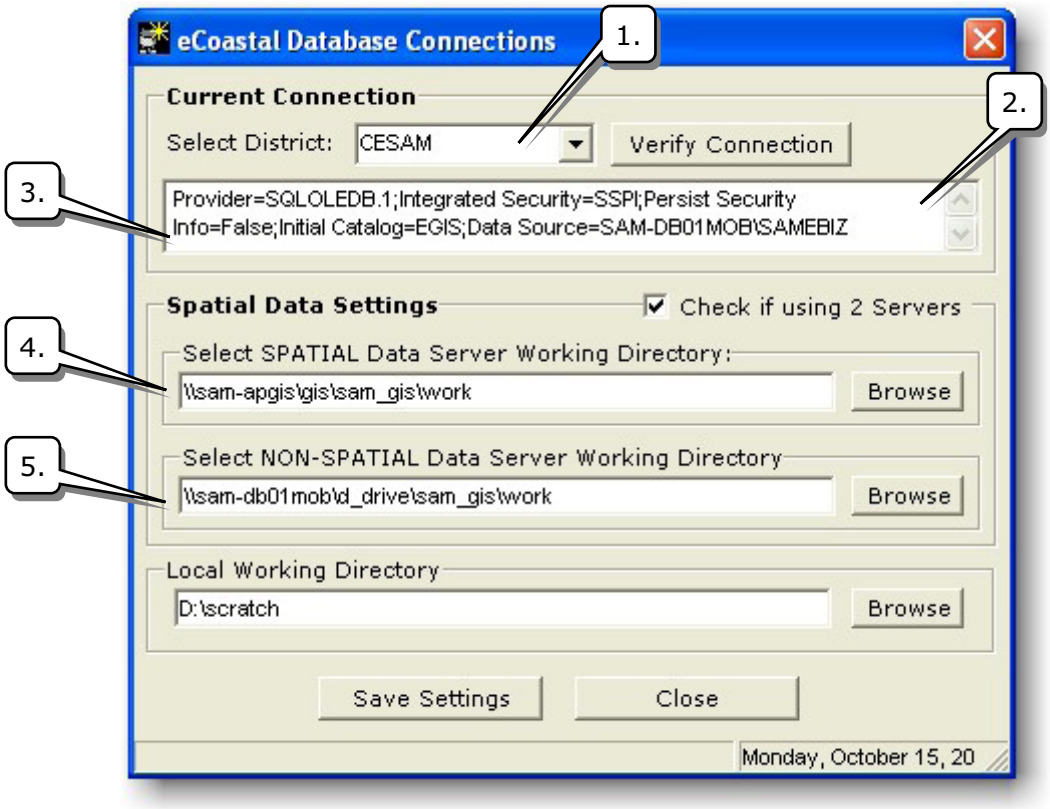


Figure 2 - eCoastal Configuration

1. This dropdown list is used to select the working district and when selected will populate the remaining items on the form. Its use is deprecated in that it is not currently supporting other districts at this time.

2. This box indicates the working database connection string that is used by the toolbox for database connectivity.

3. This UNC reference path is used to build a location for accessing project layer files. Layer files are a special ESRI file format that contains specific data about where the layer's data source is and how the data is symbolized when it is loaded in the map, and is a key part the eCoastal architecture.

4. This UNC reference path is used to build a location for accessing non-spatial data sources.

5. The local working directory is an area where scratch work is done. Typically this is data that is created in an ad-hoc fashion by the eCoastal tools and often times retrieved for later use.

3.3 Zoom to Definition Query 

Click this button to zoom to the extents of a layer's definition query. In ArcMap, a request that examines feature or tabular attributes based on user-selected criteria and displays only those features or records that satisfy the criteria is a definition query. Typically, but not always, the visible features defined by a definition query have smaller visible extents then the same layer without a definition query. This tool will honor the visible extents of the definition query.

3.4 Polygon to Polyline Tool 

Click this button to use the polygon to polyline tool. To use the tool click on any polygon feature you see in a polygon layer. This polygon feature will be converted to a polyline feature and put into a new polyline. The new polyline layer is then added to your map.

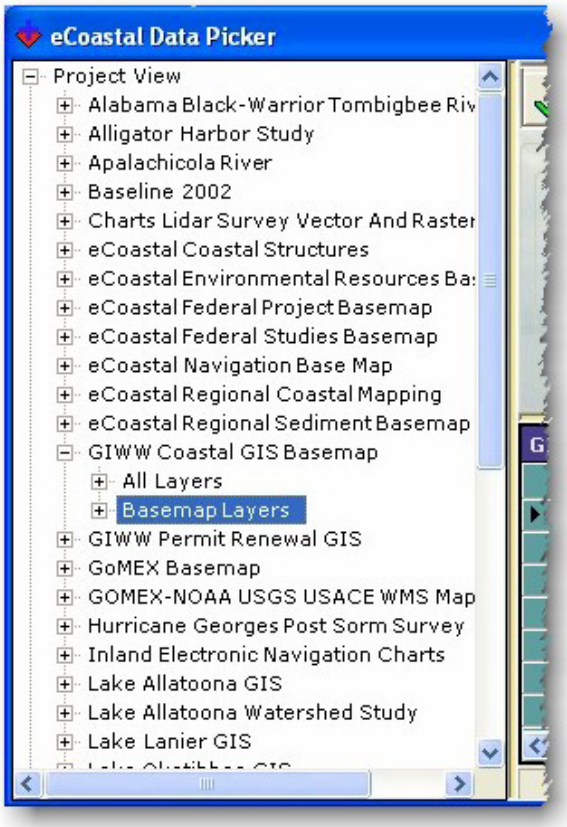


Figure 3 - Datapicker Project View

3.5 DataPicker Tool

The datapicker tool is a database driven tool that provides for easy loading of GIS data into your map. Information about each data layer is stored in the database. This information provides a pointer to a layer file, a special ESRI file format that contains specific data about where the layer's data source is and how the data is symbolized when it is loaded in the map. The Datapicker tool, shown here split into two pieces for clarity, provides several ways of accessing the indexed data references. Figure 3 - Datapicker Project View shows a "tree" view of the projects stored in the database. Every project seen under the Project View node will have two sub nodes. They are the ***All Layers*** node and the ***Basemap Layers*** node. When the Basemap Layers node is selected all of the project's basemap layers are loaded into the grid display seen in Figure 4 - Datapicker Control Panel. All basemap layers, when loaded in the grid display, are checked by default. If the All Layers node is selected all layers are loaded into the grid display but are initially unchecked.

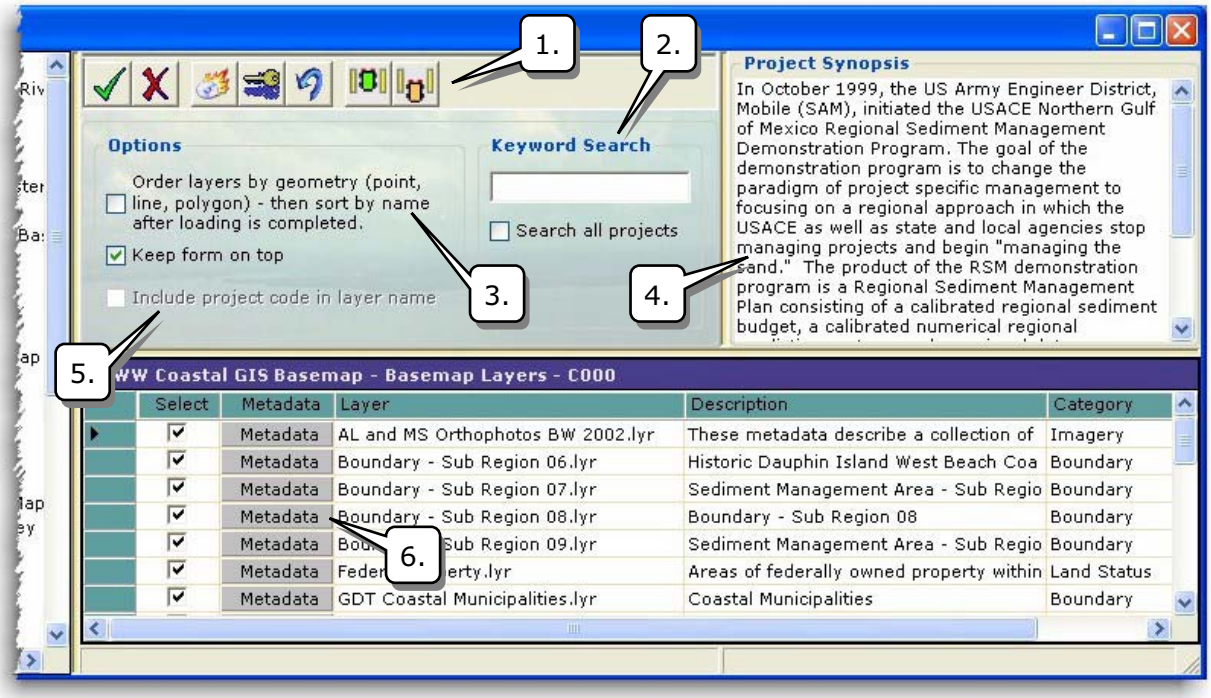


Figure 4 - Datapicker Control Panel

An alternative way to browse for data layers with the Datapicker tool would be to use the Category View seen in Figure 5 – Datapicker Category View. Under the category view node are a number of categories, beneath which, are projects that would need to have at least one layer of a particular category, in order to be seen under that category. The list of available categories is defined in Table 2. In this example we have selected the Boundary category and then the Apalachicola River project. We can see that this project has two layers that are consider being in the boundary category. When thee project node is selected the available layers are loaded into the grid display. At this point it is a matter of selecting the layer (applying the checkbox) and then loading the layers into your map. One useful way of using the category view is to select the Imagery node. This immediately provides a way of determining what projects have imagery that is available for loading.

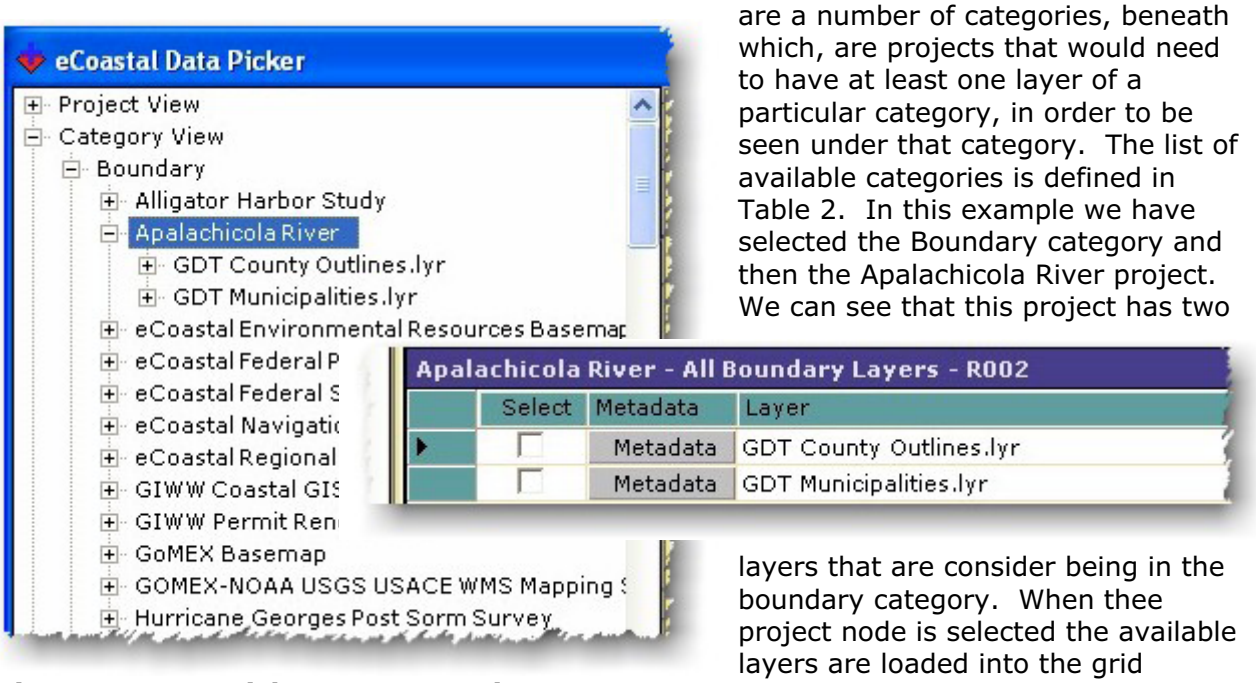


Figure 5 – Datapicker Category View

Buildings	Ecology	Future Projects	Land Status	Soil
Cadastral	Environmental Hazards	General	Landform	Transportation
Climate	Erosion	Geodetic	Landmarks	Unassigned
Cultural	Fauna	Geology	Machinery	Utilities
Demographics	Flood Control	Hydrography	Navigation	Waterways Engineering
Dredging	Flora	Imagery	Outdoor Recreation	Wetland Area

Table 2 - Datapicker Categories

3.5.1 Administrative Functions

It is very important that the layer files that are built and placed on the server are the files that actually perform the loading and symbolizing of GIS data in ArcMap. The eCoastal database contains the indexes to these layer files, and as such, the contents of the database and the layer files referred to by the database must remain synchronized. This process of synchronization should be a matter of standard operating procedure. This operating procedure can be effectively implemented by the use the administrative tools provided under the node as shown in Figure 6 - Datapicker Administrative Node. Perhaps the most useful functions are the inventory commands that are accessible with a right mouse click. The ***Inventory Orphaned Layerfiles*** command when executed determines how many layer files are on the server and compares this to the number of layer files that have been indexed in the database. A partial result of the output of this is seen in Figure 7 –Orphaned Layer Display. Immediately following an inventory action an ***Inventory Report*** is available for printing. The results of the Inventory Orphaned Layerfiles command will tell you how many layer files you must enter into the database.

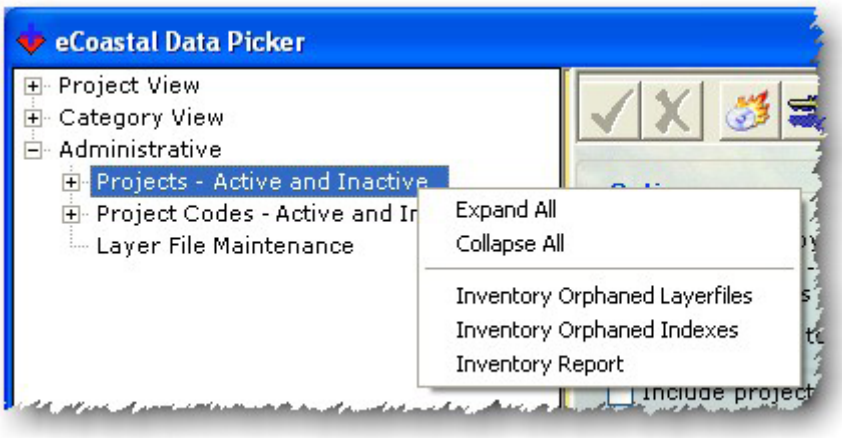


Figure 6 - Datapicker Administrative Node

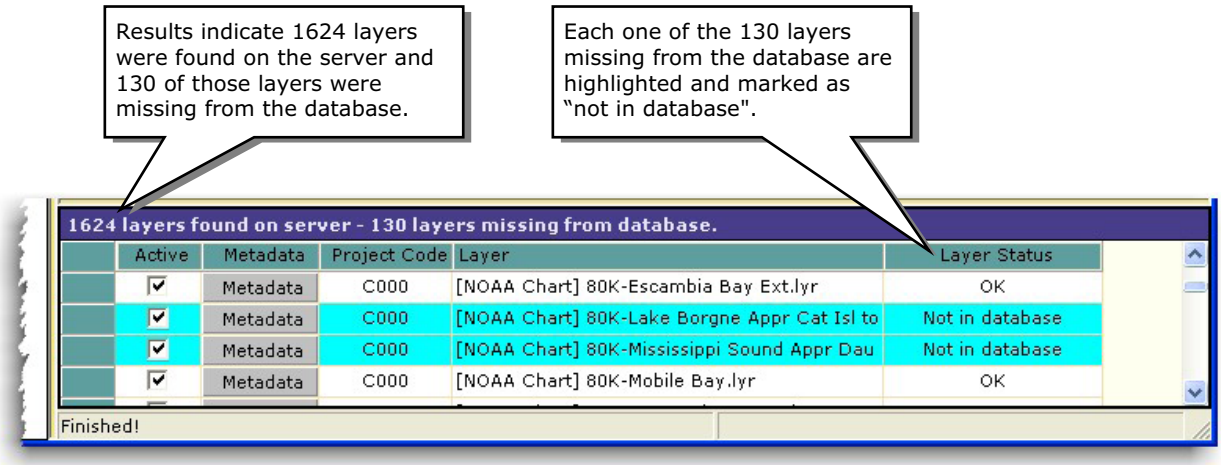


Figure 7 –Orphaned Layer Display

Similar to the Inventory Layer Layerfiles, the Inventory Layer Indexes command when executed determines how many layer indexes in the database do not have an accompanying

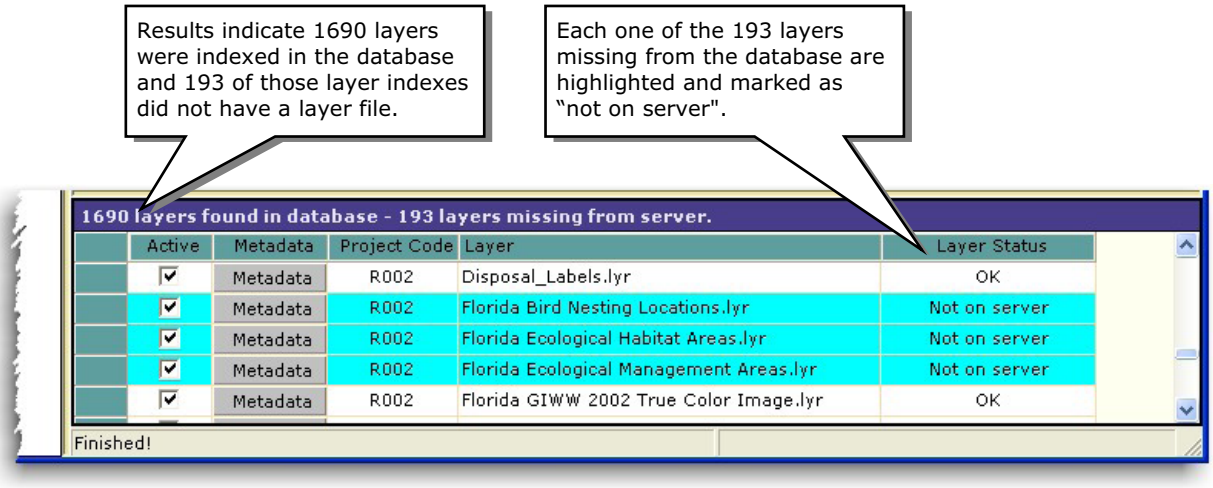


Figure 8 – Orphaned Layer Indexes

layer file on the server. A partial result of the output of this is seen in Figure 8 – Orphaned Layer Indexes. Immediately following an inventory action an ***Inventory Report*** is available for printing. The results of the Inventory Orphaned Layerfiles command will tell you how many layer files you must build and place on the server.

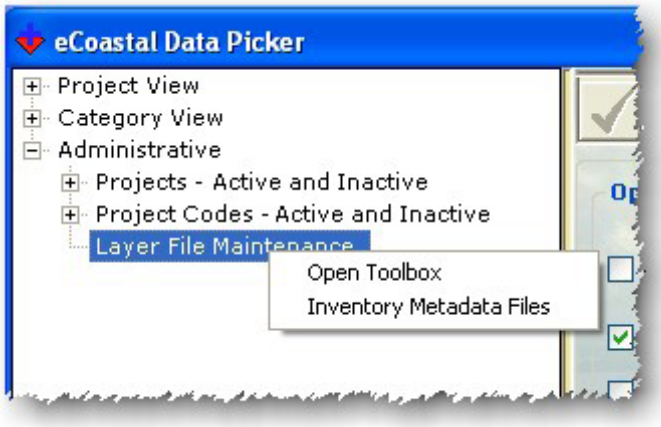


Figure 9 - Layer File Maintenance

In addition to maintaining synchronization between layer files and the database indexes the ***Inventory Metadata Files*** command determines which layer files do not have a matching metadata document. In the eCoastal schema the layer filename and the metadata document filename have the same name with only the extensions being different; i.e *.lyr vs. *.xml. Upon completing the metadata inventory any layer not having a matching metadata document is displayed as shown in Figure 10.

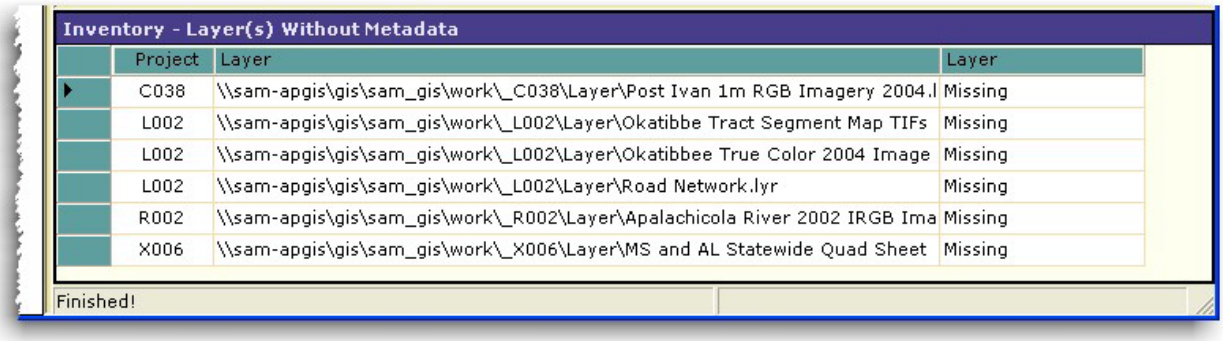


Figure 10 - Layers without Metadata

The Open Toolbox menu item, when clicked, opens the Modify Layer files dialog. The layer file is a file that contains all the information required to find and load a GIS layer. The data source referenced in a layer file can be a file based data source, such as a shapefile, or a feature layer stored in a geodatabase (SDE layer). If the data source is an SDE layer, the layer file also contains a set of properties, called connection properties, which are required for a database connection. This tool allows for these properties to be modified internally inside the layer file.

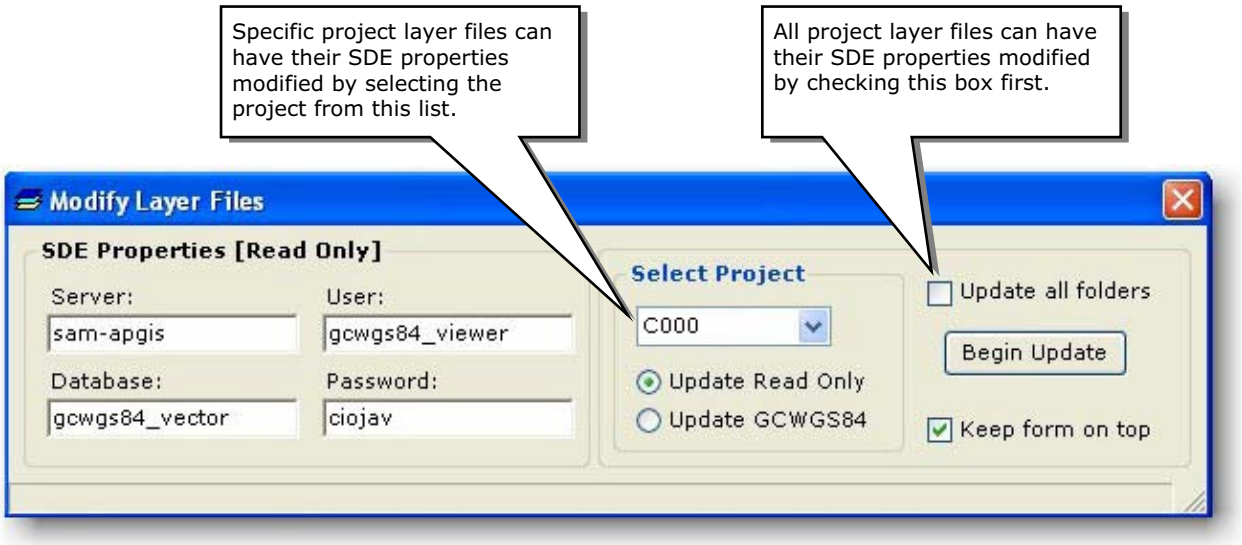


Figure 11 - Layer File Toolbox

3.6 Datapicker Control Panel Features

There are several key areas of the control panel and these are numbered in Figure 4 - Datapicker Control Panel.

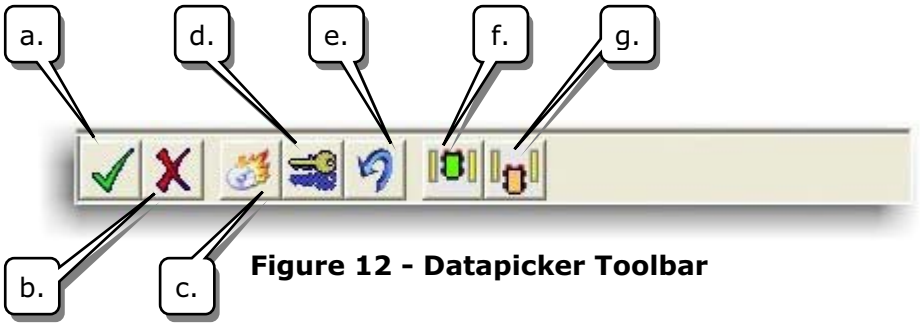


Figure 12 - Datapicker Toolbar

1. Datapicker Toolbar:

    a. Click this button to check all of the layers displayed in the layer grid.

    b. Click this button to uncheck all of the layers displayed in the layer grid.

    c. Click this button to load any checked layers into your map.

    d. Click this button to perform a keyword search. You may also just hit your enter key after typing in a keyword.

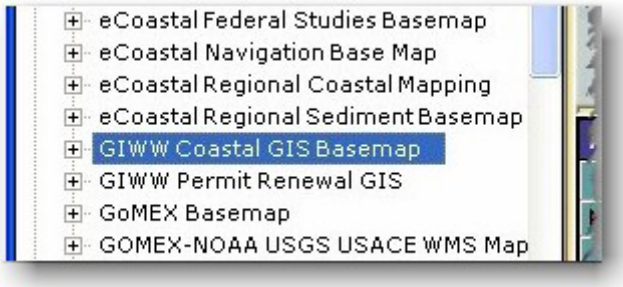
    e. Click this button to remove all layers from your table of contents in your active map.

    f. Click this button to park your Datapicker form. This resizes and parks the form in the upper left corner of your screen.

    g. Click this button to unpark your Datapicker form. This restores and repositions the form to its default size.

2. Keyword Search: A keyword search can be used to quickly find data layers. Although not seen by the user, a keyword column in the database holds one or more keywords that are searched using the keyword specified by the user. The results of a search are displayed in the layer grid as indicated. By default only the selected

Figure 13 – Keyword Search All Projects



project is searched. If a search of all projects is desired the "Search All Projects" checkbox must be checked. The result of searching all projects is seen in Figure 13. Layers are displayed in alphabetical order. The result of searching only the selected project is seen in Figure 14.

Figure 14 - Keyword Search Single Project

3. Layer Loading Order: Layers are loaded and sorted into the ArcMap table of contents in a couple of different ways. A basemap layer load is designed to be loaded with point layers at the top, followed by line layers, followed by polygons layers, then raster layers at the bottom. Within each geometry type the layer names are sorted alphanumerically. If all of the layers loaded, they are loaded in the order they are displayed in the grid. The order of loading, as previously described for basemap layer loading, can be altered by checking the order layers checkbox marked by item 3 in Figure 4 - Datapicker Control Panel.

4. Project Synopsis: When a project is selected from the project view the project synopsis can be seen. This is a somewhat short description of the projects purpose.

5. Project Codes: Project codes are an internal system for categorizing and identifying projects in the Spatial Data Branch. They are a key part of OP-J data management practices, and as such, are an integral part of the Datapicker application. Typically this option is exercised by OP-J personnel and as such may be inconsequential to the average user.

Standard Project Code Categories			
C – Coastal	R – Riverine	G – Regulatory	N – Navigation
D – Dredging/Disposal	E – Real Estate	P – Permitting	T – Training
F – Flood Control	S – Study	I – Inlet	V – Environmental
L – Lake	M – Military	H – Harbor	X – Miscellaneous
Y – Emergency Mgt	U – Natural Resources	A – Applications	W – Technical Writing

Table 3 - Standard Project Code Categories

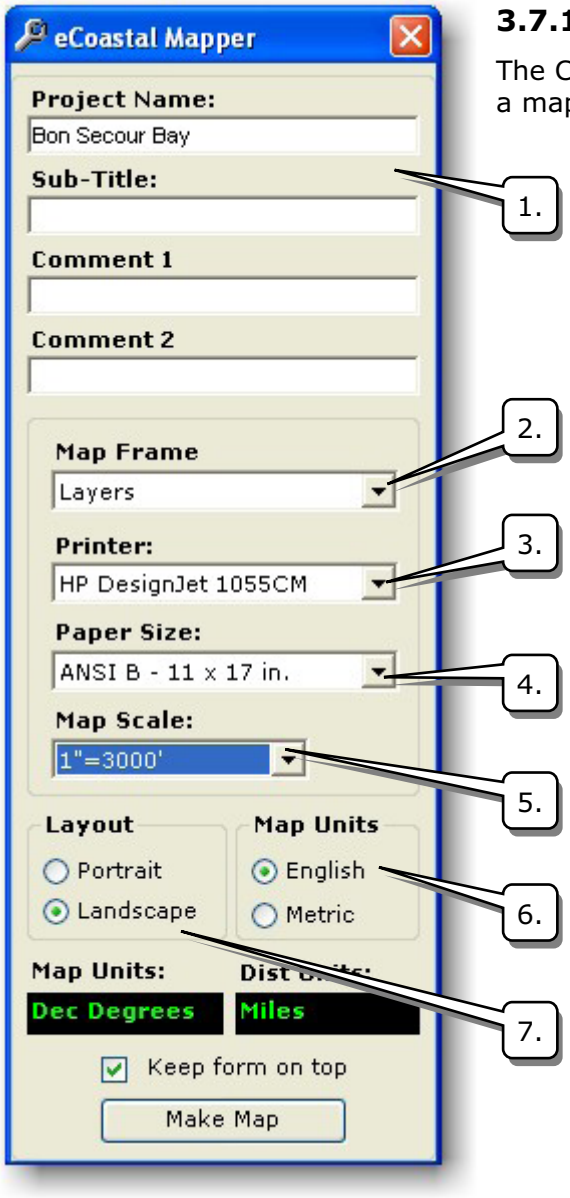
6. Metadata: Each layer displayed in the Datapicker grid has a metadata button, that when clicked, normally opens the FGDC compliant metadata record for that data layer. The metadata document is displayed in your web browser.

3.7 Map Tools

The map tools section of the Data Viewer toolbar has two dialogs the Create Map and the find by Attribute by Attribute dialogs.

3.7.1 Create Map

The Create Map tool simplifies the process of building a map layout that is suitable for printing or plotting.



1. These four boxes are used to place information onto the title block area of the auto-generated map layout.
2. Select from this list the active map.
3. Select from this list the printer or plotter to be used.
4. Select from this list the paper size. Available paper sizes are dependent on the type of printer or plotter selected.
5. Select from this list the map scale for the map. The available map scales are dependent on the selected map units.
6. The linear map units. This determines what pre-determined map scales are available when changed.
7. The layout of the map.

Once the map layout is generated the map scale, map layout, and paper size can be changed while in the layout view from this dialog directly. This will dynamically update the layout.

Figure 15 - eCoastal Mapper

3.7.2 Find by Attribute

This tool simplifies the process of finding a map feature by using an attribute value.

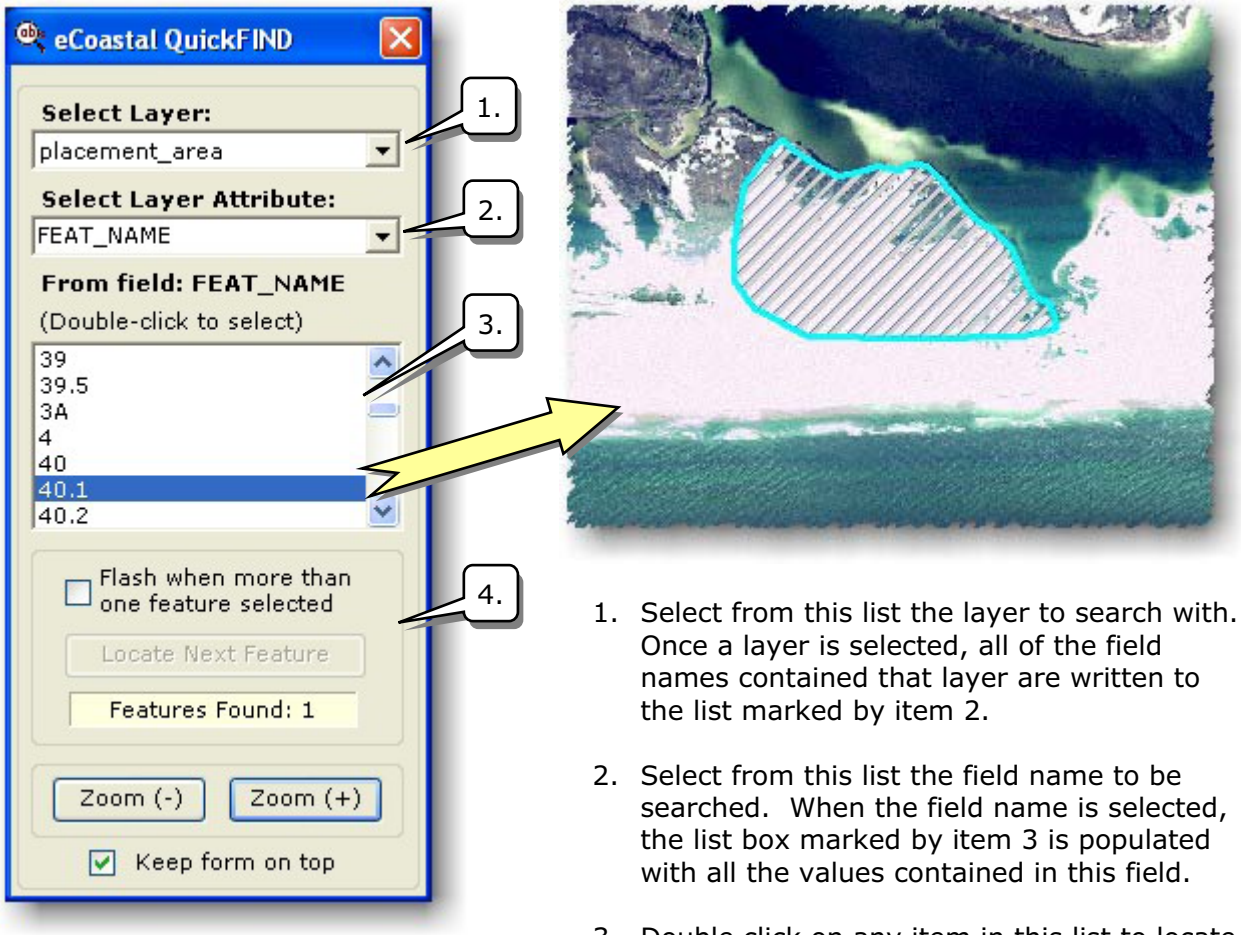


Figure 16 - Quick Find Tool

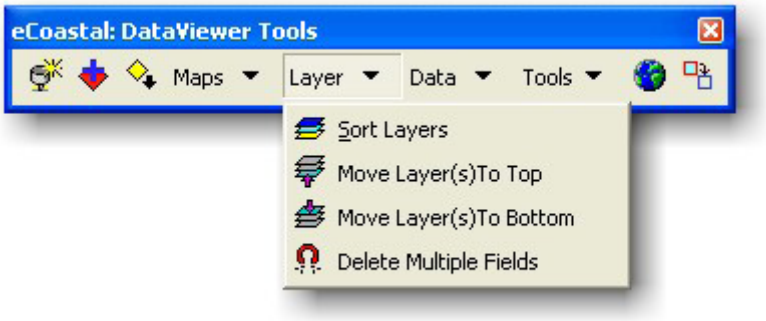
1. Select from this list the layer to search with. Once a layer is selected, all of the field names contained that layer are written to the list marked by item 2.

2. Select from this list the field name to be searched. When the field name is selected, the list box marked by item 3 is populated with all the values contained in this field.

3. Double click on any item in this list to locate to the features in your map with this value. As seen in the accompanying figure the feature is located in the map and then selected. If multiple items are found, the map will zoom to the extents of the selected features and select them.

4. Where more then one feature is found based on the selected value, the total number of features found is shown in the textbox shown here. To cycle through these features click the Locate Next Feature button shown here. To flash selected features check the checkbox shown here.

3.8 Layer Tools



1. Sort Layers: Select this to sort all layers alphanumerically.

2. Move Layer(s) to Top: Select any number of layers from your table of contents then click on this command. Those layers will be moved to the top.

3. Move Layer(s) to Bottom: Select any number of layers from your table of contents then click on this command. Those layers will be moved to the bottom.

4. Delete Multiple Fields: Click on this command to open the dialog box seen in Figure 17. Select a layer from the layer list and then select one or more fields as shown then click the delete button. If the selected layer is an SDE layer the user must have

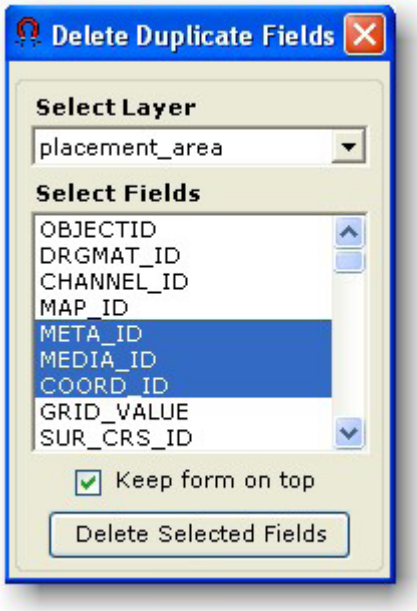
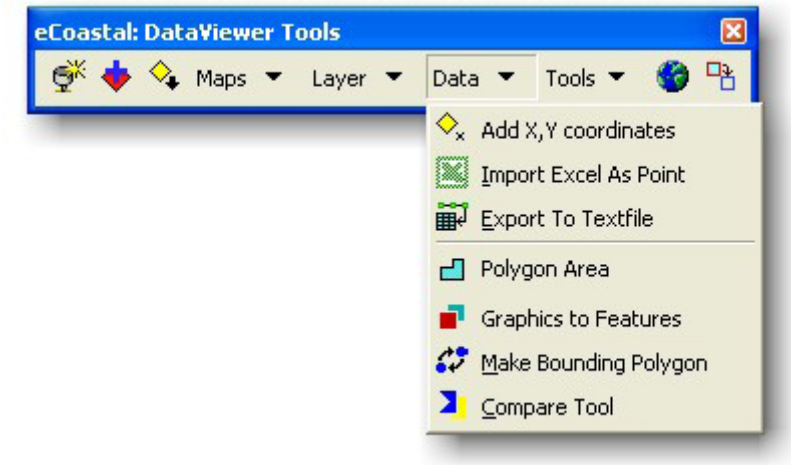


Figure 17 - Delete Duplicate Fields

the required permission to delete the fields. Users not having the required level of access will not be able to delete the selected fields.

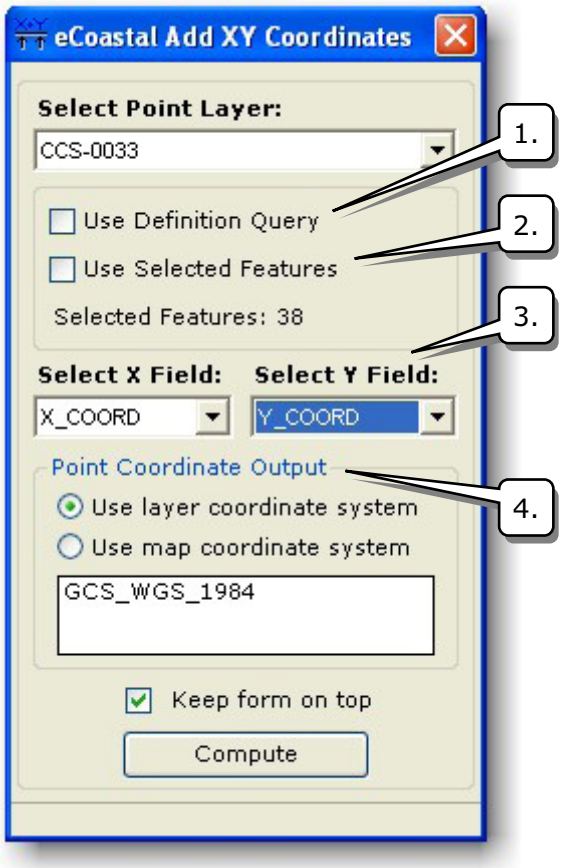
3.9 Data Tools



The data tools are a collection of applications that create or modify data, typically on features that already exists in the map.

3.9.1 Add XY Coordinates

This application will add the x and y coordinate values to the attribute table of a point feature class. The point layer list will contain a list of all point feature layers in the active map. Only users authorized to modify SDE feature layers will see SDE feature layers in this list. Otherwise only point shapefiles will be listed. In the example shown in the accompanying figure we have selected a layer that has both a defined definition query and selected features. If the boxes marked by item 1 and 2 are checked the application will calculate x and y values for these points only.



1. Check this box to honor the definition query of the selected layer. If the selected layer has not definition query this checkbox will be disabled.

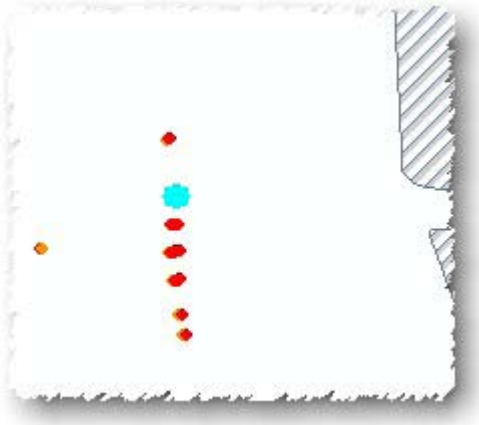


Figure 18 - Add XY Coordinates

2. Check this box to honor any selected features from the selected layer.

3. Select from these two lists the x and y fields that you wish to use to hold the x and y coordinate values. If they are left blank the application will add two fields, X_COORD and Y_COORD, and then use these fields to hold the x and y values.

4. Select from here the coordinate system you wish to use to calculate the x and y values. These two coordinate systems need not be the same. The textbox below the option buttons in Figure 18 will be the coordinate system of the option button clicked.

3.10 Imports Excel as Points

Open this application to import data from an Excel spreadsheet into ArcMap as a point shapefile.

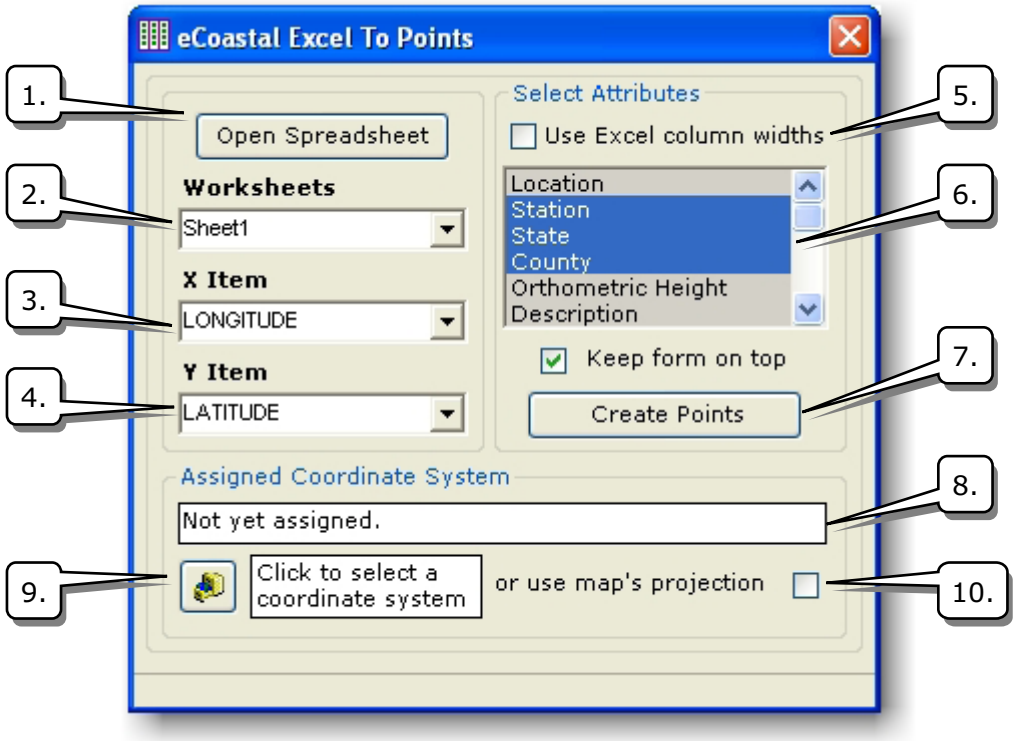


Figure 19 – Import Excel as Points

1. Click this button to open a spreadsheet.

2. Select from this list a worksheet from the spreadsheet.

3. Select from this list a column from the worksheet that represents the x coordinate of the point.

4. Select from this list a column from the worksheet that represents the y coordinate of the point.

5. Check this box to use the worksheet column widths for the width of string fields in the shapefile you are importing into. If left unchecked columns interpreted as string values will have a width of 50 characters in the shapefile.

6. Select from this list Excel columns that you want to include in the attribute table of the shapefile.

7. Click this button to create the shapefile.

8. This textbox indicates the coordinate system that will be assigned to the shapefile.

9. Click this button to open the Select Coordinate System dialog. The coordinate system selected will be the coordinate system used to build the shapefile. This button will be disabled if the box marked in item 10 is checked.

10. Check this box to use the map's current coordinate system to build the shapefile.

3.11 Export to Text File

This application will allow you to export points from different feature classes to a text file. Table 4 explains what is exported directly from the feature's geometry to the text file. In addition to these coordinates, additional attribute values can be exported at the same time. To do these select any of the attributes from the list marked by item 2 in Figure 21 – Options View.

Geometry	Output
Point	Exports the x and y coordinates of each point feature
Multipoint	Exports the x and y coordinates of each point feature
Polyline	Exports the x and y coordinate of each vertex for each polyline feature
Polygon	Exports the x and y coordinate of each vertex for each polygon feature

Table 4 - Export to Text File

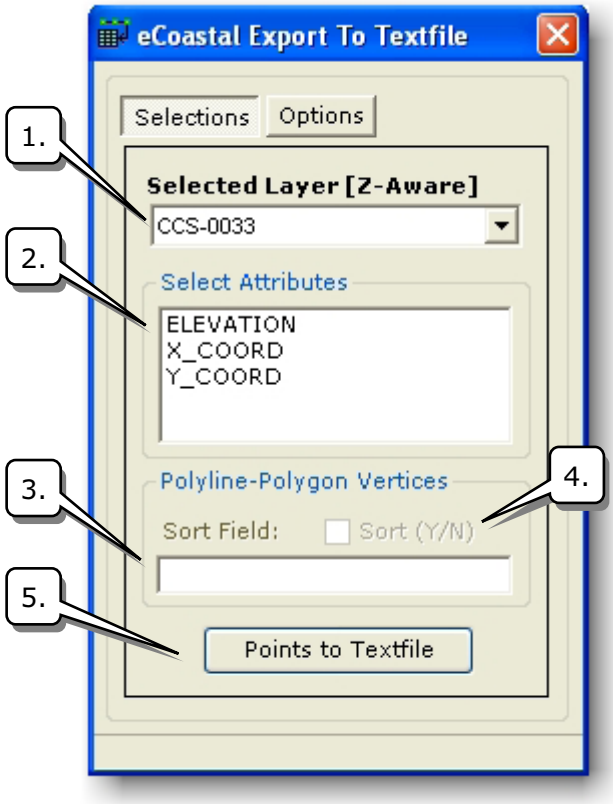


Figure 20 – Selections View

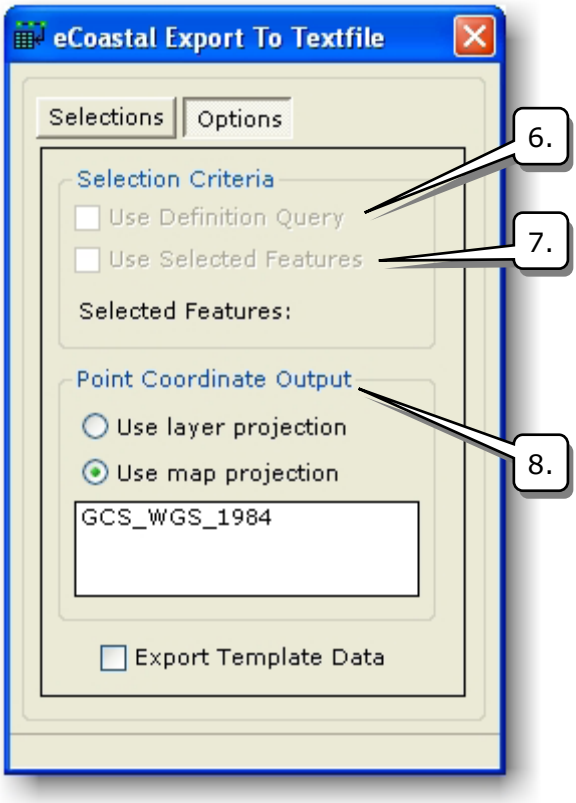


Figure 21 – Options View

1. Select from this list the feature calls to export. If the feature class is z-aware the label above the list will say that and this is illustrated in Figure 20.

2. Select from this list box any additional attributes to export with the text file. If NO additional attributes are selected, the text file will contain what is specified in Table 4 - Export to Text File. For polygon or polyline feature layers, when additional attributes as selected from the list box, it may be desirable to sort these coordinates by a sort field. To select a sort field you must first select one or more items from the

list box. With your mouse cursor over any one of the selected items, right click and select Set Sort Field. This will place the field name in the textbox marked by item 3.

3. This is the optional sort field that is used when exporting points from a polyline or polygon feature class.

4. If this box is checked then the points will be sorted by the sort field you have selected.

5. If the selected feature layer is a point layer then this button will say Points to Textfile.

6. Check this box to honor the definition query of the selected layer. If the selected layer has not definition query this checkbox will be disabled.

7. Check this box to honor any selected features from the selected layer.

8. Select from here the coordinate system you wish to use for the coordinates that are exported. These two coordinate systems may not be the same. The textbox below the option buttons in Figure 22 will be the coordinate system of the option button clicked.

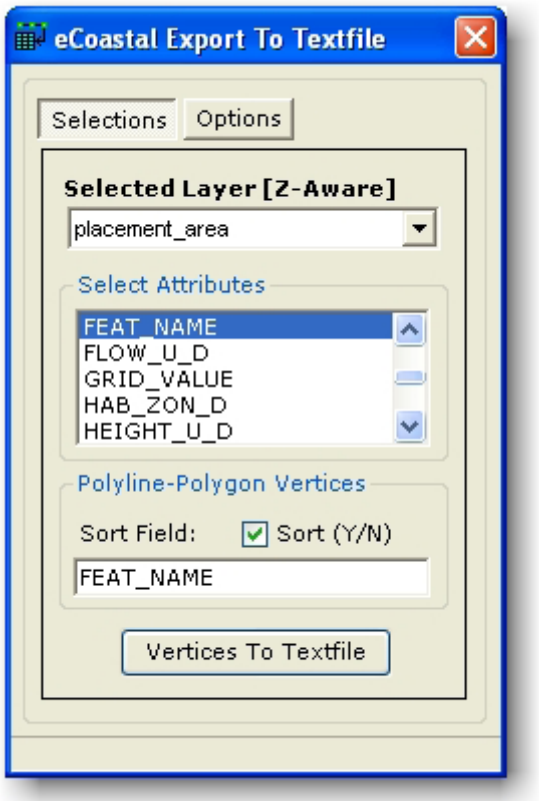


Figure 22 - Sorted Polygon Export to Text File

```
-81.76055999,24.45666704,0,Key West
-81.74222,24.45666704,0,Key West
-81.74222,24.43888888,0,Key West
-81.76055999,24.43888888,0,Key West

-89.32321649,30.35346843,0,Left Jourdan
-89.31326536,30.34847689,0,Left Jourdan
-89.31313658,30.34132759,0,Left Jourdan
-89.31719426,30.34155302,0,Left Jourdan
-89.31729091,30.34734982,0,Left Jourdan
-89.32466564,30.35060243,0,Left Jourdan
```

Figure 22 shows the export of vertices from a polygon feature layer. The additional attribute FEAT_NAME has been selected and designated as a sort field. A partial result of the exporting of this to a text file is seen in the accompanying figure. Each set of vertices for each individual polygon feature is group and sorted by the use of the sort option.

3.12 Polygon Area Tool

The polygon area tool computes area, perimeter, and centroid values of a polygon feature class. The tool is also capable of computing the values in the output units specified for a geographic projection. This is accomplished by determining what UTM zone a geographic feature is in and then projecting to that UTM zone to calculate the area and perimeter values. If the required fields do not exist in the attribute table they will be added. The area field will be as selected from the list marked by item 3 in Figure 23. The perimeter field will be PERIMETER, the x centroid will be X-CENTROID, and the y centroid will be Y-CENTROID. For an SDE feature layer a user would need the required permissions to both add the fields and also populate the values.

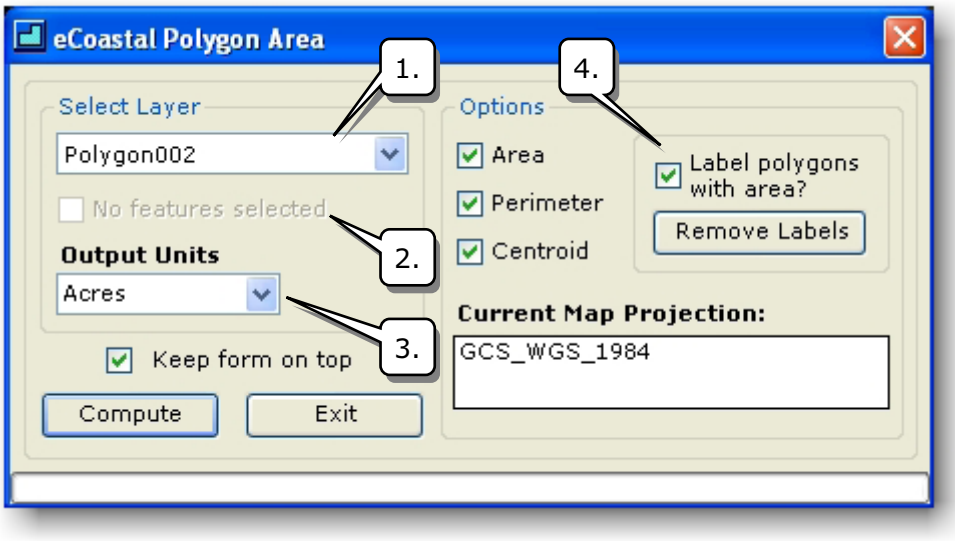


Figure 23 - Polygon Area Tool

1. Select from this list the polygon feature layer.
2. Check this box to process selected features only.
3. Select from this list the output units for area.
4. Check this box to label each polygon with the area value. Labels are graphic text. Click the Remove Labels button to remove the graphic text at any time.

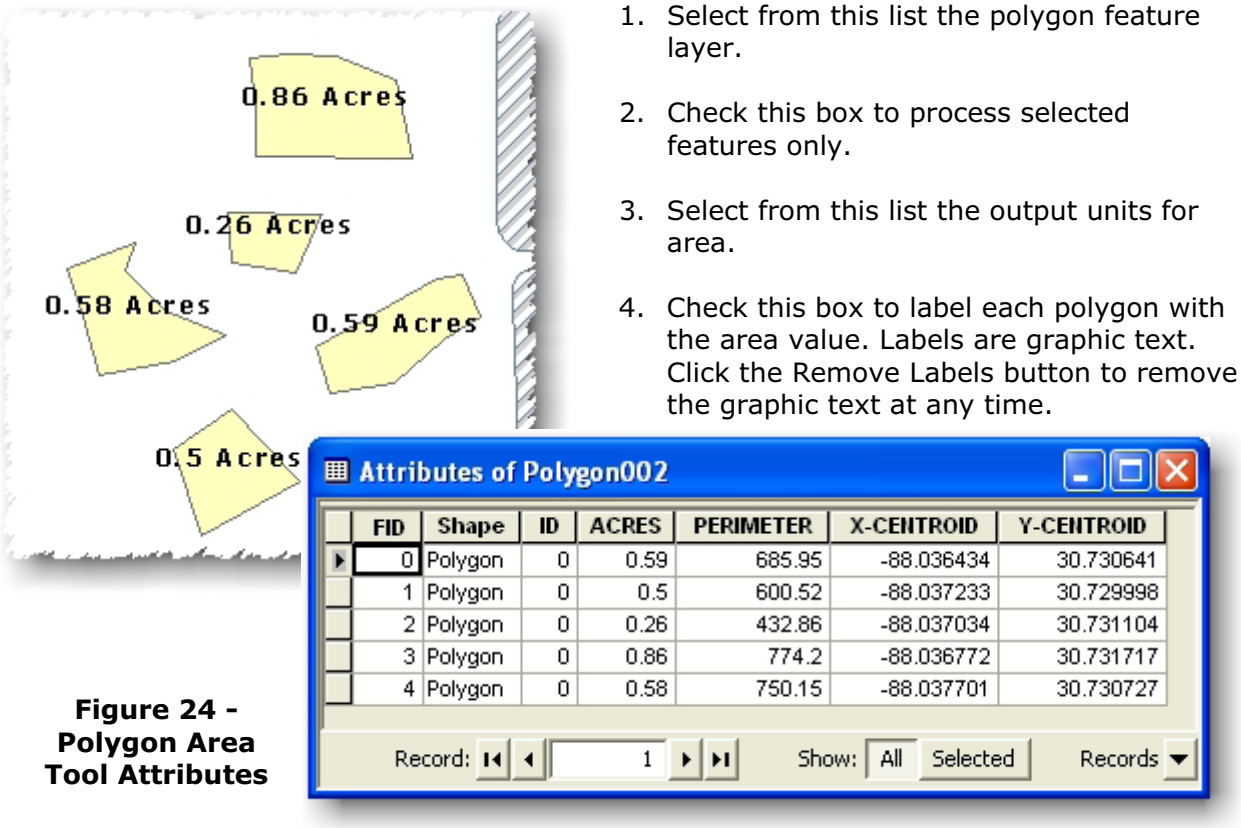


Figure 24 - Polygon Area Tool Attributes

3.13 Graphics to Shapefile

This tool converts graphics into a shapefile. Graphic polygons are converted to a polygon shapefile, graphic polylines are converted to a polyline shapefile, and graphics points are converted to a point shapefile.

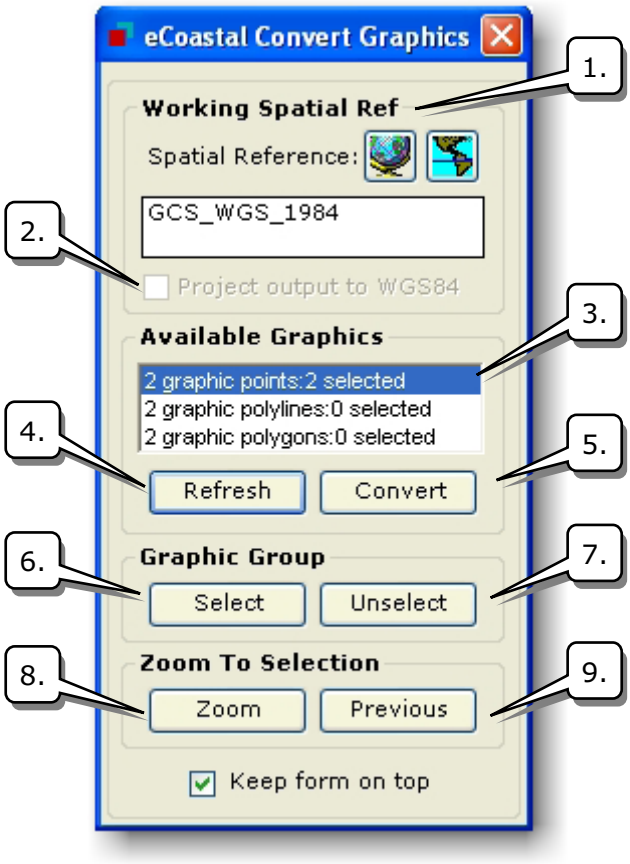


Figure 25 - Graphics to Shapefile Tool

1. Set the working spatial reference for the shapefile. Click the button on the left to choose a spatial coordinate system. Click the button on the right to select the active map's coordinate system.

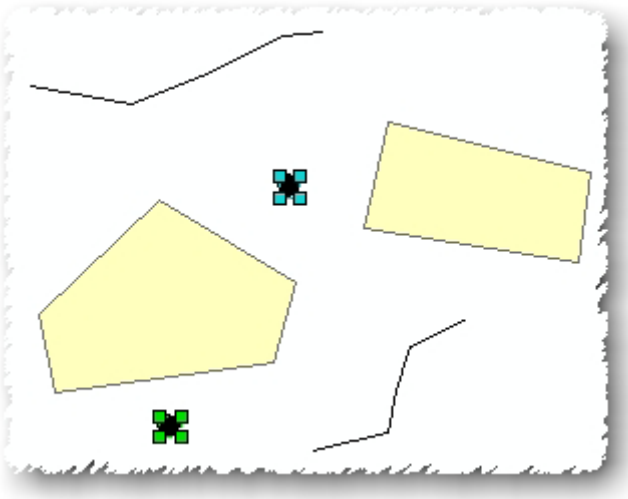
2. Check this box to project your shapefile to WGS84 geographic coordinate system. Typically this is checked when you are working in a projected coordinate system as wish to create a WGS84 projection for the shapefile.

3. This list provides a count of the total graphics in the active map and how many of those graphics are currently selected.

4. Click this button to refresh the graphics list.

5. Click this button to convert the selected graphic group to a shapefile.

6. Click this button to select a group of graphics. You must first select a graphic group from the list of available graphics.



7. Click this button to unselect a group of graphics. You must first select a graphic group from the list of available graphics.

8. Click these buttons to zoom to a selected group of graphics.

As shown in Figure 25 and the accompanying figure the two graphic points are selected. You may at your discretion add to or remove from the selected graphics with the ArcMap select graphics cursor.

4. Standard Survey Toolbar Functions

	**Toolbar: eCoastal Survey Tools** **Tool: Profile Generator** Function: The profile generator allows you to cut a profile through a gridded surface. This operation will result with in a point shapefile that is created and added to your map, or a series of profiles if multiple surfaces are cut.		**Toolbar: eCoastal Survey Tools** **Tool: Depth Difference Calculator** Function: The depth difference calculator is a tool that provides you the ability to subtract one raster grid surface from another. The result of this operation is a new raster grid surface that represents the resultant difference in terms of the elevation units of the grid cells.
	**Toolbar: eCoastal Survey Tools** **Tool: Random Point Generator** Function: The random point generator is a tool that provides the capability to create random points within specified criteria. The resulting random points created are used to automatically build a point shapefile.		**Toolbar: eCoastal Survey Tools** **Tool: Survey Manager** Function: The survey loader tool is an application that provides quick and easy access to hydrographic survey data that is stored the Mobile District production geodatabase.
	**Toolbar: eCoastal Survey Tools** **Tool: SI Dredge Viewer** Function: The SI dredge viewer tool is an application that provides quick and easy access to Silent Inspector data.		**Toolbar: eCoastal Survey Tools** **Tool: Surface Generator** Function: The surface generator is a tool that provides the ability to generate a raster grid surface or a TIN surface from an input point feature layer. The Spatial and 3D Analyst extensions are required in order to use this tool.
	**Toolbar: eCoastal Survey Tools** **Tool: 3D Surface Viewer** Function: Provides a viewer for inspecting 3D surface features.		**Toolbar: eCoastal Survey Tools** **Tool: Beach Profile Importer** Function: This application is designed to read the Florida Department of Environmental Protection (FLDEP) profile format and create the beach profile as a shapefile. Beach profile data is available for downloading from the FLDEP.

5. Survey Tools

The survey tools are a collection of tools that allow for the design and analysis of raster grids, TIN surfaces, and the loading and analysis of hydrographic survey data. The tools require the use of the 3D Analyst and Spatial Analyst extensions for ArcMap.

5.1 eCoastal Profile Generator

The profile generator allows you to cut a profile through a gridded surface. This operation will result with in a point shapefile that is created and added to your map, or a series of

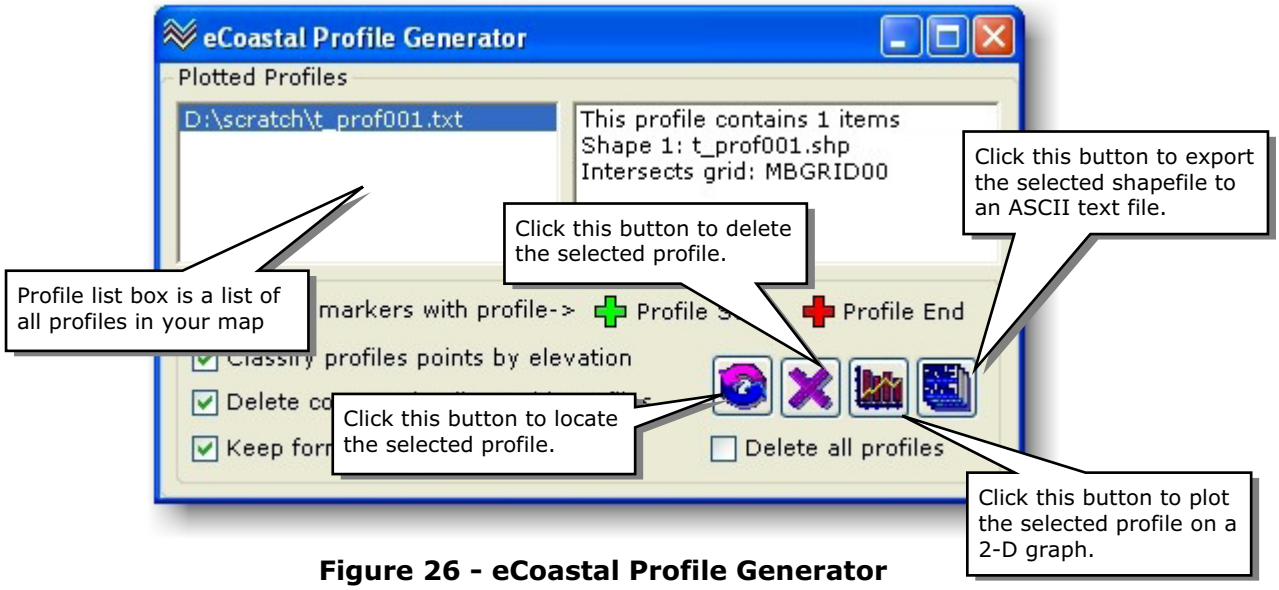


Figure 26 - eCoastal Profile Generator

profiles if multiple surfaces are cut. Each point in the shapefile represents a depth that was dynamically extracted from each grid cell that was intersected by the profile line. The resulting points may then be viewed in a 2-D graph or the data represented in the point shapefile may be exported to a comma-delimited ASCII text file. The profile shown in Figure 27 is a point shapefile with several hundred points (the points are not that discernable in this figure) with the graduated color symbology applied. The profile generator has several options available when interacting with a grid surface as indicated in

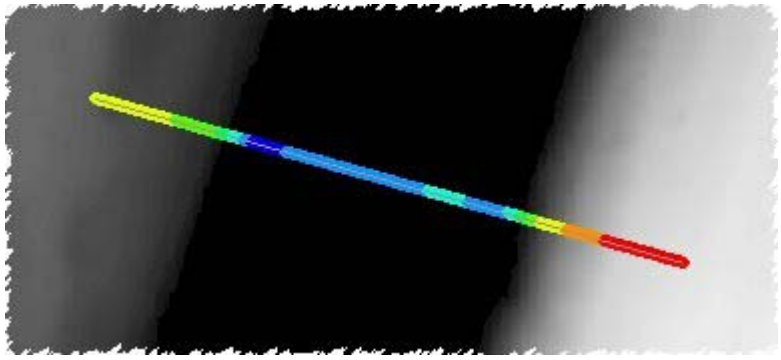


Figure 27 - eCoastal Classified Profile

Figure 28 - eCoastal Profiler (Options).

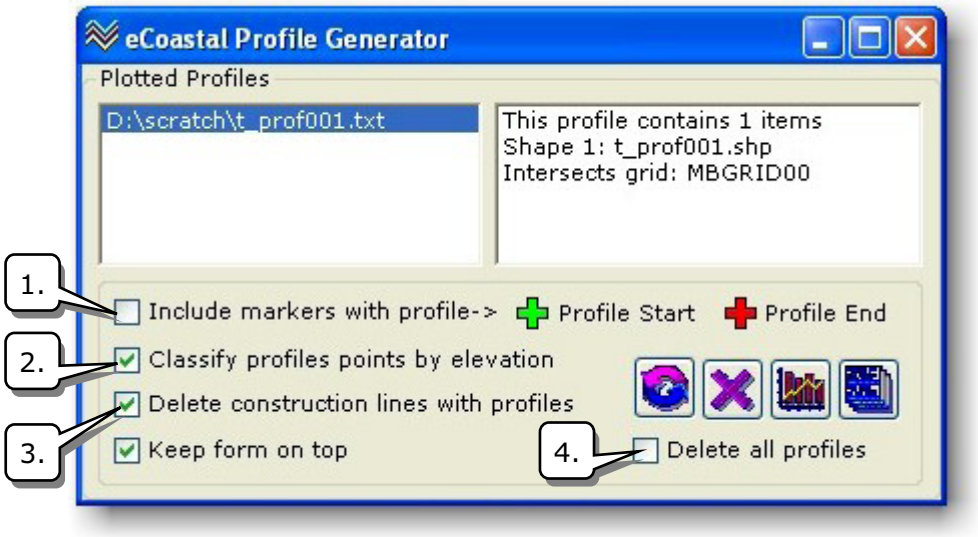


Figure 28 - eCoastal Profiler (Options)

1. When placing a profile line, hereinafter referred to as a construction line, you can include a starting and ending marker at each end of the construction for reference by checking the checkbox indicated by item 1 prior to placing the construction line. Once checked all subsequent construction lines will have the markers. The markers are graphic symbols and can be manually deleted from the map at any time if necessary.

2. You can also automatically classify the generated profile shapefile with graduated color symbology on the depth values contained in the shapefile by checking the checkbox indicated by item 2 prior to placing the construction line. Once checked all subsequent profile shapefiles will be classified.

3. The construction line, the line you draw across a gridded surface with your mouse, can be retained in your map, or automatically deleted along with its profile when you elect to delete a profile. This line is a graphic element and can be manually deleted at any time. If this box is unchecked when you select and delete a profile it will stay in your map.

4. In the case where you may have many profiles in your map and you wish to delete all of them check the checkbox shown by item 4 prior to clicking the delete profile button. This will remove all profile shapefiles from your map and also delete all associated construction lines. IMPORTANT – it will also delete all the underlying datasets from your hard drive that constitute the deleted profile(s).

When placing a construction line with the profile tool, it is perfectly fine to intersect more than one grid surface. As seen in Figure 29 - Overlaid Grid Surfaces a construction line has

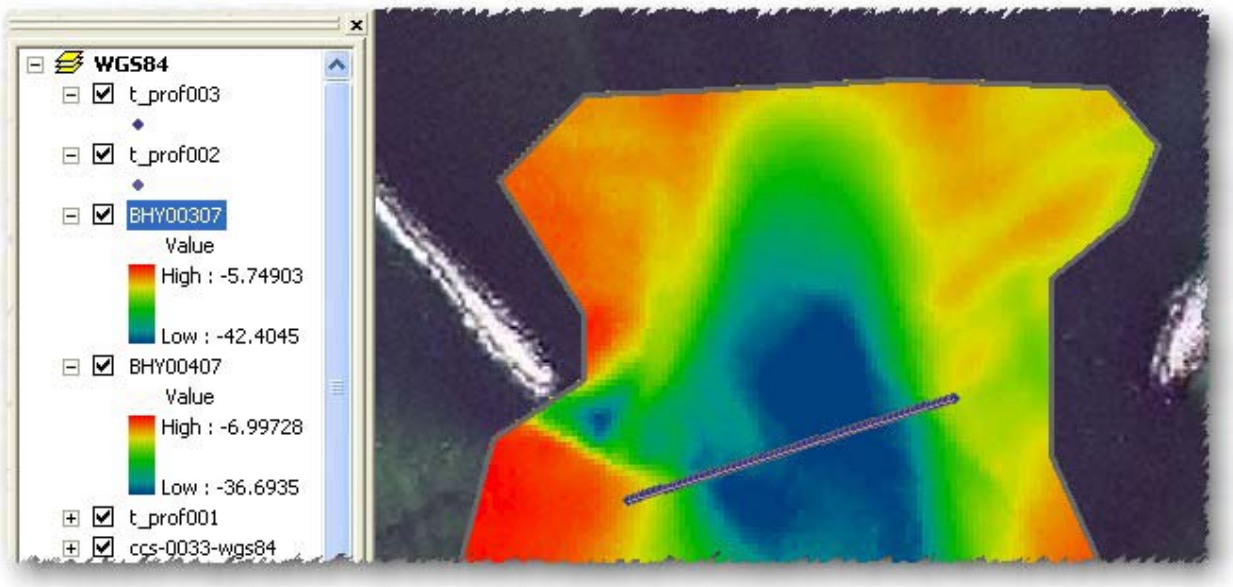


Figure 29 - Overlaid Grid Surfaces

cut two overlying grid surfaces and has generated two profile shapefiles. The resulting shapefiles are also overlaid in this figure. All of the metadata generated when cutting

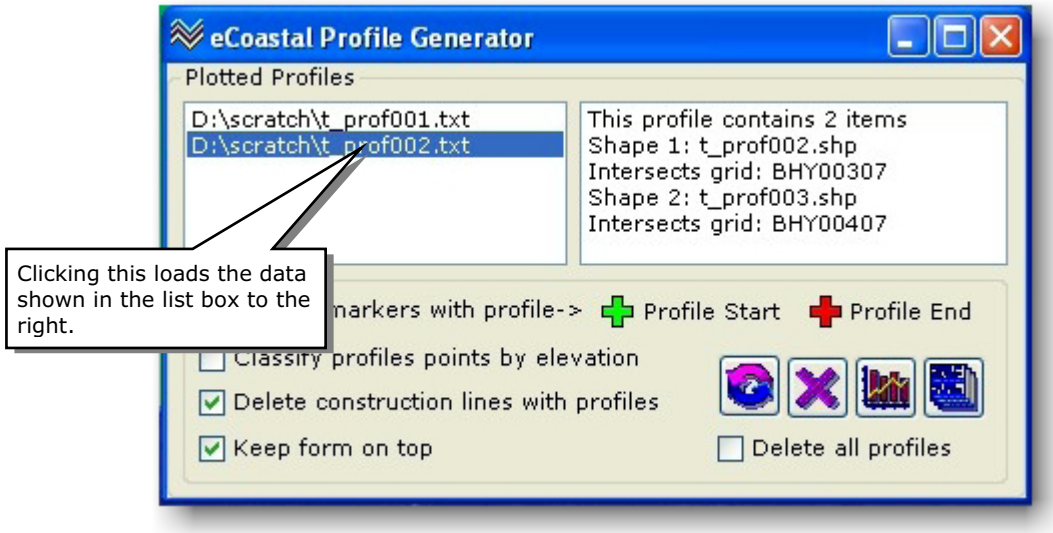


Figure 30 - Multiple Profiles

through one or more grid surfaces is stored in an ASCII text file as indicated in Figure 30 - Multiple Profiles. In the case where two grid surfaces were cut you can see that the selected text shows two profiles. This provides for a convenient mechanism to reload any profile data into your map if that particular set of profile data has been removed from you map. Clicking on any text file in the list box on the left will reload all of the profiles stored in the text file back into your map.

5.1.1 Profile Graphing

One of more profiles can be plotted into a 2D graph for further analysis and viewing. Select

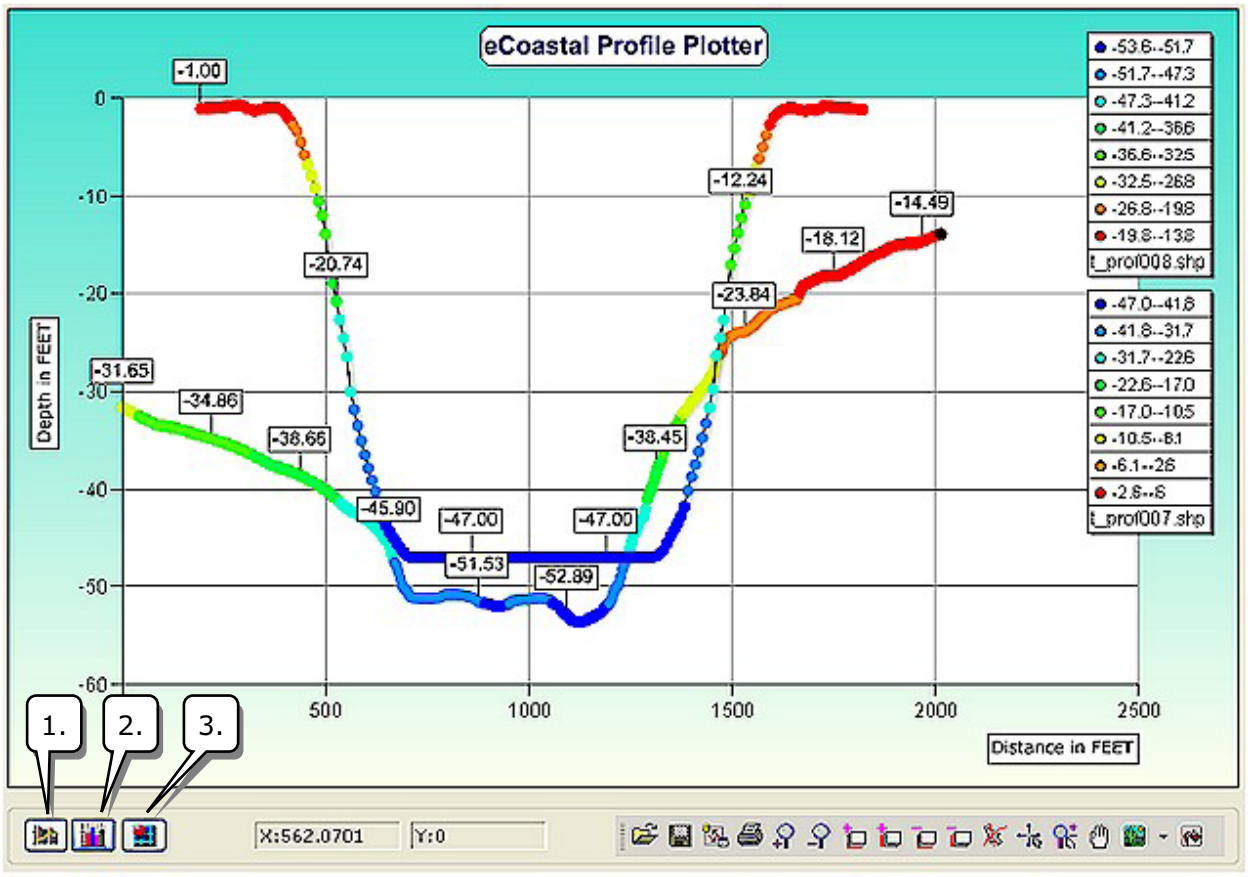


Figure 31 - Profile Plot

an item from the list box shown on the right side of eCoastal Profile Generator dialog box and then click the plot profile button as previously described hereinafter. The profiles defined in the selected item on the left side are then plotted as seen in Figure 31 - Profile Plot. There are several features associated with this form as seen across the bottom. The large toolbar seen on the bottom right contains controls that allow to you modify the look and feel of the chart. These items are zooming in and zooming out, export to image, printing dialog, and other additional features. The profiles plotted in Figure 31 are symbolized with graduated colors and as described previously this is done by checking the classify profile points by elevation checkbox prior to drawing a construction line across the grid surfaces.

1. Clicking this button will calculate the area under the plotted profile in either square feet or square meters as illustrated in Figure 32 - Profile Area under Curve.

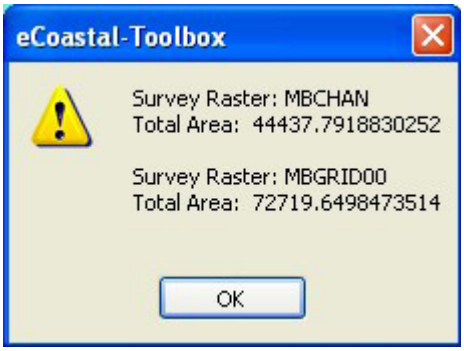


Figure 32 - Profile Area under Curve

2. Clicking this button opens the profile charting options dialog as indicated in Figure 33 - Profile Charting Options Dialog. This dialog gives you the ability to alter the formatting of the appearance of items in the profile graph.

3. Clicking this button opens the legend options dialog as indicated in Figure 34 - Profile Legend Options Dialog. This dialog gives you the ability to later the formatting of the appearance of items for a profile graph legend.

Figure 33 - Profile Charting Options Dialog

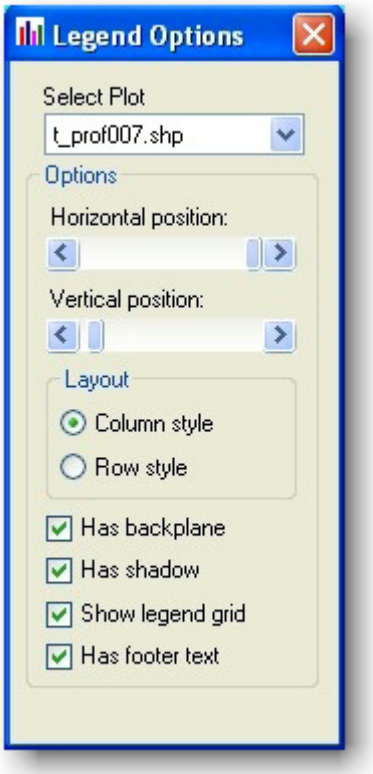


Figure 34 - Profile Legend Options Dialog

5.2 eCoastal Depth Difference Calculator

The depth difference calculator is a tool that provides you the ability to subtract one raster grid surface from another. The result of this operation is a new raster grid surface that represents the resultant difference in terms of the elevation units of the grid cells. The grid is symbolized to indicate where surface material has either accreted or eroded.

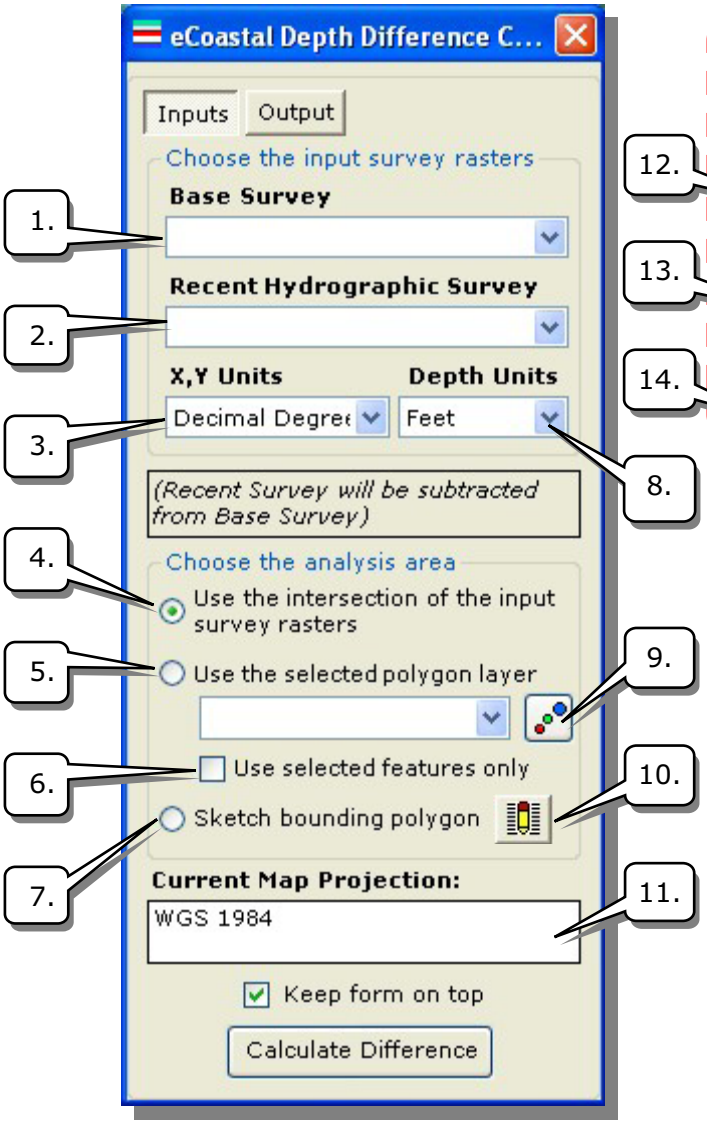


Figure 35 - eCoastal Depth Difference Calculator

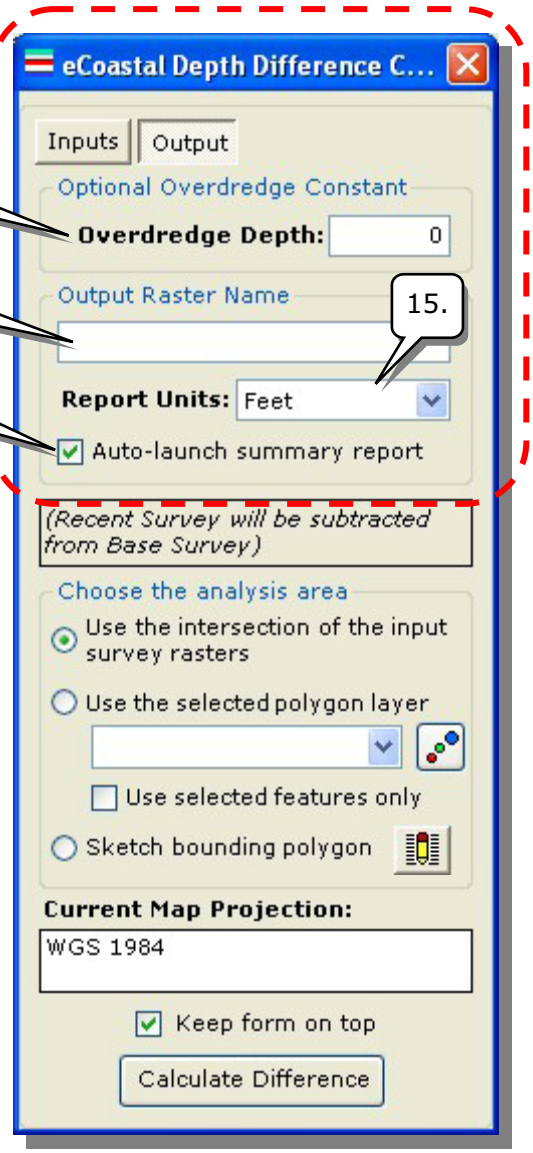


Figure 36 - eCoastal Depth Difference Output

1. Select from this list the base raster grid surface layer.

2. Select from this list a raster grid surface layer to subtract from the base raster grid surface layer.

3. Select from this list the units that represent your maps' linear unit of measurement. This parameter is used in conjunction with the report unit selected in item 15. Together they are used to set a grid surface cell size that is used in the calculation of volume differences. These volumetric numbers are contained in the automated output report.

4. Choose this option to produce a resulting grid surface that represents the intersecting area of the overlying surfaces.

5. Choose from this list an existing polygon layer from your map that is used as an analysis mask (an item that confines the resulting grid surface in size).

6. Check this if the polygon layer you are using has a selected feature and you want to use that selection only for an analysis mask.

7. Choose this option to sketch a polygon graphic in your map. This graphic is used as an analysis mask. To initiate the sketch tool the button identified by item 13 must be depressed. The sketch tool button will automatically reset itself after 20 seconds.

8. Select from this list the depth units.

9. If a polygon layer is selected from the list clicking this button will zoom the map to the extents of the polygon layer.

10. Clicking this button will initiate the sketch function if the option identified by item 7 is selected.

11. Indicates the current map coordinate system.

12. An optional amount of depth can be subtracted from the base surface by entering the value here.

13. An output raster name is required and is limited to 13 characters.

14. Upon completion of the calculation checking this box will launch an output report as shown in XXX.

15. Defines the units of measurement used for all output data contained in the report. This parameter is used in conjunction with the x, y units selected in item 3. Together they are used to set a grid surface cell size that is used in the calculation of volume differences. These volumetric numbers are contained in the automated output report.

The usage of the bounding polygon graphic (analysis mask) is illustrated in Figure 37 -

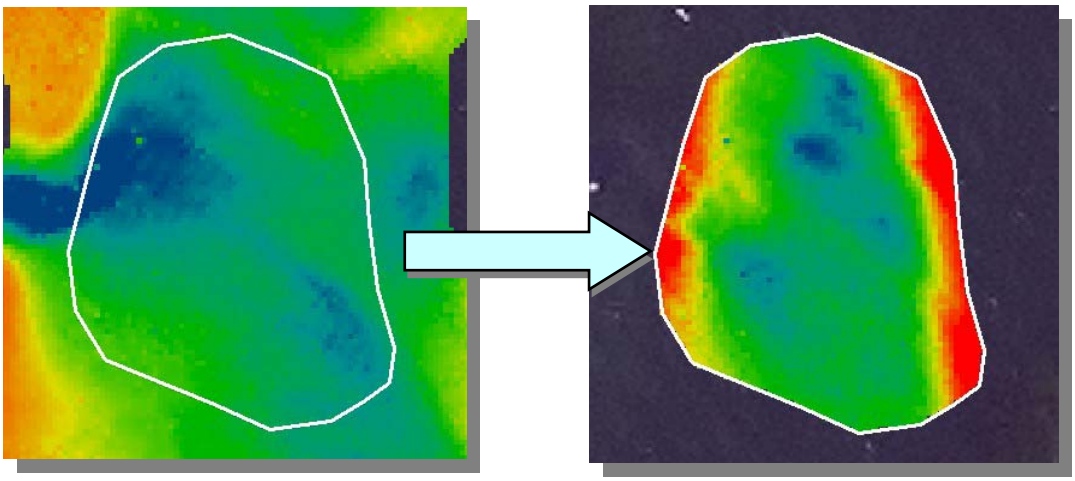


Figure 37 - Analysis Mask Usage

Analysis Mask Usage. The grid surface shown on the right represents the difference between the 2 input surfaces.

5.3 eCoastal Random Point Generator

The random point generator is a tool that provides the capability to create random points within specified criteria. The resulting random points created are used to automatically build a point shapefile.

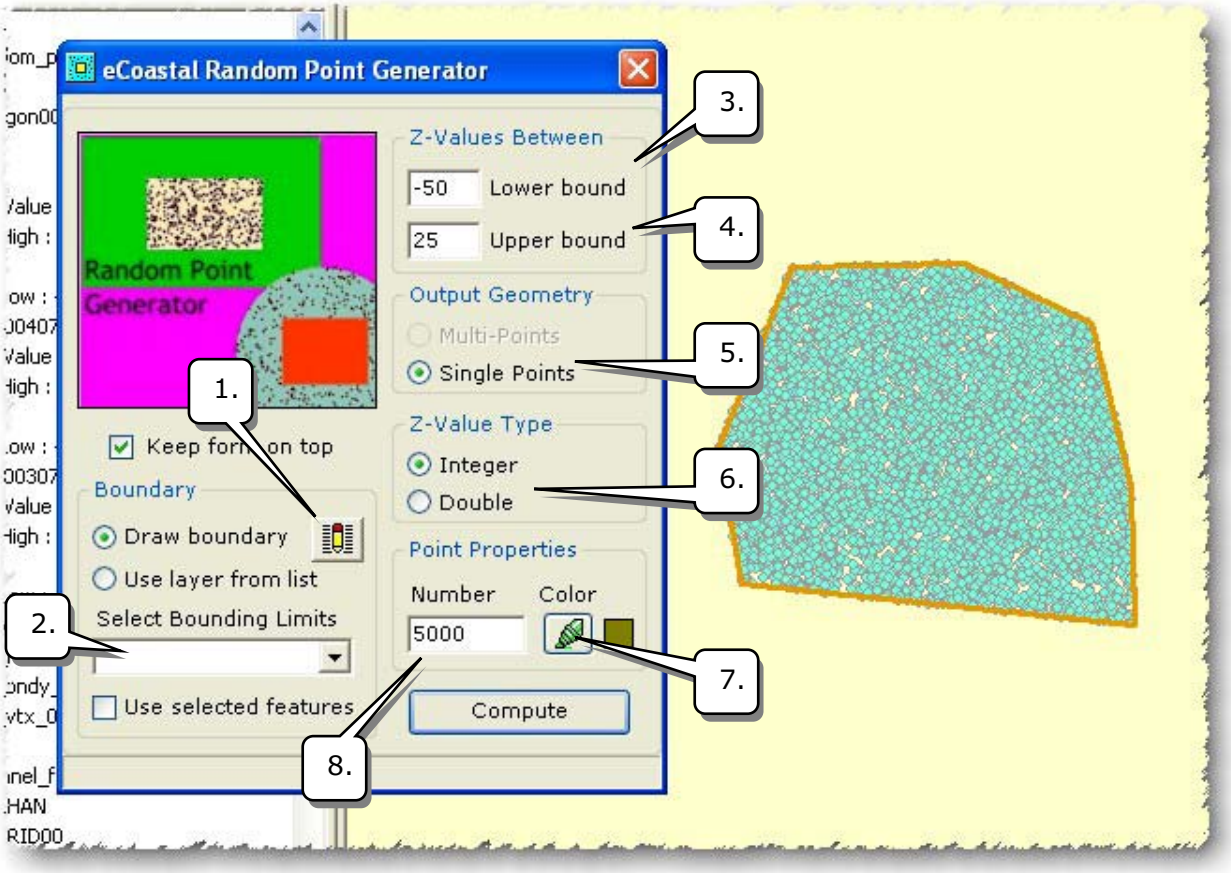


Figure 38 - Random Point Generator

1. Click this button to draw a user-defined polygon on your map. The boundary of this polygon is used to confine the random points as illustrated here.

2. Select from list a polygon shapefile that could be used to confine the random points. If necessary check the box below if your polygon shapefile has a selected record you wish to use.

3. This parameter defines the lower z value for the random number generator.

4. This parameter defines the upper z value for the random point generator.

5. This setting defines the output geometry type for the point shapefile.

6. This setting defines the number type for the z values that is created in the shapefile attribute table.

7. Click this button to open a select color dialog. The color chosen here will be used to define the color of the points in the point shapefile.

8. Enter here the number of points you wish to generate.