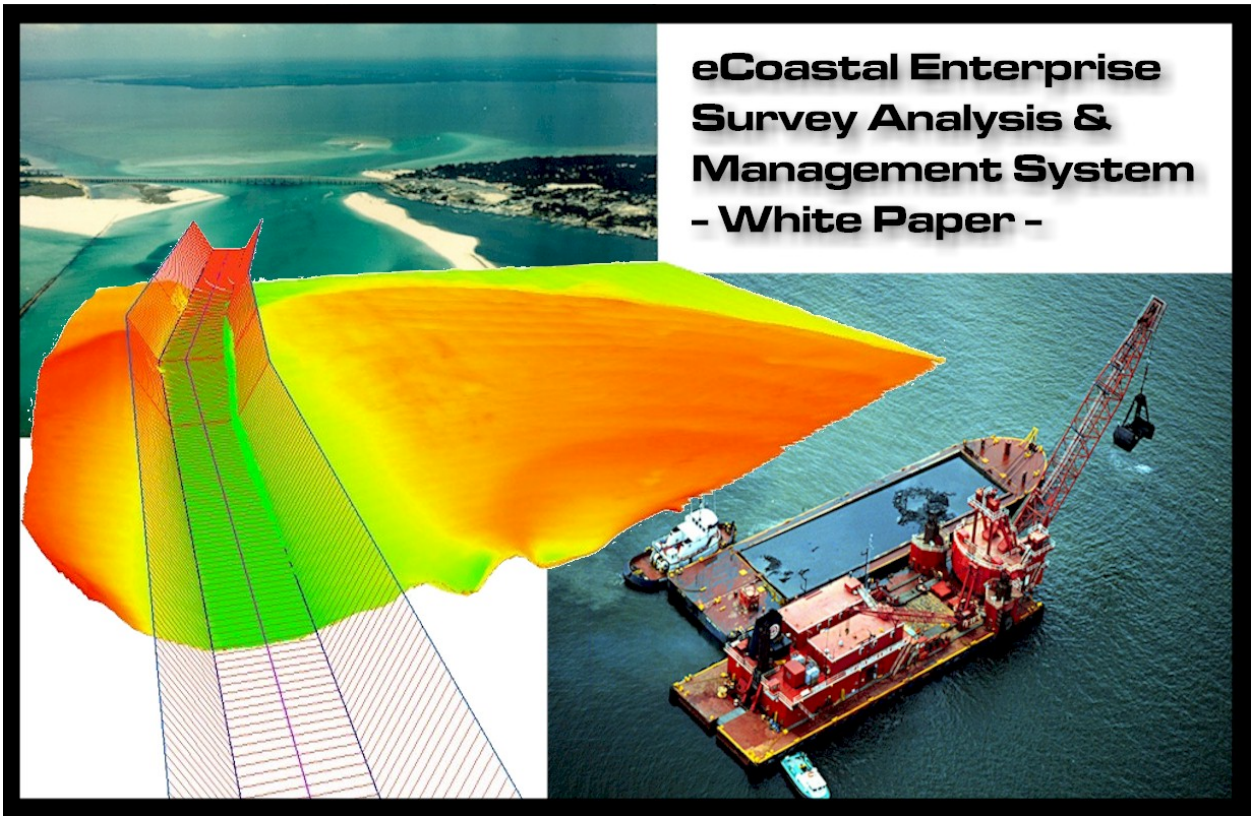

eCoastal Enterprise
Survey Analysis &
Management System
- White Paper -

eCoastal Enterprise Survey Analysis Management System Architecture White Paper

System Created By

Mark D Penton, Greg Dreaper, Irven Ingram, Teresa Parks

US Army Corps of Engineers

CESAM-OP-J, Mobile District

1. Introduction

A primary use of hydrographic surveys supporting navigation operations and maintenance is to determine the quantity of material that has shoaled in a channel and is in need of dredging. These material quantity estimates are used for planning dredging operations and for computing payment volumes. One key aspect in this process is the issue of survey data management. This involves the handling, storing, formatting, and converting of raw ASCII data into useable GIS data layers where analytical methods and visualization techniques are ultimately employed for engineering purposes.

Enterprise GIS (eGIS) is defined as an integrated geospatial technology infrastructure delivering spatial information products, services and standard datasets to all business elements and processes of the organization. The eGIS architecture defines how we deploy and manage geospatial technology within USACE. Generally, GIS architecture can be categorized as hardware, software, network infrastructure, and management practices (which include standards). To the greatest extent possible all geospatial data are stored in an SDSFIE-compliant geodatabase. The Spatial Data Standard (SDS) provides for a standardized grouping of geographically referenced (i.e., geospatial) features (i.e., real-world features or objects depicted graphically on a map at their real-world location (i.e., coordinates).

The eCoastal Survey Analysis & Management System, hereinafter referred to as SAMS, is a system developed by the Mobile District Corps of Engineers that broadly functions as an enterprise GIS application designed to facilitate the collection, storage and retrieval of finished survey products from a GIS. eCoastal is a subset of the eGIS Enterprise concept being developed by the US Army Corps of Engineers that is a framework for developing GIS that manage the coastal environment.

2. eCoastal SAMS Components

The eCoastal SAMS is a distributed GIS architecture designed to efficiently move survey data from the organization collecting the survey data to the GIS where mapping and analysis tools can be used to compute accurate dredging volumes. This includes an SDS compliant database schema to store the data spatially, a web application to provide for project setup and management, an ArcGIS desktop application to process the raw survey ASCII data into the final formatted GIS data layer, and an ArcIMS mapping and analysis component. ArcIMS is ESRI's server based system of delivering GIS data to the end user in a georeferenced map accessible via a web browser such as Internet Explorer.

2.1 eCoastal SAMS Database Model

Non-spatial SAMS data is stored relationally within an enterprise geodatabase. Spatial data is stored within the same database and retrieved through ESRI's ArcSDE (Spatial Database Engine). A database schema diagram has been included and is shown in Appendix A - Architectural Diagrams. If stored spatially, the survey data and the channel framework geometry is stored in SDS compliant 3D feature classes as described by Table 1 - 3D Feature Classes.

Feature Class	Usage
Channel Feature Line	Stores 3D channel feature geometry
Spot Elevation Point	Stores 3D topographic point data.
Elevation Profile Point	Stores 3D elevation profile point data.
Sounding Point	Stores 3D bathymetric point data.

Table 1 - 3D Feature Classes

In addition to the spatial data stored in the geodatabase, business tables are also provided to store additional project data for each survey and are described in Table 2 - SAMS Business Tables. A detailed description of all the schema tables is contained in Appendix C - Tables and Stored Procedures. What is important to point out here is that the system allows for the storage of survey data in an SDE feature class or non-spatially in business tables as columnar data.

Business Tables	Usage
EGIS_TBL_1433_SURVEY_CHANNEL_TEMPLATE	Stores template data about each station line for every channel stored in the geodatabase. This includes the depth, toe line distances, side slope angles, and centerline x and y coordinates. These data are used to plot the ideal channel template in applications.
EGIS_TBL_1433_SURVEY_CLASSIFICATION_REFERENCE	Stores data about the various types of survey available. Used as look-up table in the applications.
EGIS_TBL_1433_SURVEY_ID	Stores unique survey id with project id for each survey.
EGIS_TBL_1433_SURVEY_INVENTORY_NAMES	This is the primary stable in the schema. Stores project data about each survey. All other tables are related to this table.
EGIS_TBL_1433_SURVEY_LIMITS	Stores the x and y coordinate of each vertex of the bounding polygon of a survey. This data establishes the limits of each survey.
EGIS_TBL_1433_SURVEY_PREPROCESSED_RAW_DATA	Stores the initial survey ASCII data prior to the processing that must be done to load the survey into its appropriate SDE feature layer or survey business table.

EGIS_TBL_1433_SURVEY_SERVERCONFIG	Stores information about application settings such as database connection strings and working directories.
EGIS_TBL_1433_SURVEY_SOUNDING_POINT	Stores processed survey data. Typically bathymetric for this table. This data is stored non-spatially (ArcSDE not required).
EGIS_TBL_1433_SURVEY_ELEVATION_PROFILE_POINT	Stores processed survey data. Typically both bathymetric and topographic profile data for this table. This data is stored non-spatially (ArcSDE not required).
EGIS_TBL_1433_SURVEY_SPOT_ELEVATION_POINT	Stores processed survey data. Typically topographic for this table. This data is stored non-spatially (ArcSDE not required).

Table 2 - SAMS Business Tables

2.1.1 Stored Procedures

Much of the data retrieval and data editing is performed by stored procedures. Stored procedures are typically a set of written instructions stored in the database that typically perform some sort of action such as a selection or update of data and are typically called from an application. A detailed description of all stored procedures is contained in Appendix C - Tables and Stored Procedures.

2.2 SAMS Workflow

The workflow of SAMS is a fairly complex undertaking. The steps described hereinafter will provide detail on the various steps required to take the data from the “boat to the database”. Figure 17 - Survey Workflow provides a graphical interpretation of the workflow need to fully process a survey and ultimately have it loaded into the eCoastal enterprise database.

2.3 eCoastal SAMS Web Application

The eCoastal SAMS web application, as shown in Figure 1 - eCoastal Survey Management, is the application that initially establishes the existence of a new survey in the system. The

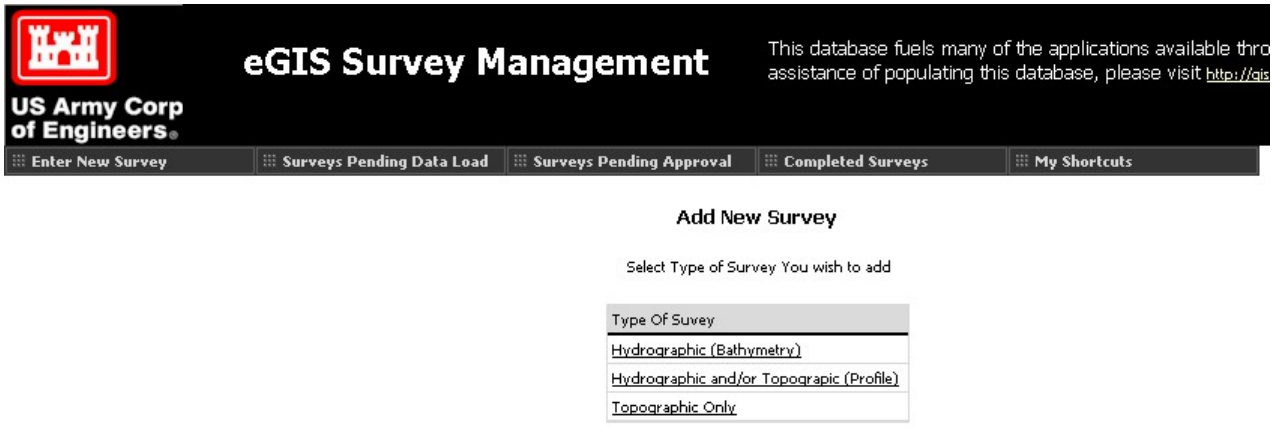


Figure 1 - eCoastal Survey Management

user can add or, once a survey is loaded, edit existing survey project information. Initially an authorized user would establish a new survey into the system. This involves as a minimum selecting the type of survey and providing the minimum required information. Types of surveys allowed are Bathymetric, Profile, and Topographic. Unique survey ids are

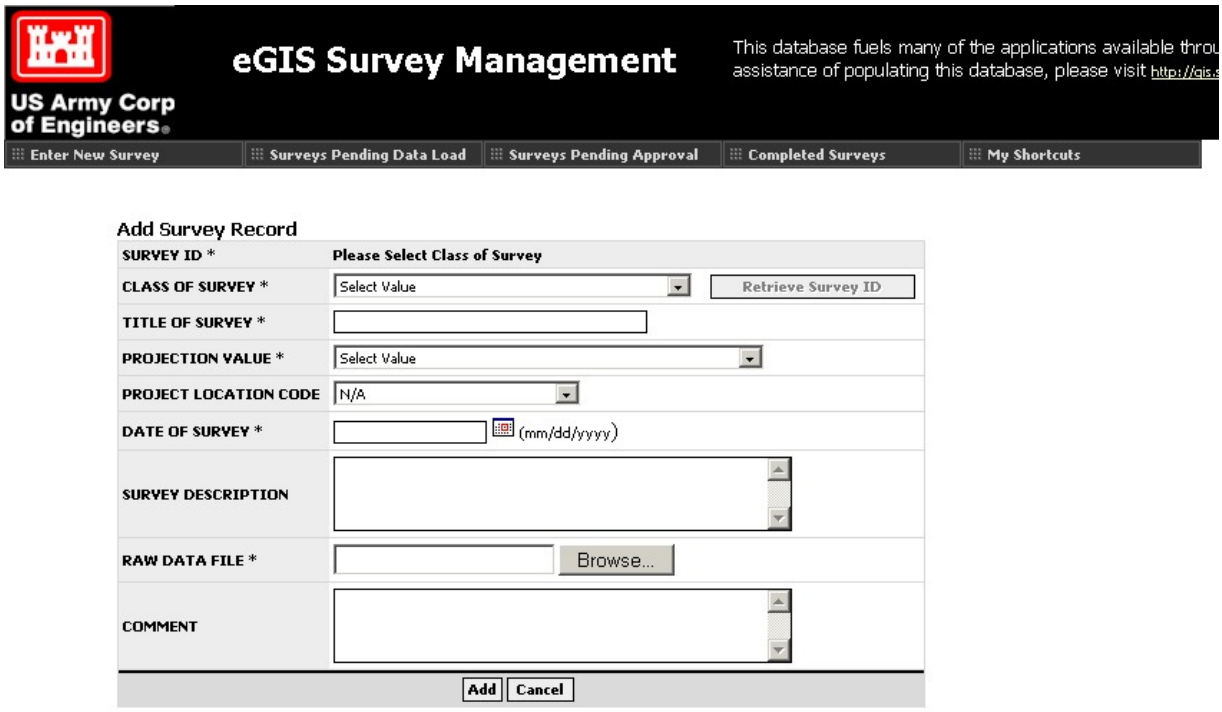


Figure 2 - eCoastal Add Survey

automatically established for each new survey based on the class of survey selected by the user. The user fills out the fields shown in Figure 2 - eCoastal Add Survey. Fields marked

with the asterisk are mandatory fields. It is at this point the user selects and uploads the initial ASCII data for a survey into the database. Processing on the desktop with ArcGIS cannot proceed until the survey project data is properly established and the survey ASCII

Figure 3 - Pending Processing

data is uploaded to the enterprise database. After the raw data file has been successfully uploaded into the enterprise database the survey is marked as a Survey Pending Data Load. This simply means that the survey is ready to be processed by ArcGIS on the desktop. The Survey Pending Data Load page is shown in Figure 3 - Pending Processing. This page is

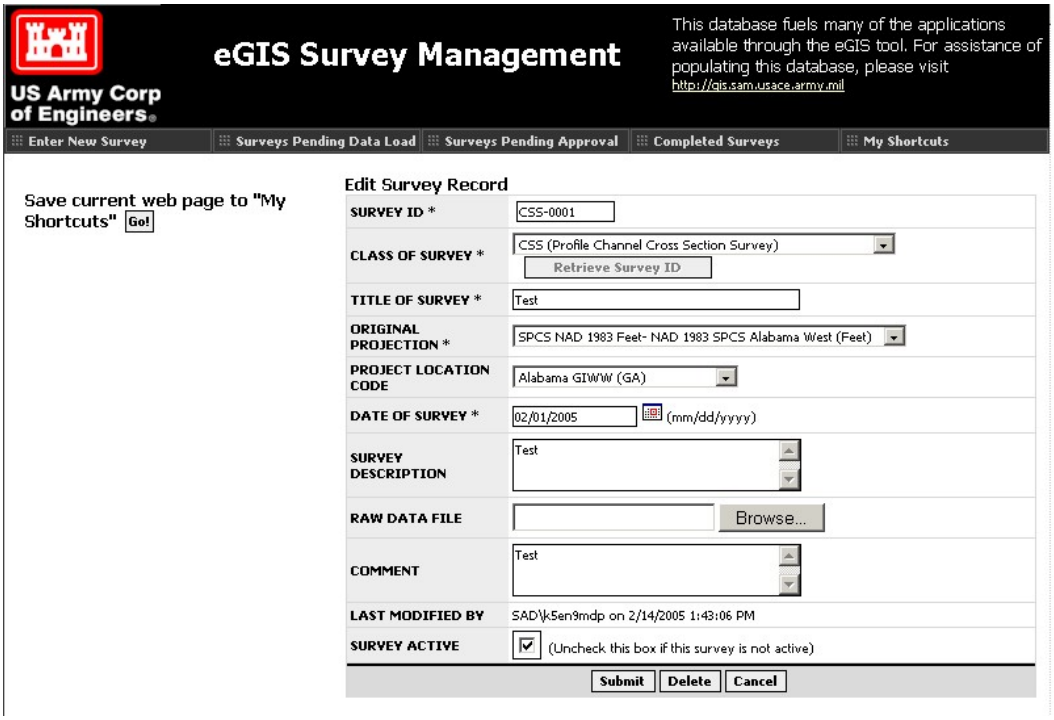


Figure 4 - eCoastal Edit Survey

accessible by clicking the Surveys Pending Data Load menu bar item as seen in Figure 1 - eCoastal Survey Management. At this point the survey project metadata is still editable and can be changed by clicking the survey id hyperlink shown in Figure 3 - Pending Processing. After clicking the survey id hyperlink, survey project data as shown in Figure 4 - eCoastal Edit Survey may be changed and the raw survey data may also be reloaded at this point if necessary.

2.4 eCoastal SAMS ArcMap Application

Once the survey project data has been established and the raw survey data has been uploaded into the enterprise database the survey is now ready for processing by the eCoastal SAMS ArcGIS desktop application as shown in Figure 5 - ArcMap Survey Application. This application takes the raw survey data and processes the survey data for final storage in the appropriate SDS compliant feature class or in the proper survey business table in the enterprise geodatabase. During this process the data is reprojected to

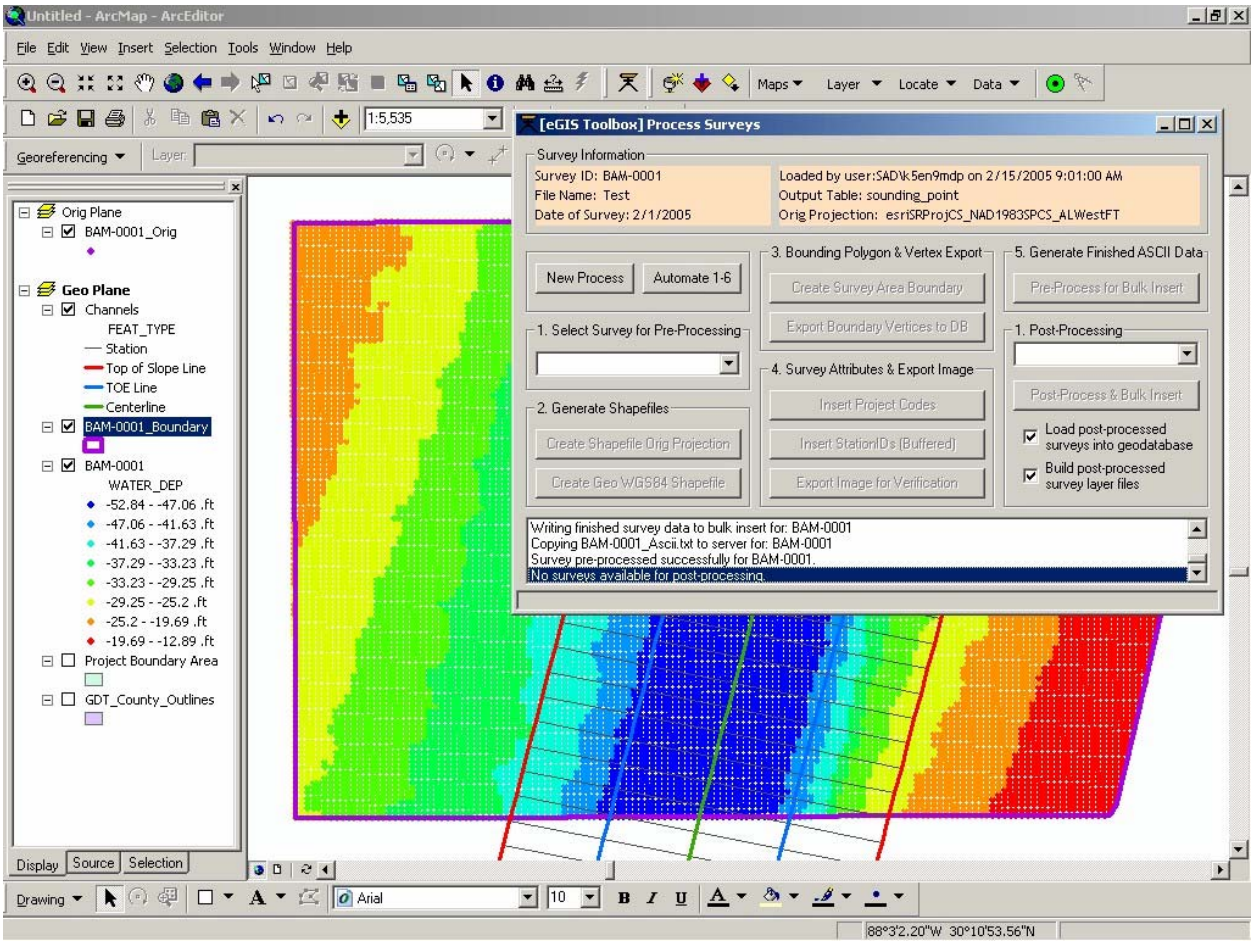


Figure 5 - ArcMap Survey Application

geographic WGS84 coordinates and properly attributed. Supporting business tables are properly populated to support data access and other engineering analysis applications. The processing of the survey data in ArcMap can be performed interactively by a user or as an unattended process on a dedicated GIS workstation. The dedicated workstation would require access to an ArcEditor license if the loading of finished survey data into an ArcSDE feature class were required.

The ArcMap survey application is broken down into two distinct operations, a pre-processing routine and a post-processing routine. The pre-processing routine takes the raw survey data up to the point where it is ready to be loaded into the appropriate survey business table or SDE feature class table. At this point the survey exists as a finished shapefile on the ArcGIS

workstation. The post-processing routine takes the finished shapefile and loads it into the ArcSDE feature class or loads the shapefile attributes into the survey business table. Prior to final loading into the enterprise database the survey must be approved before the ArcMap application is able to accomplish final loading. As shown in Figure 6 - Survey Approval Page the survey is either approved or disapproved at this point.

The survey shown on the approval page is simply a snapshot of the map taken at the conclusion of a successful pre-processing routine. Through visual inspection alone is the survey usually approved or disapproved. One exception to the process of approving or disapproving surveys through visual inspection is the internal accuracy test performed on certain profile surveys. In order to have the capability to view survey points in a profile

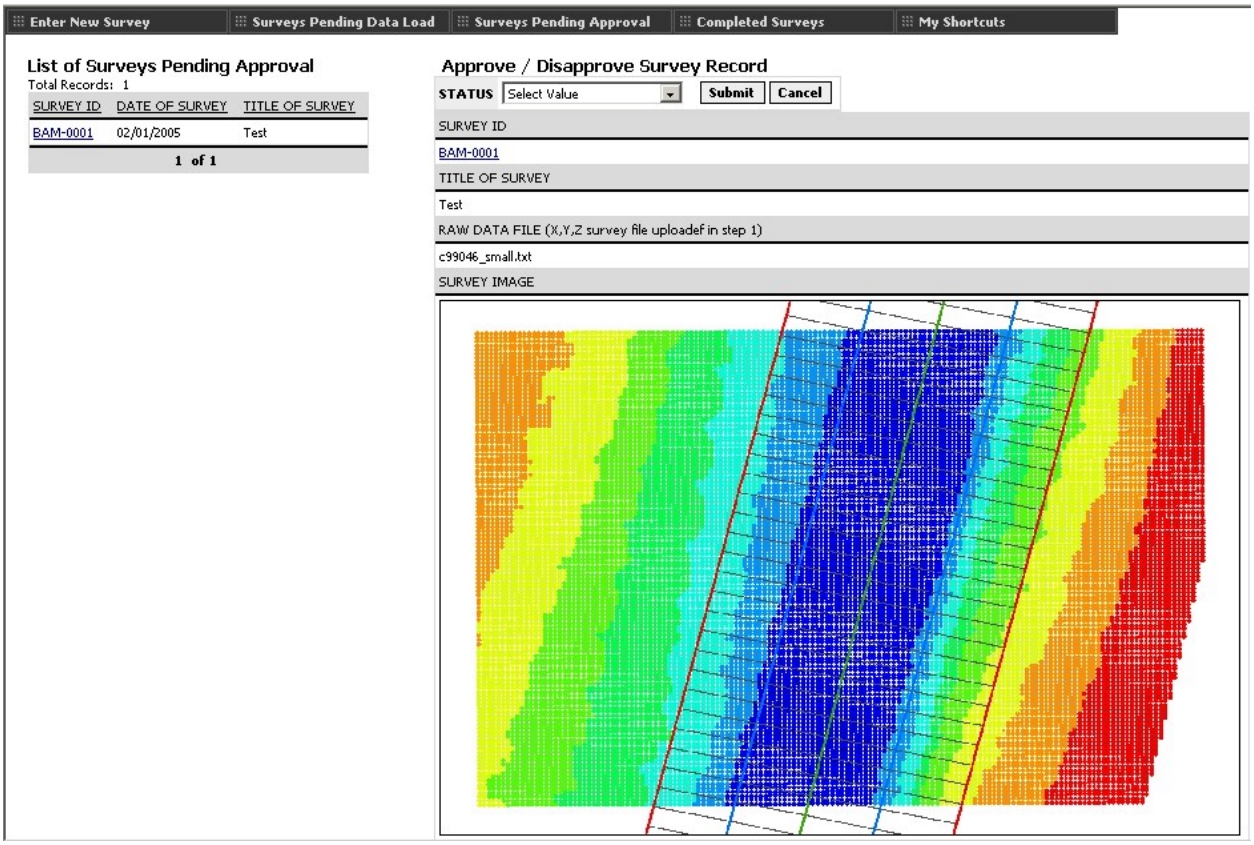


Figure 6 - Survey Approval Page

view, a set of survey points must be associated with a specific station line so that these points and the station line can be plotted in profile view. This association of survey points to station lines also allows volumetric calculations base on average end area procedures.

In the case of multi-beam hydrographic or bathymetric LIDAR surveys where a large number of points are collected over a large area, such as the survey shown in Figure 6 the SAMS process will step through each station line contained by the survey and by buffering each station line 10 feet on both sides, a slice of the points is selected and associated with that specific station line. Figure 7 illustrates the application of the 10 foot buffers (shown in blue) by each station line effectively slicing a section of survey points for each station line from a multi-beam survey.

For more traditional bathymetric profile surveys, such as the on shown in Figure 8 - Channel Profile Survey, the SAMS process, as stated previously, applies an accuracy test to these types of surveys. In order to assign survey points a station line id, the application must

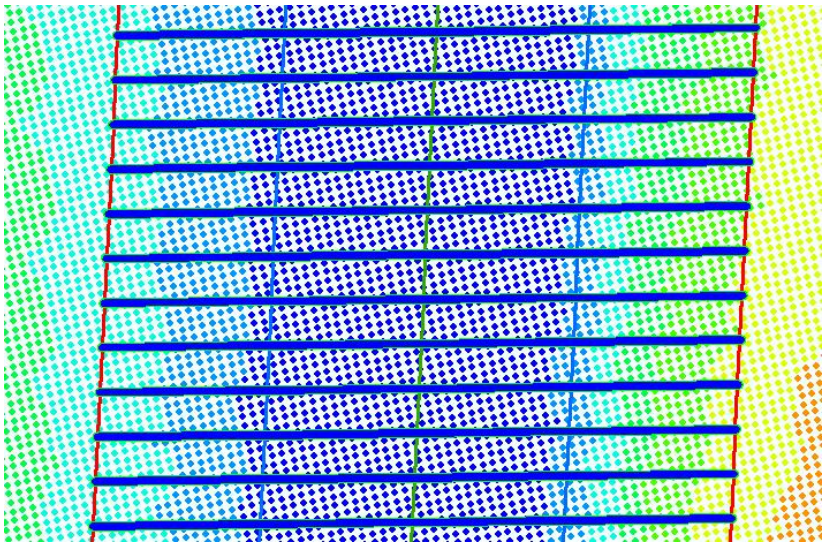


Figure 7 - Buffered Station Lines

accomplish this through the use of certain geo-processing techniques. Notice that the application of the 10 foot station line buffer in Figure 8 does not necessarily capture all the survey points across the profile. This is obviously an indication that many of the survey profile points lie further than 10 feet from a station line. SAMS makes an attempt to quantify a percentage of the survey points capable of producing a usable channel profile and

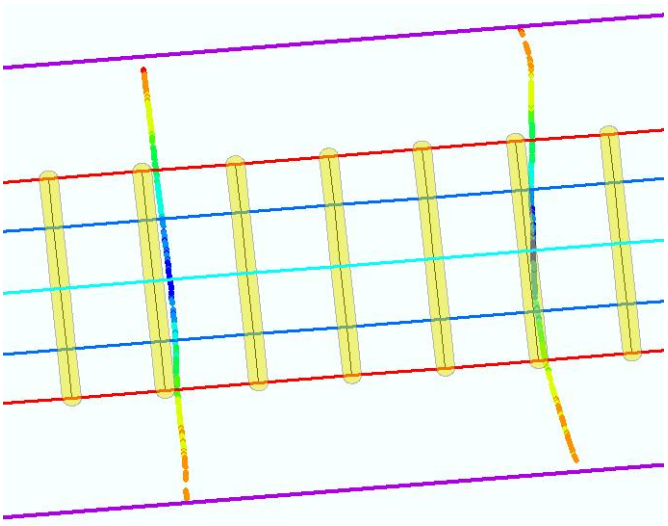


Figure 8 - Channel Profile Survey

applies the following rule. At least 70% percent of the survey points lying between the channel top of slopes lines (shown in red) in Figure 8 must be within 10 feet of either side of a station line.

To accomplish this calculation the channel centerline is buffered to match the average width of the station lines as measured from top of slope to top of slope across the channel. The buffer, shown by the green shading in Figure 9 - Profile Survey Accuracy Test is used to select only the survey points in the buffer, discarding what essentially lies outside of the top of slope lines. Please note here that the points outside of the top of slope lines are not thrown away, they are simply not assigned a station id.

As the survey points are selected via the station line buffers shown in Figure 9 a running total of these points is kept. At the conclusion of the station line buffering process the total

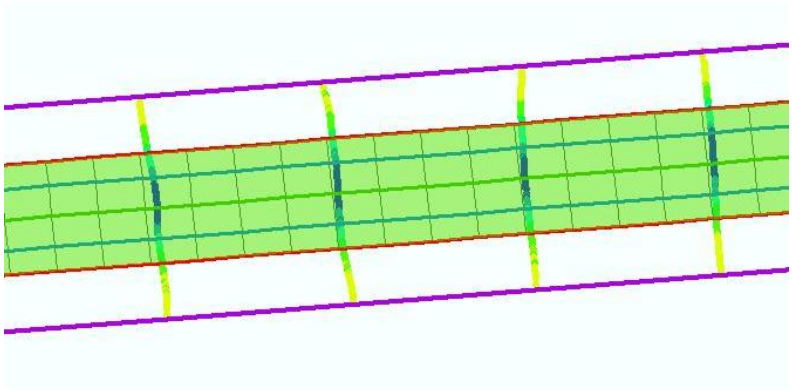


Figure 9 - Profile Survey Accuracy Test

points selected by the centerline buffer is divided into the running total maintained by the station line buffering to produce the final percentage. If the 70% figure is not attainable the processing is halted and the system e-mails authorized users of this condition.

The classes of bathymetric profile surveys submitted to this accuracy test are shown in Table 3 - Accuracy Test Profile Surveys below.

Profile Surveys Verified With Accuracy Test	
Class	**Description**
ADC	Profile After Dredge Channel Cross Section Survey
BDC	Profile Before Dredge Channel Cross Section Survey
CCS	Profile Channel Condition Cross Section Survey
CSS	Profile Channel Cross Section Survey
DCC	Profile After Dredge Channel Condition Survey

Table 3 - Accuracy Test Profile Surveys

2.5 eCoastal Channel Framework

Integral to the eCoastal SAMS is the fundamental requirement that the channel framework is stored in an SDE feature class as a collection of 3D lines. ArcGIS denotes this geometry as being "z-aware". For points this would be a pointZ shape file and for lines this would be a polylineZ shape file. The polylines include top of slope lines, toe lines, channel centerlines, and channel stationing. Channels are designed as 3D entities in CADD and are processed (attributed) in ArcMap to produce the desired shapefile. This shapefile is then loaded into the channel feature class in the enterprise geodatabase.

One key aspect of the channel framework is the fact that each individual station line in the entire system is uniquely identified with a channel station identifier. For example, MB_02300+00 identifies the station line for station 02300+00 on the Mobile Bar Channel, where MB is the channel code for this particular channel. This system eliminates redundant stationing designations in the system.

In addition to the 3D channel feature class, information about the channel geometry is extracted from the polylineZ shape file and stored as business data in the survey channel template table in the enterprise geodatabase as described in Table 4 - Survey Channel Template.

Survey Channel Template Parameters	
Field Name	**Field Type**
CHANNEL_ID	Unique Channel ID.
STATION_ID	Unique station ID.
CENTERX	Longitude of intersection of channel centerline and channel station line.
CENTERY	Latitude of intersection of channel centerline and channel station line.
TOE1X	Longitude of the intersection of a channel station line with the first channel toe line.
TOE1Y	Latitude of the intersection of a channel station line with the first channel toe line.
TOE1_WIDTH	Distance from the channel centerline to the intersection of a line station with the first toe line.
TOE2X	Longitude of the intersection of a channel station line with the second channel toe line.
TOE2Y	Latitude of the intersection of a channel station line with the second channel toe line.
TOE2_WIDTH	Distance from the channel centerline to the intersection of a line station with the second toe line.
DEPTH	Authorized depth of channel at the designated station line.
SIDE_SLOPE	The angle of the side slopes at a given station line.

Table 4 - Survey Channel Template

The design channel template represents the authorized channel design and allows for a set of parameters that can be used in application development and engineering analysis. The

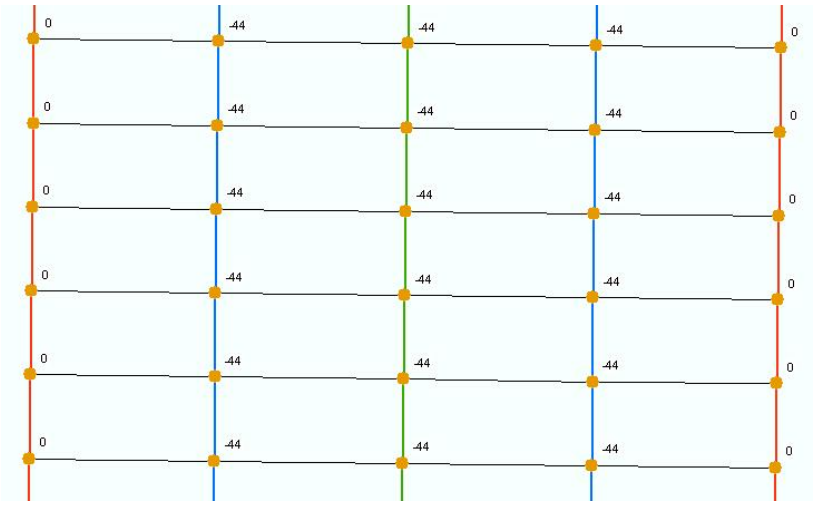


Figure 10 - 3D Channel Stationing

process used to create the 3D channel geometry is a somewhat complex procedure. Appendix B – DGN to 3D Geometry Conversion is provided to illustrate the steps required for processing the 3D channel cadd file into the 3D shape file. Figure 10 - 3D Channel Stationing illustrates the 3D channel stationing in plan view.

Notice the orange dots overlaid on the channel stationing. These are actually 3D (z-aware) points that were extracted by an ArcGIS script that was run against the channel station lines. The channel station lines, being polylineZ entities, can have their vertices extracted producing a pointZ shape file made from their coordinates. These vertices, being 3D, also have an associated z-value representing depth. Figure 11 - 3D Perspective Channel Stationing provides a view of the channel stationing overlaid with the pointZ shape file constructed from the extracted station line vertices.

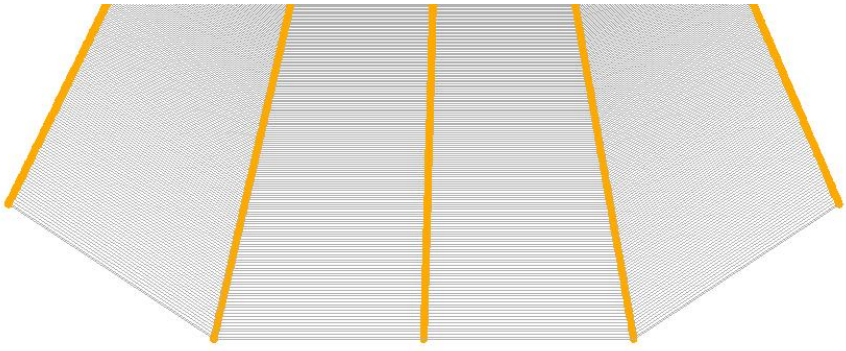


Figure 11 - 3D Perspective Channel Stationing

CHAN_ID	STATION_ID	CENTERX	CENTERY	TOE1X	TOE1Y	TOE1_ WIDTH	SIDE_ SLOPE	DEPTH
PB	PB_PB_00230+00	-88.50577	30.22339	-88.50577	30.22339	304	0.33	44
PB	PB_PB_00231+00	-88.50586	30.22313	-88.50586	30.22313	301	0.33	44
PB	PB_PB_00232+00	-88.50598	30.22288	-88.50598	30.22288	300	0.33	44

Table 5 - Survey Channel Template Parameters

Table 5 - Survey Channel Template Parameters shows most of the parameters that are loaded into the database. TOE2 parameters have been omitted from the table to conserve space. The steps required to generate this data are detailed as follows:

- The finished shape file created from the procedures outlined in Appendix B – DGN to 3D Geometry Conversion is reprojected to the appropriate WGS84 UTM zone and loaded into ArcGIS.

- A script is run against this shape file to produce an ASCII text file containing the data shown in Table 5 - Survey Channel Template Parameters. The script selects all of the station lines and steps through the vertices of each station line.

- Using the vertices, the script calculates the TOE1_WIDTH and TOE2_WIDTH distances in feet. The SIDE_SLOPE is calculated. The intersections of the station line with the channel centerline, first toe line, and second toe line are calculated and converted to WGS84 geographic coordinates. The depth is extracted from the point of intersection of the centerline and a station line. Lastly, the channel code and the station id are extracted from the station line. This process is done at each station line in the channel.

Figure 12 - 3D Channel Template and 3D Survey illustrates the overlay of the 3D channel framework and a 3D survey along the channel. Notice the shoaling seen near the toe line on the right side of the channel as indicated by the green shading. This image was produced by the overlay of the 3D channel framework and a z-aware (3D) shapefile into ArcGIS 3D Analyst.

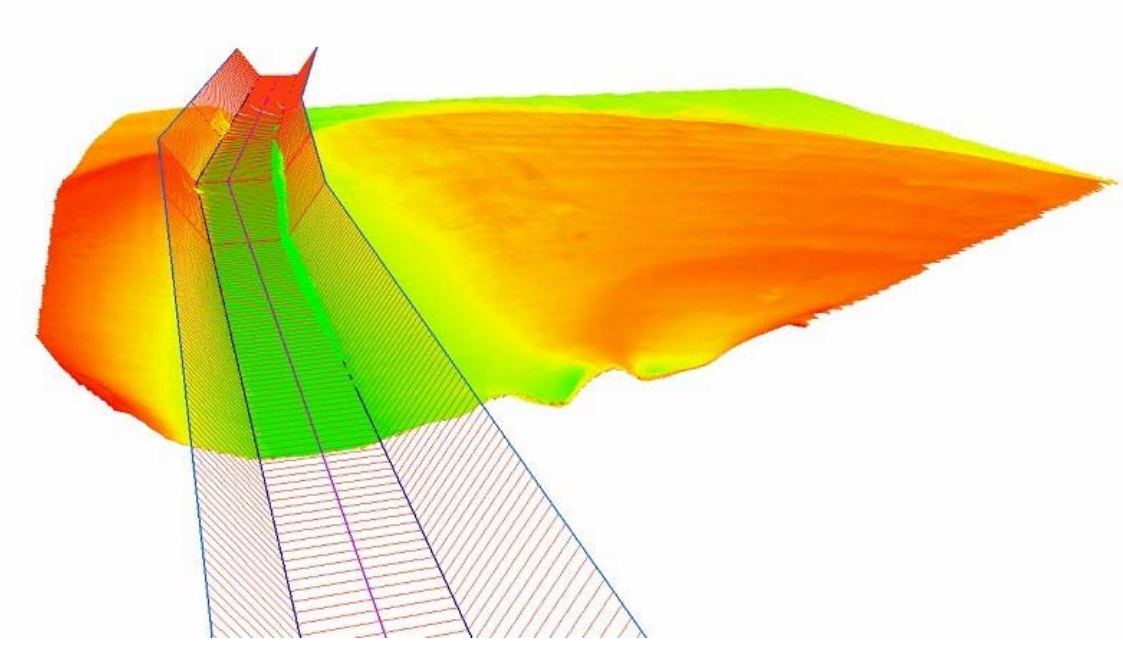


Figure 12 - 3D Channel Template and 3D Survey

3. eCoastal Mapping Services

Another key aspect of the eCoastal enterprise is the requirement to share centralized data with remote users or users who are casual viewers of the data. The data delivery pipeline in this case is the Internet. ArcIMS is a server based set of scalable components that allow for the sharing of GIS datasets via the Internet. These datasets are referenced into mapping

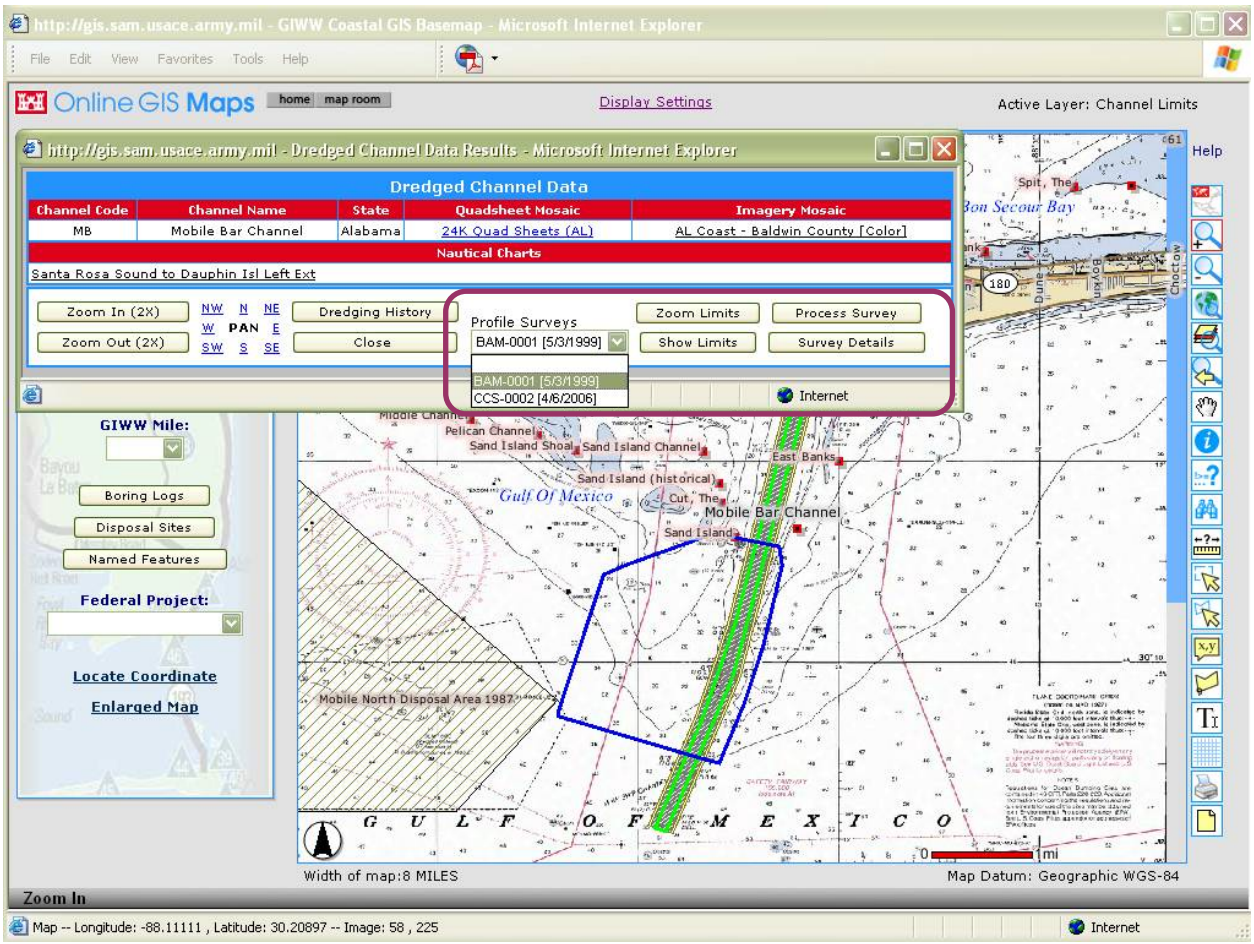


Figure 13 - eCoastal ArcIMS Interface

services created by ArcIMS and can be viewed interactively using a web browser. The eCoastal SAMS provides tools to interact with the 3D channel framework and the survey data through an interactive channel profile tool hereinafter referred to as the ArcIMS Profiler Tool. Figure 13 - eCoastal ArcIMS Interface is the web-mapping interface to the GIS data served by ArcIMS. This particular view shows the channel with an overlay of the survey limits of an existing survey denoted by the blue polygon. Contained in the purple bordered area in Figure 13 are the tools to initiate access to the ArcIMS Profiler Tool.

- Zoom Limits – Zooms the user to the bounding extent of the selected survey.
- Show Limits – Places the survey limits on the map symbolized with the blue border.
- Survey Details – Retrieves some statistical data about the specific survey as shown in Figure 14 - Survey Details.

- Process Survey – Starts the ArcIMS Profiler Tool as shown in Figure 15 - eCoastal Channel Profiler.

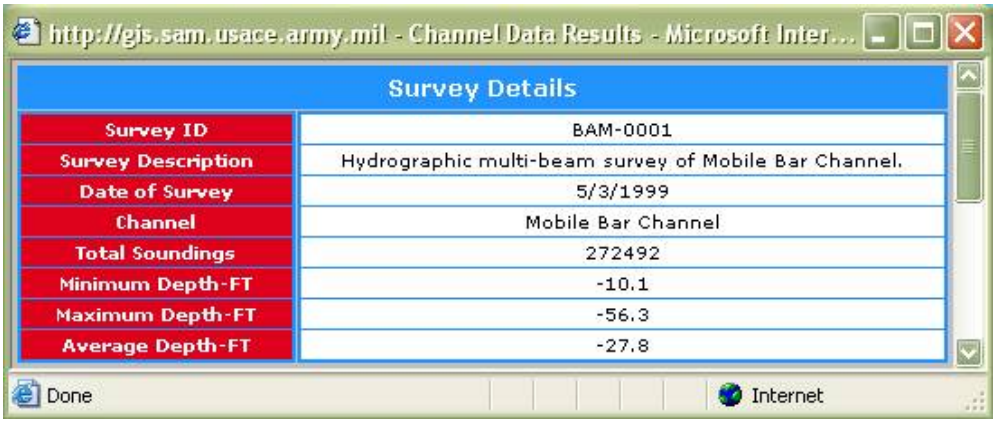


Figure 14 - Survey Details

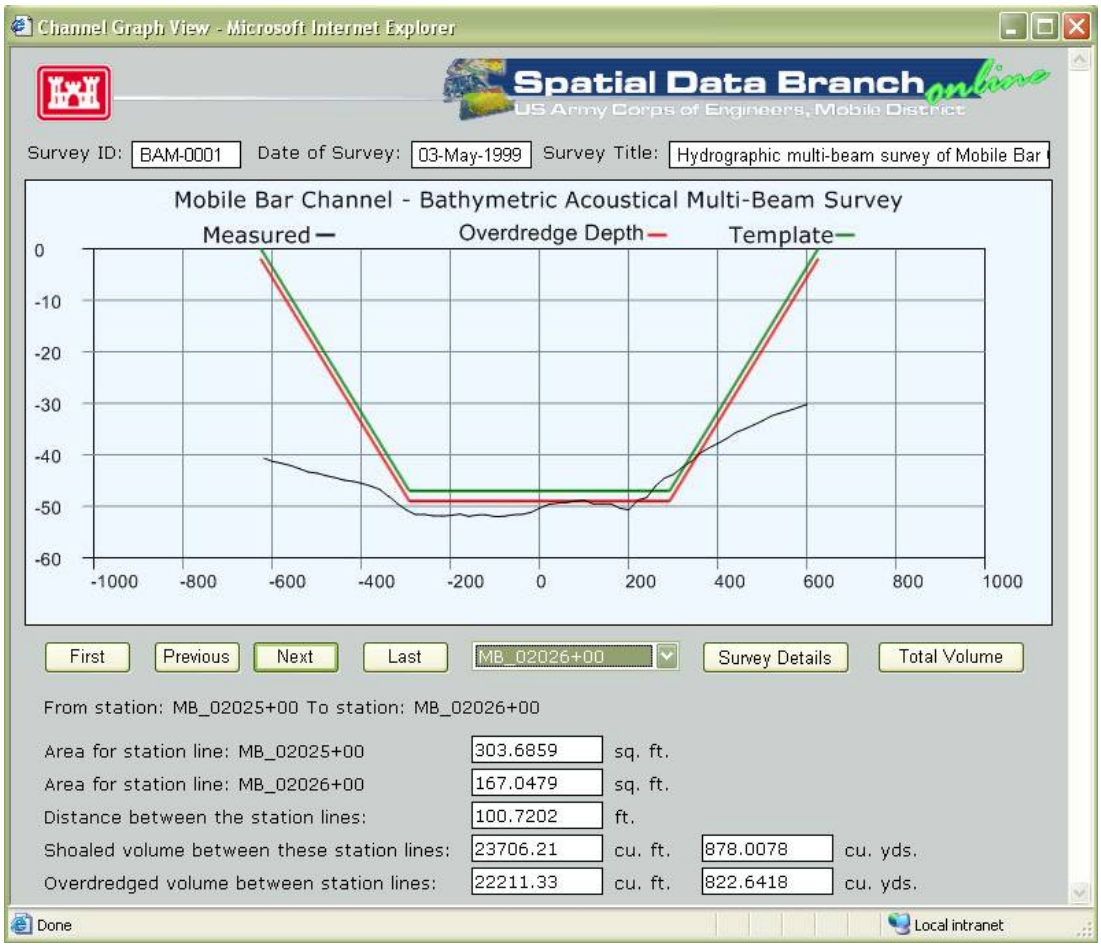


Figure 15 - eCoastal Channel Profiler

The Profiler tool allows a user to overlay a profile of a set survey data against the channel design template. The plot of a station line on the graph in Figure 15, as indicated by the

green line is generated on the fly from data stored in the Survey Channel Template business table as hereinbefore mentioned in this document. The profile plot of the survey data for this station line is pulled from the Survey Sounding Point, or the Survey Elevation Profile Point business table. Optionally the data can be pulled from the Sounding Point or the Elevation Profile Point SDE feature class. The ArcIMS Profiler Tool has the capability to calculate volumes between any two consecutive stations based on average end area methodology outlined in Chapter 15 Dredge Measurement and Payment Volume Computations of EM 1110-2-1003 Engineering and Design – Hydrographic Surveying. Total volume for the survey can also be calculated and printed in report form. It should be emphasized that use of this tool requires nothing but Internet Explorer.

4. eCoastal SAMS Business Process (TBD)

Potential benefits and enhancements

- Delivery of survey points bypassing ArcSDE to external customers
- Delivery of an updated channel framework to external customers such as NOAA

5. Appendix A - Architectural Diagrams

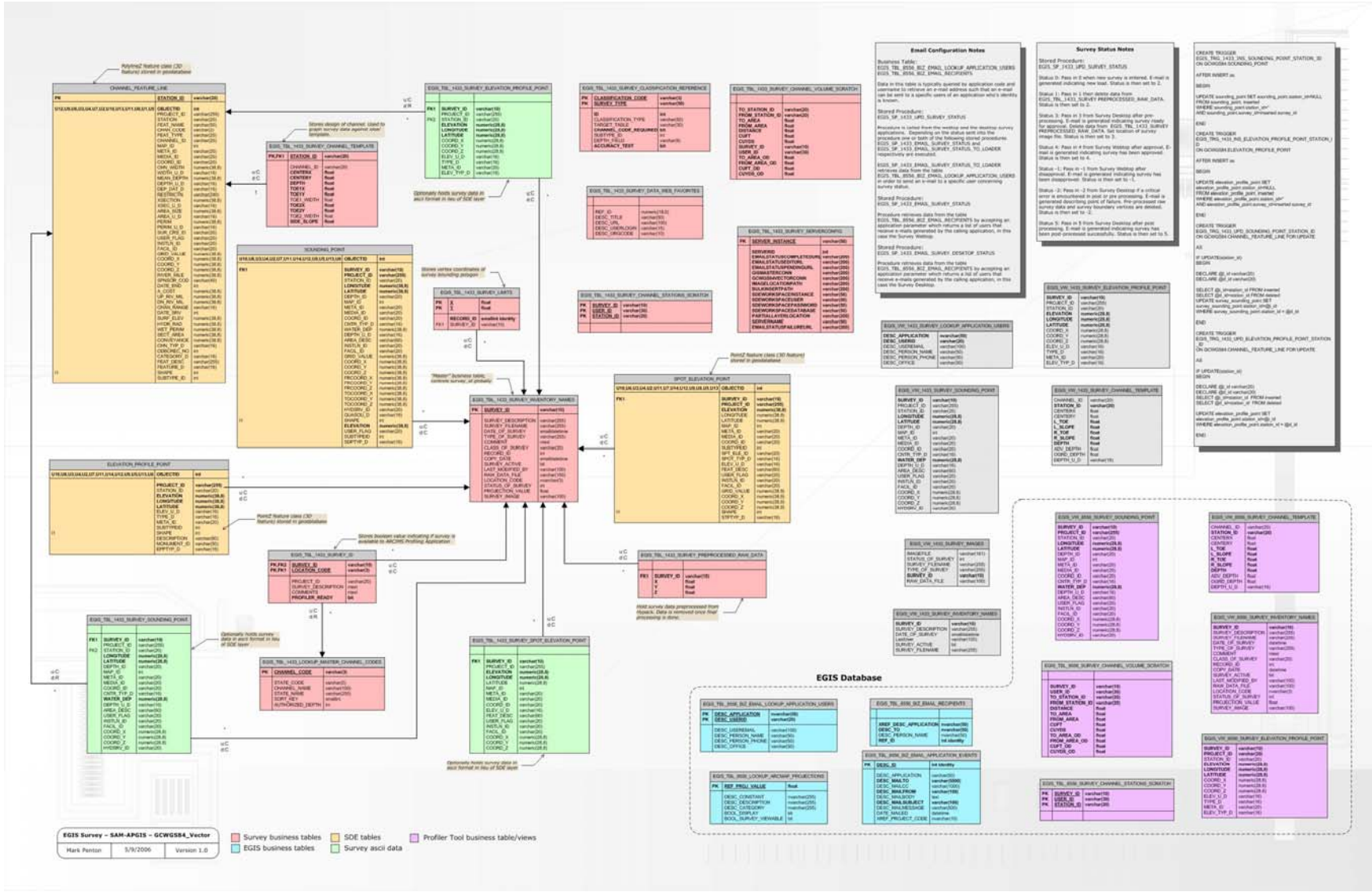


Figure 16 - Survey Database Schema

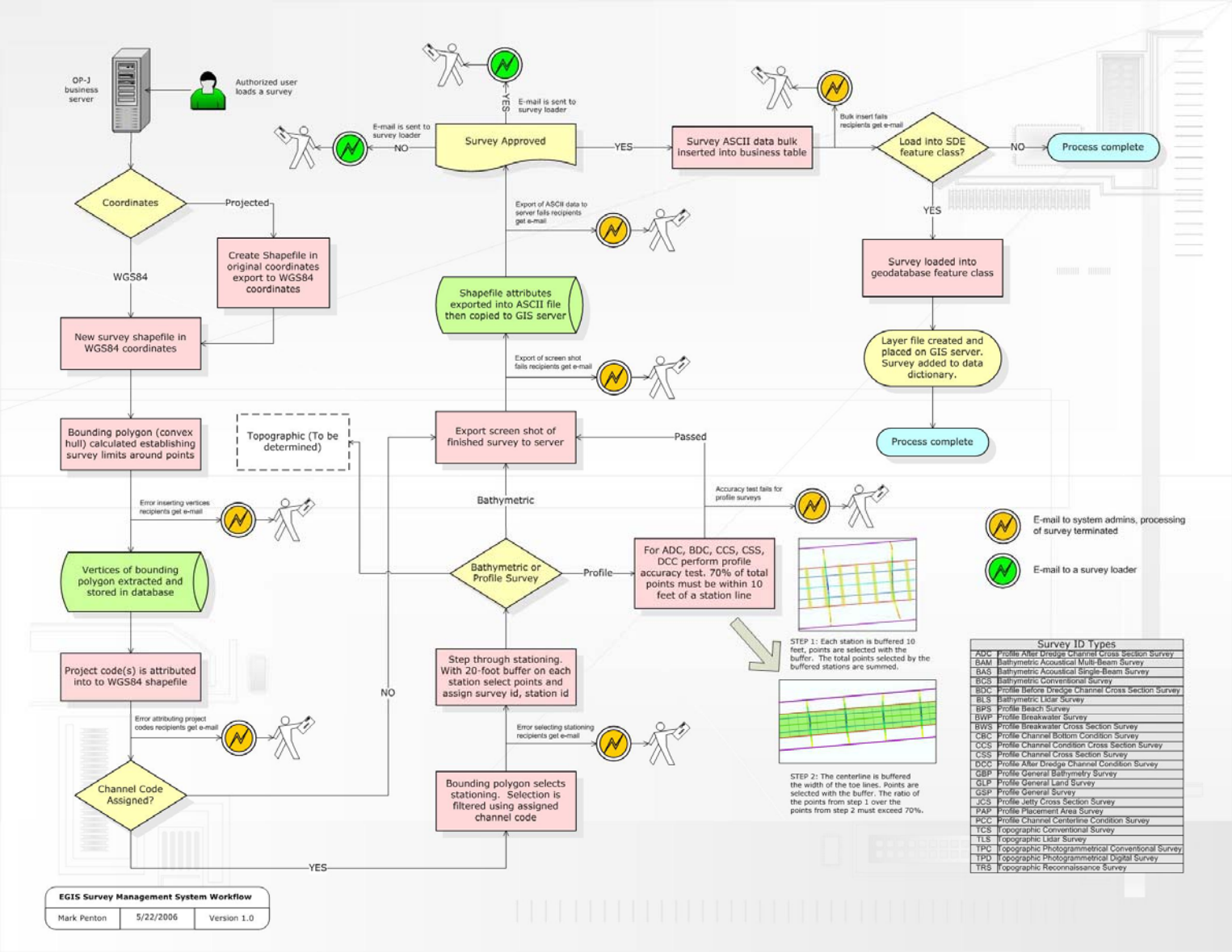
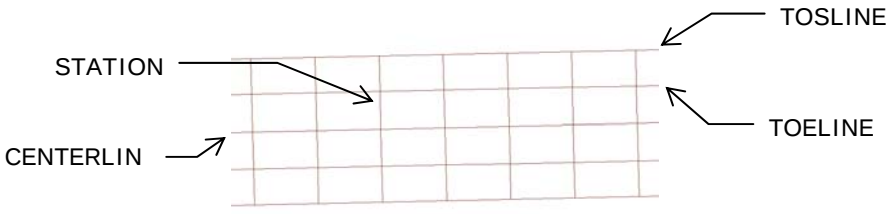


Figure 17 - Survey Workflow

6. Appendix B – DGN to 3D Geometry Conversion

1. Open DGN file and make sure level names STATION, TOELINE, TOSLINE, and the channel code levels are present. Channel code level should be upper case and is the level that contains the station lines. The STATION level is the level that contains the station text nodes. Verify that all duplicate geometries have been removed! Drop all complex chains. Drop all graphic groupings.



2. Make sure the STATION level is the active level. Verify you have the folder c:\cesam established on your c: drive. Run the txt_to_asc macro on the DGN file. It should create a file called report.txt in c:\cesam. Exit Microstation.

3. Start ArcGIS and assign the proper state plane coordinate system to the data frame. Add the DGN file to a data frame.

4. Select the polyline layers (should be just one) and export the polyline layer as a shape file to the CHANNELS\EDITED_MASTER_SHAPES\ SCRATCH folder. Accept default name for the shape file and choose the data frame coordinate system as the coordinate system of the exported layer.

5. Add the exported shape file into the current data frame and verify that the SHAPE column is indicating Polyline ZM geometry. Next remove all other layers from the data frame.

6. Delete all columns from the attribute table except for the layer and shape columns.

7. Run the Make PointZ Shape tool in ArcMap and select the exported ASCII text file made earlier in the process. Select STATION as the only attribute field prior to running the PointZ Shape tool. Accept the default file name and locate it in the CHANNELS\EDITED_MASTER_SHAPES\ SCRATCH folder. Lastly, add it into the current dataframe.

8. Spatially join the PointZ shape file to the channel shape file (use nearest point to a station line). You want to "give" all the attributes in the PointZ shape file to the channel shape file. Select the "channel" polyline shape file, right click and select Join. Choose the PointZ shape file as the layer to join to. Accept the default output shape file and place it in the SCRATCH folder. After loading it into the current data frame delete all fields from the attribute table except for the Layer and STATION attributes.

9. Add the STATION_ID field as text type with a column width of 20. Calculate STATION_ID as Layer + "_" + STATION where Layer and STATION are fields in the attribute table. Make sure all the STATION values have 5 characters to the left of the + sign prior to calculating the STATION_ID field.

10. Using Select By Attribute do the following:

    a. Using the Layer column select all CENTERLINE and calculate the STATION_ID as CHAN_CODE + "_CEN".

    b. Using the Layer column select all TOELINE and calculate the STATION_ID as CHAN_CODE + "_TOE".

    c. Using the Layer column select all TOSLINE and calculate the STATION_ID as CHAN_CODE + "_TOS".

11. Using the "Select By Attributes" tool and using the "Layer" column from the attribute table select all attributes marked as CHAN_CODE + "_CEN". Verify visually that the correct geometry is selected! If not then adjust the values in the "Layer" column appropriately. Continue on with the rest of the geometry types from the previous step and visually check the results adjusting accordingly.

12. Continuing on with the same shape file open the Arc Toolbox. Under Data Management Tools select Generalization and then run the Dissolve tool. Select the STATION field as a "first statistic" and the STATION_ID as the dissolve field when setting up the dissolve operation. Write your dissolved shape file to the CHANNELS\EDITED_MASTER_SHAPES\ SCRATCH folder. After dissolving add the dissolved shape to the

current data frame. Add the STATION field to the dissolved output as indicated in Table 6 and calculate the STATION field equal to the “FIRST_STAT” column. Next delete the “FIRST_STAT” column.

13. Add the following fields to the attribute table of the shape file from the previous step.

Name	Type	Width	Sample
PROJECT_ID	Text	255	C000
STATION	Text	20	00001+00
FEAT_NAME	Text	50	Cadet Bayou
CHAN_CODE	Text	2	CB
FEAT_TYPE	Text	20	STATION, TOELINE, TOSLINE, or CENTERLINE

Table 6 – DGN Conversion

14. Populate the newly added attribute accordingly. For FEAT_NAME use the channel name from the EGIS_TBL_1433_LOOKUP_MASTER_CHANNEL_CODES table from the GCWGS84_VECTOR database. For CHAN_CODE use the channel code from the EGIS_TBL_1433_LOOKUP_MASTER_CHANNEL_CODES table from the GCWGS84_VECTOR database.

15. Export out the shape file using the current data frame projection to the appropriate state plane folder in the Edited_Master_Shapes folder as DWG03_SPMSE_NAD83_Master, where DWG03 is the sequence of the shape file, SPMSE_NAD83 represents the projection of the shape file.

16. Reproject the shape file to Geographic WGS84 coordinates and give to Greg as DWG03_GCWGS84_Master, where DWG03, for example, should reflect the current drawing sequence number.

17. Reproject the shape file to the proper UTM WS84 coordinate system and load the shape file into a new data frame. From the eGIS-Toolbox load the Export “Attributes to Textfile” tool and generate the channel template text file. Finally load the channel template ASCII file into the EGIS_TBL_1433_SURVEY_CHANNEL_TEMPLATE table in the GCWGS84_VECTOR database.

7. Appendix C - Tables and Stored Procedures

- Stores template data about each station line for every channel stored in the geodatabase. This includes the depth, toe line distances, side slope angles, and centerline x and y coordinates. These data are used to plot the ideal channel template in applications.

EGIS_TBL_1433_SURVEY_CHANNEL_TEMPLATE			
Field Name	**Field Type**	**Field Size**	**Allow Nulls**
CHANNEL_ID	varchar	20	YES
STATION_ID	varchar	20	NO
CENTERX	float	8	NO
CENTERY	float	8	NO
TOE1X	float	8	NO
TOE1Y	float	8	NO
TOE1_WIDTH	float	8	YES
TOE2X	float	8	NO
TOE2Y	float	8	NO
TOE2_WIDTH	float	8	YES
SIDE_SLOPE	float	8	YES
DEPTH	float	8	NO

- Stores data about the various types of survey available. Used as look-up table in the applications.

EGIS_TBL_1433_SURVEY_CLASSIFICATION_REFERENCE			
Field Name	**Field Type**	**Field Size**	**Allow Nulls**
CLASSIFICATION_CODE	nvarchar	6	YES
CLASSIFICATION_TYPE	nvarchar	100	NO
ID	Int	4	YES
SURVEY_TYPE	nvarchar	100	YES
TARGET_TABLE	Varchar	30	NO
CHANNEL_CODE_REQUIRED	Bit	1	NO
SUBTYPE_ID	Int	4	NO

- Stores unique survey id with project id for each survey.

EGIS_TBL_1433_SURVEY_ID			
Field Name	**Field Type**	**Field Size**	**Allow Nulls**
PROJECT_ID	nvarchar	40	YES
SURVEY_ID	nvarchar	20	YES
SURVEY_DESCRIPTION	nvarchar	5000	NO
COMMENTS	nvarchar	5000	NO
LOCATION_CODE	nvarchar	510	NO
PROFILER_READY	Bit	1	NO

- Stores project data about each survey.

EGIS_TBL_1433_SURVEY_INVENTORY_NAMES			
Field Name	**Field Type**	**Field Size**	**Allow Nulls**
SURVEY_ID	nvarchar	20	YES
SURVEY_DESCRIPTION	varchar	255	NO
SURVEY_FILENAME	nvarchar	510	NO
DATE_OF_SURVEY	datetime	8	NO
TYPE_OF_SURVEY	nvarchar	510	NO
COMMENT	nvarchar	5000	NO
CLASS_OF_SURVEY	nvarchar	6	NO
RECORD_ID	Int	4	YES
COPY_DATE	datetime	8	NO
SURVEY_ACTIVE	Bit	1	NO
LAST_MODIFIED_BY	varchar	100	NO
RAW_DATA_FILE	varchar	100	NO
LOCATION_CODE	varchar	3	NO
STATUS_OF_SURVEY	Int	4	NO
PROJECTION_VALUE	Float	8	NO
SURVEY_IMAGE	varchar	100	NO

- Stores the x and y coordinate of each vertex of the bounding polygon of a survey. This data establishes the limits of each survey.

EGIS_TBL_1433_SURVEY_LIMITS			
Field Name	**Field Type**	**Field Size**	**Allow Nulls**
SURVEY_ID	nvarchar	20	YES
X	Float	8	YES
Y	Float	8	YES
RECORD_ID	Int	4	YES

- Stores the initial survey ASCII data prior to the processing that must be done to load the survey into its appropriate SDE feature layer.

EGIS_TBL_1433_SURVEY_PREPROCESSED_RAW_DATA			
Field Name	**Field Type**	**Field Size**	**Allow Nulls**
SURVEY_ID	nvarchar	20	YES
X	Float	8	YES
Y	Float	8	YES
Z	Float	8	YES

- Stores information about application settings such as database connection strings.

EGIS_TBL_1433_SURVEY_SERVERCONFIG			
Field Name	**Field Type**	**Field Size**	**Allow Nulls**
ServerID	int	4	YES
Server_Instance	varchar	50	YES
EmailStatusCompletedURL	varchar	200	YES
EmailStatusEditURL	varchar	200	YES
EmailStatusPendingURL	varchar	200	YES
GisMasterConn	varchar	200	YES
GCWGS84VectorConn	varchar	200	YES
ImageLocationPath	varchar	200	YES
SDEWorkspaceInstance	varchar	50	YES
SDEWorkspaceUser	varchar	50	YES
SDEWorkspacePassword	varchar	50	YES
SDEWorkspaceDatabase	varchar	50	YES
PartialLayerLocation	varchar	200	YES
ServerName	varchar	20	YES

- Stores information about elevation profile point surveys.

EGIS_TBL_1433_SURVEY_ELEVATION_PROFILE_POINT			
Field Name	**Field Type**	**Field Size**	**Allow Nulls**
SURVEY_ID	varchar	10	YES
PROJECT_ID	varchar	20	YES
STATION_ID	varchar	20	YES
ELEVATION	numeric	17	YES
LONGITUDE	numeric	17	YES
LATITUDE	numeric	17	YES
COORD_X	numeric	17	YES
COORD_Y	numeric	17	YES
COORD_Z	numeric	17	YES
ELEV_U_D	varchar	16	YES
TYPE_D	varchar	16	YES
META_ID	varchar	20	YES
ELEV_TYP_D	varchar	16	YES

- Stores information about sounding point surveys.

EGIS_TBL_1433_SURVEY_SOUNDING_POINT			
Field Name	**Field Type**	**Field Size**	**Allow Nulls**
SURVEY_ID	varchar	10	YES
PROJECT_ID	varchar	255	YES
STATION_ID	varchar	20	YES
LONGITUDE	numeric	17	YES
LATITUDE	numeric	17	YES
DEPTH_ID	varchar	20	YES
MAP_ID	int	4	YES
META_ID	varchar	20	YES
MEDIA_ID	varchar	20	YES
COORD_ID	varchar	20	YES
CNTR_TYP_D	varchar	16	YES
WATER_DEP	numeric	17	YES
DEPTH_U_D	varchar	16	YES
AREA_DESC	varchar	60	YES
USER_FLAG	varchar	20	YES
INSTLN_ID	varchar	20	YES
FACIL_ID	varchar	20	YES
COORD_X	numeric	17	YES
COORD_Y	numeric	17	YES
COORD_Z	numeric	17	YES
HYDSRV_ID	varchar	20	V

- Stores information about topographic point surveys.

EGIS_TBL_1433_SURVEY_SPOT_ELEVATION_POINT			
Field Name	**Field Type**	**Field Size**	**Allow Nulls**
SURVEY_ID	varchar	10	YES
PROJECT_ID	varchar	255	YES
ELEVATION	numeric	17	YES
LONGITUDE	numeric	17	YES
LATITUDE	numeric	17	YES
MAP_ID	int	4	YES
META_ID	varchar	20	YES
MEDIA_ID	varchar	20	YES
COORD_ID	varchar	20	YES
ELEV_U_D	varchar	16	YES
FEAT_DESC	varchar	60	YES
USER_FLAG	varchar	20	YES
INSTLN_ID	varchar	20	YES
FACIL_ID	varchar	20	YES
COORD_X	numeric	17	YES
COORD_Y	numeric	17	YES
COORD_Z	numeric	17	YES

Stored Procedures – Survey Management System	Input Parameter	Parameter Description
EGIS_SP_1433_SEL_SURVEY_COMPLETED_SURVEYS EGIS_TBL_1433_SURVEY_INVENTORY_NAMES: Returns SURVEY_FILENAME, DATE_OF_SURVEY, TYPE_OF_SURVEY, SURVEY_ID, CLASS_OF_SURVEY, STATUS_OF_SURVEY on completed surveys only.	Ex. BAM	Type of survey
EGIS_SP_1433_DEL_SURVEY_RECORD Returns nothing. Completely removes a pre-processed survey from gcwgs84_vector database. Tables affected are EGIS_TBL_1433_SURVEY_ID, EGIS_TBL_1433_SURVEY_PREPROCESSED_RAW_DATA, EGIS_TBL_1433_SURVEY_LIMITS, EGIS_TBL_1433_SURVEY_INVENTORY_NAMES	-	-
EGIS_SP_1433_SEL_SURVEY_PROJECTIONS EGIS_TBL_8556_LOOKUP_ARCMAP_PROJECTIONS: Returns coordinate system data from a standard lookup table.	-	-
EGIS_SP_1433_SEL_SURVEY_IDS EGIS_TBL_1433_SURVEY_INVENTORY_NAMES: Returns SURVEY_ID. Procedure retrieves a list of surveys ids based on its status. Status is either active or inactive.	1 or 0	Active or inactive
EGIS_SP_1433_SEL_SURVEY_UTM_VALUE Returns a long value representing a coordinate system which is utilized by Arc Object code to create a UTM coordinate system	Wildcard characters	Text
EGIS_SP_1433_INS_SURVEY_RAWDATA Returns nothing. This procedure performs a bulk insert of raw data into preprocessed survey data table.	File name and path of XYZ file.	
EGIS_SP_1433_SEL_SURVEY_RECORD EGIS_TBL_1433_SURVEY_INVENTORY_NAMES: SURVEY_ID, TYPE_OF_SURVEY, SURVEY_FILENAME, DATE_OF_SURVEY, SURVEY_DESCRIPTION, COMMENT, STATUS_OF_SURVEY, LAST_MODIFIED_BY, RAW_DATA_FILE, LOCATION_CODE EGIS_TBL_1433_SURVEY_CLASSIFICATION_REFERENCE: SUBTYPE_ID, CLASSIFICATION_CODE, TARGET_TABLE EGIS_TBL_8556_LOOKUP_ARCMAP_PROJECTIONS: CONSTANT, DESCRIPTION, VALUE	Ex. BAM-0014	Survey ID
EGIS_SP_1433_SEL_SURVEY_STATUS EGIS_TBL_1433_SURVEY_INVENTORY_NAMES: Returns SURVEY_DESCRIPTION, SURVEY_FILENAME, DATE_OF_SURVEY, TYPE_OF_SURVEY, SURVEY_ID, RECORD_ID, COPY_DATE, SURVEY_ACTIVE, LAST_MODIFIED_BY, RAW_DATA_FILE, CURRENT_STATUS. Status definitions are used on web page for users to view current status' definitions.	1 or 0	Active or inactive
EGIS_SP_1433_SEL_SURVEY_TYPES_BY_CLASS EGIS_TBL_1433_SURVEY_CLASSIFICATION_REFERENCE: Returns list of distinct SURVEY_TYPE (Topographic, Profile, or Bathymetric)	None	-
EGIS_SP_1433_UPD_SURVEY_STATUS Returns nothing. This procedure will update the current status of a survey. If the status is changed to 1 we need to remove all of the preprocessed data; update the status, and Filename. If the status is changed to 2 all we do is update the status, and filename. For status 0 and 3, all we do is update the status.	Image File Name, Survey ID, Status	
EGIS_SP_1433_SEL_SURVEY_CHANNEL_CODES EGIS_TBL_1433_LOOKUP_MASTER_CHANNEL_CODES: Returns STATE_CODE, CHANNEL_NAME, CHANNEL_CODE. Used to create pick list for channels in eCoastal ArcIMS maps.	-	-
EGIS_SP_1433_SEL_SURVEY_CHANNEL_PRODUCTION_CODES EGIS_TBL_1433_LOOKUP_MASTER_CHANNEL_CODES: CHANNEL_CODE, CHANNEL_NAME, STATE_NAME EGIS_TBL_1433_SURVEY_CHANNEL_TEMPLATE: CHANNEL_ID Returns data for channels that have been placed in production. Production channels are channels that have 3D geometry in the SDE feature class.	-	-

Stored Procedures – Survey Management System	Input Parameter	Parameter Description
EGIS_SP_1433_EMAIL_SURVEY_DESKTOP_STATUS E-mails all authorized users e-mail generated by survey desktop processing.	@Project Code, @Application, @Subject, @Body	The survey id, standard app code, e-mail subject, and e-mail body.
EGIS_SP_1433_EMAIL_SURVEY_STATUS E-mails all authorized users e-mail generated by survey web top processing.	@Project Code, @Application, @Subject, @Body	The survey id, standard app code, e-mail subject, and e-mail body.
EGIS_SP_1433_EMAIL_SURVEY_STATUS_TO_LOADER E-mails the originating survey loader of all activity in the pre-processing phase of survey data processing.	@Project Code, @Application, @Survey_ID, @Subject, @Body	The survey id, standard app code, e-mail subject, and e-mail body.
EGIS_SP_1433_SEL_SURVEY_VALID_SURVEY_TYPES EGIS_TBL_1433_SURVEY_CLASSIFICATION_REFERENCE: Returns a list of distinct survey types.	-	-
EGIS_SP_1433_SEL_SURVEY_PREPROCESSED_DATA		

Stored Procedures – Profiler Tool	Input Parameter	Parameter Description
EGIS_SP_1433_SEL_PROFILER_AVERAGE_SURVEY_DEPTH_BY_SURVEY_ID GCWGS84_Vector.SOUNDING_POINT: AVG (WATER_DEP or ELEVATIOM) Calculates average water depth by survey id.	Ex. HAM-0014	Survey ID
EGIS_SP_1433_SEL_PROFILER_DISTINCT_STATIONING_BY_SURVEY_ID GCWGS84_Vector.Survey_Channel_Template: Returns a list of STATION_ID that are part of a known set of survey data.	Ex. BAM-0001	Survey ID
EGIS_SP_1433_SEL_PROFILER_MAXIMUM_SURVEY_DEPTH_BY_SURVEY_ID GCWGS84_Vector.SOUNDING_POINT: Returns MAX (WATER_DEP or ELEVATION), OBJECTID	Ex. HAM-0014	Survey ID
EGIS_SP_1433_SEL_PROFILER_MINIMUM_SURVEY_DEPTH_BY_SURVEY_ID GCWGS84_Vector.SOUNDING_POINT: Returns MIN (WATER_DEP or ELEVATION), OBJECTID	Ex. HAM-0014	Survey ID
EGIS_SP_1433_SEL_PROFILER_POINT_COUNT_BY_SURVEY_ID Returns total point count for a survey for a given survey ID	Ex. HAM-0014	Survey ID
EGIS_SP_1433_SEL_PROFILER_PROJECT_DATA EGIS_TBL_1433_SURVEY_INVENTORY_NAMES: SURVEY_DESCRIPTION, DATE_OF_SURVEY, SURVEY_ID, SURVEY_FILENAME EGIS_TBL_1433_LOOKUP_MASTER_CHANNEL_CODES: CHANNEL_CODE, CHANNEL_NAME LINKED_8556_PROJECTIONS: DESC_CONSTANT Returns selected project data for a given survey_id.	Ex. HAM-0014	Survey ID
EGIS_SP_1433_SEL_PROFILER_SURVEY_CLASSIFICATION GCWGS84_Vector.Survey_Inventory_Names: Returns CLASSIFICATION_TYPE (Ex. Bathymetric Acoustical Multi-Beam Survey)	Ex. BAM	Survey Class
EGIS_SP_1433_SEL_PROFILER_SURVEY_LIMITS_BY_SURVEY_ID GCWGS84_Vector.Survey_Limits: Returns X, Y, RECORD_ID (RECORD_ID used to order X, Y)	HAM-0014	Survey ID
EGIS_SP_1433_SEL_PROFILER_SURVEY_STATION_VOLUMES_FOR_REPORT EGIS_TBL_1433_SURVEY_CHANNEL_VOLUME_SCRATCH: Returns TO_STATION_ID, FROM_STATION_ID, TO_AREA, FROM_AREA, DISTANCE, CUFT, CUYDS, TOE1_DIST, TOE2_DIST, SIDE_SLOPE, DEPTH	-	-
EGIS_SP_1433_SEL_PROFILER_SURVEYS_FOR_ARCIMS_BY_CHANNEL_CODE EGIS_TBL_1433_SURVEY_ID: SURVEY_ID, LOCATION_CODE SURVEY_INVENTORY_NAMES: DATE_OF_SURVEY, STATUS_OF_SURVEY Returns a survey id and date of survey to build a lookup list for eCoastal ArcIMS maps based on the channel selected in the ArcIMS map.	MB	Channel Code