

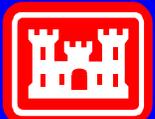


# **Regional Morphology Analysis Program (RMAP)**

**Brian K. Batten, Ph.D.**

**and**

**Nicholas C. Kraus, Ph.D.**

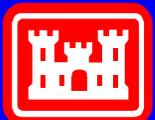


**US Army Corps  
of Engineers**

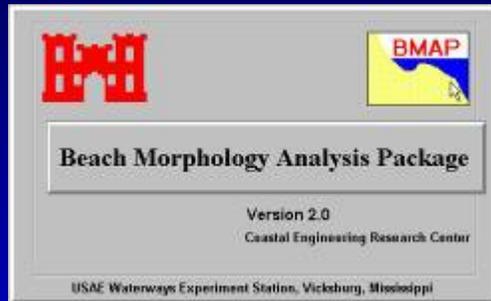
**Coastal and Hydraulics Laboratory  
Engineer Research & Development Center**

# Motivation

1. Typically, analysis of beach profile and/or shoreline position data requires several software packages
2. Engineering and numerical modeling environment needs tools directly supporting work flow (from survey to QC to analysis to project report or model)
3. Regional Sediment Management involves data sets covering wide area, different coordinate systems, different States
4. Need management and analysis of different types of geospatial data in a single package



# Evolution



**Step 1**



**2D beach profiles**

**Distance-elevation  
data**

**Profile analysis  
routines**

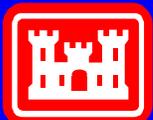
**Beach Fill Module**

**Geospatial Data Handling**

**Map Mode**

**Shoreline Analysis**

**Coordinate Conversions**



**US Army Corps  
of Engineers**

**Coastal and Hydraulics Laboratory  
Engineer Research & Development Center**

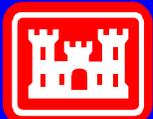
# Analysis Capabilities

## Beach Profile Analysis

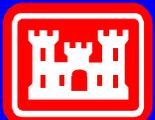
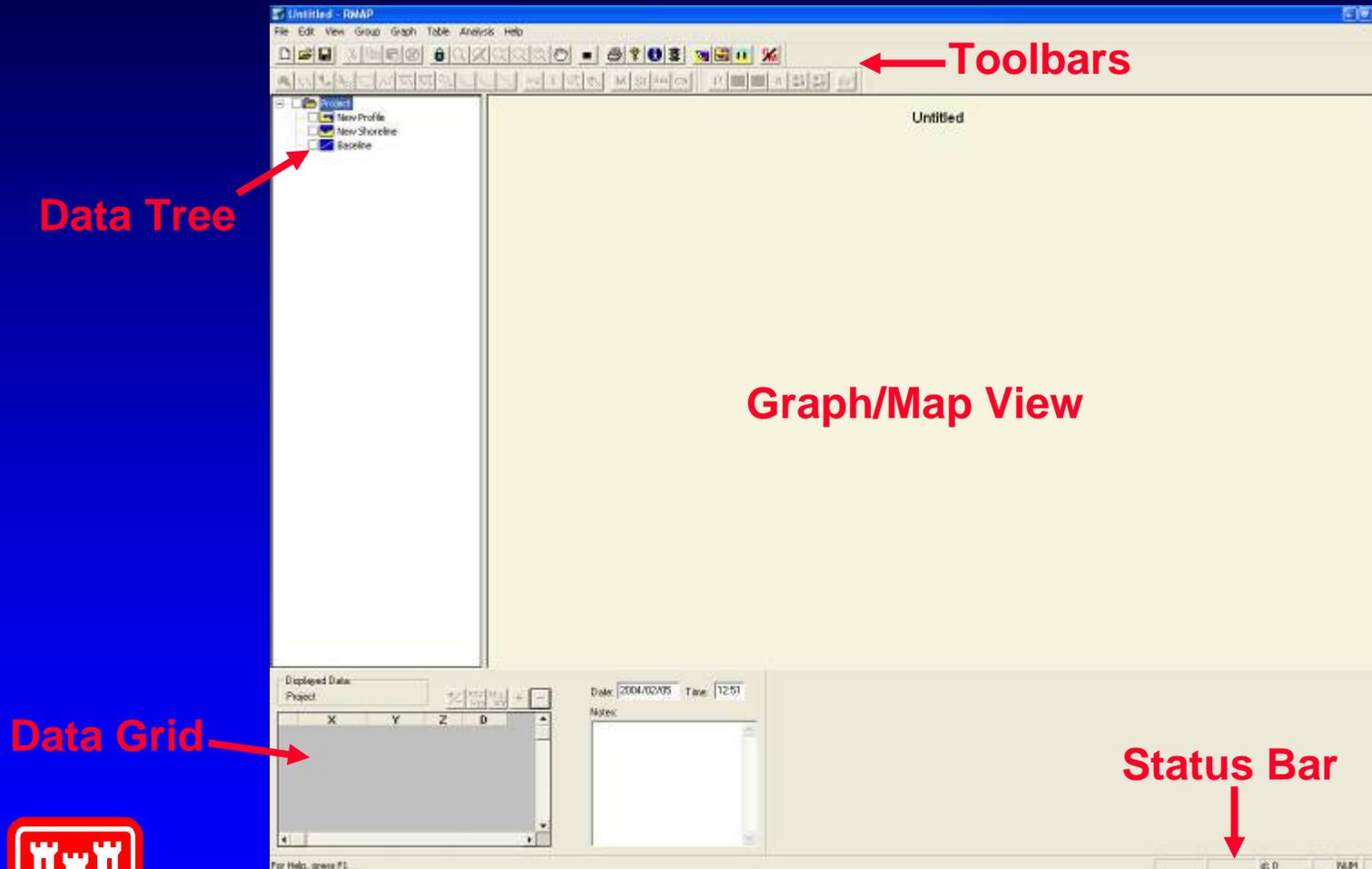
- profile envelope
- bar properties
- profile volume
- cut and fill
- translation
- EBP least-squares
- cross-shore transport rates
- synthetic profiles
- beach fill module
- interpolation

## Shoreline Change Rate

- baseline generation
- end-member change rate
- interpolation
- data smoothing



# RMAP Interface

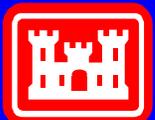
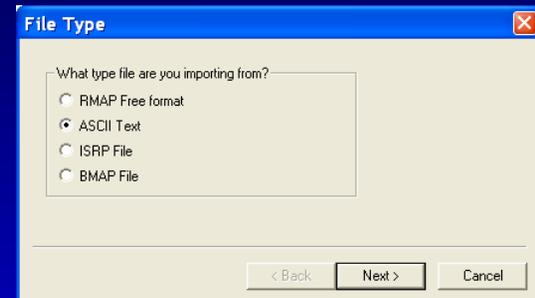




# Importing Data

## Capabilities

- Import BMAP files
- Import ASCII files
- Copy/paste from spreadsheet
- Import ISRP
- Import ESRI shapefiles
- Display background georef-imagery



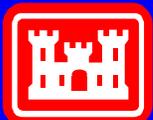
# Adding Data

## Import from Text

The image shows a sequence of four dialog boxes for importing data from a text file:

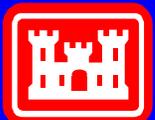
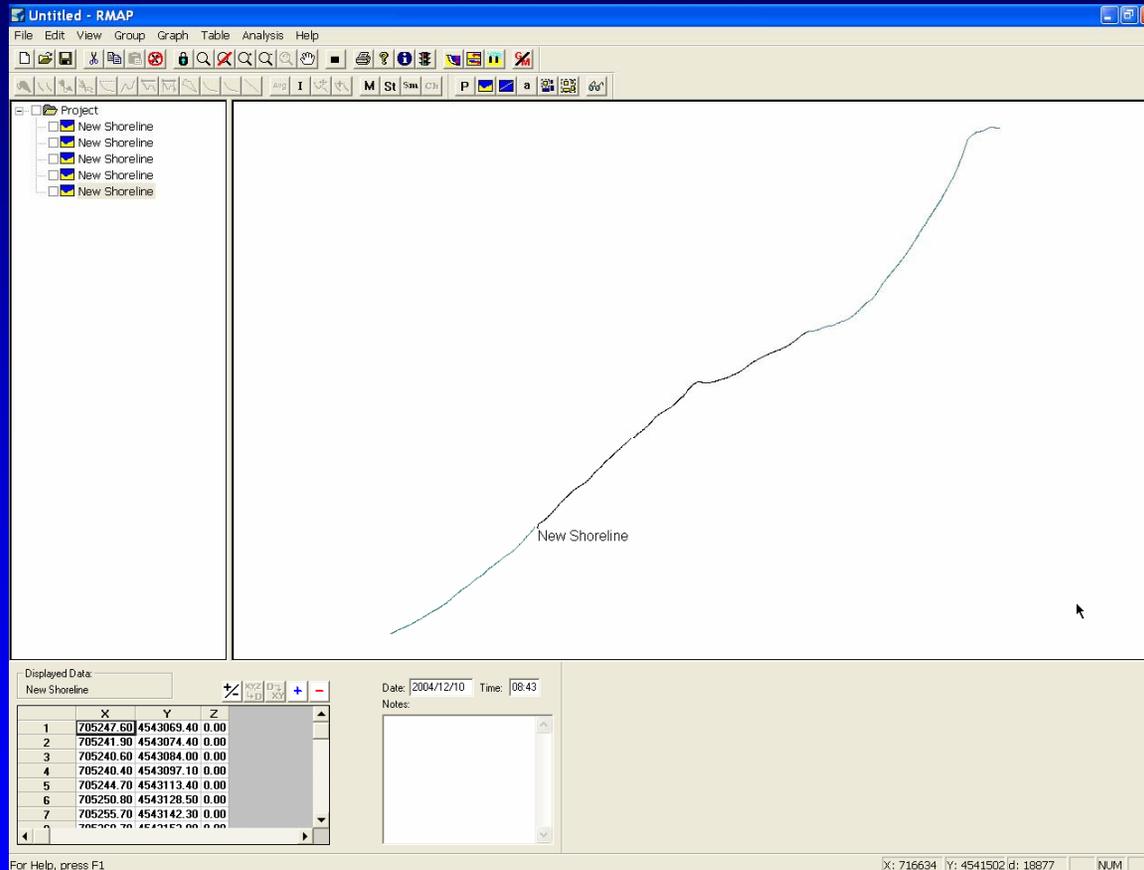
- File Type:** Asks "What type file are you importing from?" with options: RMAP Free format, ASCII Text (selected), ISRP File, and BMAP File.
- Import What?:** Asks "What type item are you importing?" with options: Shoreline (selected), Profile, and Baseline.
- Import Information:** Shows a "Data Preview (First 20 rows)" table with columns X, Y, and Z. Below the table, it asks to select columns to store in variables. The X, Y, and Z variables are listed on the left, and the X, Y, and Z columns are listed on the right. Buttons for "Remove >>", "Remove All", "Move Up", and "Move Down" are present.
- Additional Information:** Asks for a constant value for the Z data (input: 0), a date (1989/01/17), and a time (optional). It also has a "Notes" field containing "wet/dry shoreline".

X	Y	Z
3693212.56921	256458.32922	wetdry0
3693231.45367	256479.85481	wetdry0
3693264.46287	256549.24697	wetdry0
3693279.12121	256589.41595	wetdry0
3693293.05847	256623.82738	wetdry0
3693318.37011	256692.68593	wetdry0
3693336.05348	256719.99585	wetdry0
3693361.78264	256772.82745	wetdry0
3693387.99181	256814.11714	wetdry0
3693404.44732	256845.28923	wetdry0
3693431.73258	256871.82449	wetdry0



# Adding Data

Convert from Shapefile



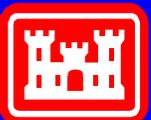
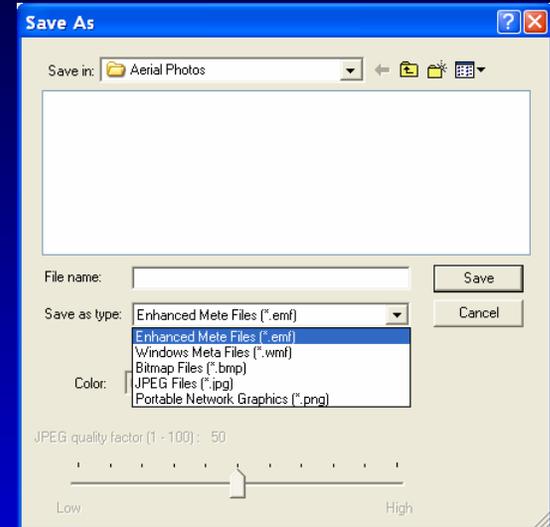
US Army Corps  
of Engineers

Coastal and Hydraulics Laboratory  
Engineer Research & Development Center

# Data Management

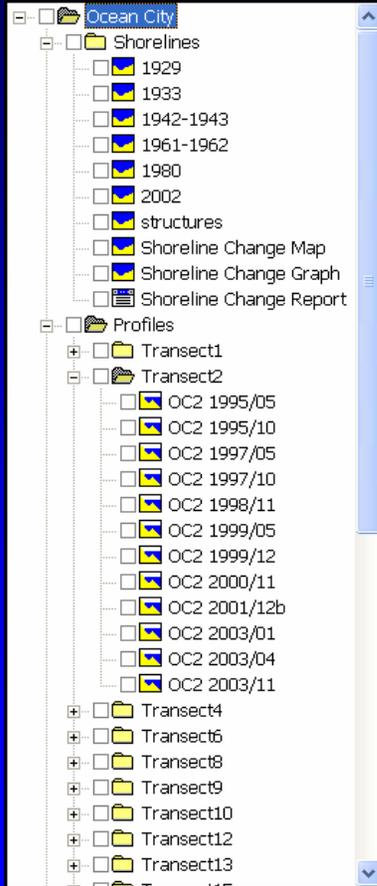
## Data Handling

- Organize and sort data types
  - Profiles
  - Shorelines
  - Baselines
- Multiple coordinate systems
- Coordinate conversion
  - ☺ Single or multiple items
- Export figures
- Export analysis reports
- Export and archive data

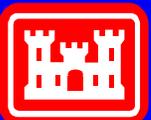
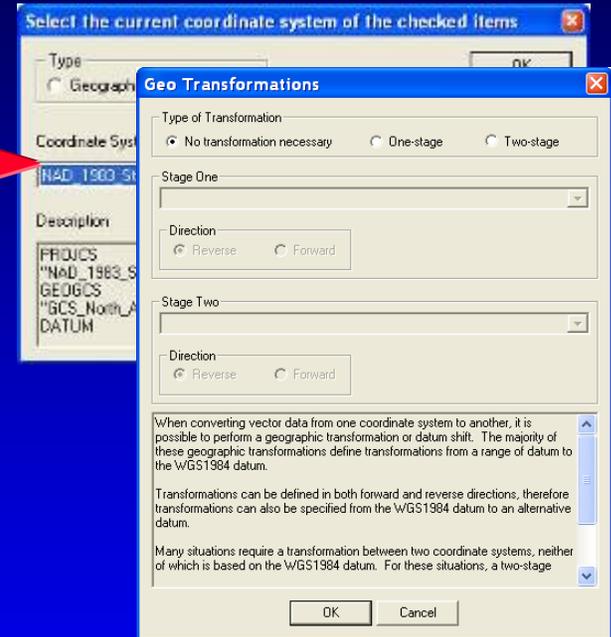
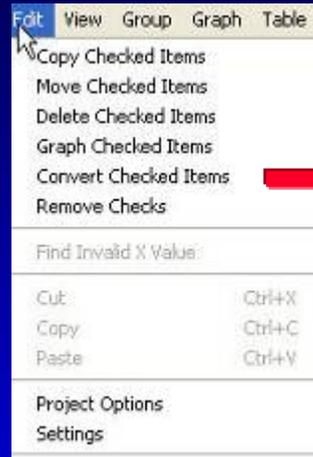


# Data Management

## Organize Data



## Built-in Coordinate Conversion

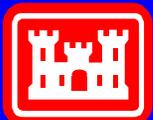


# Metadata

## Metadata Levels

- Project
- Data Group
- Data Item
  - Item history
    - File origin (on import)
    - Coordinate conversion
    - Translation

```
MHW shoreline  
Datum: NAD83 UTM Z18N  
Units: m  
PROJCS  
"NAD_1983_StatePlane_Maryland  
_FIPS_1900_Feet"  
GEOGCS  
"GCS_North_American_1983"  
DATUM  
"D_North_American_1983"
```



## Profile Origins

The GeoRef Profile Origins dialog box has two tabs: 'Origin' and 'Shoreline'. The 'Origin' tab is active. It contains a 'Monument Coordinates' section with input fields for 'X' (containing '0') and 'Y' (containing '0'). Below this is an 'Azimuth (deg)' field containing '0'. At the bottom are 'OK', 'Cancel', '<Apply>', and 'Help' buttons.

## Shoreline Definitions

The GeoRef Shoreline Definitions dialog box has two tabs: 'Origin' and 'Shoreline'. The 'Shoreline' tab is active. It features a 'Shoreline Definition:' label and a dropdown menu. The dropdown menu is open, showing a list of options: 'N/A', 'LWL', 'HWL', 'Wetted Boundary', 'Beach Line', 'Vegetation Line', and 'N/A'. The bottom 'N/A' option is highlighted. At the bottom are 'OK', 'Cancel', '<Apply>', and 'Help' buttons.

# Data Grid and Tools

Displayed Data:  
OC 46 030411

Date: 2004/02/05 Time: 13:23

	X	Y	Z	D
1	1358409.000	232916.00	12.72	-26.02
2	1358419.00	232916.20	15.46	-16.02
3	1358427.00	232916.50	16.63	-8.02
4	1358440.00	232917.00	15.69	-5.00
5	1358454.00	232917.70	13.81	19.01
6	1358469.00	232918.30	16.17	34.02
7	1358479.00	232918.70	16.01	44.03
8	1358483.00	232918.90	13.90	48.04

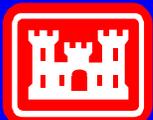
Notes:



+/-  
distance

calculate  
distance  
or  
coordinates

Insert/delete  
rows





# Map Mode

The screenshot displays the RMAP software interface. The main window shows a map of a coastal area with a profile view on the left. The profile view shows a vertical axis with values from 21.040 to -30.160. The map shows a coastline with a profile line and a data table at the bottom. The data table has columns X, Y, and Z, and rows 1 through 9. The status bar at the bottom shows the date 2006/07/30 and time 14:37.

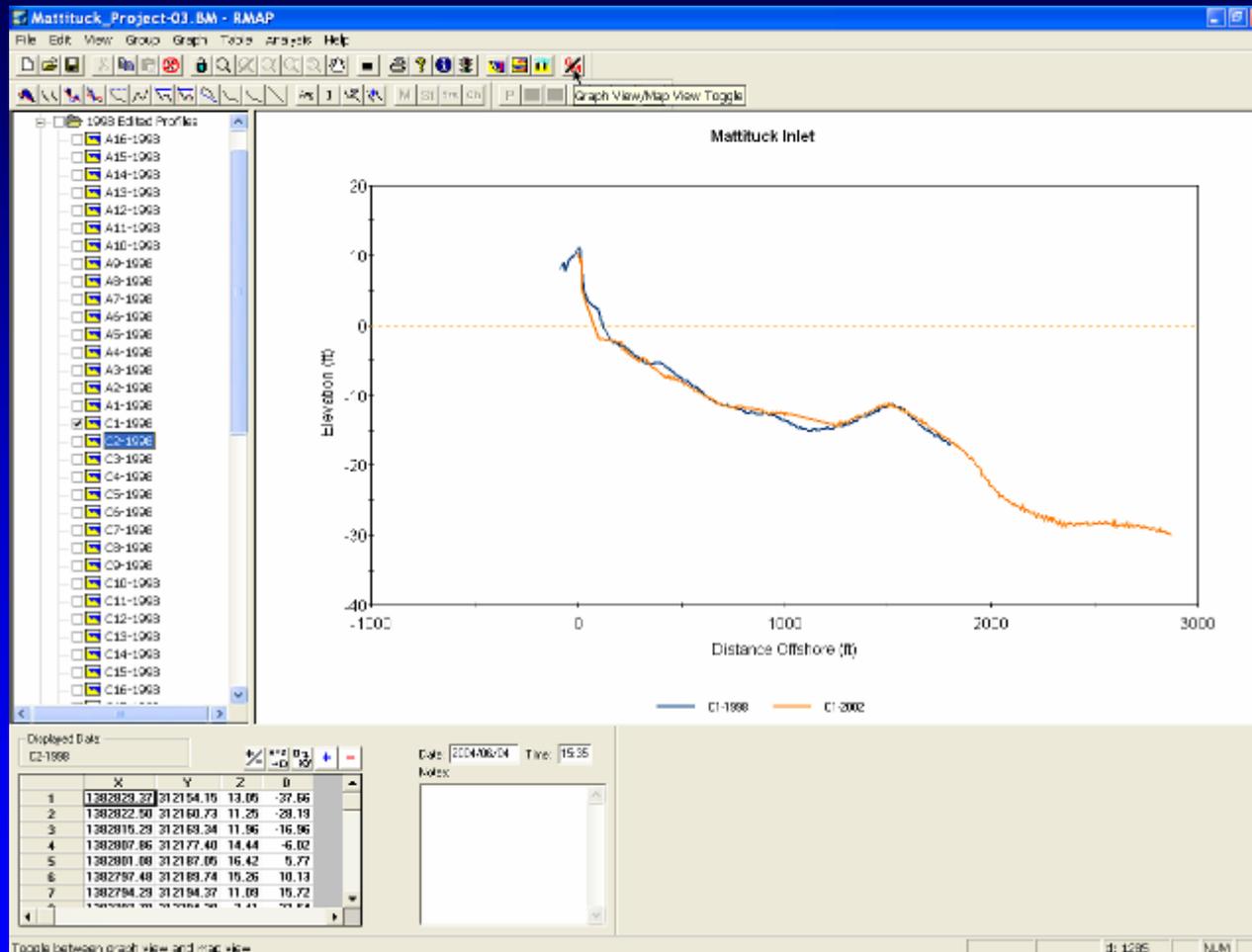
	X	Y	Z
1	1358337.00	231712.00	18.25
2	1358347.00	231712.20	21.04
3	1358350.00	231712.50	18.68
4	1358363.00	231713.00	17.61
5	1358386.00	231713.30	15.86
6	1358397.00	231714.30	15.49
7	1358404.00	231714.60	17.59
8	1358411.00	231714.80	14.79

The Map Properties dialog box is open, showing the Map tab. It includes sections for Colors (Shallow Color and Deep Color), Default Thickness, and Default Font (Arial, size 10). The dialog also has tabs for Profiles, Shorelines, Baseline, and Rate Graph.

The Font dialog box is open, showing the Font list with Arial selected. It includes sections for Font style (Regular, Italic, Bold, Bold Italic), Size (10), Effects (Strikeout, Underline), Color (Blue), Sample (AaBbYyZz), and Script (Western).



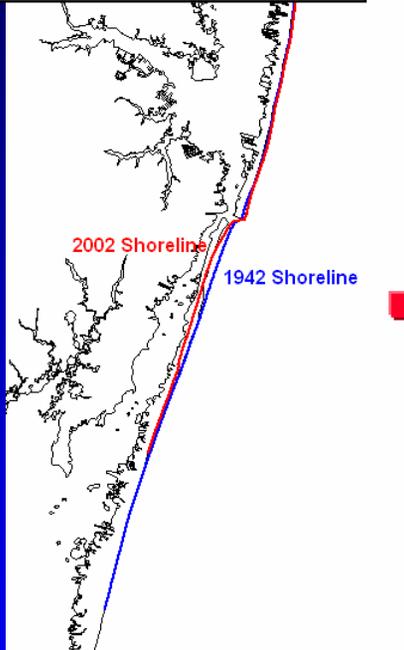
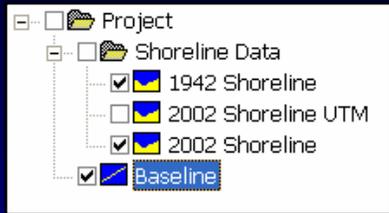
# Data Qa/Qc



US Army Corps  
of Engineers

Coastal and Hydraulics Laboratory  
Engineer Research & Development Center

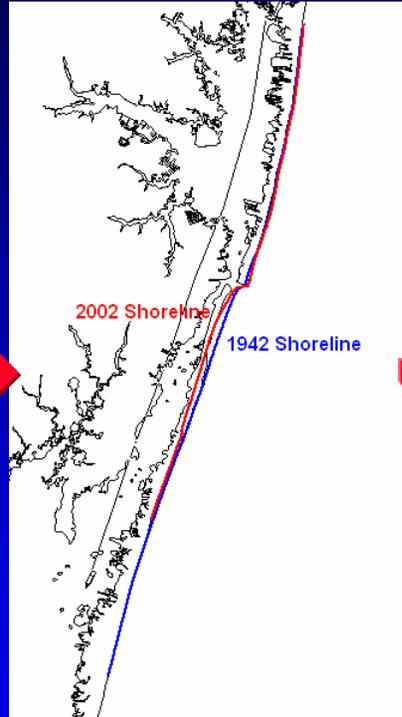
# Shoreline Analysis



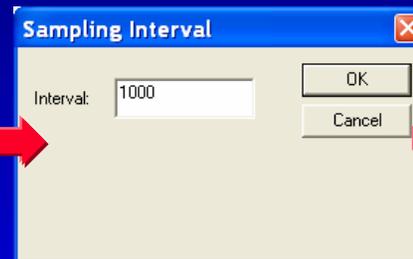
Select shorelines  
In map view



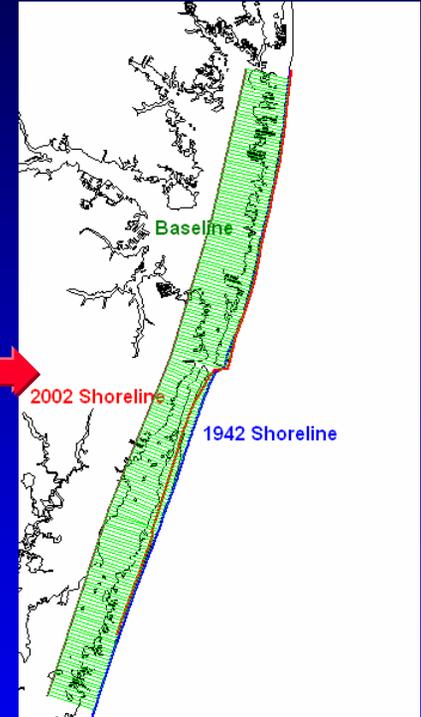
US Army Corps  
of Engineers



Draw or import  
baseline



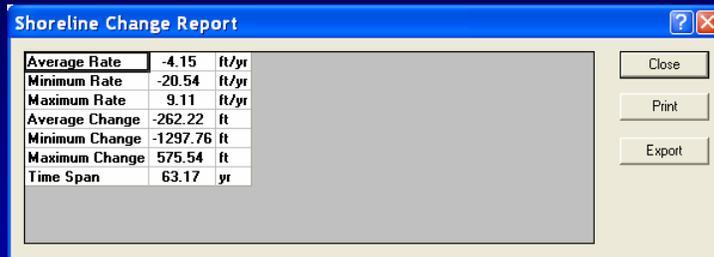
Select shoreline  
change tool,  
specify baseline  
transect  
sampling interval



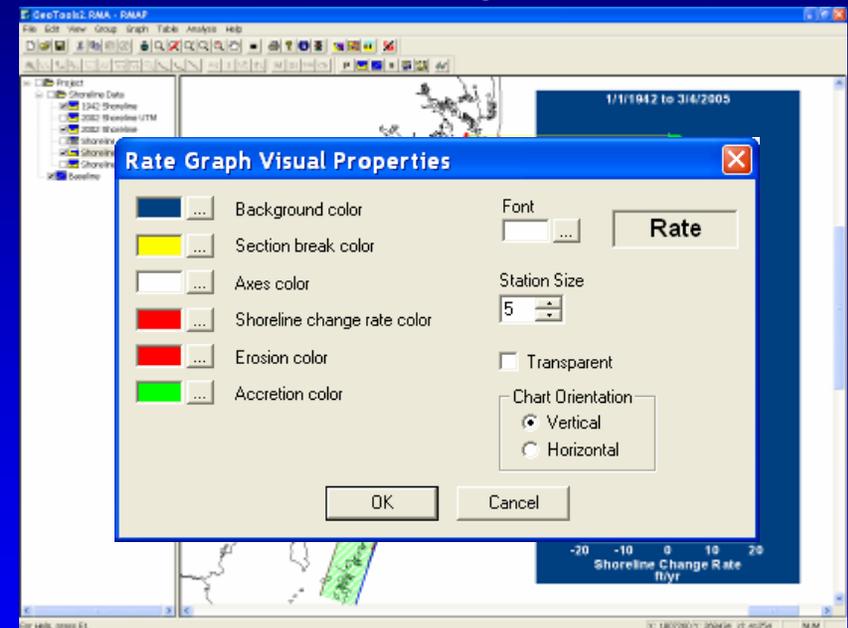
Coastal and Hydraulics Laboratory  
Engineer Research & Development Center

# Shoreline Change Products

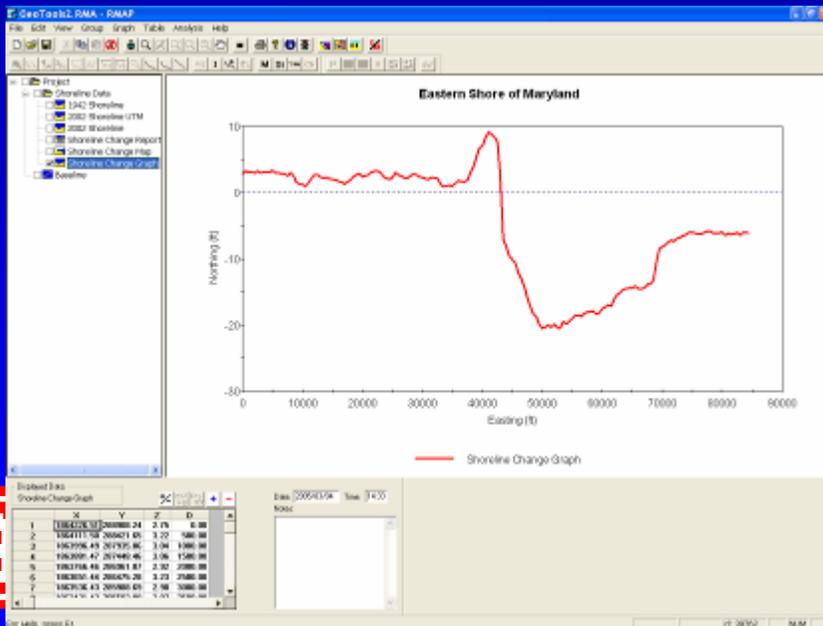
Basic stats



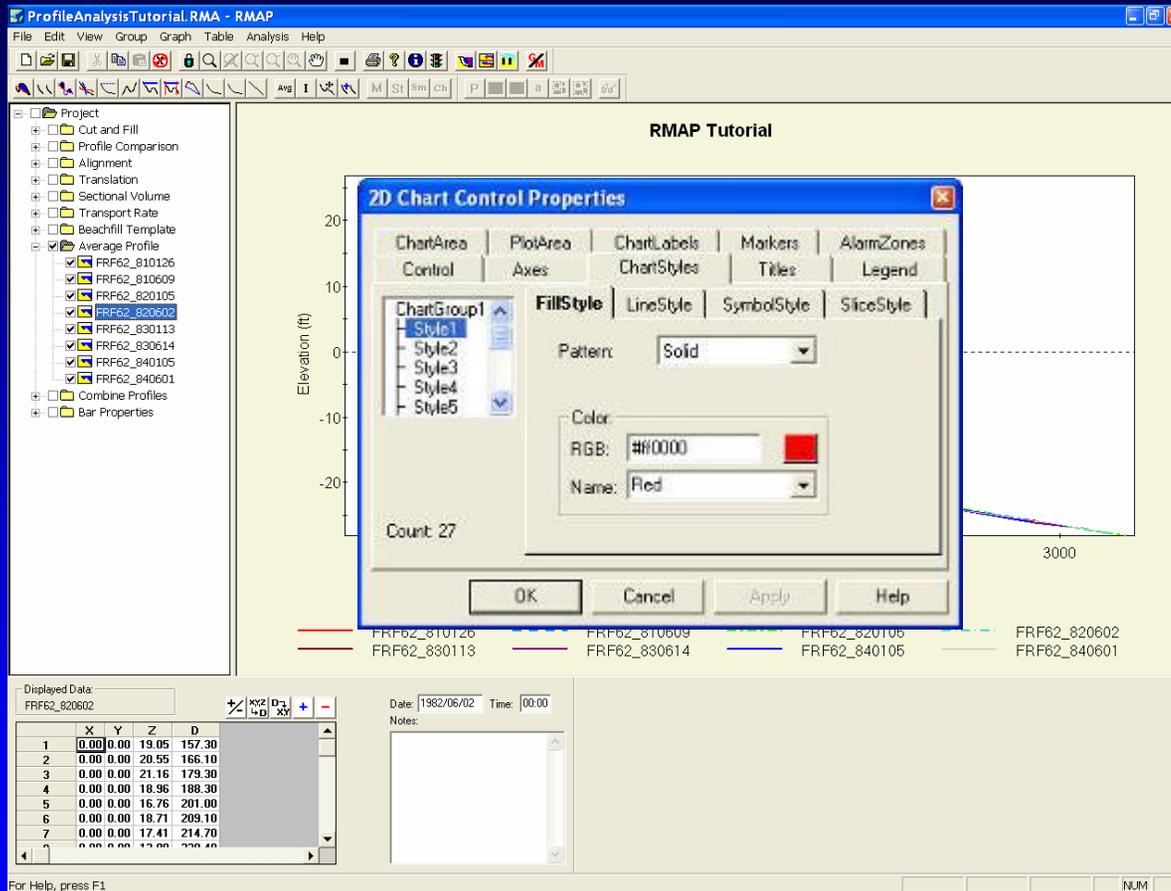
Geospatial change rate map



Change rate along baseline

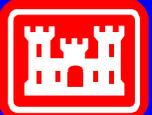


# Profile Analysis

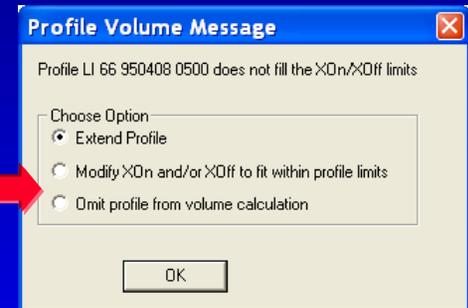
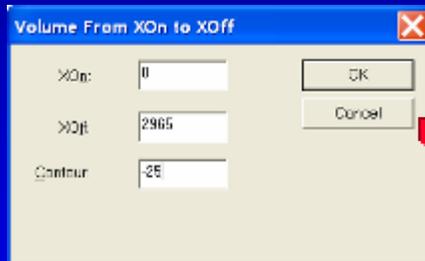
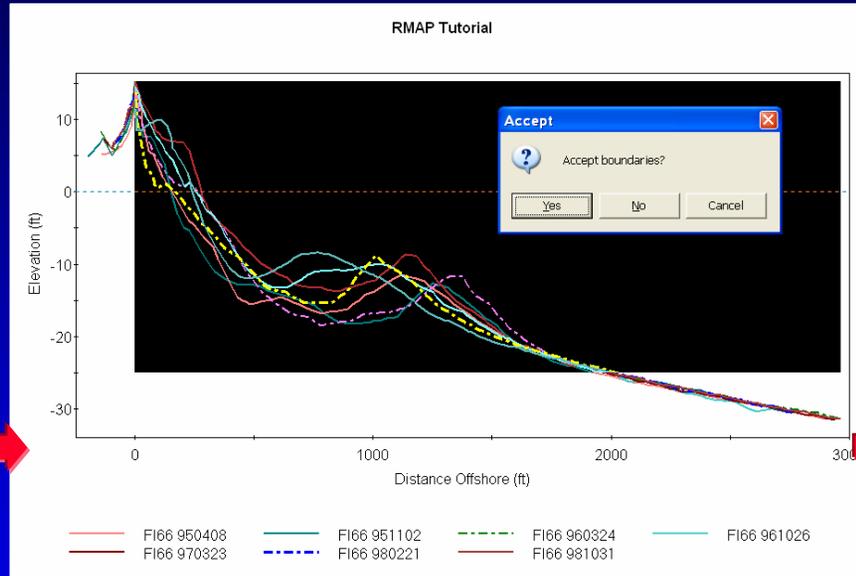
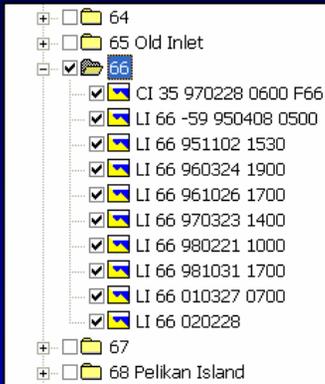


- Bar Properties
- Profile Comparison
- Cut and Fill
- Horizontal Alignment
- Least Square Estimate
- Sectional Volume
- Transport Rate
- Volume
- Average
- Interpolate
- Translation
- Combine Profiles/Shorelines
- Mean Shoreline
- Shoreline Stats
- Smooth Shoreline
- Shoreline Change Rate
- Synthetic Profiles

- Beach Fill Placement
- Equilibrium Profile
- Interpolated Profile
- Modified Equilibrium Profile
- Plane Sloping Profile



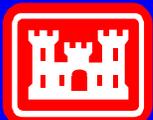
# Profile Analysis: Volume



Profile Volume Report

Profile	XOn(ft)	XOff(ft)	Volume(cu. yd/ft)	Contour Location(ft)
LI 66 950408 0500	0.00	2918.00	768.352	1940.67
LI 66 951102 1530	0.00	2734.00	806.022	1991.00
LI 66 960324 1900	0.00	2953.00	855.830	1990.00
LI 66 961026 1700	0.00	2672.00	1007.022	1990.00
LI 66 970323 1400	0.00	2942.00	959.223	1982.00
LI 66 980221 1000	0.00	2761.00	857.725	2025.00
LI 66 981031 1700	0.00	2965.00	928.475	2010.00

Close  
Print  
Export

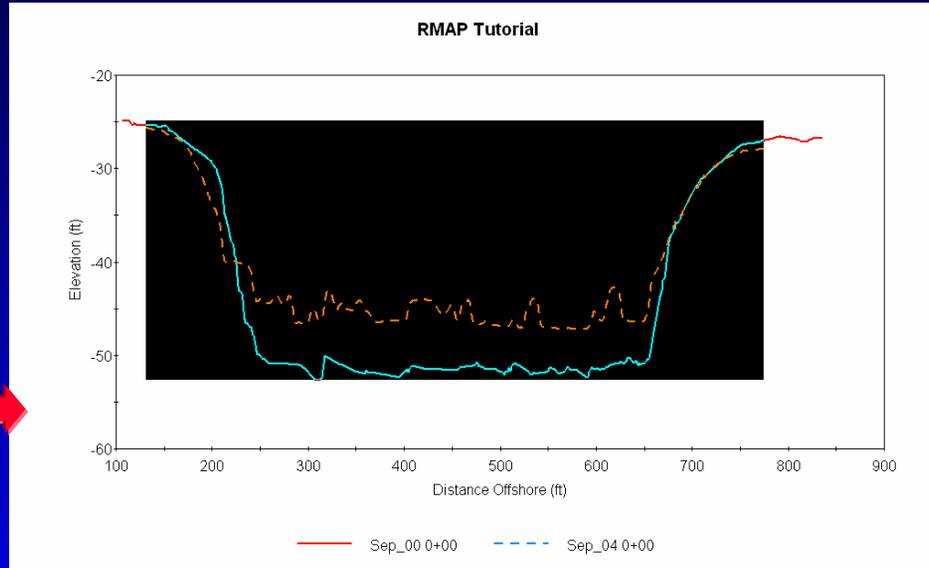


# Profile Analysis: Comparison



**Profile Comparison**

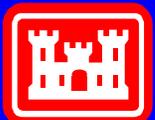
XOn: 131    OK  
XOff: 775    Cancel  
Contour: -52



**Profile Comparison Report**

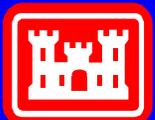
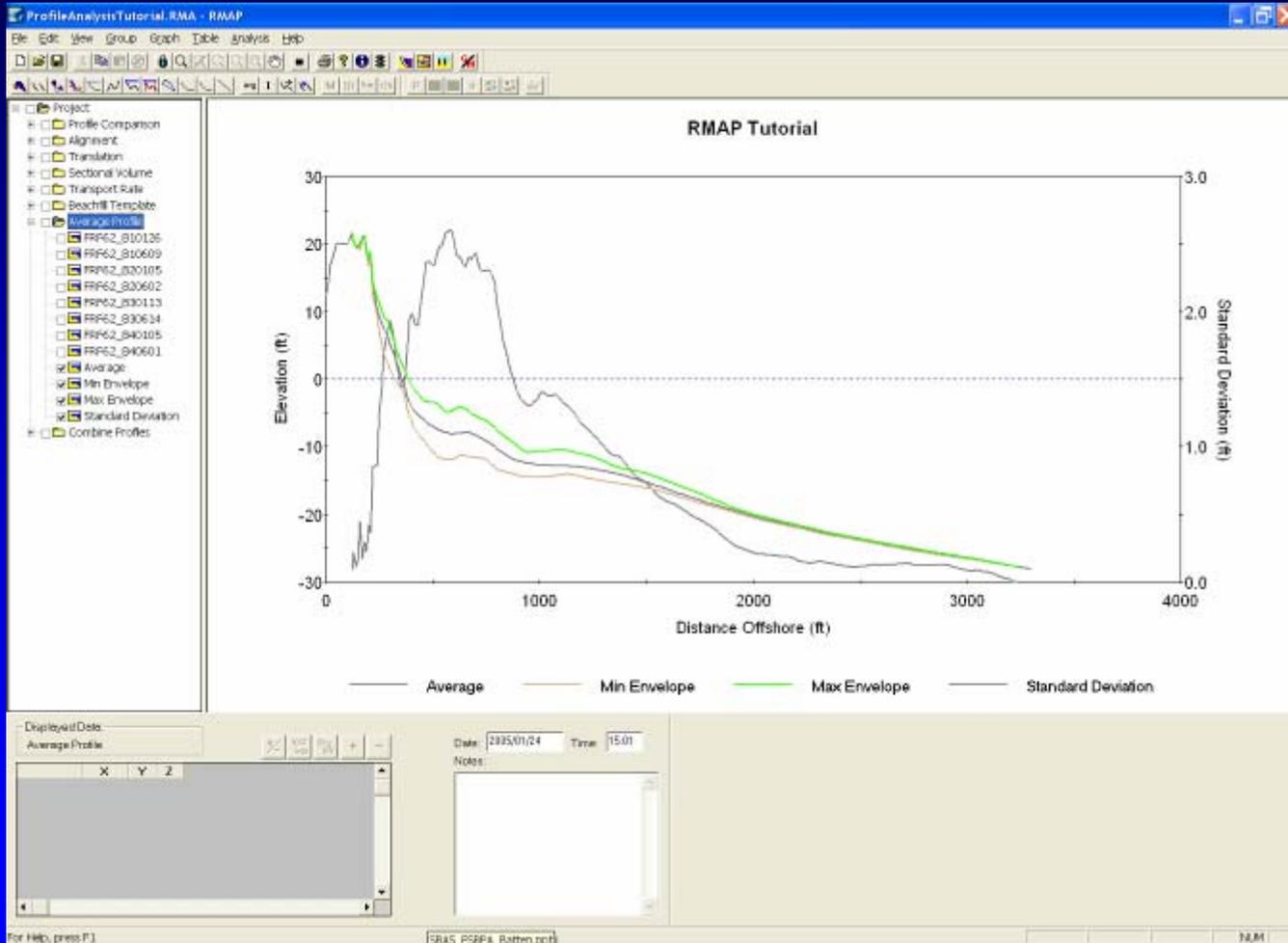
Profile 1:	Sep_00 0+00
Profile 2:	Sep_04 0+00
XOn:	131.00 ft
XOff:	775.00 ft
Contour:	-52.00 ft
Volume Change:	87.693 cu. yd/ft
Contour Change:	0.00 ft

Close  
Print  
Export



# Profile Analysis: Average (Depth of Closure)

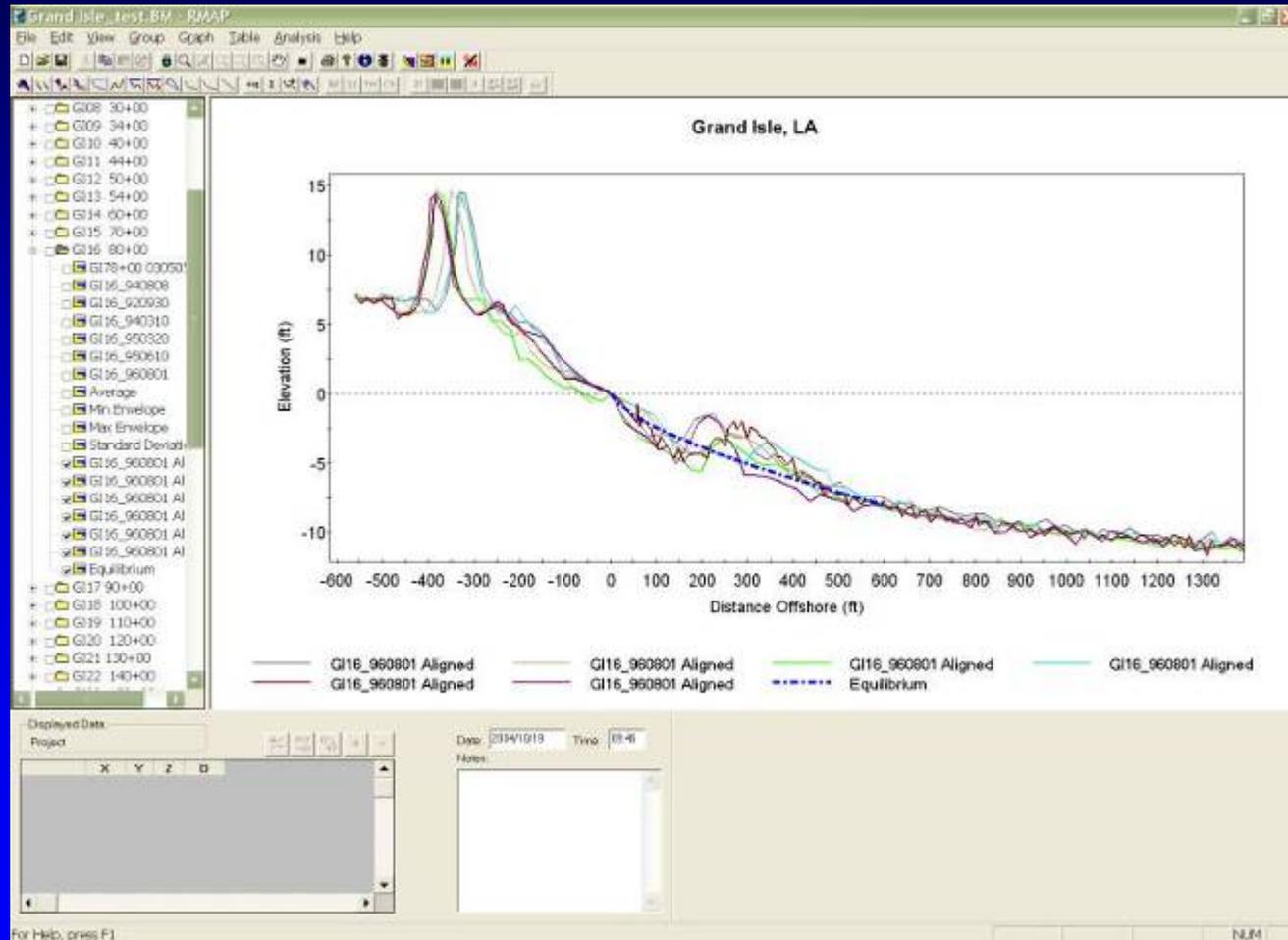
Avg



US Army Corps  
of Engineers

Coastal and Hydraulics Laboratory  
Engineer Research & Development Center

# Profile Analysis Equilibrium Beach Profile



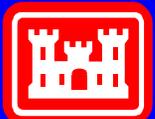
# Summary – Present and Planned Capabilities

## Present

1. **Backward compatible**
2. Geospatial data handling
3. Data re-projection
4. Map/Graph Views
5. Report quality graphics
6. Shoreline analysis/tools
7. Profile analysis/tools

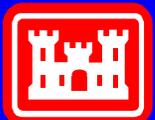
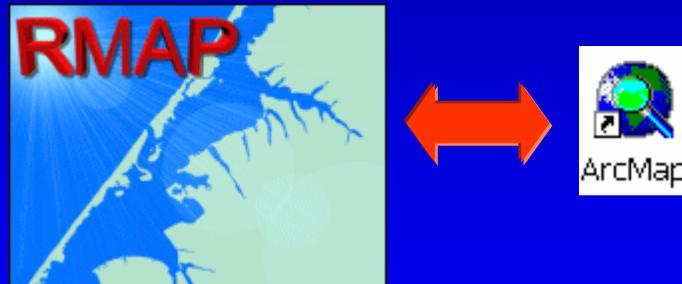
## Planned

1. Fitting of crenulate bay shorelines (log-spiral, parabolic, etc.)
2. Improved shoreline analysis tools
3. 2D empirical eigenfunctions
4. 3D analysis tools
5. 3D empirical eigenfunctions
6. 3D cut and fill
7. Channel cross-section tools
8. .... **What are your needs?**



# Evolution - Step 2

1. Database storage structure
2. Interoperability with GIS
3. Break into COM objects and create GIS extension

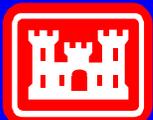


# Availability

Coastal Engineering and Design and Analysis System  
Software Package (CEDAS) version 4.0  
or  
stand-alone component

Timeframe: Mid-April

Contact: Veri-Tech, Inc. [www.veritechinc.com](http://www.veritechinc.com)



US Army Corps  
of Engineers

Coastal and Hydraulics Laboratory  
Engineer Research & Development Center

# Questions

?

**Contact Info:**

**Brian.K.Batten@erdc.usace.army.mil**

**Voice: 601-634-3563**