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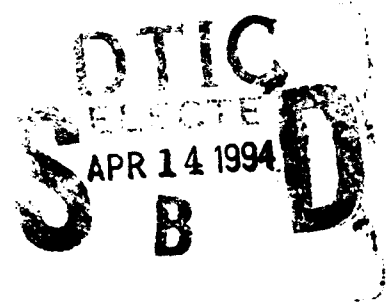
## **BFM: Beach Fill Module**

### **Report 1 Beach Morphology Analysis Package (BMAP) — User's Guide**

*by Barry G. Sommerfeld, John M. Mason  
Coastal Engineering Research Center*

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Texas A&M University — Corpus Christi*

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## **Report 1**

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**Final report**

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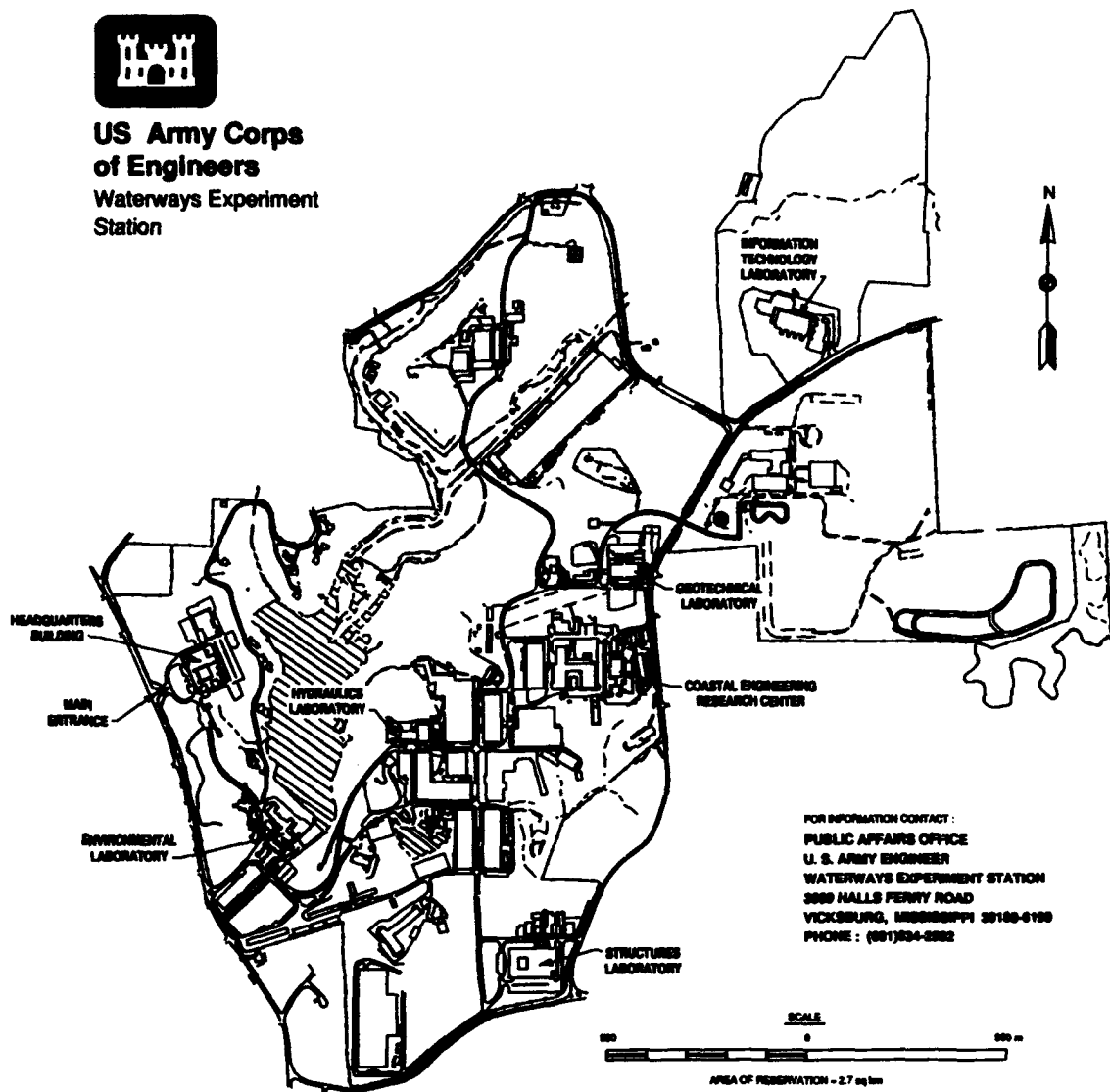
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# Preface

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The work described herein was authorized as a part of the Civil Works Research and Development Program by Headquarters, U.S. Army Corps of Engineers (HQUSACE). Work was performed under the Beach Fill Engineering Work Unit 32801 of the Shore Protection and Restoration Program at the Coastal Engineering Research Center (CERC), U.S. Army Engineer Waterways Experiment Station (WES). Messrs. John H. Lockhart, Jr., John G. Housley, and Barry W. Holliday were HQUSACE Technical Monitors. Ms. Carolyn M. Holmes, CERC, was Program Manager.

This report was written by Mr. Barry G. Sommerfeld, Contract Computer Scientist, Coastal Processes Branch (CPB), Research Division (RD), CERC; Mr. John M. Mason, ASCI Corporation Contract Computer Scientist for CPB, RD; Dr. Nicholas C. Kraus, Director, Conrad Blucher Institute for Surveying and Science, Texas A&M University - Corpus Christi; and Dr. Magnus Larson, Associate Professor, Department of Water Resources Engineering, University of Lund, Sweden. Most of the analysis programs described in this report were written by Drs. Larson and Kraus as part of numerical modeling activities. Messrs. Sommerfeld and Mason modified these programs for use on desktop microcomputers and developed the operating shell and graphics routines. Mr. W. Gray Smith, CPB, RD, assisted in debugging of the software package and report preparation. Ms. Allison Abbe, CPB, RD, and Ms. Peggy T. Brown, CPB, Office of the Senior Scientist, CERC, assisted in text entry and formatting. The operating shell was designed by all of the authors. This study was performed under the administrative supervision of Dr. James R. Houston, Director, CERC; Mr. Charles C. Calhoun, Jr., Assistant Director, CERC; Mr. H. Lee Butler, Chief, RD; and Mr. Bruce A. Ebersole, Chief, CPB. Dr. Kraus was the Principal Investigator, Work Unit 32801 during the majority of the development of the software package, and Mr. Smith was the Principal Investigator at the time of publication.

At the time of publication of this report, Director of WES was Dr. Robert W. Whalin. Commander was COL Bruce K. Howard, EN.

# 1 Introduction

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## Background

As part of ongoing research activities, the Beach Fill Engineering work unit of the Shore Protection and Restoration program is developing a micro-computer and work-station-based analysis software package called the Beach Fill Module (BFM). The BFM is an integrated system of analysis and graphics programs that incorporates major engineering and planning functions required in beach fill design as performed by the U.S. Army Corps of Engineers. A series of reports is planned to document the BFM and associated analysis programs.

This report is the first in the BFM series and is a user's guide for the Beach Morphology Analysis Package (*BMAP*), consisting of automated and interactive procedures to analyze morphologic and dynamic properties of beach profiles. The *BMAP* can be called from within the BFM or run as a stand-alone program. This guide provides information to operate *BMAP* as a stand-alone program under the Disk Operating System (DOS) running on a personal computer (PC).

Cross-shore modeling of storm-induced beach erosion is a central component of modern shore-protection planning. The *BMAP* is a computation utility developed at the Coastal Engineering Research Center (CERC), U.S. Army Engineer Waterways Experiment Station, to support desktop computer simulation studies of cross-shore modeling of storm-induced beach erosion for beach fill design.

Originally, *BMAP* was conceived to simplify and automate the numerical modeling work flow through analysis of the input data and results of computations from CERC's Storm-induced BEACH change model (SBEACH) (Larson and Kraus 1989; Larson, Kraus, and Byrnes 1990). Because of its utility and convenience, it has evolved to incorporate functions to inspect and analyze beach profiles and beach profile change. The *BMAP* graphical interface produces on-screen plots of user-selected profiles and calculation results that are easily exported to a printer. The present report covers Version 1 of *BMAP*, which is capable of two-dimensional analysis; that is, analysis of beach profiles. Further *BMAP* versions are planned to extend the profile analysis

capabilities, the shell interface, and to perform three-dimensional analysis of beach morphology.

The *BMAP* supplies the coastal engineer and scientist, in one compact and convenient software package, with a multitude of capabilities in support of beach profile analysis and cross-shore modeling activities of storm-induced beach erosion. The objective of this report is to describe the features and operation of *BMAP*.

Chapter 7 is included to exercise and demonstrate *BMAP*. Profile survey data used in these examples were taken from two sources. One set of data was generated in a field monitoring study at Ocean City, Maryland, site of a major beach fill project. The project and data set are described in Stauble et al. (1993). The other data set pertains to the SUPERTANK Laboratory Data Collection project that was conducted with a large wave tank. The SUPERTANK project is described in Kraus, Smith, and Sollitt (1992).

## Scope of Report

This report is intended to serve as a user's guide and tutorial for operating *BMAP*. All major features of *BMAP* version 1.0 are described. Chapter 1 gives the background of *BMAP*. Chapter 2 gives an overview of the functions in *BMAP*. Chapter 3 begins step-by-step tracing of *BMAP* functions with a discussion on the **Project Options Menu**. Chapter 4 contains a discussion of the various options in the **Main Menu**. Chapter 5 begins the discussion on the analysis capability of *BMAP*, continued in Chapter 6 with an explanation of synthetic profiles and how they are generated and used. Chapter 7 leads the user through a test run of *BMAP* using authentic data collected at Ocean City, Maryland, and in the SUPERTANK project. Appendix A describes the particular format of profile survey data required for use with *BMAP* and contains the data corresponding to the worked examples. Appendix B provides instructions on how to install and execute *BMAP*. Appendix C describes the conversion between the two *BMAP* profile survey data formats. Appendix D contains mathematical notation used in this report.

## Name Convention

In this manual, names of keys on the PC console or keyboard are written in capital letters and enclosed in triangular brackets. Menus in *BMAP* are written in bold Roman script in reference to the menu itself or its functioning, whereas if a menu name refers to a chapter title, it is italicized.

## **Updates to Manual**

Located on the distribution diskette is a file called README.TXT. This file contains information about modifications to *BMAP* after the printing of the manual. Please consult this file before starting *BMAP*.

## 2 Overview

---

The *BMAP* complements and is file-compatible with the Interactive Survey Reduction Program (ISRP) (Birkemeier 1984), widely used by U.S. Army Corps of Engineers personnel dealing with coastal processes and beach profile change. The ISRP was developed as an aid to beach profile survey parties and permits "...interactive reduction, editing, and plotting of field survey notes and the corrections of previously entered data" (Birkemeier 1984). In contrast, the *BMAP* is a stand-alone program that can be executed independently in support of a wide range of beach profile analysis objectives and numerical modeling studies of profile change. The *BMAP* does not contain utilities (as does ISRP) for assisting survey parties directly, but, rather, provides comprehensive data analysis capability for office studies once reduction and checking of the profile data have been completed.

### Capabilities

Capabilities of BMAP 1.0 include:

- a. On-screen color plotting and black and white hard copies of multiple profile surveys from one or more input files.
- b. Average of multiple profile surveys between a given spatial range. Included within this option is the ability to display the standard deviation and envelope of profile change.
- c. Calculation of cut and fill cells giving changes in volume between two profile surveys.
- d. Fitting of an equilibrium profile for a single grain size.
- e. Calculation of a cross-shore sand transport rate.
- f. Calculation of bar properties, including volume, location, and height. These calculations may be performed with or without a reference profile.

- g. Calculation of profile volume with respect to specified reference elevation and/or segment along the profile, with the capability to compare two profiles.
- h. Specification of user-defined synthetic profiles (four different types) to be used for comparison and analysis with measured profiles.
- i. Vertical and horizontal shifting of profiles.
- j. Alignment of the profile origin to a specified elevation.
- k. A utility to convert ISRP data files to and from free format (two-column format).
- l. On-line, context-sensitive help obtained by pressing <F1>.

Calculation and graphical manipulation procedures are presently being developed for aiding beach fill design. A planned upgrade will allow mouse-controlled manual construction and modification of beach fill profile shape, from which added volume may be calculated by *BMAP* to develop optimal profile cross-section design and support advanced beach profile analysis.

## Projects

The package has the option of storing data and associated parameters into uniquely named files called "projects," allowing different users to access *BMAP* on the same computer system in analysis of the same or a different project with a common or different subset of a database. Projects would usually contain particular profile surveys for a specific location and different times in the case of field data. In analysis of laboratory data, such as for SUPER-TANK, a project might correspond to a single test involving surveys of profiles generated under the same wave conditions and water level. The advantage of defining projects is that one may have a data file which contains a large amount of data with some profile surveys unrelated to other profiles within the same file; definition of projects readily gives accessibility to a subset of the large file, hence allowing the user to functionally separate the file and group profiles for like locations, times, or test.

Each project must consist of a project file name, the input file name, the length unit, and multipliers related to the number of significant digits for the horizontal and vertical coordinates. Typically, the project consists of one or more profiles from the input data file. The project may also contain output profiles that have been generated by *BMAP* and may be saved to disk.

## Keyboard Functions

The *BMAP* is operated through a series of menu screens and data edit screens. The *BMAP*'s menu structure is described at length in Chapters 2 through 6. The most widely used keys that control the system are now reviewed.

### ESCAPE

Perhaps the most often used key in *BMAP* is the ESCape key, <ESC>. Pressing the ESCape key on a menu returns the user to the previous menu. The ESCape key also provides the method of exiting *BMAP*. When the current menu is the **Project Options Menu** (described in subsequent chapters), and the user presses <ESC>, *BMAP* prompts for confirmation of the request to exit.

### ALT-S and ALT-X

In most data edit screens, i.e., screens where data are entered by the user, the <ALT-X> key terminates the current process without saving changes and takes the user to the previous menu screen, distinguishing it in function with the <ALT-S> key in such screens. The <ALT-S> key exits the data edit screen and saves all changes before performing the next task.

### ENTER

In menu screens, the <ENTER> key is pressed to make a selection. In most data edit screens, the <ENTER> key moves the cursor to the next field, if it is not the last field. If the cursor already rests upon the last field, pressing the <ENTER> key usually saves the data entered and performs the corresponding calculations.

### ALT-I, ALT-D, ALT-M, TAB

Some keys are unique to the data edit screens, e.g., the **Load Profile Menu** discussed in a later chapter. In these screens, <ALT-D> deletes the current line, <ALT-I> inserts a line, <TAB> moves one column to the right, <SHIFT-TAB> moves one column to the left, down arrow moves one line down, and up arrow moves one line up. The <ALT-M> key toggles how *BMAP* handles the command to insert a line (<ALT-I>). Upon entering the **Load Profile Menu**, pressing <ALT-I> causes *BMAP* to insert a line before the current line. Pressing <ALT-M> causes lines to be inserted after the current line when <ALT-I> is pressed. These conventions are consistent for all data edit screens.



except for the **Output Profile Menu** where <ALT-L> and <ALT-M> are deactivated because all output profiles are generated by *BMAP*.

### <ALT-P>

Whenever a graph appears on the screen, the user has the option of obtaining a hardcopy of the graph to an HP Laserjet II-compatible printer. Pressing <ALT-P> on such screens plots the graph to the printer.

### <ALT-R>

Whenever data result from calculations, *BMAP* allows the user to save the data to a file or print a copy on the attached printer. If the user presses <ALT-R> in such a case, *BMAP* prompts the user of the destination, i.e., file or printer. If the user chooses file, *BMAP* requests that the user enter the file name. This file name must be a valid DOS file name. No directory should be entered, however. *BMAP* automatically saves all output to the project's data directory specified in the **Project Parameters** screen. If the user chooses printer as the destination, the results immediately are sent to the printer.

### <F1>

*BMAP* is equipped with on-line, context-sensitive help. To obtain help for any option in *BMAP*, you should press <F1>, and a help screen pertaining to the current function will be displayed. For more general help, press <F1> again.

## Output Profiles

Whenever calculations are performed and a profile is generated from those calculations, the user may wish to save that profile for later inspection. The *BMAP* provides a way of saving output profiles. Figure 1 shows a sample of the message displayed by *BMAP* after output data have been generated by some means. *BMAP* automatically assigns to all generated graphs a two-letter descriptor followed by a number that is incremented by one for each graph of the same type. Following are the two-letter descriptors and the respective option that generates these output data:

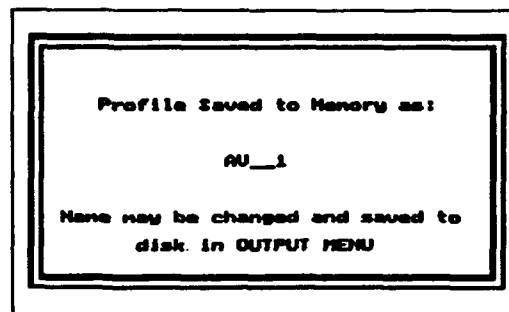


Figure 1. Output profile saved screen

- a. **ZM - Zoom Profiles.**
- b. **AV - Averaging.**
- c. **EV - Envelope of profile change (generated by Averaging routine).**
- d. **SD - Standard deviation (generated by Averaging routine).**
- e. **HA - Horizontal Alignment.**
- f. **LS - Least-Square Estimate.**
- g. **TL - Translation.**
- h. **TR - Transport Rate.**
- i. **EP - Equilibrium Profile.**
- j. **IP - Interpolated Profile.**
- k. **MP - Modified Equilibrium Profile.**
- l. **PS - Plane-Sloping Profile.**

Consult the section entitled *Output Profiles Menu* for more information about output profiles and the way they are stored.

## **Data Format**

*BMAP* input files presently must be formatted to the specifications associated with ISRP, a format more commonly known as "ISRP format." If output profiles are stored to disk, they are also saved in ISRP format so they may be loaded into *BMAP* as input. See Appendix A for an explanation of ISRP format. A conversion utility allows *BMAP* to access and convert between ISRP and two-column free format files. See Appendix C for a discussion of the conversion utility and the format of these files.

## **BMAP Menus**

The *BMAP* operates through a series of self-explanatory menus. One chapter of this report is devoted to each of the individual menus.

As an overview, Figure 2 shows the hierarchy of menus. The **Project Options Menu** is the initial menu encountered and serves as *BMAP*'s internal file handling system, performing such basic functions as loading data, and

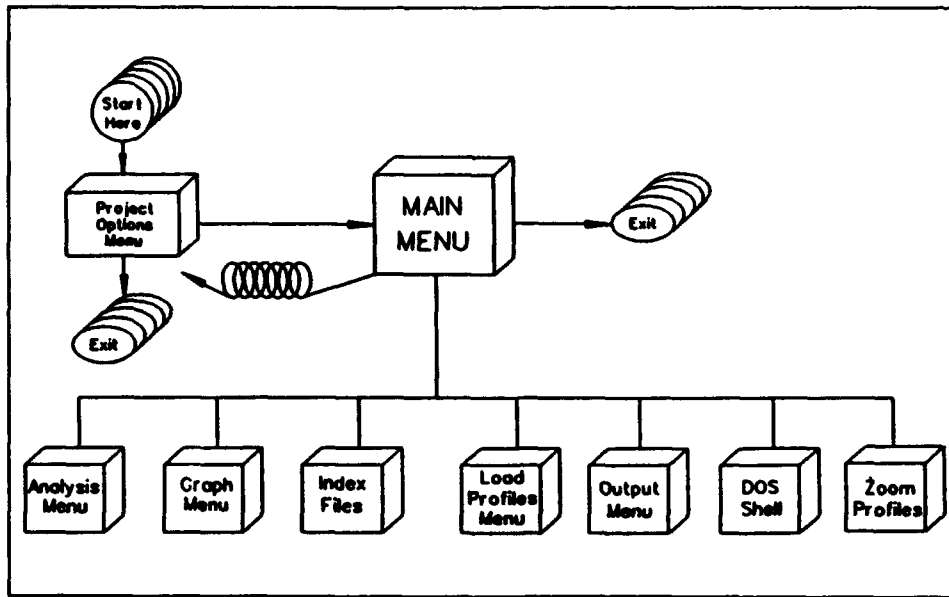


Figure 2. Menu structure of the *BMAP*

creating, copying, and deleting work projects. The **Main Menu** is the “control center” that leads to the possible routes of analysis, graphics, and input and output of data. *BMAP* is also exited through the **Main Menu** and the **Project Options Menu**.

The remainder of this report concerns the functioning of all selections or capabilities listed on the menus.

## 3 Project Options

---

The concept of "Projects" was discussed in the previous chapter. In this section, the user will learn how to create and manipulate projects.

### Creating Projects

After typing *BMAP* from the DOS command line, the **Project Options Menu** appears, as shown in Figure 3. Several selections or options are displayed; however, because you have just entered *BMAP*, only two options are available, **Create Project** or **Load Project**. If you are planning to begin a new project, or if this is the first time you have entered *BMAP*, you will probably wish to create a project.

Once **Create Project** has been selected, you are prompted to enter the project name. This name should be no longer than eight characters and must be a valid DOS file name. Do not enter an extension, however, because *BMAP* automatically appends the extension ".prj" to all project names for storing to your hard disk.

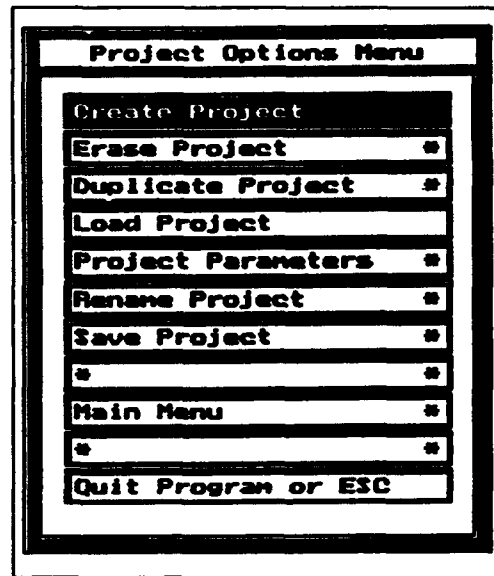


Figure 3. Project Options Menu

### Parameters

After entering the project name, the **Parameters** menu is displayed (Figure 4). The first field of this menu is the data directory field. This directory should be the directory where *all* input data files for this project reside. This is also the directory to which *BMAP* saves all output information. The next

PARAMETERS	
Data Directory:	C:\BMAP\DATA
Default Input File:	OC370FF.ISR
Units (ft/m):	ft
Length Multiplier	
Distance (x):	1.0
Elevation (z):	0.1

Figure 4. Sample Project Parameters screen

file must be in the data directory specified above. If this is the first time *BMAP* has accessed this file, the file is indexed. Depending upon the size of the data file, indexing may take a while, but this one-time wait will save much time in future calculations to be performed. In the units field, tell *BMAP* whether project data were recorded in meters or in feet<sup>1</sup>. Enter the horizontal (distance, x) and vertical (elevation, z) length multipliers in the next two fields. These multipliers allow flexibility in precision. Standard *ISRP* format allows no significant digits for x and one significant digit for z. The default multipliers corresponding to standard *ISRP* format are 1.0 for x and 0.1 for z. In many applications, greater precision is available, so *BMAP* allows user-specified multipliers. For example, if profile data are stored with one significant digit for x and two significant digits for z, enter 0.1 for x and 0.01 for z.

field is the *default* input file. This is helpful if most or all of the profiles for this project come from the same data file. Entering the name of the valid *ISRP* file here will avoid retyping the file many times when loading the profiles. No directory should be entered here as the

## Loading profiles

Following the *Parameters* screen is the *Load Profile Menu* (Figure 5). This menu allows you to enter the unique identification information for each profile from the input file.

Each profile is identified by four external attributes: file name, identification (ID) (five characters), date, and time. By pressing <ALT-L>, you are able to view these attributes for all the profiles in the file (Figure 6). You may then scroll with your cursor keys and tag each profile you wish to load by pressing <ALT-T>. Pressing <ALT-T> twice on the same profile untags it. When you have completed making your selection, press <ALT-S> to return to the *Load Profile Menu*. *BMAP* automatically copies the tagged information to the *Load Profile Menu*. Pressing <ALT-X> returns the user to the *Load Profile Menu* without copying the information. Change to a different file by changing the name of the file on an empty line. Pressing <ALT-L> after

<sup>1</sup> One foot in American customary units equals 0.3048 meter in metric units.

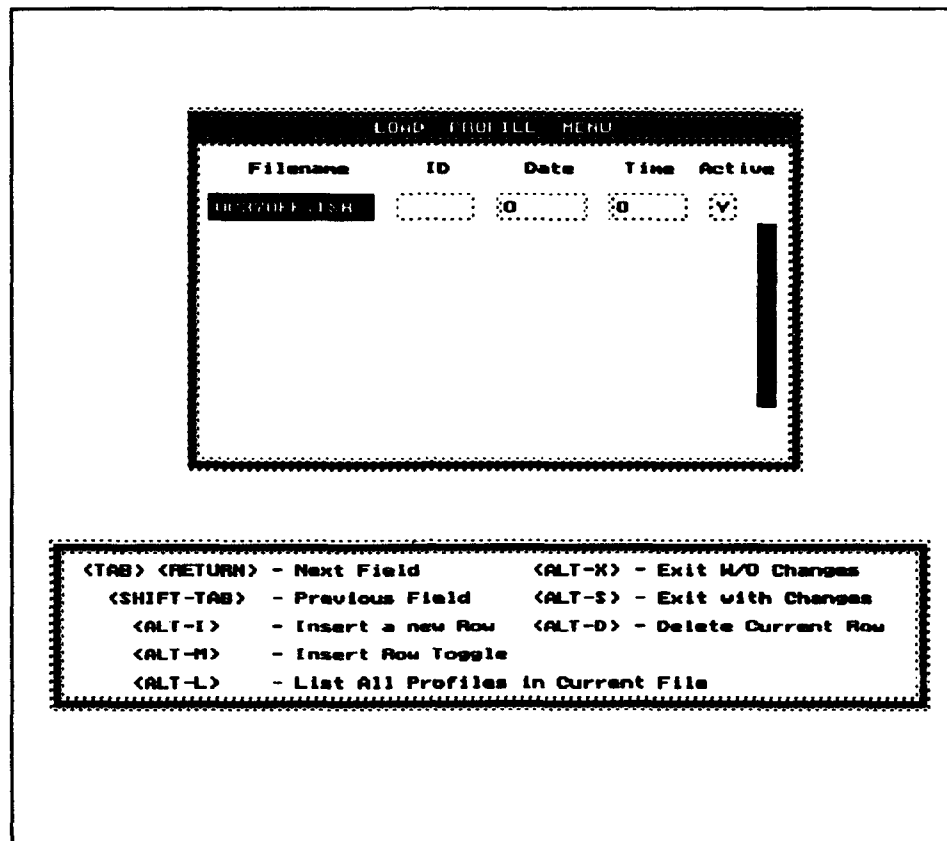


Figure 5. Load Profile Menu

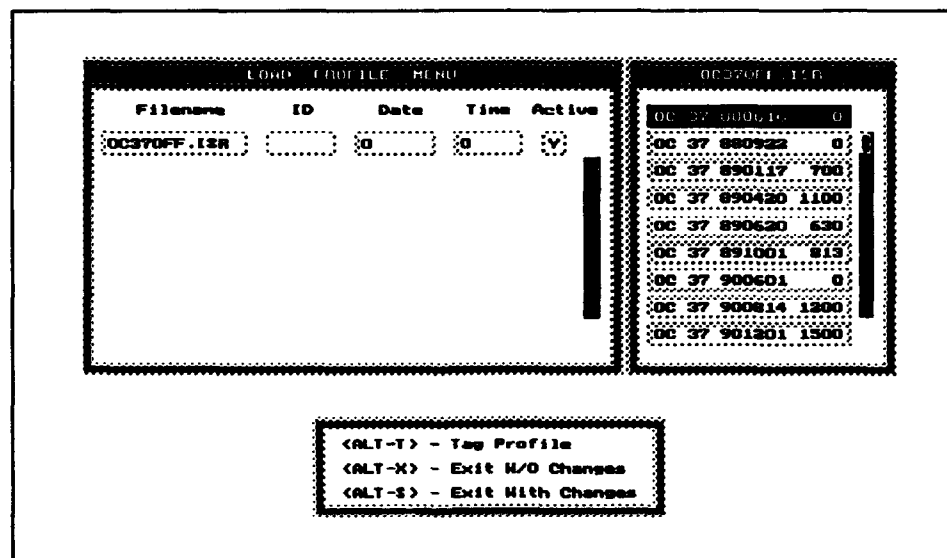


Figure 6. Example of profile listing

making that change causes *BMAP* to display the profile information of the new file.

There is another field attribute, internal to your particular *BMAP* session and attached to each profile, called **Active** or **Activate**. In many *BMAP* analysis procedures, you are given the option of performing calculations with selected profiles (called "active profiles"). It is in the **Load Profile Menu** that you are able to activate them, thereby allowing you to isolate work to a subset of your larger project data set.

Within the **Load Profile Menu**, the following keystrokes apply:

- a. <ALT-D> - Delete current row.
- b. <ALT-I> - Insert row.
- c. <ALT-M> - Toggle insert mode (initially, a row is inserted after current row when <ALT-I> is pressed. Pressing <ALT-M> toggles the insertion point to be before the current row.).
- d. <TAB>  
or <RETURN> - Move right one field.
- e. <SHIFT-TAB> - Move left one field.
- f. <Up Arrow> - Move up one row.
- g. <Down Arrow> - Move down one row.
- h. <ALT-X> - Exit without saving changes.
- i. <ALT-S> - Save and exit.
- j. <ALT-L> - List profiles in current data file.
- k. <ALT-T> - Tag current profile in the profile listing.

After all requested profiles have been loaded and activated as required, *BMAP* places you in the **Main Menu**, ready to perform calculations and to plot profiles.

## Erase Project

When you choose this option within the **Project Options Menu**, the current project is erased from the disk and is removed from the *BMAP* session. After

the project has been erased, you must either load a new project or create a new project before proceeding.

*Note: Only the project file is erased with this option. Because input files and their associated index file are used for multiple projects, these files are not erased. Output files associated with the erased project will likewise remain on the hard drive, as it is not uncommon for output files to be used to produce graphs external to BMAP.*

## **Duplicate Project**

This option allows you to copy the contents of the current project into another project file. When prompted for the file name, you should enter a maximum of eight characters. The name must be a valid DOS file name, but no extension should be given, as *BMAP* automatically appends the extension ".prj" to all projects. This aids in quick creation of a new project that has parameters similar to those of another, existing project.

## **Load Project**

This option displays all projects in the current directory. You may then use your cursor keys (or mouse) to choose the project you wish to load. If you have not saved the project on which you have been working, you are queried as to whether or not you wish to save the project and/or the output profiles, if any. **Load Project** loads all the previously saved parameters of the associated project and places you in the **Main Menu** ready for calculations.

## **Rename Project**

This option allows you to rename the current project. The name of the project should be no more than eight characters long and must be a valid DOS file name. No extension should be added, as *BMAP* automatically appends the extension ".prj" to all project names.

## **Save Project**

The **Save Project** option saves the project currently in memory to disk. It is stored on disk as the name of the project (already specified) with the extension ".prj." If output profiles have been generated in the current session, but have not been saved to disk, *BMAP* allows you to do so at this time before the project is saved. If output profiles are not stored on disk, they are not kept within the project file when saving the project.



## 4 Main Menu

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After a project has been created or loaded into memory, you are ready to start performing calculations and other tasks such as viewing and cleaning data and making graphical comparisons. At this point you are brought to the Main Menu (Figure 7). The Main Menu serves as an intersection and junction to other menus and basic operations.

### Analysis Menu

Choosing this option places you in the Analysis Menu, where all calculations are performed. For an extended discussion on available calculations, see Chapter 5, "Analysis."

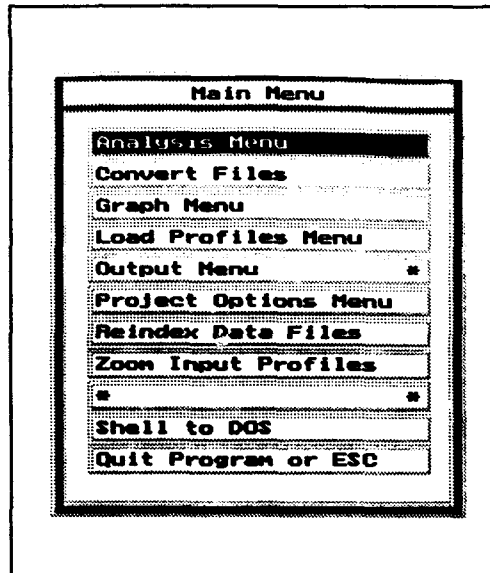


Figure 7. Main Menu

### Convert Files

*BMAP* allows the user to conveniently convert free format files to *ISRP* files so that they may be used in *BMAP*. The user may also convert *ISRP* files to free format so that they may be used in other applications such as spreadsheet packages. When the user chooses **Convert Files** from the Main Menu, the **Convert Files** screen is displayed (Figure 8). The user chooses the option desired. *BMAP* then allows the user to enter the respective file names. If *BMAP* successfully converts the file, it displays a message. If there is an error, *BMAP* notifies the user. Errors typically occur if the free format file is not consistent with *BMAP*'s free format. See Appendix C for an explanation of the *BMAP* free format.

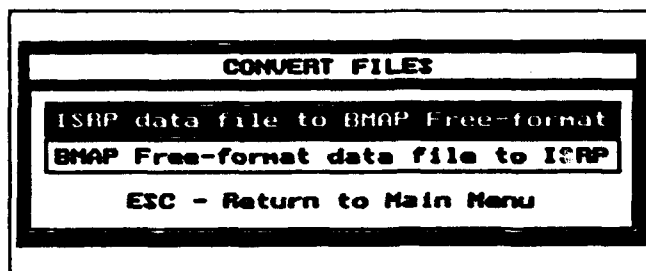


Figure 8. Convert Files screen

(Figure 9). Choosing All Profiles displays all input profiles (both active and inactive) and all output profiles located in memory. Choosing Input Profiles displays all input profiles (both active and inactive). To display only the output profiles, you should choose Output Profiles. By choosing Active Input Profiles, you receive a graph of all input profiles that have been tagged as active in the Load Profile Menu.

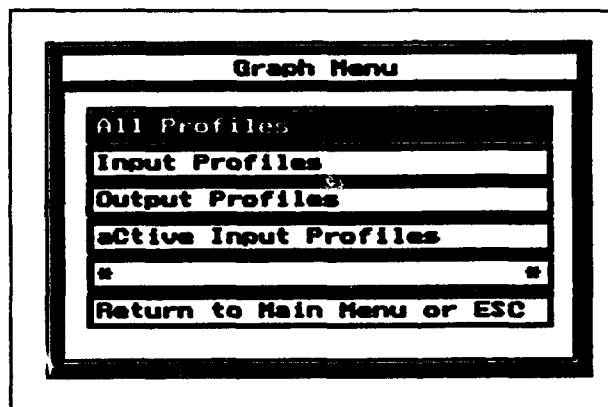


Figure 9. Graph Menu

## Graph Menu

Choosing this option places you in the Graph Menu, which provides various options for graphing the profiles in memory. *BMAP* offers four options for graphing profiles

## Load Profile Menu

This option allows you to load the profile data into memory. For an extended discussion on loading profiles, see the section entitled *Loading Profiles* in Chapter 3, "Project Options."

## Output Menu

After a calculation is performed and a new profile results, *BMAP* stores the profile (called an "output profile") to memory under a unique name. The data associated with this profile are stored only to memory. In order to store such profiles to the hard drive you must select **Output Menu** from the **Main Menu**. Figure 10 shows a sample session with the **Output Menu** selected.

Figure 10 displays the **Output Profile** screen before any editing has been done. Note that the names (file names if stored to disk) are blank at this time, and the ID information has limited meaning apart from the fact that each calculated profile has a unique two-letter prefix. In this case there are five

OUTPUT PROFILE MENU						
No.	Name	Description	ID	Date	Time	Save to Disk?
1			ZM_1	930813	911	N
2			ZM_2	930813	911	N
3			ZM_3	930813	911	N
4			ZM_4	930813	911	N
5			ZM_5	930813	911	N
6			AV_1	930813	912	N
7			HA_1	930813	912	N
8			HA_2	930813	912	N

<TAB>	- Next Field	<Shift-TAB>	- Prev. Field
<ALT-X>	- Abort	<ALT-S>	- Save & Exit
<ALT-D>	- Delete Profile		

Figure 10. Sample Output Profile Menu

“zoomed profiles” (profile data calculated by zooming on the input profiles), an “average profile” (profile data calculated by averaging one or more input profiles), and three “horizontally aligned profiles” (profile data produced by requested alignment of input profiles). For a listing of each two-letter identification and its corresponding function, consult the section entitled *Output Profiles* in Chapter 2. All file names may be changed in this menu to be more descriptive to the user. The file name must be a valid DOS file name. No extension should be entered as *BMAP* automatically appends the extension “prf” to output data files. The user should not enter a directory as *BMAP* stores all output data to the data directory of the project. A description may also be included. All parameters here are saved to an ISRP data file. The descriptions are saved to the project file if the project is saved. Figure 11 shows the same set of output profiles, but the descriptive information has now been changed.

Output profiles may also be deleted from the list, as well as from memory, by pressing <ALT-D>. Figure 12 shows the same set of output profiles, but this time “AV\_1” (No. 6) has been deleted, not being required by the user.

To exit this menu, saving all modifications to disk, press <ALT-S>. To abort without saving any changes, press <ALT-X>.

## Project Options Menu

The **Project Options Menu** allows you to enter all associated parameters pertaining to a project and to save these parameters. You may also erase, duplicate, and rename projects in this menu. For a detailed discussion on the **Project Options Menu**, see Chapter 3, “Project Options.”

OUTPUT PROFILE MENU						
No.	Name	Description	ID	Date	Time	Save to Disk?
1	scan1	Profile 1 scanned 100-1000	2H_1	930813	911	<input checked="" type="checkbox"/>
2	scan2	Profile 2 scanned 100-1000	2H_2	930813	911	<input checked="" type="checkbox"/>
3	scan3	Profile 3 scanned 100-1000	2H_3	930813	911	<input checked="" type="checkbox"/>
4	scan4	Profile 4 scanned 100-1000	2H_4	930813	911	<input checked="" type="checkbox"/>
5	scan5	Profile 5 scanned 100-1000	2H_5	930813	911	<input checked="" type="checkbox"/>
6			2H_1	930813	912	<input type="checkbox"/>
7	align1	Profile 1 aligned at 8 elev	2A_1	930813	912	<input checked="" type="checkbox"/>
8	align2	Profile 2 aligned at 8 elev	2A_2	930813	912	<input checked="" type="checkbox"/>

<TAB> - Next Field <ALT-N> - Abort <ALT-D> - Delete Profile	<Shift-TAB> - Prev. Field <ALT-S> - Save & Exit
---	--

Figure 11. Modified Output Profile Menu

OUTPUT PROFILE MENU						
No.	Name	Description	ID	Date	Time	Save to Disk?
1	scan1	Profile 1 scanned 100-1000	2H_1	930813	911	<input checked="" type="checkbox"/>
2	scan2	Profile 2 scanned 100-1000	2H_2	930813	911	<input checked="" type="checkbox"/>
3	scan3	Profile 3 scanned 100-1000	2H_3	930813	911	<input checked="" type="checkbox"/>
4	scan4	Profile 4 scanned 100-1000	2H_4	930813	911	<input checked="" type="checkbox"/>
5	scan5	Profile 5 scanned 100-1000	2H_5	930813	911	<input checked="" type="checkbox"/>
7	align1	Profile 1 aligned at 8 elev	2A_1	930813	912	<input checked="" type="checkbox"/>
8	align2	Profile 2 aligned at 8 elev	2A_2	930813	912	<input checked="" type="checkbox"/>
9	align3	Profile 3 aligned at 8 elev	2A_3	930813	912	<input checked="" type="checkbox"/>

<TAB> - Next Field <ALT-N> - Abort <ALT-D> - Delete Profile	<Shift-TAB> - Prev. Field <ALT-S> - Save & Exit
---	--

Figure 12. Profile deleted from Output Profile Menu

## Reindex Data Files

The *BMAP* makes use of index files to reduce time spent reading from and writing to the hard drive. Each data file that is used by *BMAP* has an associated index file. Occasionally, these files may become invalid due to the addition or deletion of profiles from the input or output files. If you are experiencing problems with profiles seeming incorrect, you should re-index your files before proceeding.

## Shell to Operating System

This option allows you to go to DOS and perform DOS applications without exiting *BMAP*, while keeping all current parameters in memory. When you have completed your DOS tasks, you may type "exit" at the command prompt, which brings you back in the **Main Menu** of *BMAP* where you left off.

## Zoom Profiles

Occasionally the user wishes to inspect more closely a section of a plot of profiles in order to make better decisions. The **Zoom Profiles** option has been included in *BMAP* specifically for that purpose.

Upon choosing **Zoom Profiles**, you are presented with a graph of all active input profiles. A screen to the right of the graph requests you to enter values for the parameters XON and XOFF. These are the beginning and ending points on the horizontal axis. After these values have been entered, *BMAP* shows this section on the graph, i.e., every data pair whose x-value is greater than or equal to XON and less than or equal to XOFF. No interpolation is performed for this option. Note that the value of XON must be less than the value of XOFF. Any of the **Zoom Profiles** may be saved to disk within the **Output Menu**.

## 5 Analysis

After you have selected **Analysis Menu** (Figure 13) from the **Main Menu**, you are ready to begin calculating with the active profiles. You should now make your choice as to which type of calculation procedure you would like to access.

### Averaging

This option averages all active profiles, creating one output profile that is given the temporary name "AV###," where ### is the sequential number in the order of averaged profiles created. (For an explanation of Active Profiles, see section entitled *Loading Profiles* in Chapter 3, "Project Options.") Once you select this option, plots of all active profiles are displayed on the screen, and *BMAP* prompts you to enter **Xon**, **Xoff**, and **Dx**. **Xon** is the position on the *x*-axis where you wish to begin averaging; **Xoff** is the position on the *x*-axis where you wish to terminate averaging; and **Dx** is the interval increment for the calculation of the average profile and determines the number of points that will be contained in the output (average) profile. As at any time in *BMAP* when a graph appears on screen, you have the option of printing the graph to your printer. By pressing <ALT-P>, you will receive a hard copy of the screen graph. You are now ready to enter the parameters.

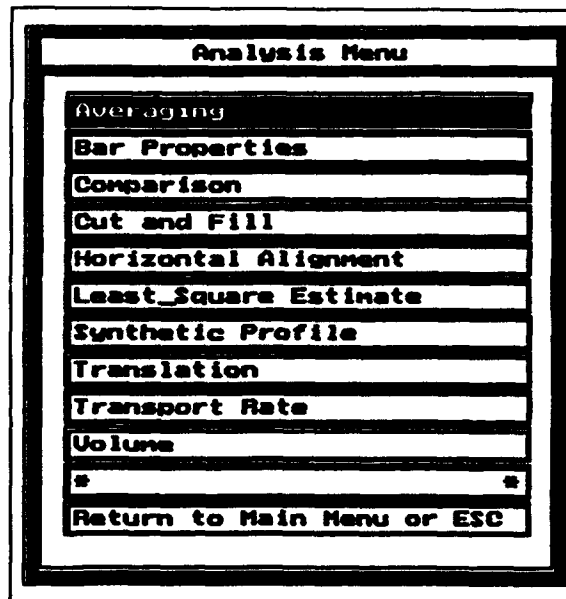


Figure 13. Analysis Menu

## Average, Envelopes, and Standard Deviation

After you have entered values for the parameters, and calculations have been performed, *BMAP* displays the output profile. You now have six options. First, you may redisplay the original input profiles. You may display the input profiles with the standard deviation. The average profile may also be displayed. The user may plot the average profile along with the standard deviation, minimum and maximum envelopes, or both. Once again, for any of these plots you may either press <ALT-P> to obtain a hard copy of the profiles, or you may press <ESC> to return to the **Analysis Menu**. Once you press <ESC>, *BMAP* informs you that it has saved the output profiles to memory. It also displays the default names to which they have been saved. For a listing of each two-letter identification and its corresponding function, consult the section entitled *Output Profiles* in Chapter 2. You may later wish to change the default names as well as save them to your hard disk. This can be done in the **Output Menu**. Consult the *Output Menu* section in Chapter 4, "Main Menu" for instructions on output profiles.

## Bar Properties

In this section, you are able to determine various properties pertaining to a bar including minimum depth and location, maximum height and location, volume, and the distance to the center of mass.

The *BMAP* provides two different ways to calculate bar properties. If you have an adequate equilibrium profile associated with the profile containing the bar, you may wish to perform calculations with the equilibrium profile as the reference profile (Larson and Kraus 1992). Choose **With a Reference Profile** from the **Bar Properties Menu** (Figure 14). If you do not have an adequate equilibrium profile associated with the profile containing the bar, choose **Without a Reference Profile**. This option requires you to estimate beginning and ending points of the bar.

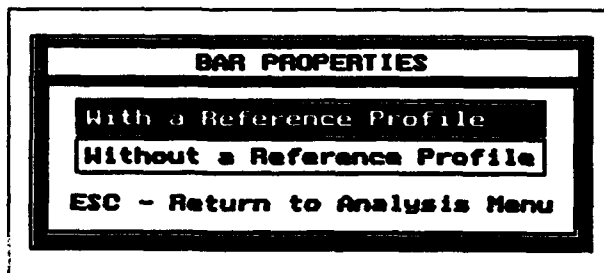


Figure 14. Bar Properties Menu

### Using a reference profile

If you choose to use the reference profile, you are prompted to specify the source of this profile (Figure 15). If the profile has been loaded from your input file, choose **Input File**; if it has been generated by *BMAP*, e.g., a Dean equilibrium profile (Dean 1977), choose **Output File**.

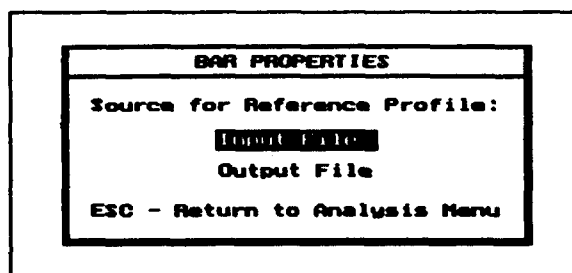


Figure 15. Reference Profile Source Menu

Once the source file for the profile is chosen, *BMAP* graphically displays all the profiles (either input or output) which it has loaded into memory. Inform *BMAP* of your choice by moving the box to the correct profile and pressing <ENTER>. You must perform the same

operation for the profile containing the bar (specific profile).

Once you have chosen both profiles, *BMAP* plots them to the screen and displays a menu of crossing points from which you may choose *Xon* (shoreward crossing point) and *Xoff* (seaward crossing point). In order to locate these cross pairs, *BMAP* has found where the target profile intersects the reference profile such that the elevation of the next point is greater than the reference profile's elevation at the next point. However, before this intersection is included in the list of cross pairs, there must be a corresponding second intersection where the target profile's elevation at the next point is less than that of the reference profile. These two intersections define a bar and therefore may be considered a valid pair. It is common for multiple pairs to occur on the lower portion of the profile survey, and the plot on the screen allows one to recognize the pair corresponding to a well-defined bar. When you have found the corresponding pair, use the cursor key to move the selection bar to that pair and press enter. The *BMAP* proceeds to perform the calculations and returns results.

### Omitting the reference profile

If an adequate equilibrium profile is not available for the corresponding profile containing the bar, or manual definition is desired, *BMAP* provides the opportunity of specifying the starting and ending positions of a bar. This is done by visual estimation.

Upon selecting **Without a Reference Profile**, you must choose your profile containing the bar (specific profile). See note above under *Using a reference profile* concerning choosing profiles.

Once you have chosen the profile, *BMAP* displays it on the screen, and you must now enter the starting and ending points of the bar (*Xon* and *Xoff*). Bar volume will be calculated with respect to a straight line connecting the two points (Keulegan 1948). The *BMAP* then plots the resulting reference line under the bar so you may determine the reasonability of the calculations. It also returns all other results. If you wish to save this information, you may



press <ALT-R> for a report. The *BMAP* asks if you wish to send the report to a file or a printer. If you choose file, you must enter the file name. You should not enter the directory because *BMAP* automatically stores the file in the data directory of the project. If you choose printer, *BMAP* immediately begins to print the report to your connected printer.

If the requested *Xon* and *Xoff* positions do not seem reasonable, you may press <ENTER>, and *BMAP* gives you the opportunity to try again. When you have finished, you should press <ESC> to return to the Analysis Menu.

## Cut and Fill

The Cut and Fill option is similar to that found in ISRP and calculates losses and gains, respectively, in volume. Cut and fill areas are determined with respect to distance across shore in cells defined by successive intersections of two profiles, or by the most landward and most seaward common points of survey data along the profiles for the first and last cells if there is no intersection at the beginning and end of the profiles. Two profiles must be chosen to perform the cut and fill calculation. Refer to the subsection in this chapter entitled *Using a reference profile* under the section entitled *Bar Properties* for instructions on how to choose profiles.

Once the two profiles are chosen, *BMAP* calculates and displays the results in two windows. The window on the right side of the screen contains the most landward and most seaward distances common to both profiles, called *Xon* and *Xoff*, volume change above and below the datum taken to be 0, change in shoreline position at the datum, and the starting and ending positions of the zero-depth contour. The bottom window displays the following information for each cut and fill cell: distance to the seaward end of the cell, elevation of the seaward end of the cell, cell volume (including a sign), average cell thickness (including a sign), cumulative volume, and gross volume. If there are more than three cells, additional cells are viewed by scrolling through the window with the UP and DOWN arrow keys. The cumulative volume at the last cell would be zero if there were sand conservation across shore; that is, if the sum of all cut volumes equalled the sum of all fill volumes. The gross volume, which is the sum of the absolute values of all cut and fill volumes, gives an indication of profile change or "activity" of the profile. If you wish to save the information, press <ALT-R> for a report. The *BMAP* asks for the target device as a file on disk or a printer. If you choose file, a file name is required. The directory should not be entered because *BMAP* automatically stores the file in the data directory of the project. If you choose printer, *BMAP* immediately begins to print the report to your connected printer. Like all other screens in *BMAP* where a graph appears, you may obtain a hard copy of the graph by pressing <ALT-P>.

## Profile Comparison

Profile comparison calculates volume change and contour change between two profiles given specified contour elevations. You must first choose the profiles for comparison. See the subsection entitled *Using a reference profile* under the section *Bar Properties* above for instructions on how to choose profiles.

Once the profiles are chosen, the contours to be compared should be specified. You may enter multiple contours. Enter the first contour, and, if you desire to enter a second, press <ALT-I> to insert another row. When you have entered the last requested contour, press <ALT-S> to begin calculating. *BMAP* displays the volume and contour change of each contour. If you wish to save this information, press <ALT-R> for a report. *BMAP* asks if you wish to send the report to a file or a printer. If you choose file, you must enter the file name. Do not enter the directory because *BMAP* automatically stores the file in the data directory of the project. If you choose printer, *BMAP* immediately begins to print the report to your connected printer. Like all other screens in *BMAP* where a graph appears, you may obtain a hard copy of the graph by pressing <ALT-P>.

## Horizontal Alignment

Sometimes it becomes necessary to shift profiles back and forth so that they cross at a specific elevation (the most shoreward elevation is used if the chosen elevation occurs several times along the profile). For example, a natural elevation on which to align profiles would be zero elevation, i.e., the shoreline or datum plane. After selecting an alignment elevation, the horizontal (distance) coordinate will begin at the profile elevation chosen for the alignment. The horizontal alignment location may be selected from the profiles or assigned as required. The *BMAP* offers this option in **Horizontal Alignment**.

**Horizontal Alignment** plots all active profiles and prompts you to enter the alignment factor, the elevation to which the profiles will be aligned. Once this is entered, *BMAP* aligns all the profiles to that location and stores them temporarily in memory. You may later choose **Output Menu** from the **Main Menu** to store them to your hard drive. See section entitled *Output Menu* in Chapter 4, "Main Menu" for a discussion on storing output profiles. Like all other screens in *BMAP* where a graph appears, you may obtain a hard copy of the graph by pressing <ALT-P>.

## Least-Square Estimate

This option generates a best-fit equilibrium profile to a given profile. The target profile must first be chosen to which the equilibrium profile will be fit. See the subsection entitled *Using a reference profile* under the section entitled

*Bar Properties* above for instructions on how to choose profiles. After you have chosen the profile, enter the beginning (**Xon**) and ending (**Xoff**) points of the generated profile. As a default, **Xon** is automatically computed as the location where the profile crosses the zero elevation. You have the option of changing this value. **BMAP** generates the best-fit profile and plots it on top of the reference profile. It also displays the *A*-parameter (shape parameter for the equilibrium profile), the correlation coefficient squared  $R^2$ , and the grain size  $d_{50}$ . The relation between *A* and  $d_{50}$  is calculated from data given by Moore (1982) as implemented by Hanson and Kraus (1989). The resulting best-fit profile is stored temporarily in memory. You may later choose **Output Menu** from the **Main Menu** to store it to your hard drive. See the section entitled *Output Menu* in Chapter 4, "Main Menu" for a discussion on storing output profiles. If you wish to save the other data relating to the least-square estimate, e.g., *A*-parameter, coefficient, and grain size, press <ALT-R> for a report. The **BMAP** asks if you wish to send the report to a file or a printer. If you choose file, you must enter the file name. Do not enter the directory because **BMAP** automatically stores the file in the data directory of the project. If you choose printer, **BMAP** immediately begins to print the report to your connected printer. Like all other screens in **BMAP** where a graph appears, you may obtain a hard copy of the graph by pressing <ALT-P>.

## Synthetic Profiles

The **BMAP** offers the option of generating synthetic profiles given certain parameters. This may be done in the Synthetic Profile Menu. See Chapter 6, "Synthetic Profiles," for detailed instructions concerning synthetic profiles.

## Translation

Translation allows you to shift profiles vertically and horizontally a specified distance. The **BMAP** displays all active profiles and prompts you to enter the vertical and horizontal shift (for a discussion on active profiles see the section entitled *Loading Profiles* in Chapter 3, "Project Options"). The **BMAP** shifts all the profiles the specified distance and stores the results temporarily to memory. You may later choose **Output Menu** from the **Main Menu** to store them to your hard drive. See section entitled *Output Menu* in Chapter 4, "Main Menu," for a discussion on storing output profiles. Like all other screens in **BMAP** where a graph appears, you may obtain a hard copy of the graph by pressing <ALT-P>.

## Transport Rate

This option computes the cross-shore transport rate from the starting point of two profiles to the ending point. The transport rate is calculated by integrating the equation for conservation of sand (Larson and Kraus 1989). First

choose two profiles for calculations. See the subsection above entitled *Using a reference profile* in the section entitled *Bar Properties* for an explanation on choosing profiles. You are then prompted to enter **Dx** (horizontal increment factor) and the time difference, in decimal hours, between two profiles. A default time difference is automatically computed by *BMAP*, which looks at the dates and times of the profiles. You have the option to change this value if needed, e.g., if only dummy time information is contained in the header. A plot of the resulting transport rates is then displayed together with additional information on maximum and minimum transport rates and their locations. The *BMAP* also displays the transport rate at the most seaward point. The transport rate is stored temporarily to memory. You may later choose **Output Menu** from the **Main Menu** to store the rates to your hard drive. See section entitled *Output Menu* in Chapter 4, "Main Menu," for a discussion on storing output profiles. If you wish to save the other data relating to the transport rate, you may press <ALT-R> for a report. *BMAP* asks if you wish to send the report to a file or a printer. If you choose file, you must enter the file name. Do not enter the directory because *BMAP* automatically stores the file in the data directory of the project. If you choose printer, *BMAP* immediately begins to print the report to your connected printer. Like all other screens in *BMAP* where a graph appears, you may obtain a hard copy of the graph by pressing <ALT-P>.

## Volume

There are two options for *BMAP* to compute profile volume. You may specify a section of the profile along which *BMAP* computes the volume between the entered values of **Xon** and **Xoff**. Another option is to specify a contour above which you wish to compute volume. These options are illustrated schematically in Figure 16.

If you choose **From Xon to Xoff**, *BMAP* prompts you for three parameters: the starting point of the section (shoreward point or **Xon**), the ending point of the section (seaward point or **Xoff**), and zero elevation. If you choose instead **Above a Chosen Contour**, you are prompted to enter that contour. In either case *BMAP* computes the volume of each active profile and displays it, along with the contour location, if applicable, for each profile, in a data screen to the right of the graph, which you may scroll to view all volumes. If you wish to save this information, you may press <ALT-R> for a report. *BMAP* asks if you wish to send the report to a file or a printer. If you choose file, you must enter the file name. Do not enter the directory because *BMAP* automatically stores the file in the data directory of the project. If you choose printer, *BMAP* immediately begins to print the report to your connected printer. Like all other screens in *BMAP* where a graph appears, you may obtain a hard copy of the graph by pressing <ALT-P>.

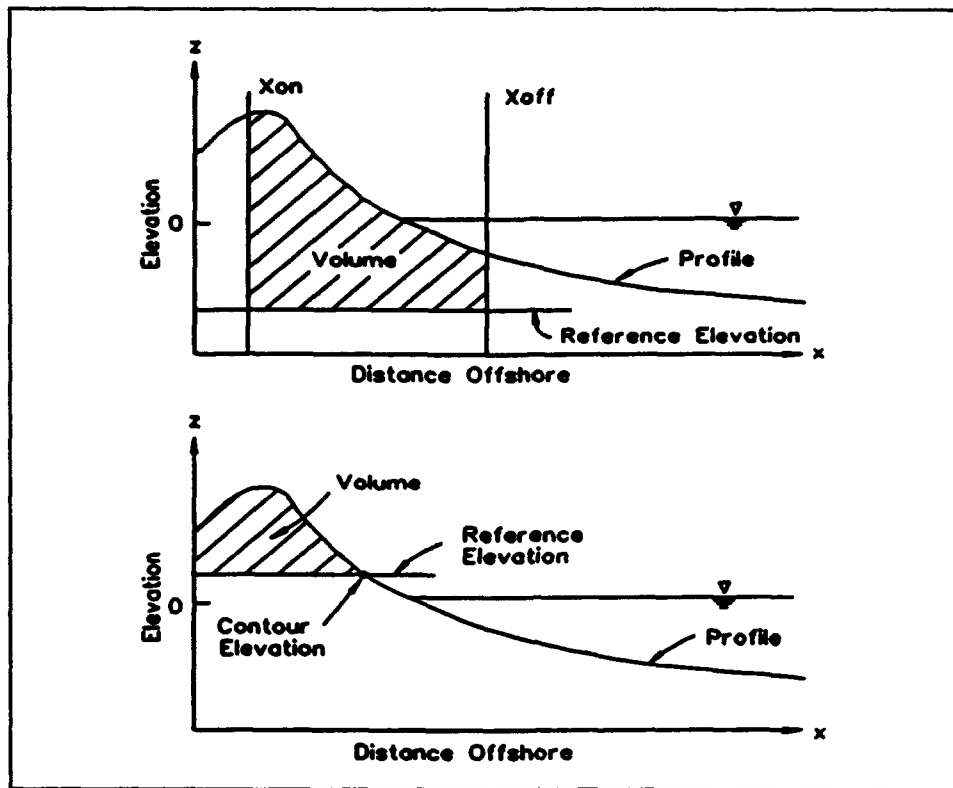


Figure 16. Definition sketch for the profile volume calculation

## 6 Synthetic Profiles

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Not only does *BMAP* produce profile data generated from various calculations performed upon other profiles, but it also provides an option for creating artificial profiles defined by certain parameters. Here we discuss the available synthetic profiles and how they are generated.

### Equilibrium Profile

The equilibrium profile has been made popular by Dean (1977, 1991) and is a concave monotonic profile given by the power-law relation

$$h = Ax^{2/3} \quad (1)$$

where  $h$  is water depth,  $A$  is the shape parameter, or simply,  $A$ -parameter, and  $x$  is distance offshore from the shoreline. The shoreline is defined as  $h=0$  and  $x=0$  by this simple equation. The  $A$ -parameter is a function of median grain size (Moore 1982). An equilibrium profile can be generated by specifying either  $A$  directly or by specifying the median grain size  $d_{50}$  from which *BMAP* determines the required value of  $A$ .

Upon choosing **Equilibrium Profile**, *BMAP* queries for the parameters needed to produce the equilibrium profile (Figure 17). These parameters are: **Xon** (the beginning horizontal position or shoreline), **Xoff** (the ending horizontal position), **Dx** (horizontal increment), choice between grain size (option G) or  $A$ -parameter (option A), and the median grain size value  $d_{50}$  or  $A$ -parameter value (whichever was chosen).

After all parameters have been entered, *BMAP* displays the generated equilibrium profile, which is stored to memory under the displayed name. You may later choose **Output Menu** from the **Main Menu** to store it to your hard drive. See section entitled *Output Menu* in Chapter 4, "Main Menu," for a discussion on storing output profiles. Like all other screens in *BMAP* where a graph appears, you may obtain a hard copy of the graph by pressing <ALT-P>.

**EQUILIBRIUM PROFILE**

Xon:       Xoff:   
 DX:   
 Grain Size (G)  
 or A-Parameter (A):   
 Value for (G) or (A):

<TAB> <RETURN> - Next Field  
 <SHIFT-TAB> - Previous Field  
 <ALT-X> - Exit M/D Changes  
 <ALT-S> - Exit With Changes

Figure 17. Sample equilibrium profile screen

## Interpolated Profile

This option of *BMAP* allows you to interpolate a selected profile already in memory. After you have selected **Interpolated Profile**, you must choose the profile which is to be interpolated. For a discussion related to choosing profiles, see the subsection entitled *Using a reference profile* under the section entitled *Bar Properties* in Chapter 5, "Analysis."

The *BMAP* then plots that profile to the screen; you should then enter the horizontal starting point **Xon**, ending point **Xoff**, and the horizontal increment **Dx**. The *BMAP* displays the interpolated profile along with the original profile, and the interpolated profile is stored to memory under the displayed name. You may later choose **Output Menu** from the **Main Menu** to store it to your hard drive. See the section entitled *Output Menu* in Chapter 4, "Main Menu," for a discussion on storing output profiles. Like all other screens in *BMAP* where a graph appears, you may obtain a hard copy of the graph by pressing <ALT-P>.

## Modified Equilibrium Profile

The modified equilibrium beach profile (Larson 1991) is a concave monotonic profile shape developed to describe beaches that may be steeper near to shore than in the offshore, corresponding to a decrease in grain size from coarser near the shoreline to finer in the offshore. The modified equilibrium profile depends on two empirical parameters (in addition to the *A*-parameter of the equilibrium profile). These are an energy dissipation ratio called  $D_{ratio}$  in *BMAP* and a parameter  $\lambda$  which controls change in grain size from coarser to finer. The modified equilibrium profile equation is

$$h = A \left[ x + \frac{1}{\lambda} (D_{ratio} - 1) (1 - \exp(-\lambda x)) \right]^{2/3} \quad (2)$$

Values of  $D_{ratio}$  typically lie between 1 and 5, and values of  $\lambda$  typically lie between 0.005 and 0.03  $m^{-1}$ .

The **Modified Equilibrium Profile** option requires entry of values for **Xon**, **Xoff**, and **Dx**. It also requires an **A**-parameter value (no choice of grain size). In addition, you must enter values for  $D_{ratio}$  and the coefficient  $\lambda$ .

After all parameters have been entered, *BMAP* displays the generated equilibrium profile, which is stored to memory under the displayed name. You may later choose **Output Menu** from the **Main Menu** to store it to your hard drive. See the section entitled *Output Menu* in Chapter 4, "Main Menu," for a discussion on storing output profiles. Like all other screens in *BMAP* where a graph appears, you may obtain a hard copy of the graph by pressing <ALT-P>.

## Plane-Sloping Profile

After you have made the choice to calculate a plane-sloping profile, *BMAP* prompts you for the following parameters: **Xon** (horizontal starting point), **Xoff** (horizontal ending point), **Dx** (horizontal increment), elevation at **Xon**, and elevation at **Xoff**.

After all parameters have been entered, *BMAP* displays the generated plane-sloping profile, which is stored to memory under the displayed name. You may later choose **Output Menu** from the **Main Menu** to store it to your hard drive. See the section entitled *Output Menu* in Chapter 4, "Main Menu," for a discussion on storing output profiles. Like all other screens in *BMAP* where a graph appears, you may obtain a hard copy of the graph by pressing <ALT-P>.



## 7 Examples

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In Chapters 2 to 6, all functions implemented in *BMAP* Version 1.0 are discussed. This chapter presents two examples for which the options of *BMAP* are accessed, and you have the opportunity to view the screens as we proceed. Selected data for these examples are listed in Appendix A, and they are also included on the installation diskette. It is recommended that you read this chapter at your computer with *BMAP* running and follow the examples by operating *BMAP* along with us. If *BMAP* is not yet installed, consult Appendix B.

There are two example projects. Most of the options will be exercised using a small number of profile surveys from the Ocean City, Maryland, beach fill monitoring project (Kraus 1993, Stauble et al. 1993). The second example mainly concerns changes of length unit precision, and for this we use a small subset of the SUPERTANK profile survey data set (Kraus, Smith, and Sollitt 1992).

### Ocean City

#### Create project

First, we will begin *BMAP* by typing *BMAP* at the DOS prompt from within our *BMAP* directory.

```
C:\BMAP>BMAP
```

The *BMAP* loads and the **Project Options Menu** is displayed (Figure 18). In order to begin, we must first create a project. The project will be called **OC\_TEST** (Figure 19).

After we have told *BMAP* the name of the project, the **Project Parameters** screen is displayed (Figure 20). The first field required for this screen is the data directory. For our example, we have stored the data in the \BMAP\DATA directory. If your data files are located in a different directory, enter the correct location here. *BMAP* asks for a default input file. This file name

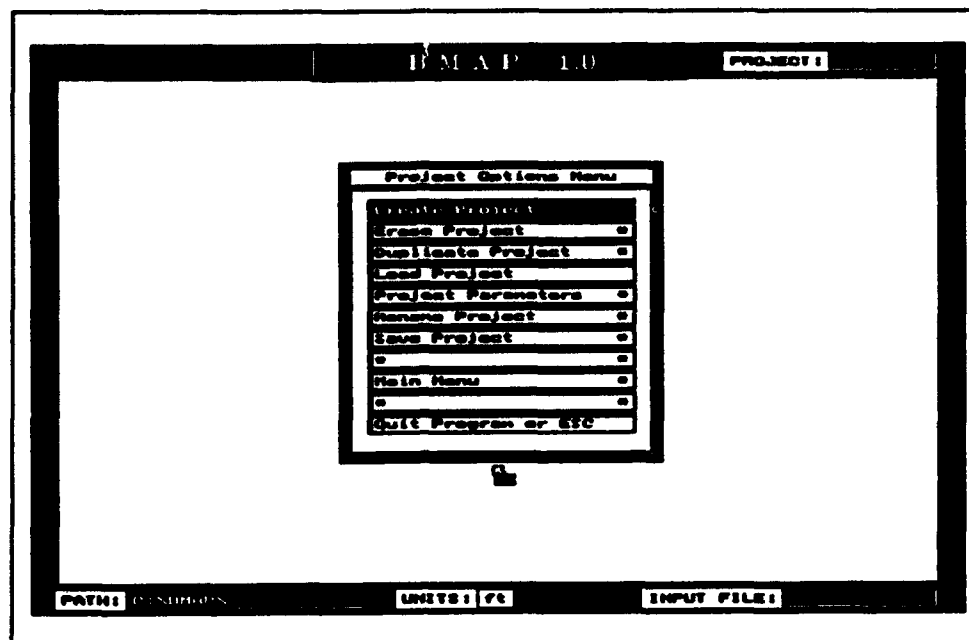


Figure 18. Project Options Menu

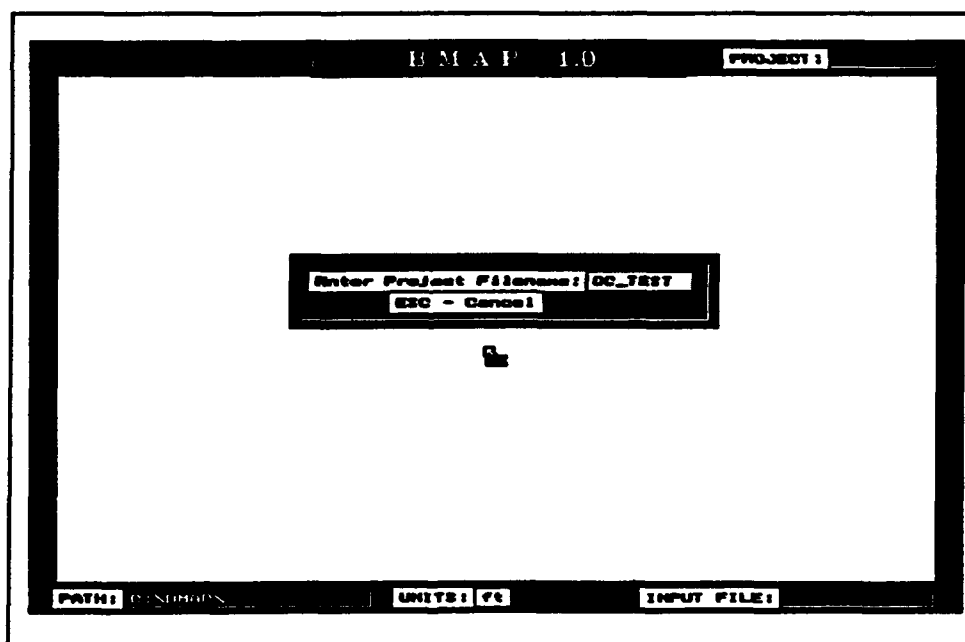


Figure 19. Entering project name, OC\_TEST

automatically is displayed later in the Load Profile Menu. The data file associated with this project is OC37OFF.ISR. The profile survey data contained in this file were taken from ISRP-processed files from the Ocean City, Maryland, monitoring project. The profile elevation is referenced to National

**BMAP 1.0** **PROJECT 1**

**PARAMETERS**

Data Directory:

Default Input File:

Units (ft/m):

Length Multiplier

Distance (m):

Elevation (m):

<TAB> <RETURN> - Next Field

<SHIFT-TAB> - Previous Field

<ALT-N> - Exit N/O Changes

<ALT-S> - Exit With Changes

**PATH:** G:\BMAP\DATA
**UNITS:** ft
**INPUT FILE:**

Figure 20. Input file name

Geodetic Vertical Datum (NGVD). Next we must tell *BMAP* the length multipliers and the units. Ocean City profile survey data are in standard ISRP format and are recorded in feet. So our length multipliers are 1.0 for distance and 0.1 for elevation, and the units are feet. Note that the project name appears on the upper right side of the screen, and the data directory, length units, and the default input file name are on the bottom of the screen.

### Load profiles

The *BMAP* now displays the Load Profile Menu with the default file name in the left column of the first row (Figure 21). By pressing <ALT-L>, we obtain a listing of all the profiles in this file (Figure 22). Move the cursor to the desired profiles and press <ALT-T> to tag each profile. After tagging all desired profiles, you should press <ALT-S> to copy the profile information to the Load Profile Menu.

All profiles are active by default. If you wish to make some profiles inactive, move to the Active field and press "N." For our application we want all profiles to be active. Figure 23 shows the profiles we have chosen for our example.

We have told *BMAP* all the profiles we want to load from the input file. Press <ALT-S>, and *BMAP* will begin to load the profiles.

After the profiles have been loaded, you are returned to the Main Menu (Figure 24).

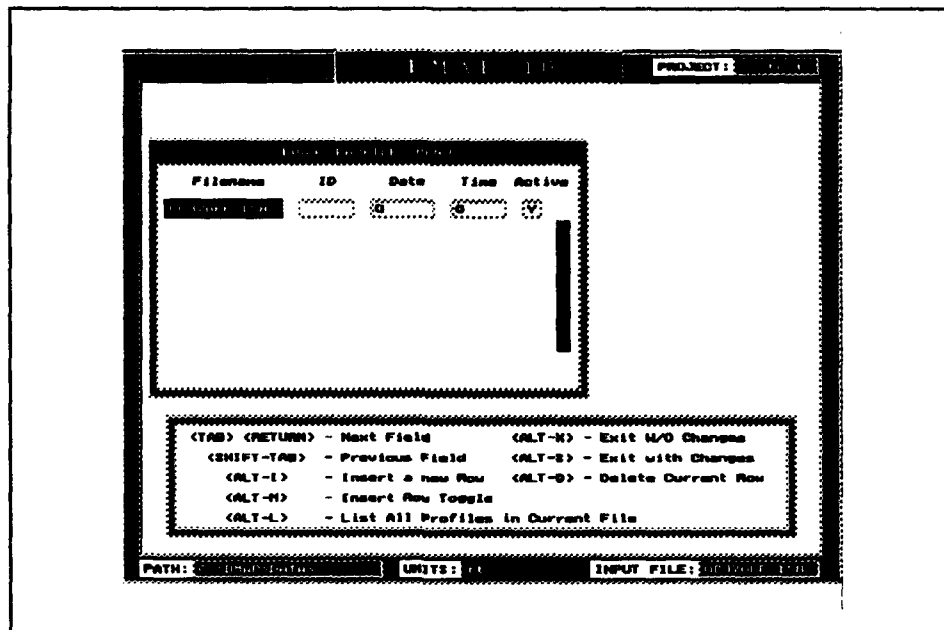


Figure 21. Load Profile Menu

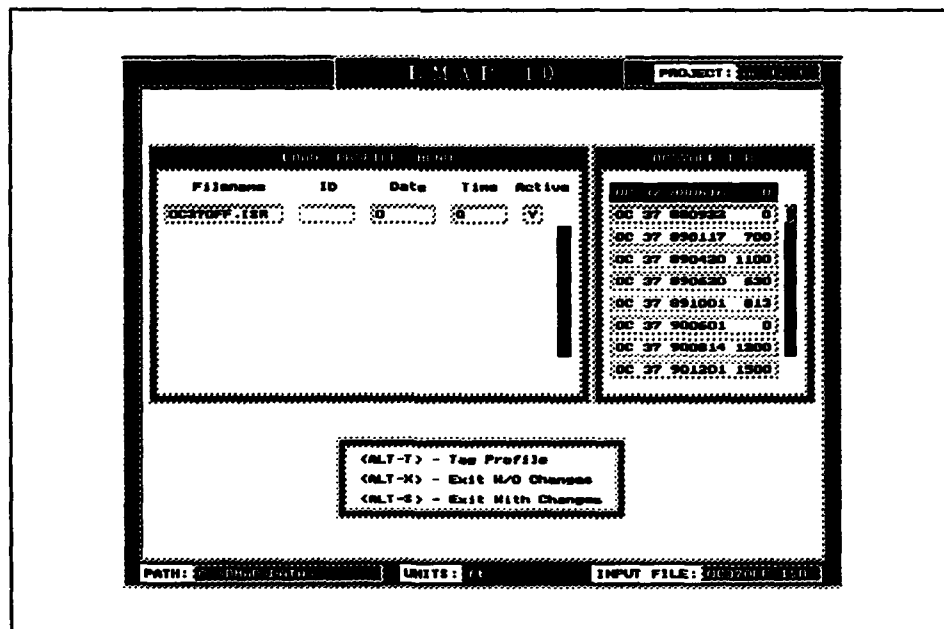


Figure 22. Listing profiles

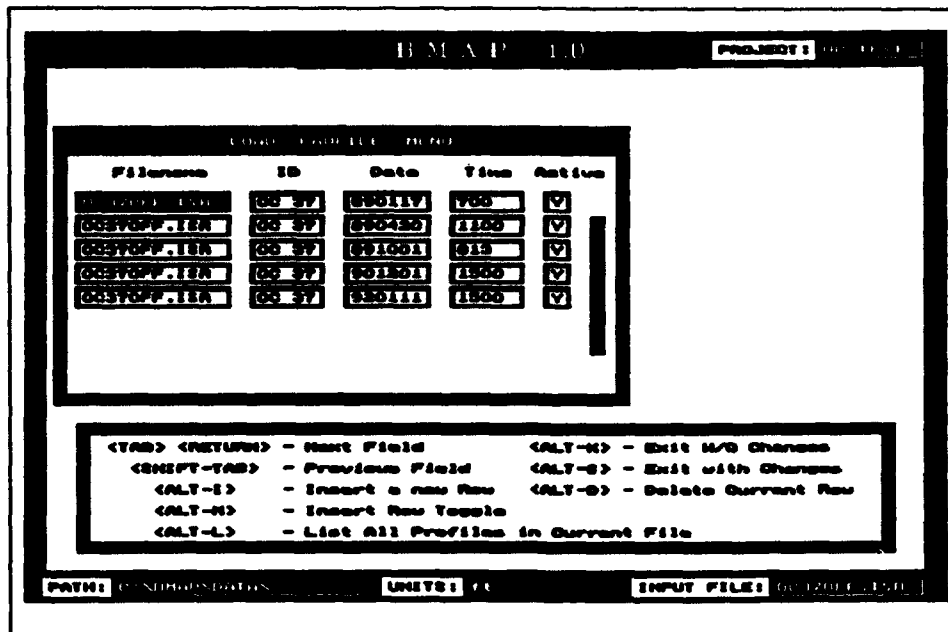


Figure 23. Activating profiles

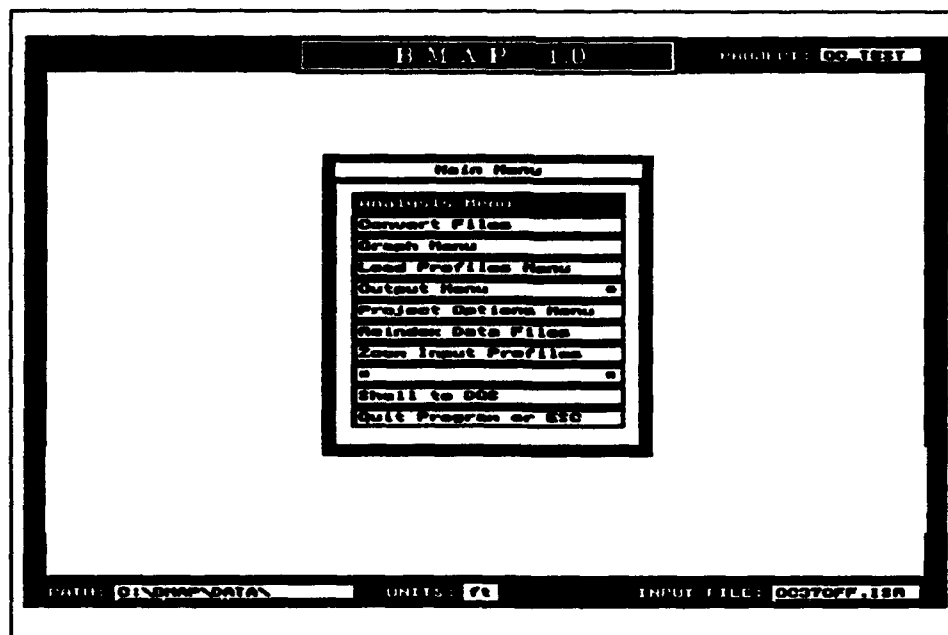


Figure 24. Main Menu; after loading profiles

## Graph profiles

Before proceeding to analysis, visually inspect the data. To do this, choose **Graph Menu** and graph all the **Input Profiles** (Figure 25).

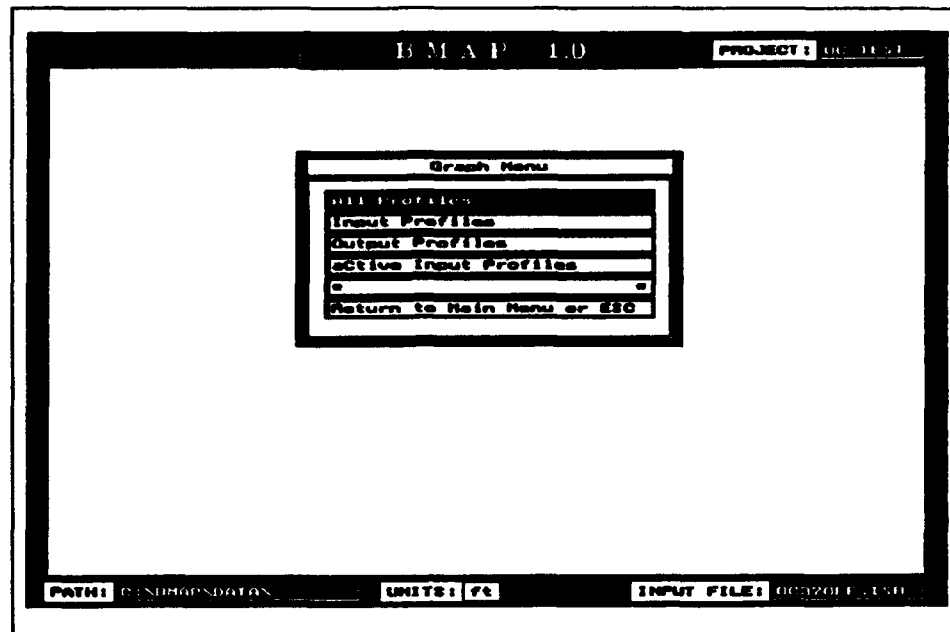


Figure 25. **Graph Menu**; select **Input Profiles**

The profile data are plotted, and the graph should look like Figure 26.

If you would like to place a mark (\*) where each point is plotted to see the density of actual data points, press <DWN-ARROW> and the lines will be replaced with asterisks at the data points (Figure 27).

Press <ALT-P> to receive a hard copy of this graph. Press any other key to return to the **Graph Menu**. After returning to the **Graph Menu**, press <ESC> to return to the **Main Menu**.

You may notice that the **Output Menu** is invalid at the time, because we have not yet generated any output profiles. *BMAP* does not allow selection of this option until output data are generated.

## Reindex data files

Another option included in the **Main Menu** is the **Reindex Data Files** option. This command re-indexes the input file. Spurious loss of indexing may be the cause of odd results. Use this option if you begin to have unexplained problems with the data.

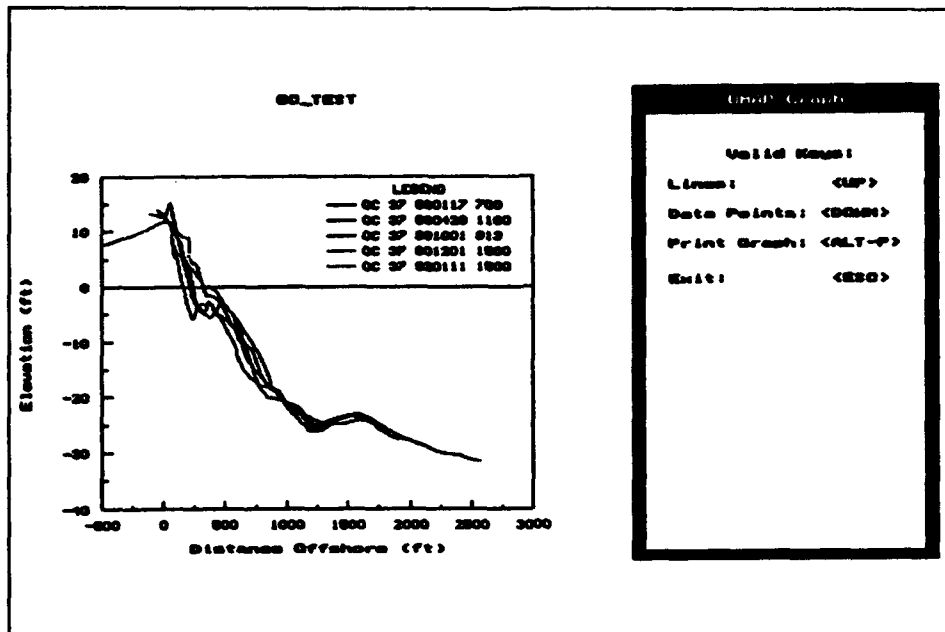


Figure 26. Graph of Ocean City active profiles

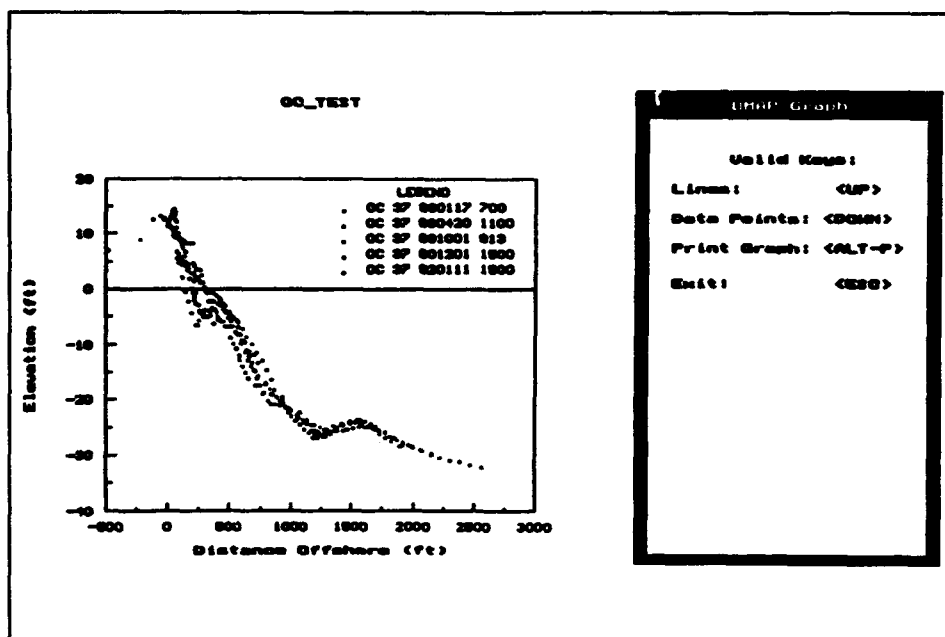


Figure 27. Graph of Ocean City test profiles; data points option

## Zoom profiles

The **Zoom Profiles** option is included to assist you in zooming in on a certain part of the profiles to view things such as crossing points and bars. This option is displayed in Figures 28 and 29 for our example.

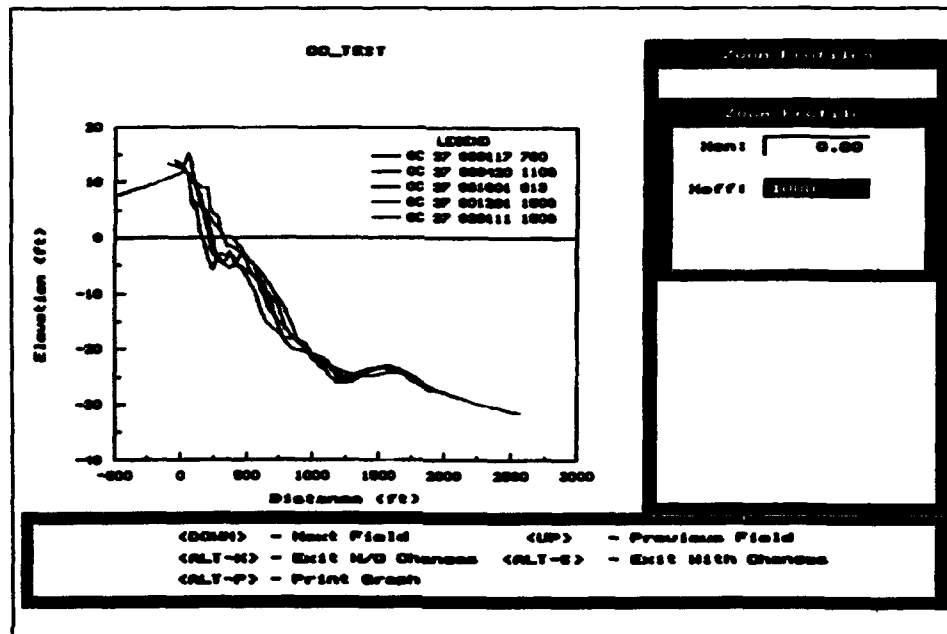


Figure 28. Selecting zoom between 0 and 1,000 ft

## Averaging

Now that we have exercised the valid options in the **Main Menu**, we explore the analysis options. Choose the **Analysis Menu**, as shown in Figure 30.

Let's choose **Averaging** so that we may calculate the average profile for the five profiles we have loaded in memory (the active profiles). We will enter an **Xon** value of -500, an **Xoff** value of 2,500, and our **Dx** will be 50, as shown in Figure 31. After pressing <ENTER>, **BMAP** will use linear interpolation to produce an average profile at 50-ft increments starting from 500 ft behind the baseline (Figure 32). The averaging routine automatically adjusts if the number of lines changes at a given distance. For example, at 2500 ft, there is only one profile, so only one profile is used in the averaging process there. Notice that a menu appears in the right window with six options. Choosing one of these options displays the corresponding graph.



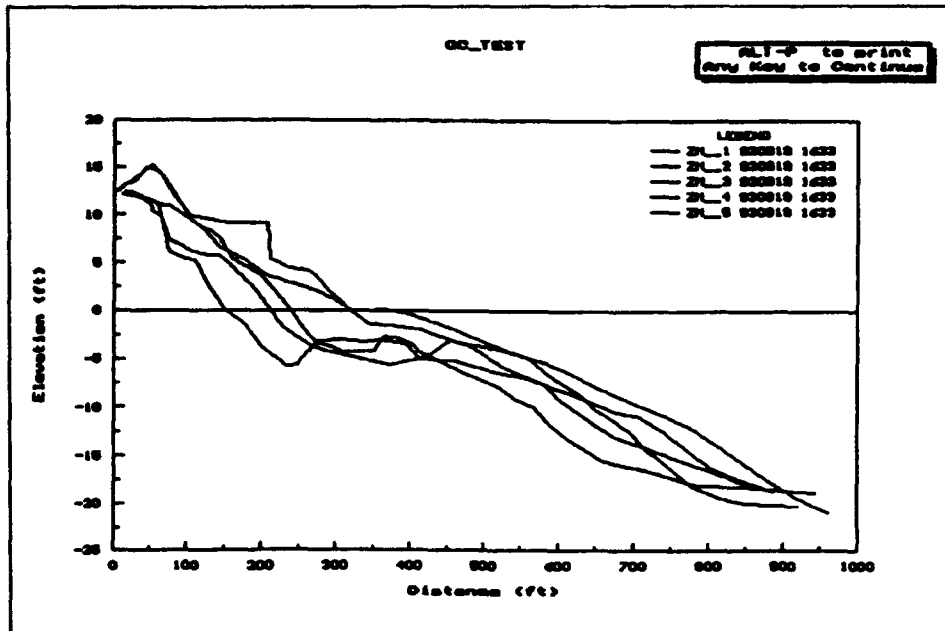


Figure 29. Zoomed profiles from Figure 28

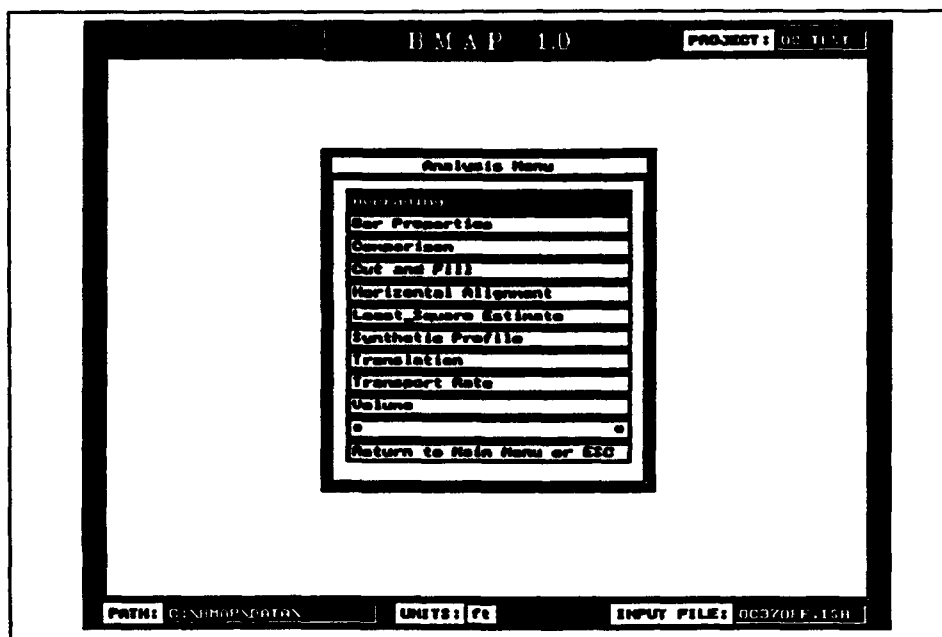


Figure 30. Analysis Menu; averaging selected

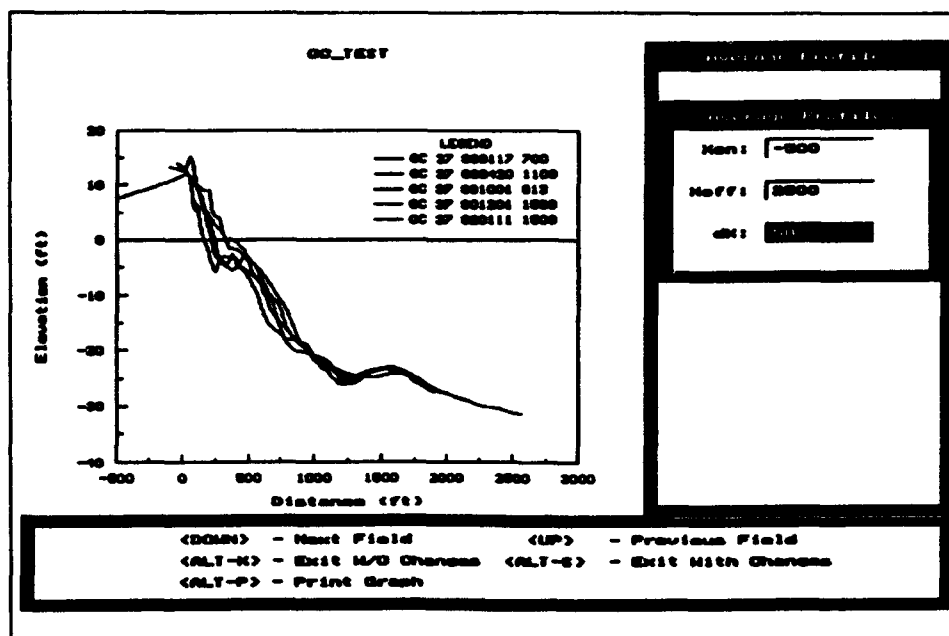


Figure 31. Average Profiles screen; averaging parameters selected

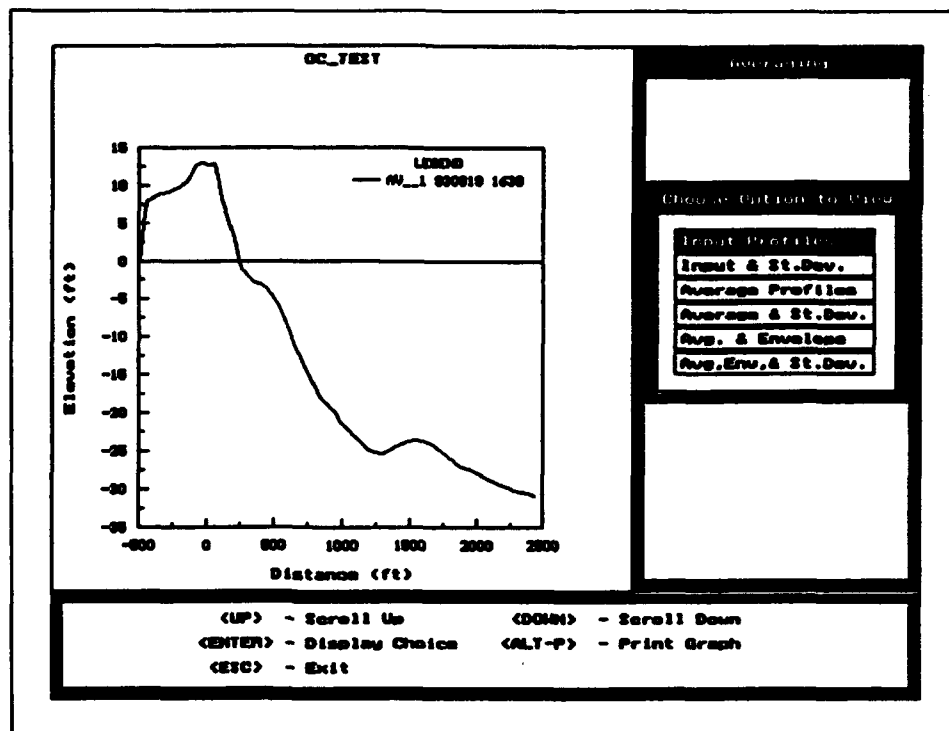


Figure 32. Average profile for the screen in Figure 31

## Output profiles

After viewing the calculated profiles, press <ESC> and *BMAP* indicates the name it has assigned to these profiles (Figure 33). You may change these names, add descriptions, and save the profiles to disk in the **Output Menu**. Let's do that at this time.

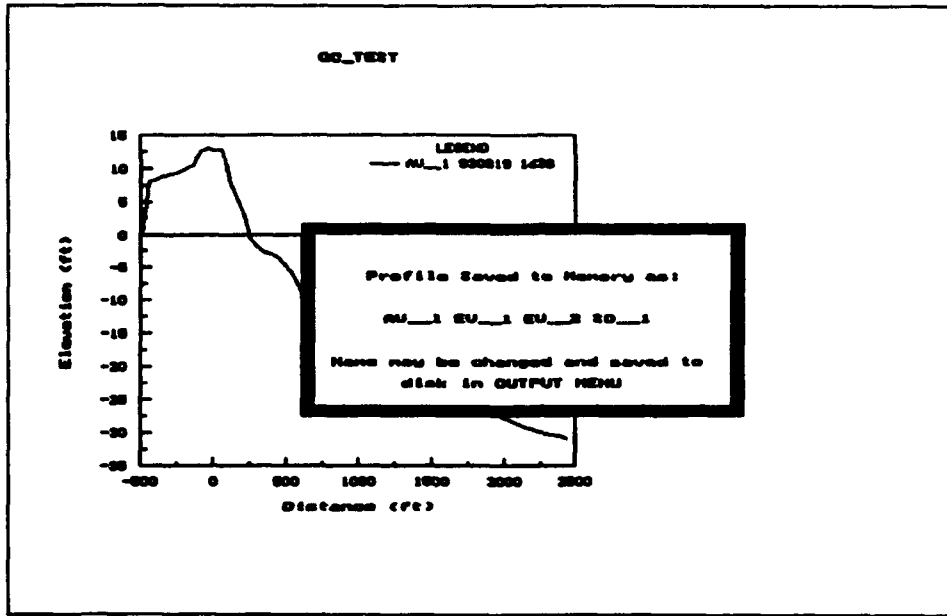


Figure 33. Average profile saved as an output profile

Press <ESC> twice to return to the **Main Menu**. Choose **Output Menu**. The first five rows include information about the profiles generated from the **Zoom Profiles** option (Figure 34). Scroll down the list until the profile **AV\_\_1** (No. 6) is selected. Insert **OC37AVG** to the first blank name field. This serves as the file name for the data. Change the ID and add a description to this profile (Figure 35). Save these changes by pressing <ALT-S>.

## Bar properties; least-square estimate

The next option available on the **Analysis Menu** is **Bar Properties**. Generate a best-fit equilibrium profile to use in calculating bar properties. The option is **Least-Square Estimate**. So, before we invoke the **Bar Properties** option, we choose **Least-Square Estimate** to generate the equilibrium profile.

The **Least-Square Estimate** option generates a best-fit equilibrium profile with respect to a target profile. First tell *BMAP* the source of the input target profile. To determine the bar properties of one of our input profiles, we choose **Input File** as our source. The *BMAP* then graphically displays all the input profiles from which a selection is made (Figure 36). Choose Profile

**BMAP 1.0** PRODUCT: 00-1001

---

OUTPUT PROFILE MENU

No.	Name	Description	ID	Date	Time	Save to Disk?
1			ZH_1	930814	1407	(N)
2			ZH_2	930814	1407	(N)
3			ZH_3	930814	1407	(N)
4			ZH_4	930814	1407	(N)
5			ZH_5	930814	1407	(N)
6			ZU_1	930814	1411	(N)
7			ZU_1	930814	1411	(N)
8			ZU_2	930814	1411	(N)

<TAB> - Next Field      <Shift-TAB> - Prev. Field  
 <ALT-M> - Abort      <ALT-S> - Save & Exit  
 <ALT-D> - Delete Profile

CODE: 01\SWP\DATA\      UNITS: ft      INPUT FILE: 0037OFF.100

Figure 34. Output Profile Menu

**BMAP 1.0** PRODUCT: 00-1001

---

OUTPUT PROFILE MENU

No.	Name	Description	ID	Date	Time	Save to Disk?
1			ZH_1	930815	1150	(N)
2			ZH_2	930815	1150	(N)
3			ZH_3	930815	1150	(N)
4			ZH_4	930815	1150	(N)
5			ZH_5	930815	1150	(N)
6	0037AUG	Average of profiles on 37th St	37AUG	930815	1150	(N)
7			ZU_1	930815	1150	(N)
8			ZU_2	930815	1150	(N)

<TAB> - Next Field      <Shift-TAB> - Prev. Field  
 <ALT-M> - Abort      <ALT-S> - Save & Exit  
 <ALT-D> - Delete Profile

CODE: 01\SWP\DATA\      UNITS: ft      INPUT FILE: 0037OFF.100

Figure 35. Average profile; new name assigned

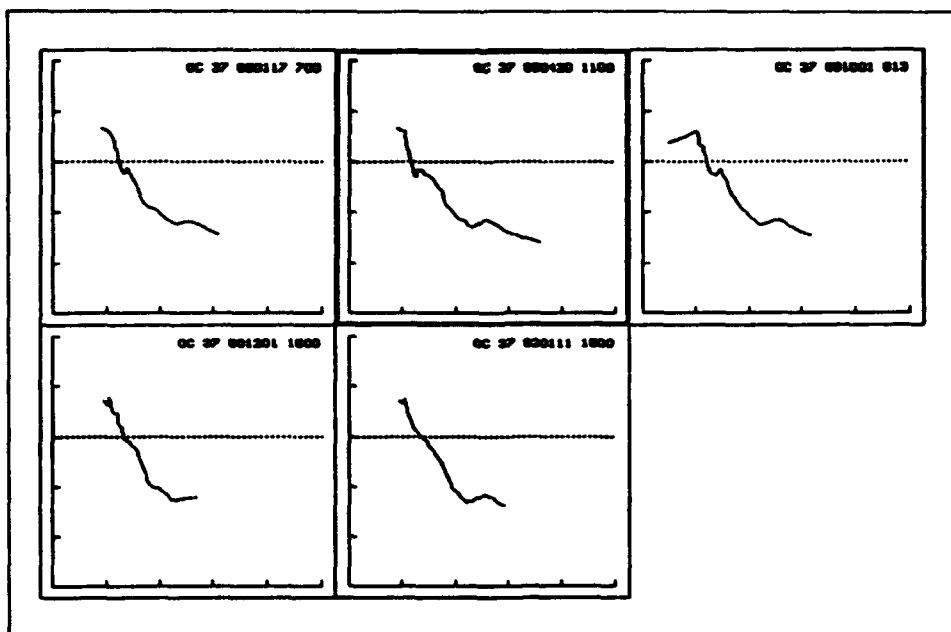


Figure 36. Profile Display Menu

OC 37 890420 1100 because it has a well-defined bar. Move the selection box to the desired profile and press <ENTER> to select. An alternative and preferred method would be to fit the equilibrium profile to the average profile that we have generated and saved as an output profile. We leave this as an exercise to the reader. Our aim here is to demonstrate the profile selection procedure of the Profile Display Menu.

After selecting Profile OC 37 890420 1100, we are ready to do our calculations. *BMAP* asks for *Xon* and *Xoff* for defining the equilibrium profile. As a default, *Xon* is automatically computed by *BMAP* as the location where the profile crosses the zero elevation. You have the option of changing this value. For our case, we will keep that contour and enter 2,500 for *Xoff*. Press <ENTER>, and Figure 37 shows the resulting equilibrium profile, together with the original profile.

In viewing Figure 37, we see at the right-hand box that the best-fit *A*-parameter was determined by *BMAP* to be  $0.13 \text{ ft}^{1/3}$  with a corresponding median grain size  $d_{50} = 0.29 \text{ mm}$ . This value of grain size is close to that determined by sediment samples in the nearshore (Stauble et al. 1993). If a visual appraisal of the resultant profile were deemed unacceptable, we could press any key and be in a position to enter different parameters. Instead we will press <ALT-S> and keep the equilibrium profile. *BMAP* has the capability to print a hard copy of the calculated data in the right window of the screen. To do this, press <ALT-R>. *BMAP* asks if you wish to send the information to the printer or to a file. If you choose printer, *BMAP* immediately begins to print the information. If you choose file, enter a valid DOS file name. Do not

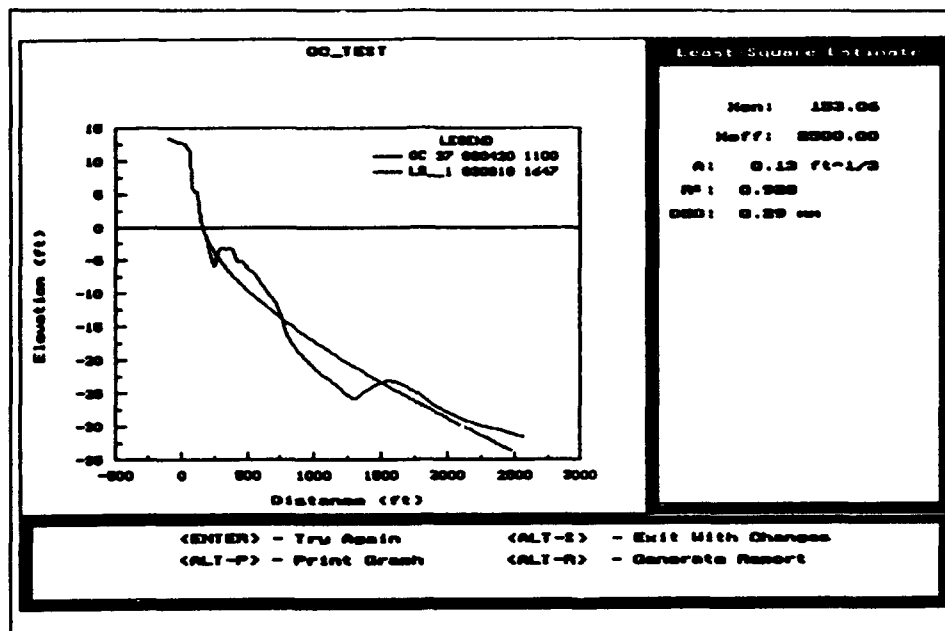


Figure 37. Best-fit equilibrium profile

include the directory because *BMAP* automatically saves the file in the data directory of the project.

### Bar properties; with a reference profile

We now have an adequate equilibrium profile. Let's use that profile to determine bar properties. First, choose **Bar Properties** from the **Analysis Menu**. Because we have the equilibrium profile, choose **With a Reference Profile**, Figure 38. We will choose **Output file** as our source because the equilibrium (reference) profile was generated by *BMAP*. Choose the **LS\_1** profile (the generated equilibrium profile).

Choose **Input File** as the source for the specific target profile (Figure 39). Because we used Profile OC 37 890420 1100 to generate the equilibrium profile, let's choose it here as our specific profile.

The *BMAP* automatically computes the crossing pairs of the two profiles, indicating the presence of a bar (Figure 40) located from approximately 261 ft to 761 ft.

Choose the pair by pressing <ENTER>. The *BMAP* then computes the bar properties and displays them to the side of the screen, as shown in Figure 41.

According to Figure 41, the minimum depth (referenced to NGVD) over the bar, called the bar crest depth, was 3 ft, and the crest was located 307 ft from the shoreline. The maximum bar height with respect to the equilibrium profile

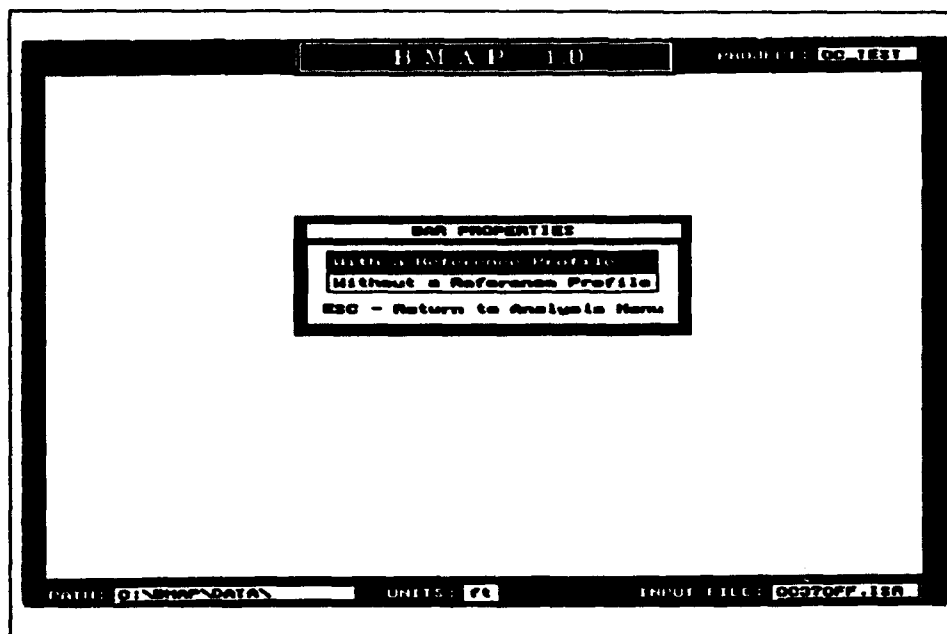


Figure 38. Bar Properties Menu

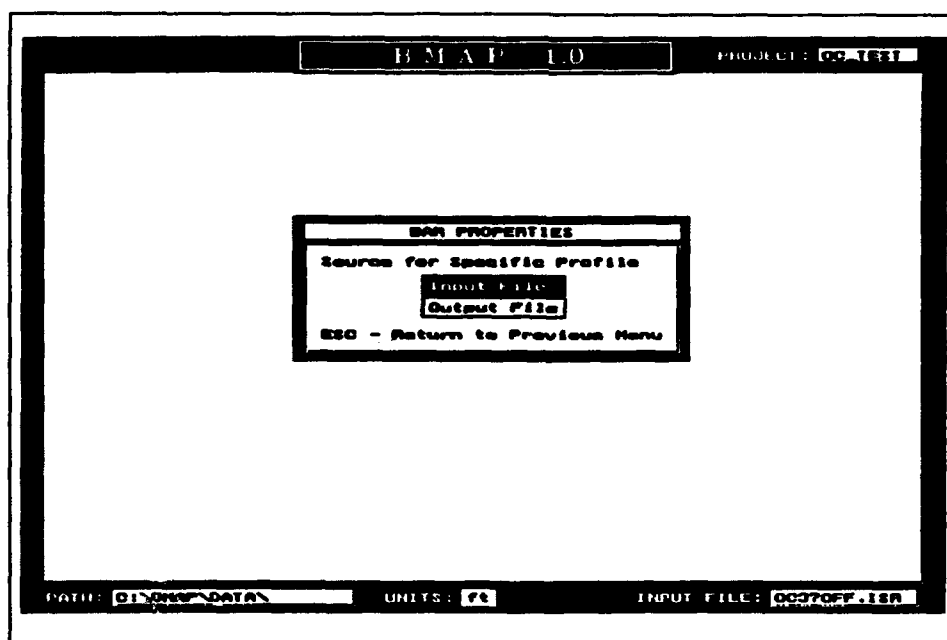


Figure 39. Source for specific profile

was 4 ft, located 394 ft from the shoreline. The volume of the bar was 50 yd<sup>3</sup>/ft, and its length was 500 ft. The center of mass of the bar was located approximately 492 ft from shore. BMAP has the capability to print a hard copy of the calculated data in the right window of the screen. To do this,

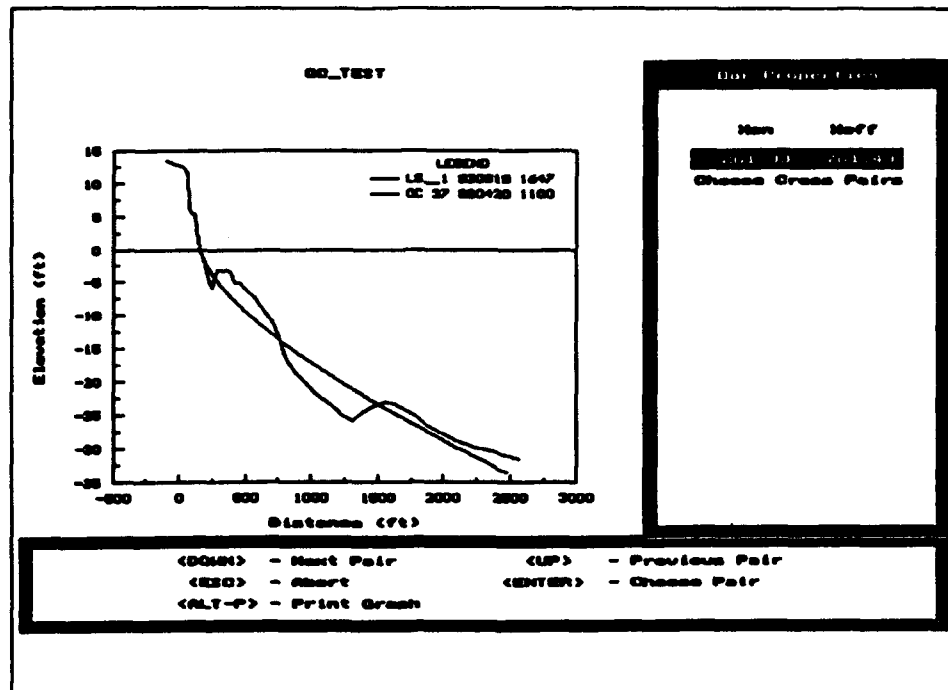


Figure 40. Bar defined by cross pair intersection

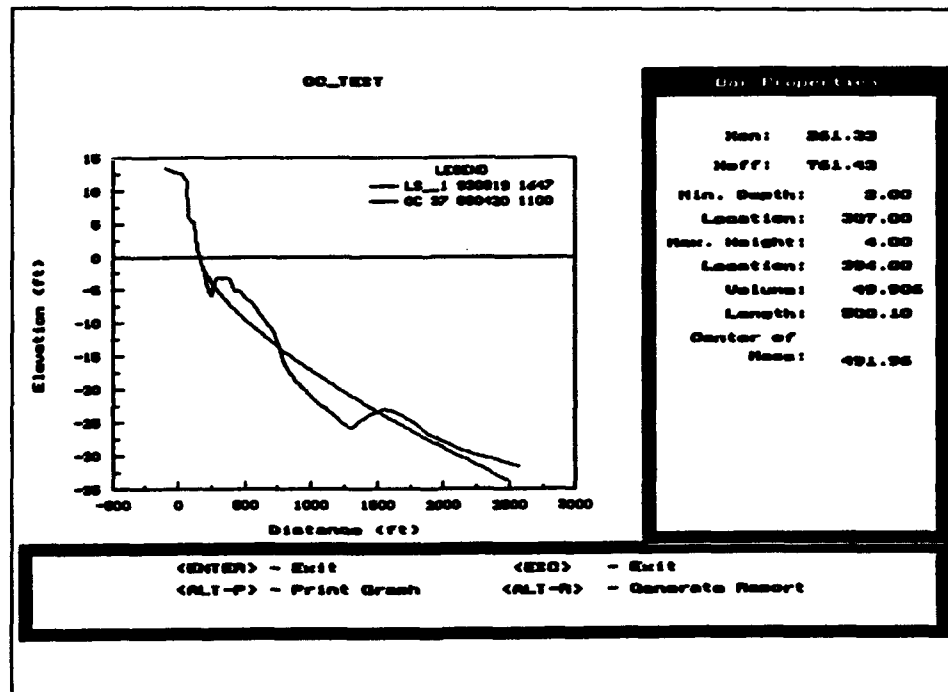


Figure 41. Results of bar properties calculation



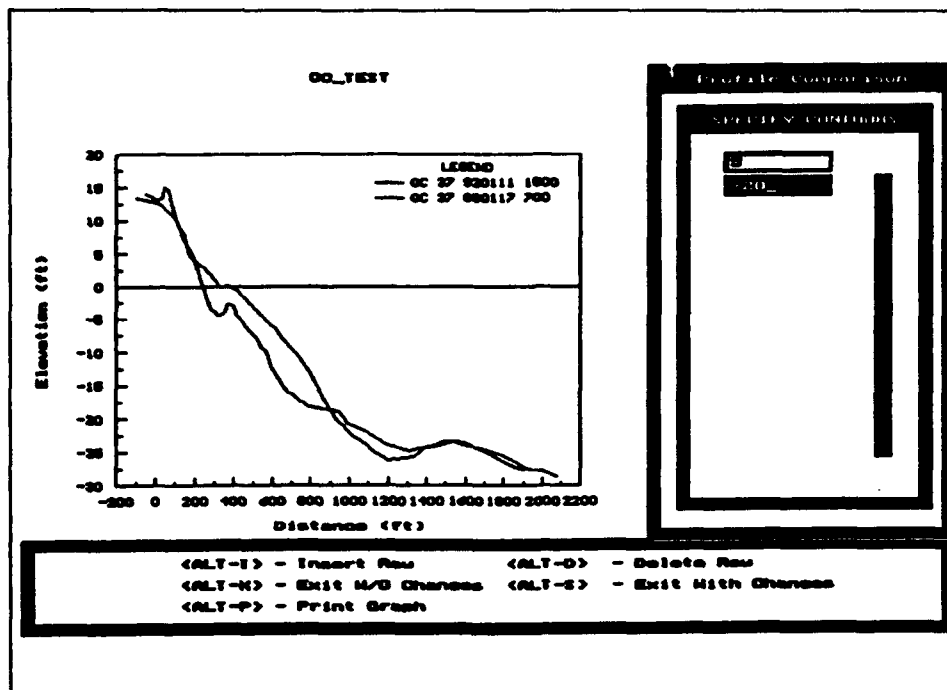


Figure 42. Specifying depth contours for comparison

press <ALT-R>. *BMAP* asks if you wish to send the information to the printer or to a file. If you choose printer, *BMAP* immediately begins to print the information. If you choose file, enter a valid DOS file name. Do not include the directory because *BMAP* automatically saves the file in the data directory of the project.

### Compare profiles

Return to the **Analysis Menu** by pressing <ESC>. We are now going to compare two profiles. You already know how to choose profiles, so we will omit explanation of choosing profiles from here on. We chose Profiles OC 37 920111 1500 and OC 37 890117 700 from the input file (Figure 36) as the two target profiles to compare, using the **Comparison** option. After you have chosen the two profiles, *BMAP* displays them and prompts you to enter the contours between which the quantitative comparison will be made. Enter the first contour and press <ALT-I> to add a row for the next contour. Enter the contours that are written in Figure 42. When you have finished entering the contours, press <ALT-S> to compare, giving the results shown in Figure 43.

After the comparison has been made, *BMAP* displays the volume change and contour location for each profile in a scroll box (Figure 43). *BMAP* has the capability to print a hard copy of the calculated data in the right window of the screen. To do this, press <ALT-R>. *BMAP* asks if you wish to send the information to the printer or to a file. If you choose printer, *BMAP*

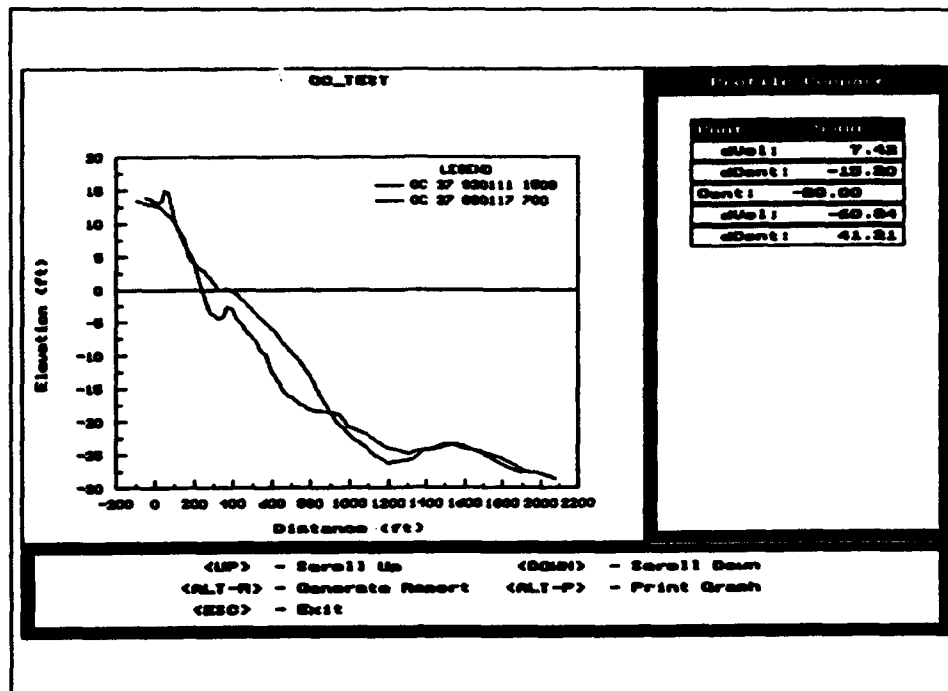


Figure 43. Profile comparison results

immediately begins to print the information. If you choose file, enter a valid DOS file name. Do not include the directory because *BMAP* automatically saves the file in the data directory of the project.

In the scroll box in Figure 43, the units of volume change are  $\text{yd}^3/\text{ft}$  for American customary units and  $\text{m}^3/\text{m}$  if the project data are in metric units.

### Cut and Fill

For this example, Profiles OC 37 891001 813 and OC 37 890117 700 were chosen from the Input file list (Figure 36). The *BMAP* calculates and the results are displayed (Figure 44). Press the <DWN-ARROW> or <UP-ARROW> to scroll through the list of cells. As seen in the information box to the right, the cut and fill volumes were calculated between the most common location points having elevations, -108 ft as the landward starting point, and 2,092 ft as the most seaward point. If you would like a hard copy of the results or to save the results to a file, press <ALT-R>. If you choose to save the results to a file, enter a valid DOS file name without the directory. The *BMAP* automatically saves the file to the data directory of the project. Choosing printer as the destination immediately sends the output to the connected printer.

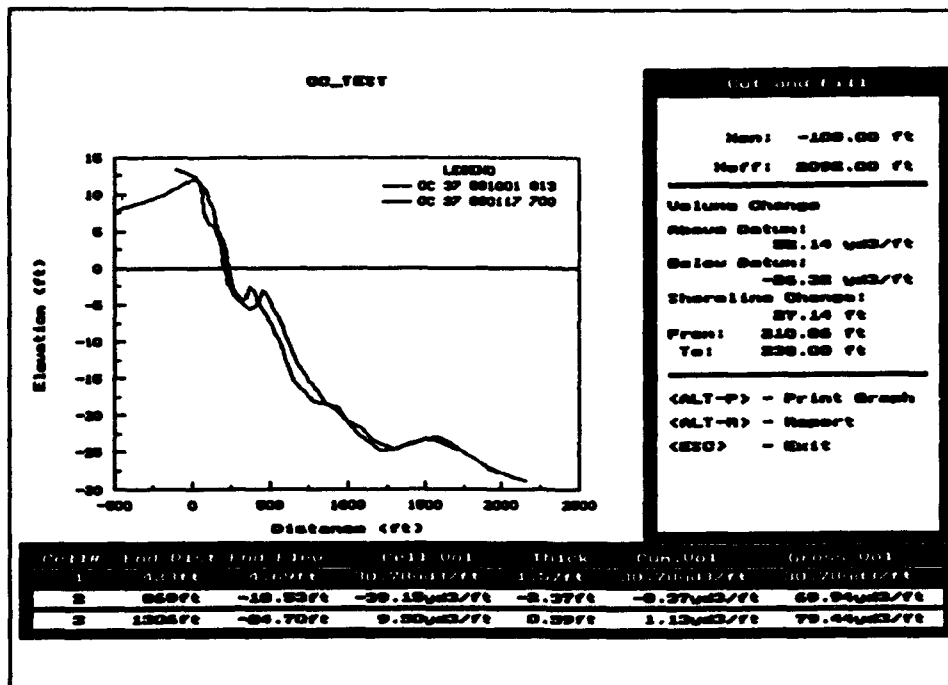


Figure 44. Cut and fill results

## Horizontal Alignment

The next option is **Horizontal Alignment**. This option allows us to align all profiles to a specified location. The graph is displayed in Figure 45 after we have selected this option, and we will enter the 5-ft elevation as our location. Next the user specifies the horizontal position of the aligned profiles. This option allows the profiles to be aligned to other profile locations or zero. For this example choose an X-reference equal to 0 ft. All profiles are translated horizontally to coincide at the 5-ft elevation, as shown in Figure 46.

After you press a key, you may notice that the message informing you of the name of the saved profile is in a different form than earlier output profiles. You see that the name of the profile is **HA\_##**. The symbols **##** are inserted because more than one profile has been generated from a single option. The profiles are saved starting with the next value for HA and incremented by one for each generated profile. It is recommended that you change these names if you plan to use these output profiles later, because output profile data tend to accumulate in the course of analysis, and it is easy to forget what was done. For a listing of each two-letter identification and its corresponding function, consult the section entitled *Output Profiles* in Chapter 2.

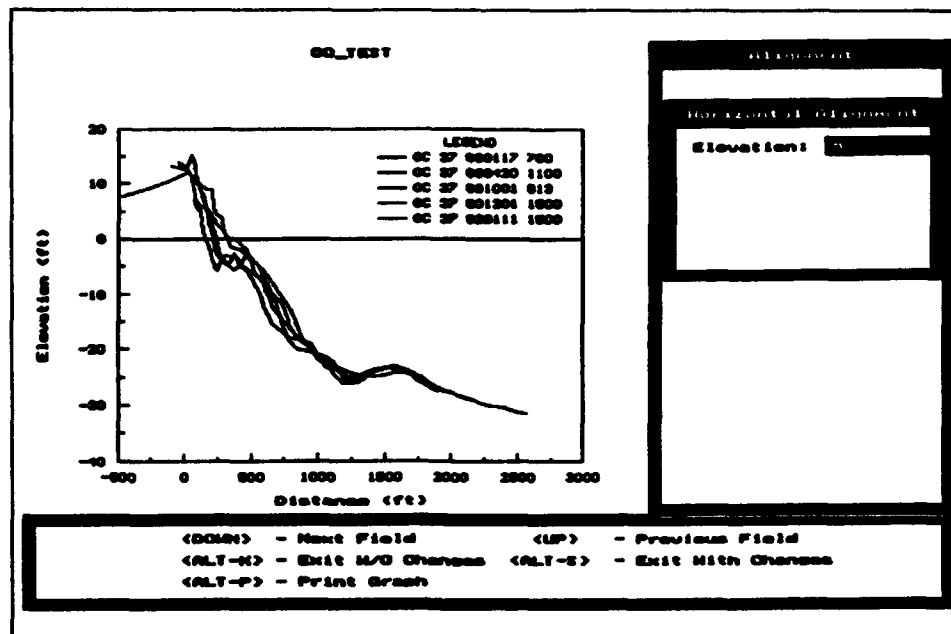


Figure 45. Profiles prior to horizontal alignment

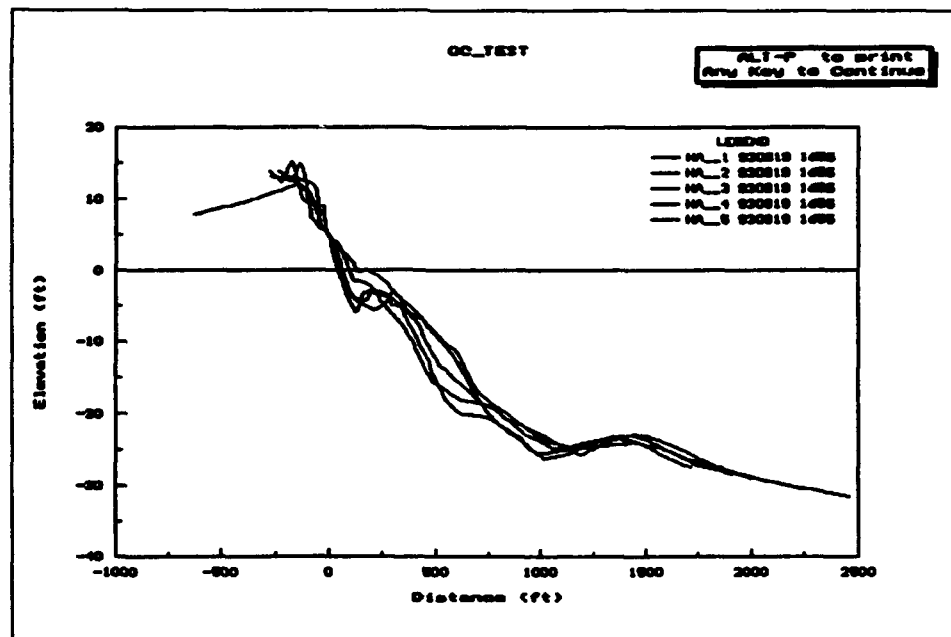


Figure 46. Profiles aligned at the 5-ft elevation

## Translation

The next option we will discuss is **Translation**, having already discussed the **least-square fit** option and saving synthetic profiles for later. The **Translation** option is similar to **Horizontal Alignment** and may be confused with it. **Translation** shifts (or translates) all values of all profiles by specified horizontal and vertical amounts, whereas the **Alignment** option aligns all profiles at a certain elevation. When you select **Translation**, *BMAP* displays the profiles and prompts you to enter the horizontal and vertical shifts. These values are added to the profile data to shift the profiles the specified amount. Here we will enter -5 ft for the vertical shift and 100 ft for the horizontal shift (Figure 47). Figure 48 shows the results of translating the profiles. Note that as you exit, these profiles are saved as **TL\_##**.

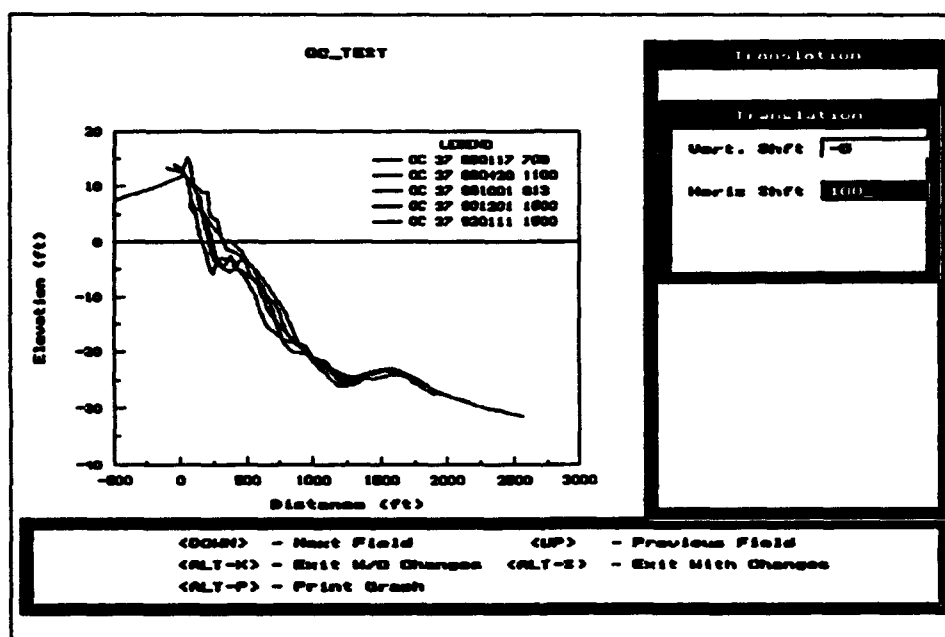


Figure 47. Before translating profiles

## Transport rate

Let us now move to the **Transport Rate** option. To illustrate the **Transport Rate** option, we return to the **Load Profile Menu** to load the **OC\_37** survey of 911103, the last survey prior to the severe 4 January 1992 storm that impacted Ocean City. We will calculate the cross-shore transport rate between the profile surveys of 911103 and 920111, under the assumption that cross-shore transport was solely responsible for beach profile change during the approximately 2-month time interval. After you choose the profiles, *BMAP* plots them and prompts you to enter **Dx** (horizontal increment) and the time difference that has been automatically computed by *BMAP* from the time in

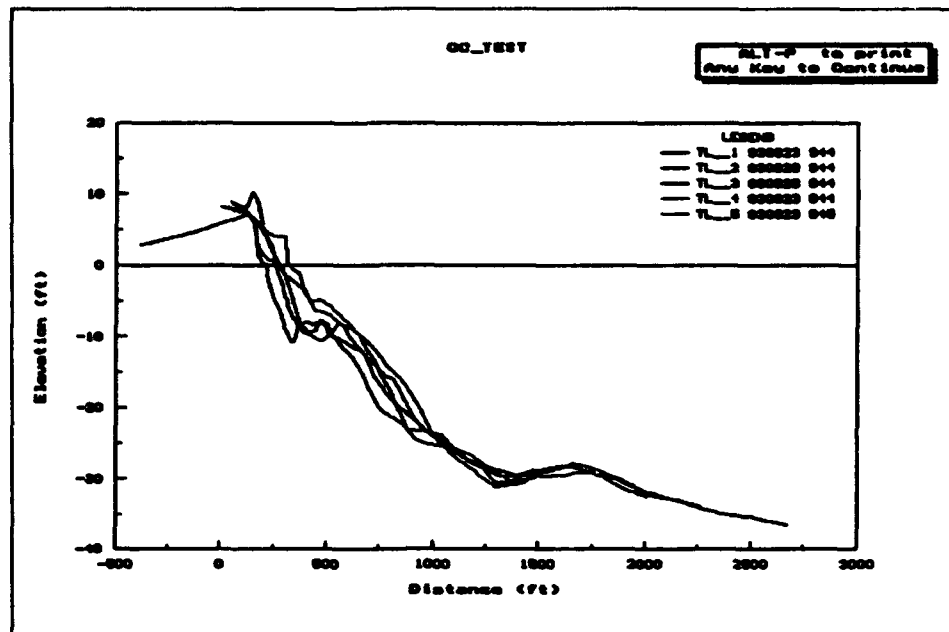


Figure 48. After translating profiles

the header of each profile (Figure 49). We have entered a value of 100 for the  $D_x$  and a value of 24 for the time difference under the assumption that the storm lasted 24 hr. After you have entered the values, *BMAP* plots a graph of

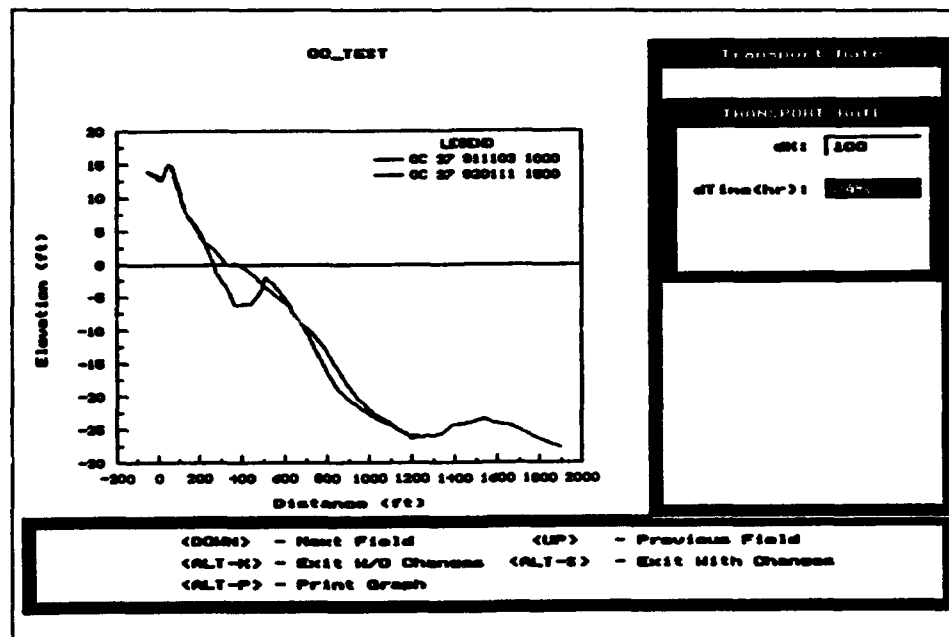


Figure 49. Entering values to calculate the transport rate

the cross-shore transport rate and displays basic information to the right (Figure 50).

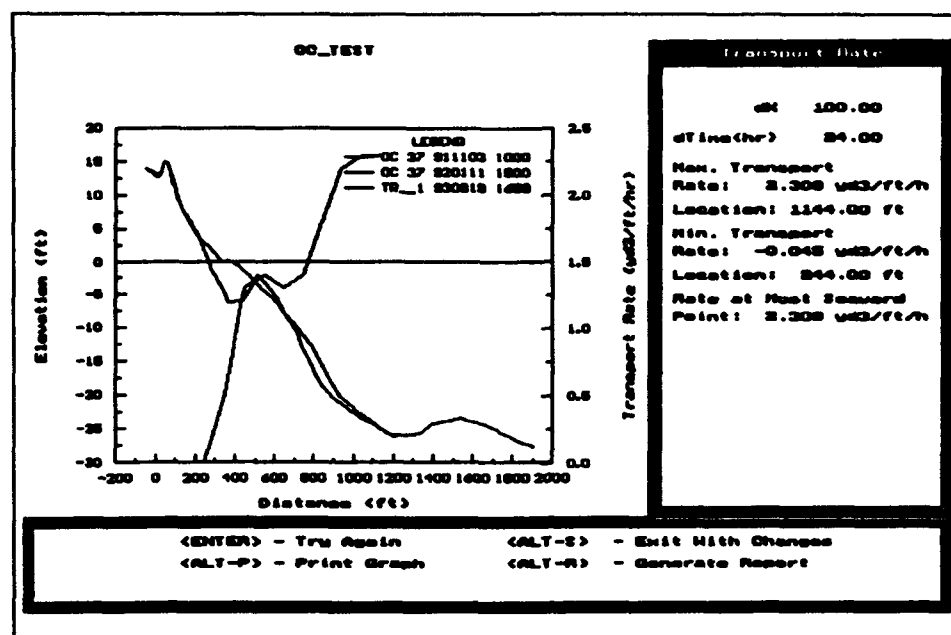


Figure 50. Results of transport rate calculation

Figure 50 shows that the cross-shore transport rate was positive, indicating offshore transport because the  $x$ -axis is positive directed offshore. Of course, during the time between surveys, longshore transport and other factors such as beach fill placement and artificial manipulation of the subaerial profile may have occurred, so that the resultant profile change was not solely a result of cross-shore transport. The calculated maximum and minimum transport rates shown in the information box have units of  $m^3/m/hr$  if the project is in metric units and  $yd^3/ft/hr$  if in American customary units as in our example.

*BMAP* has the capability to print a hard copy of the calculated data in the right window of the screen. To do this, press **<ALT-R>**. *BMAP* asks if you wish to send the information to the printer or to a file. If you choose printer, *BMAP* immediately begins to print the information. If you choose file, enter a valid DOS file name. Do not include the directory because *BMAP* automatically saves the file in the data directory of the project.

## Volume

After Volume is chosen, you will notice that there are two options (Figure 51). We will first choose From Xon to Xoff. A graph appears with the prompt to enter Xon, Xoff, and Zero elevation. We shall enter 0 for Xon, 1000 for Xoff, and 0 for Zero elevation (Figure 52). The *BMAP* then displays

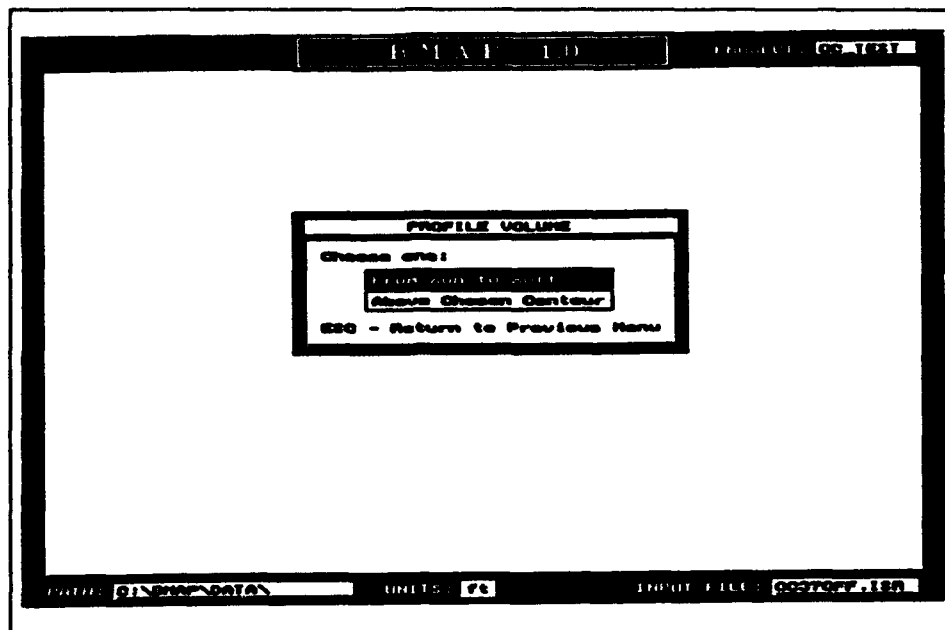


Figure 51. Profile Volume Menu

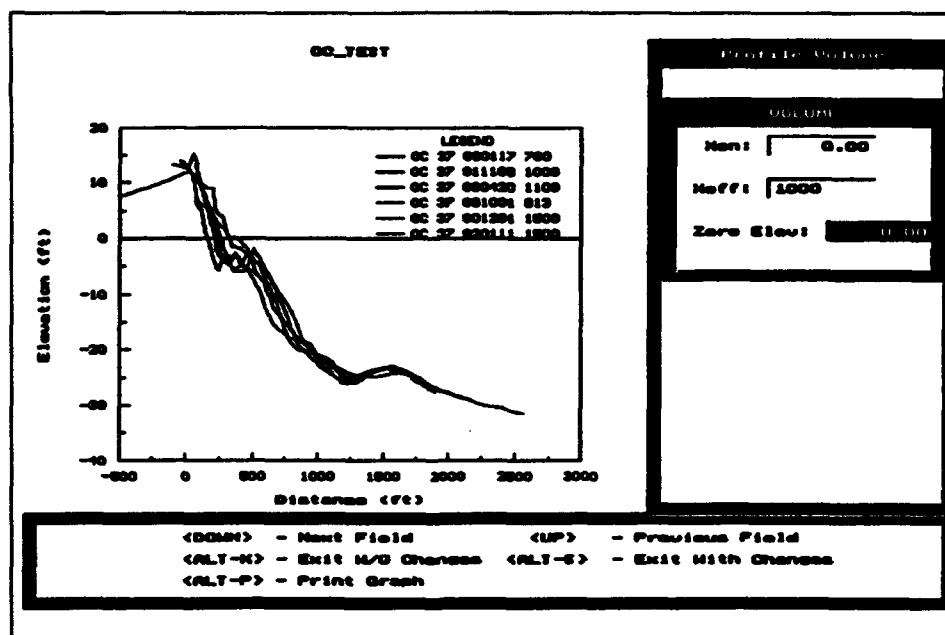


Figure 52. Entering values for profile volume calculation

a scroll screen with the volume of each profile over that distance with respect to zero elevation (Figure 53).

The results of the volume calculation are shown in the scroll box in the right-hand window of the screen. In metric units, the volume will be given in



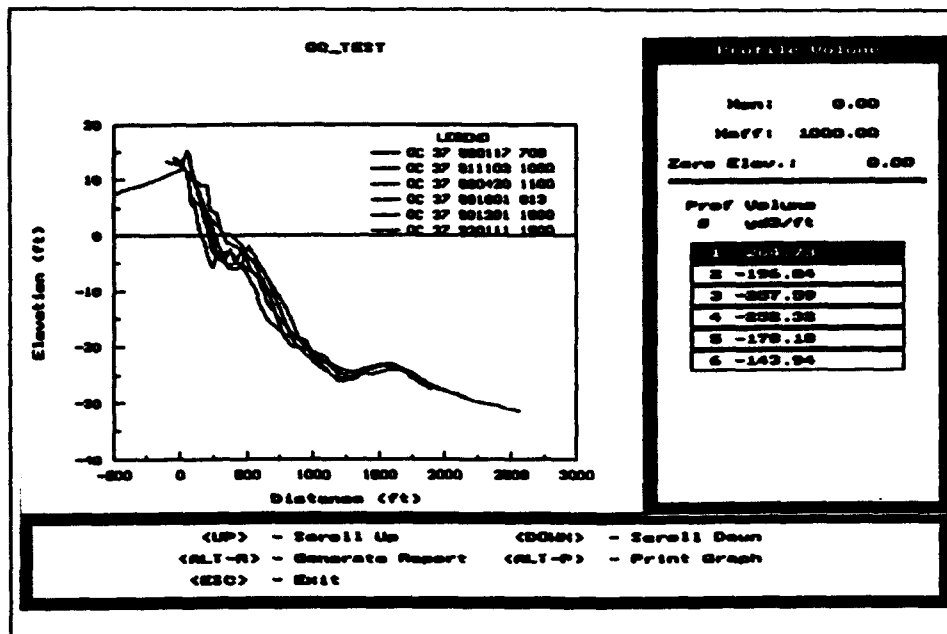


Figure 53. Results for profile volume calculation

$\text{m}^3/\text{m}$ . For the present situation of American customary units, the output is in  $\text{yd}^3/\text{ft}$ .

ESCAPE from that screen and choose **Volume** again, but this time choose **Above a chosen contour**. The *BMAP* now waits for you to enter the contour, which we choose as -5 ft (Figure 54). *BMAP* shows a scroll screen with the volume of all of the profiles, and this time it displays the location of the -5 ft elevation contour (Figure 55). The *BMAP* has the capability to print a hard copy of the calculated data in the right window of the screen. To do this, press <ALT-R>. The *BMAP* asks if you wish to send the information to the printer or to a file. If you choose printer, *BMAP* immediately begins to print the information. If you choose file, enter a valid DOS file name. Do not include the directory because *BMAP* automatically saves the file in the data directory of the project.

### Synthetic profiles

Now choose the option **Synthetic Profiles**, and we can discuss the four different types of artificial profiles that can be generated. Choose **Equilibrium Profile**. You are prompted to enter *Xon*, *Xoff*, *Dx*, and the *A*-parameter or grain size. Choose the values as entered in Figure 56. We selected the *G*-option, grain size, and entered 0.30 mm as a round value based on our best-fit equilibrium profile exercise performed previously. The *BMAP* now plots the equilibrium  $x^{2/3}$  profile to the screen (Figure 57).

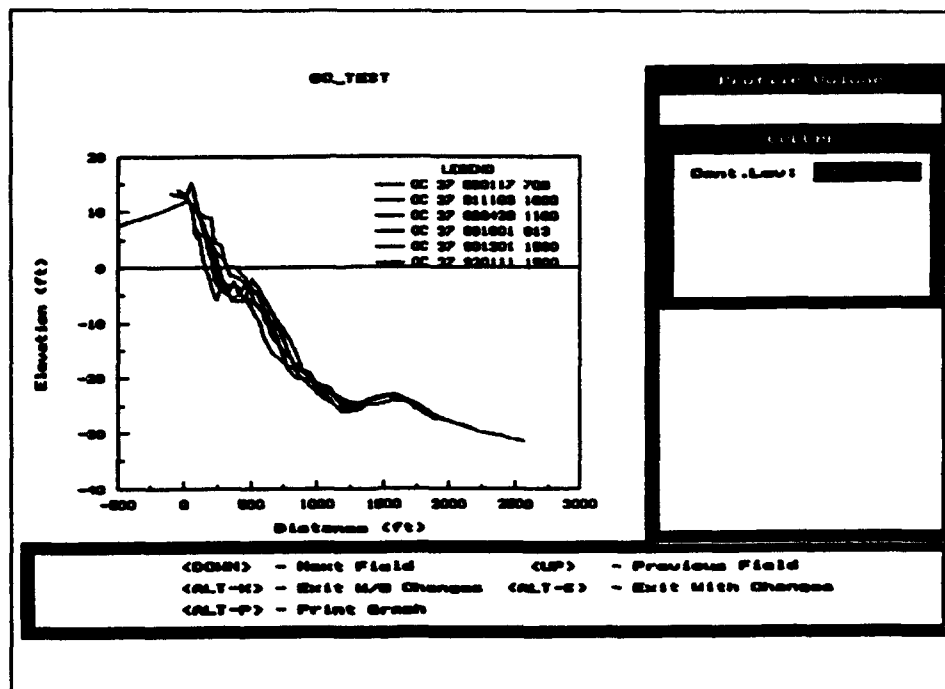


Figure 54. Entering contour for volume calculation

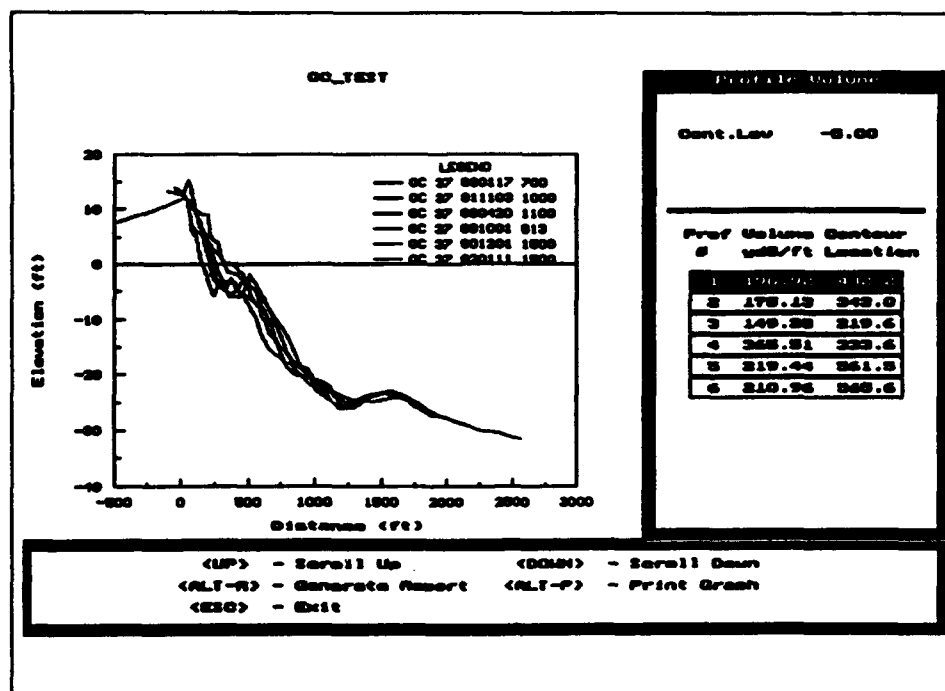


Figure 55. Results for profile volume above a chosen contour

BMAP 1.0
PROJECT: 100 000

**EQUILIBRIUM PROFILE**

Xon:       Xoff:   
 SM:   
 Grain Size (G):  
 or A-Parameter (A):   
 Value for (G) or (A):

<TAB> <RETURN> - Next Field  
 <SHIFT-TAB> - Previous Field  
 <ALT-N> - Exit M/O Changes  
 <ALT-S> - Exit 1st Changes

PATH: C:\SDR\BMAP\DATA
UNITS: ft
INPUT FILE: 0012001.FIN

Figure 56. Entering values for Equilibrium Profile option

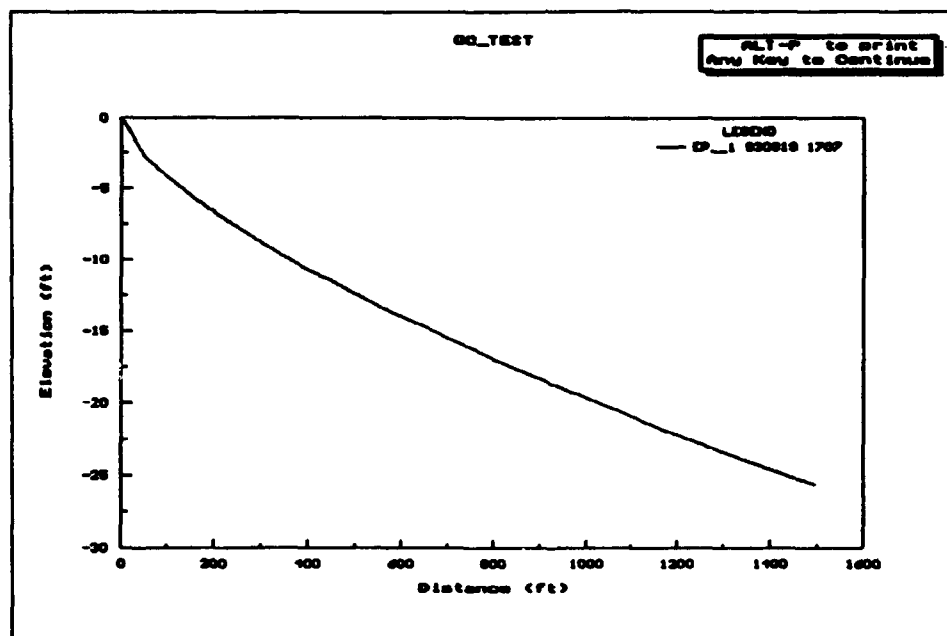


Figure 57. Generated equilibrium profile

ESCAPE back and we will now compute an interpolated profile. The **Interpolate Profile** option requires that we choose a profile to interpolate. We have chosen Profile OC 37 891001 813 from the input file (Figure 36). After you have chosen the profile, enter Xon, Xoff, and Dx (Figure 58). Enter 0 for Xon, 1500 for Xoff, and 100 for Dx. The *BMAP* then displays the

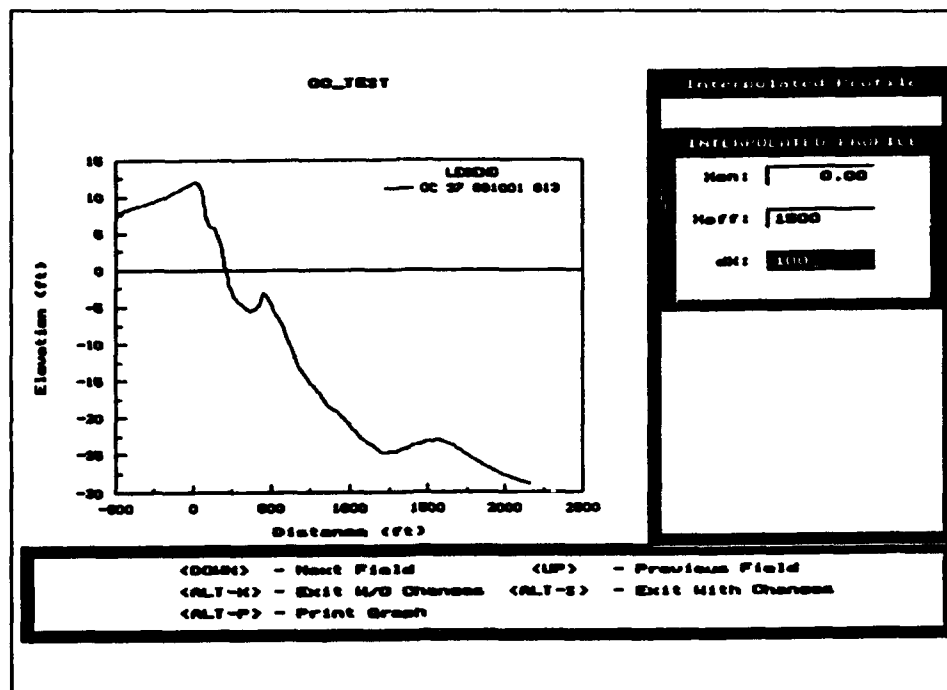


Figure 58. Entering values for Interpolated Profile option

interpolated profile (Figure 59). Note that the interpolated profile (IP\_\_1) has lost some resolution of profile features as compared to the input profile, the actual profile based on measurements, because the interpolation interval of 100 ft typically spans (omits) several survey points.

Next we come to **Modified Equilibrium Profile**, which is similar to **Equilibrium Profile**. Enter the values as they are shown in Figure 60. The *BMAP* then plots the resulting equilibrium profile (Figure 61).

The last-listed synthetic profile option included within *BMAP* is the plane-sloping profile. Here you need only enter *Xon*, *Xoff*, *Dx*, elevation at *Xon*, and elevation at *Xoff*. If you enter the values shown in Figure 62, the profile displayed in Figure 63 should result.

We have now covered all the options of *BMAP* and are ready to exit the program. To do this, return to the **Main Menu** (press **ESCAPE** until the **Main Menu** is displayed). Now press **<Q>** to quit. You will return to the screen as shown in Figure 64. Choose "YES" to exit. You will then be prompted with the screen shown in Figure 65. Choose "YES" to save the project. You will then be prompted with the screen shown in Figure 66. Choose "YES" again to prepare to save some of the output profiles from our session.

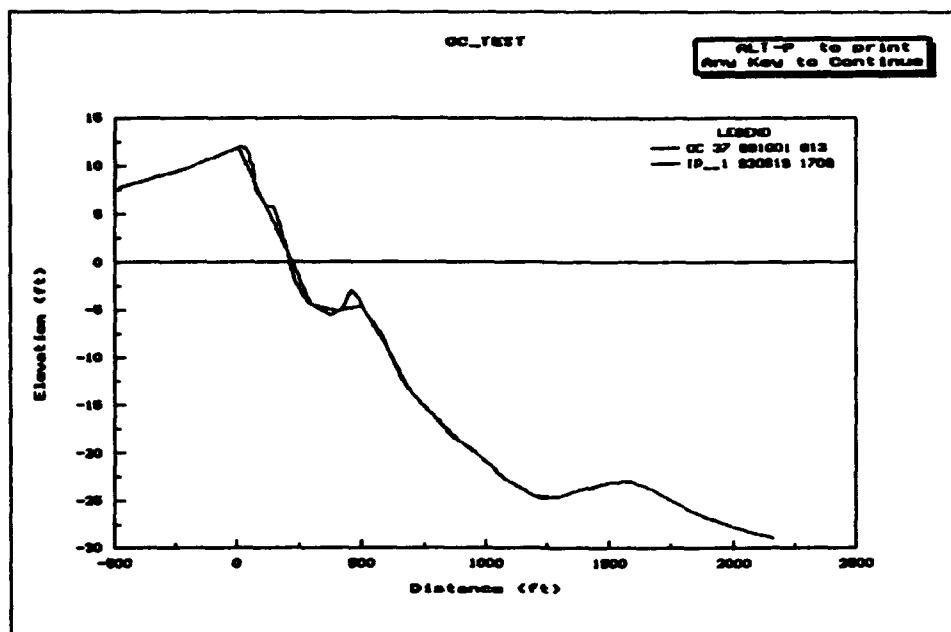


Figure 59. Interpolated profile, DX = 100

Figure 60 is a screenshot of the BMAP 1.0 software interface. The main window displays the "MODIFIED EQUILIBRIUM PROFILE" dialog box. The dialog box contains the following fields and values:

- Nont: 0.0
- Neff: 1700
- DX: 50
- A-Parameter: 0.1
- DRatio: 0.1
- Densy Coefficient: 0.12

Below the fields, a list of keyboard shortcuts is provided:

- <TAB> <RETURN> - Next Field
- <SHIFT-TAB> - Previous Field
- <ALT-N> - Exit N/O Changes
- <ALT-E> - Exit With Changes

The bottom status bar shows the following information:

- PATH: D:\BMAP\DATA\B
- UNITS: ft
- INPUT FILE: 000201.F.15D

Figure 60. Entering values for modified equilibrium profile

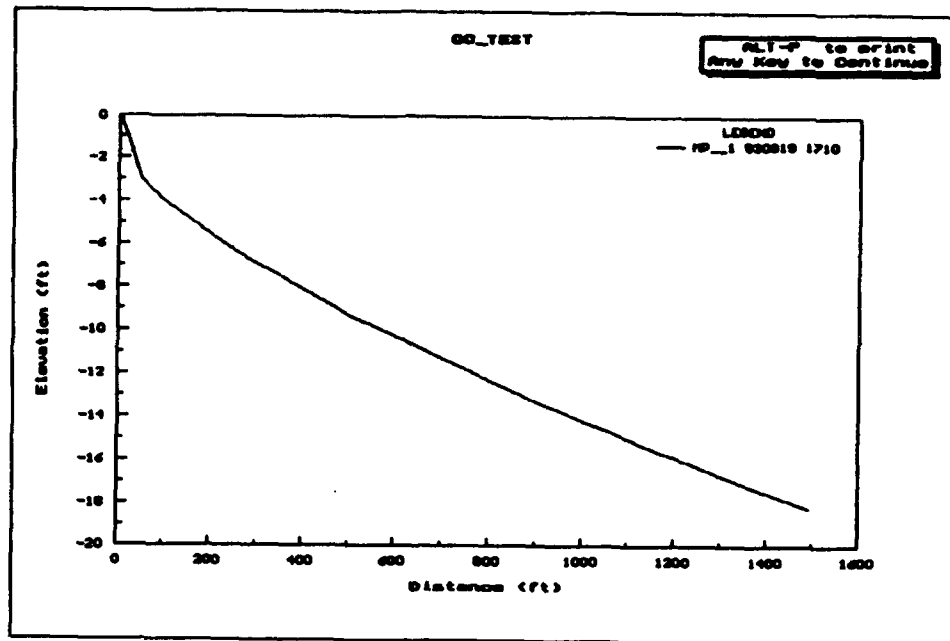


Figure 61. Generated modified equilibrium profile

Figure 62. Entering values for plane-sloping profile

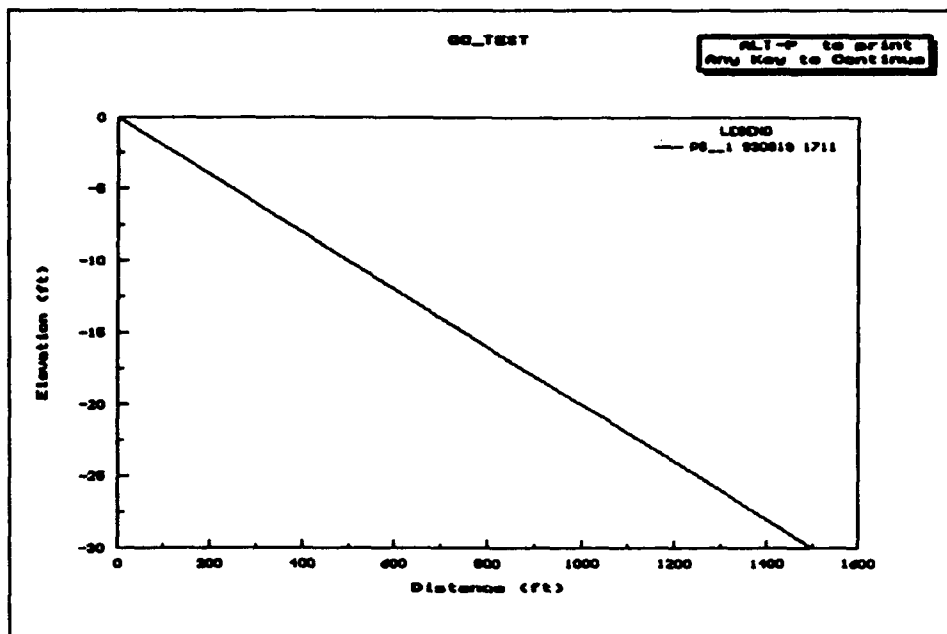


Figure 63. Generated plane sloping profile

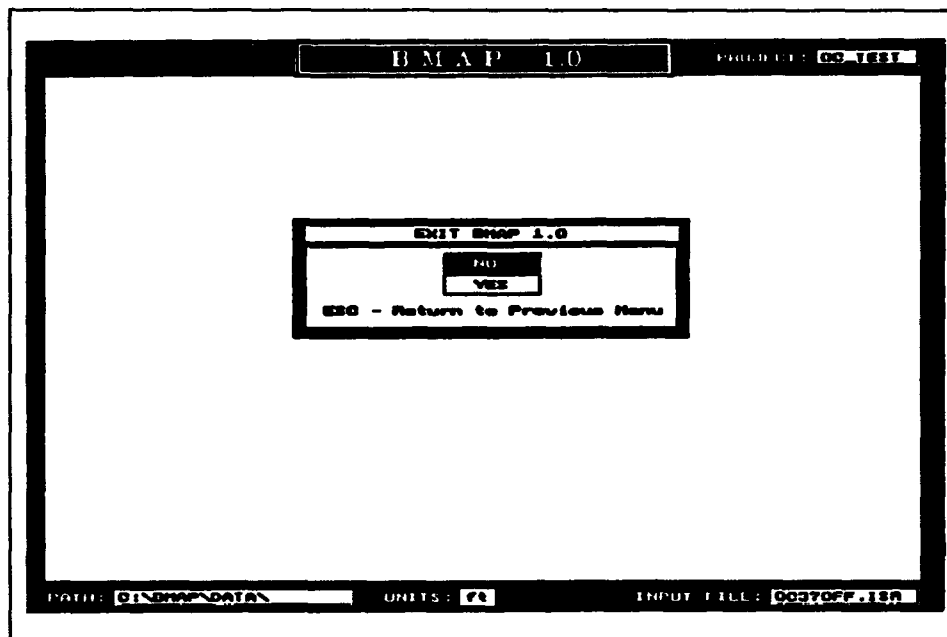


Figure 64. Exit confirmation

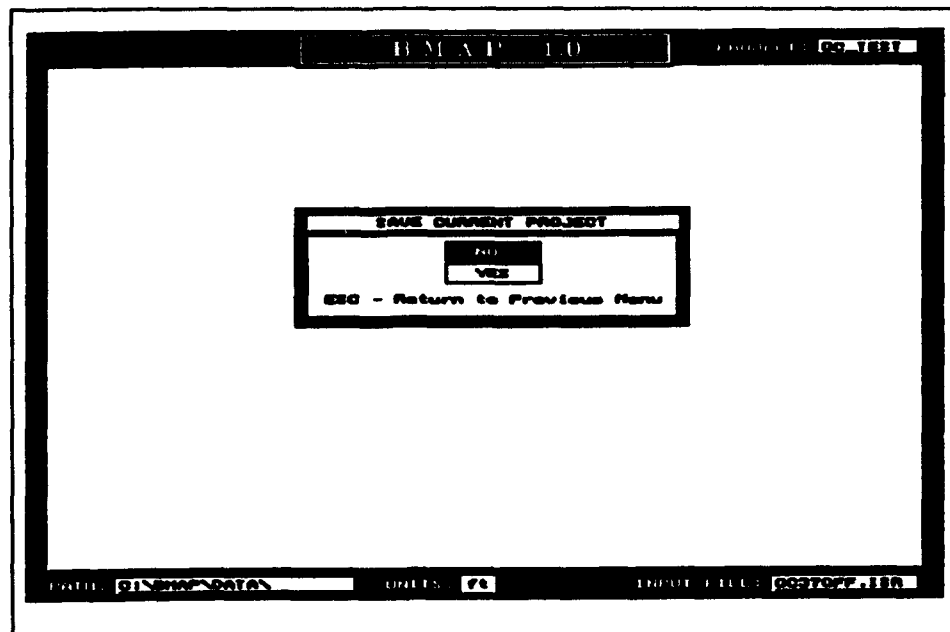


Figure 65. "Save Project" message

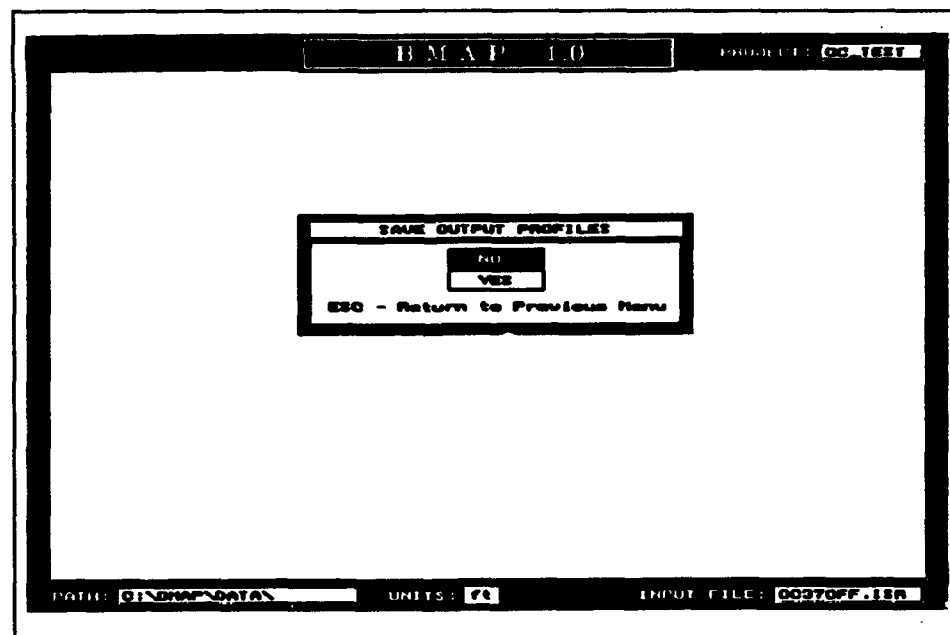


Figure 66. "Save Output Profiles" message

You are now in the **Output Profiles Menu**. Here you may change the names and descriptions of the output profiles. You also have the option to save the profiles to disk. The file you specify should contain no extension.



The *BMAP* automatically appends ".prf" to the file name. Figure 67 shows the profiles as we have saved them. You may or may not wish to save these profiles at this time.

No.	Name	Description	ID	Date	Time	Save to Disk?
18	YMSLY63	prf 3 translated	VL_3	930818	1201	<input checked="" type="checkbox"/>
19	YMSLY64	prf 4 translated	VL_4	930818	1201	<input checked="" type="checkbox"/>
20	YMSLY68	prf 5 translated	VL_5	930818	1201	<input checked="" type="checkbox"/>
21	YMSLY61	trans rate from 91103-930111	VR_1	930818	1201	<input checked="" type="checkbox"/>
22	YMSLY61	Synthetic equil. profile	EP_1	930818	1201	<input checked="" type="checkbox"/>
23	YMSLY61	Synthetic interpolated profile	IP_1	930818	1201	<input checked="" type="checkbox"/>
24	YMSLY61	Synthetic mod. equil. profile	MP_1	930818	1201	<input checked="" type="checkbox"/>
25	YMSLY61	Synthetic plane-sloping prof	PS_1	930818	1202	<input checked="" type="checkbox"/>

<TAB> - Next Field      <Shift-TAB> - Prev. Field  
 <ALT-M> - Abort      <ALT-S> - Save & Exit  
 <ALT-D> - Delete Profile

INPUT: 01000P.DAT      UNITS: ft      INPUT FILE: 00000P.ISR

Figure 67. Saving output profiles

When completed renaming files and entering descriptions, press <ALT-S> to save the changes. You will be returned to the DOS prompt outside of *BMAP*.

This concludes our example using data from Ocean City. You may now wish to review the next example, which makes use of data from the SUPERTANK Laboratory Data Collection Project involving a large wave tank.

## SUPERTANK

In this example, we will only discuss a few operations that provide interesting differences from those of the Ocean City example. We have created a project for SUPERTANK and entitled it ST\_TEST. The default input file, which is found on your installation diskette, is entitled ST\_10.2D, which is a test with monochromatic waves. We will be calculating the bar properties for these profiles.

SUPERTANK data were recorded with a higher precision than standard ISRP, and, therefore, different length multipliers must be used. When creating the project, the Project Parameters screen is displayed (Figure 68). Change the distance and elevation multipliers to 0.01 to confirm how SUPERTANK

**BMAP 1.0** **PROJECT: 1**

**PARAMETERS**

Data Directory:

Default Input File:

Units (ft/m):

Length Multiplier

Distance (x):

Elevation (x):

**KEYBOARD SHORTCUTS**

<TAB> <RETURN> - Next Field  
 <SHIFT-TAB> - Previous Field  
 <ALT-N> - Exit M/D Changes  
 <ALT-S> - Exit With Changes

**PATH:** C:\BMAP\ **UNITS:** ft **INPUT FILE:**

Figure 68. Entering length multipliers for SUPERTANK

profile survey data were recorded, which was to the 0.001 ft in horizontal distance and elevation.

The profiles that we have loaded for this test are listed in Figure 69. All five of the available profiles have been activated.

**BMAP 1.0** **PROJECT: 1**

**Profiles Available**

Filename	ID	Date	Time	Active
ST_10.20	ST 6	9/10/06	1730	V
ST_10.20	ST 6	9/10/06	1730	V
ST_10.20	ST 6	9/10/06	1730	V
ST_10.20	ST 6	9/10/06	1730	V
ST_10.20	ST 6	9/10/06	1730	V

**KEYBOARD SHORTCUTS**

<TAB> <RETURN> - Next Field  
 <SHIFT-TAB> - Previous Field  
 <ALT-I> - Insert a new Row  
 <ALT-N> - Insert Row Toggle  
 <ALT-L> - List All Profiles in Current File  
 <ALT-N> - Exit M/D Changes  
 <ALT-S> - Exit with Changes  
 <ALT-D> - Delete Current Row

**PATH:** C:\BMAP\ **UNITS:** ft **INPUT FILE:**

Figure 69. Profiles available in the file ST\_TEST

Now we calculate bar properties. Enter on Bar Properties from the Analysis Menu, then choose With a Reference Profile. For this example, we chose Profile ST 6 910805 1005 for the reference and Profile ST 6 910808 1240 as the specific target profile. Figure 70 shows the two profiles and the crossing pairs, and Figure 71 shows the results of the calculations.

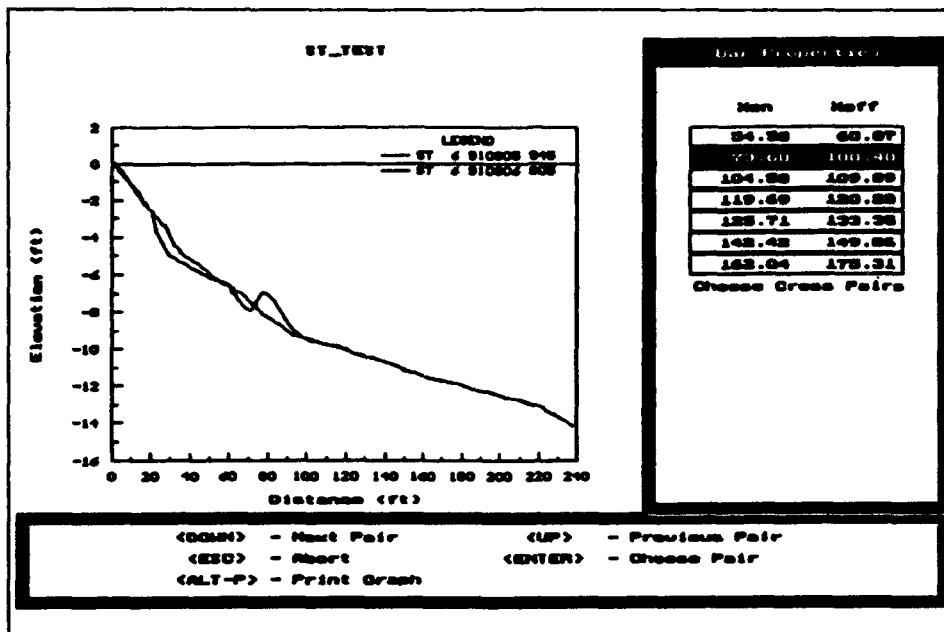


Figure 70. Choosing cross pairs for bar properties for ST\_TEST

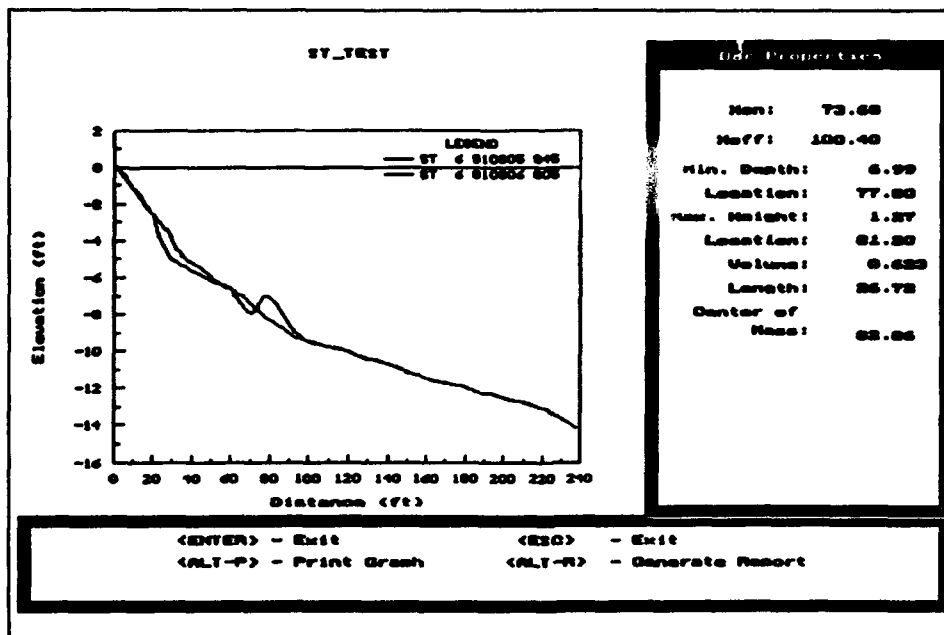


Figure 71. Results of bar properties for ST\_TEST

In Figure 70, we see that several bars have been located. Some of these are observed on the graph to simply be large ripples generated by the monochromatic waves. There is only one large break-point bar, located in the region between 73.68 and 100.40 ft. Therefore, enter on this bar to calculate bar properties in Figure 71.

This concludes the example chapter. For more detailed instructions on running *BMAP*, consult Chapters 1 through 6 of this manual.

# References

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# Appendix A

## Example Data and Format

---

This appendix reviews the Interactive Survey Reduction Program (ISRP) format (Birkemeier 1984)<sup>1</sup> and lists the survey data used in the examples given in the main text of the report.

### ISRP Format

The ISRP format is summarized in Table A1. The format is defined by record line number, position on the line, and the content of the information. The Beach Morphology Analysis Package (*BMAP*) will look for profile survey information in exactly this format; errors in format may produce either run-time errors or spurious results. Examples of survey data in ISRP format are given in the next section.

### Example Survey Data

The survey data for the Ocean City, Maryland, and SUPERTANK example projects are given respectively in Figures A1 and A2.

In Figure A1, the entry "OC\_37" identifies the survey line as "Ocean City, profile line No. 37." The "41" leading the next entry indicates that this entry is "line 1 of card 4," is not necessary, and is not read by *BMAP*. The date of the survey is "890117" (17 January 1989). The entry "700" is the time of the survey (0700), and there are 59 coordinate (horizontal, elevation) pairs. The entry "-286" indicates that the minimum elevation is -28.6 ft. The entry "Ocean City" is optional material treated as blank space by *BMAP*. The next entry, "-108 134" is the first coordinate pair, indicating a horizontal distance of 108 ft behind the baseline, and a profile elevation of 13.4 ft. (These entries are in standard ISRP format with regard to precision.) The other entries follow similarly.

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<sup>1</sup> References cited in this appendix can be found in the reference list at the end of the main text.

<b>Table A1 Explanation of ISRP Data Format</b>	
<b>Position</b>	<b>Description of Entry</b>
<b>First Data Line in Each Record</b>	
1-5	Profile Location Number
6-10	Blank
11-16	Date of Survey (year, month, day)
17-21	Time of Survey (e.g., 1250 = 12:50)
22-24	Number of coordinate pairs in the survey
25-29	Minimum elevation in the survey (e.g., -258 = -25.8 units)
30-40	Blank
41-80	First four distance-elevation pairs Elevation values have one significant digit (e.g., 90 45 = Horizontal Distance 90 units, Elevation 4.5 units)
<b>Following Data Lines in Each Record</b>	
1-10	Same as first data line
11-80	Seven distance-elevation pairs

Values of the coordinate pairs for the SUPERTANK example data set include an extra precision value which differs from standard ISRP format. Under the **Project Options Menu**, there is an option called **Units**, in which the length and elevation multipliers (cf, Chapter 2) can be changed to account for extra survey precision. For SUPERTANK, the distance length multiplier was 0.01 and the elevation length multiplier was 0.01. Therefore, the first coordinate-pair entry "10 -5" is read as horizontal distance of 0.10 ft from the baseline with an elevation of -.05 ft. Other header information in the first line follows standard ISRP format. The "ST\_6" entry indicates Test 6 of the SUPERTANK series (Kraus, Smith, and Sollitt 1992), and the first survey shown in Figure A2 was done on 5 August 1991 at 0945. There are 130 coordinate pairs in the survey.



OC 37	41890117	700	59	-286	OCEAN CITY	-108	134	14	125	29	121	44	117
OC 37	42	59	113	74	111	89	102	104	95	117	89	129	85
OC 37	43	159	54	178	45	197	38	217	21	238	0	258	-21
OC 37	44	291	-37	310	-43	331	-43	351	-41	365	-26	386	-29
OC 37	45	412	-43	438	-52	465	-61	523	-81	543	-92	568	-100
OC 37	46	595	-122	614	-133	638	-145	660	-156	722	-168	790	-182
OC 37	47	947	-190	998	-208	1087	-218	1148	-231	1203	-239	1254	-243
OC 37	48	1386	-243	1447	-239	1494	-235	1558	-235	1601	-237	1643	-241
OC 37	49	1731	-248	1794	-255	1858	-264	1930	-275	2017	-280	2092	-286
OC 37	51890420	1100	54	-317	OCEAN CITY	-108	134	21	126	39	120	58	114
OC 37	52	75	62	95	54	110	53	126	28	150	2	176	-15
OC 37	53	233	-58	249	-57	254	-49	276	-31	307	-30	336	-33
OC 37	54	356	-30	394	-34	412	-50	457	-51	505	-61	559	-70
OC 37	55	675	-105	710	-111	744	-127	805	-164	834	-174	893	-189
OC 37	56	1011	-215	1065	-223	1119	-230	1179	-239	1249	-252	1306	-260
OC 37	57	1440	-240	1504	-236	1560	-230	1623	-233	1706	-241	1793	-252
OC 37	58	1978	-276	2088	-286	2172	-294	2249	-299	2328	-303	2410	-306
OC 37	59	2586	-317										
OC 37	71891001	813	60	-291	Ocean City	-483	79	-224	98	11	122	22	121
OC 37	72	32	120	49	112	51	109	51	105	63	100	74	75
OC 37	73	96	66	107	62	118	59	130	58	142	58	154	51
OC 37	74	184	27	202	9	210	1	216	-6	223	-12	231	-19
OC 37	75	268	-37	289	-43	372	-56	421	-48	456	-30	486	-37
OC 37	76	513	-52	528	-59	581	-76	604	-93	631	-108	659	-123
OC 37	77	712	-141	742	-150	802	-166	867	-185	943	-196	1010	-213
OC 37	78	1148	-237	1216	-249	1295	-248	1363	-242	1435	-237	1506	-233
OC 37	79	1667	-237	1746	-249	1832	-261	1929	-272	2001	-278	2078	-284
OC 37	101901201	1500	66	-257			-56	140	-25	134	2	126	15
OC 37	102	27	140	39	147	50	154	65	143	79	129	97	102
OC 37	103	123	97	138	95	151	92	166	92	179	92	193	92
OC 37	104	210	55	224	50	237	44	252	43	266	41	278	32
OC 37	105	304	12	318	2	343	-14	372	-15	410	-19	432	-24
OC 37	106	501	-37	522	-40	560	-49	582	-63	606	-76	632	-88
OC 37	107	676	-115	701	-128	717	-143	736	-155	756	-168	780	-183
OC 37	108	854	-202	888	-203	924	-204	972	-206	1017	-214	1081	-226
OC 37	109	1184	-251	1203	-256	1248	-257	1290	-254	1335	-253	1371	-251
OC 37	10:	1441	-249	1486	-247	1532	-246	1574	-244	1625	-244	1669	-242
OC 37	141920111	1500	65	-277			-56	140	-21	136	10	131	29
OC 37	142	43	151	60	147	71	135	82	119	93	109	104	96
OC 37	143	142	67	177	53	209	36	221	34	231	31	242	28
OC 37	144	263	23	273	20	298	11	322	0	341	0	361	2
OC 37	145	398	-4	419	-8	436	-13	464	-20	474	-24	507	-34
OC 37	146	582	-54	616	-64	652	-79	693	-93	736	-107	779	-122
OC 37	147	846	-157	880	-176	921	-195	942	-203	965	-210	990	-217
OC 37	148	1058	-232	1095	-240	1124	-248	1158	-255	1193	-262	1198	-264
OC 37	149	1284	-260	1340	-257	1398	-244	1448	-241	1547	-234	1593	-239
OC 37	14:	1705	-248	1746	-256	1793	-263	1842	-270	1914	-277		

Figure A1. Ocean City, Maryland, test data set

ST	6	910805	945130			10	-5	15	-5	16	-3	109	6
ST	6	215	-7	355	-21	489	-38	654	-57	818	-86	983	-107
ST	6	1244	-140	1405	-164	1641	-219	1642	-218	1645	-218	1646	-218
ST	6	1695	-211	1818	-238	2043	-256	2636	-340	2642	-339	2659	-337
ST	6	3153	-443	3285	-450	3444	-472	3478	-485	3482	-484	3484	-484
ST	6	3485	-484	3486	-484	3519	-483	3604	-487	3689	-500	3708	-505
ST	6	3709	-505	3709	-505	3710	-505	3710	-505	3712	-505	3713	-505
ST	6	3856	-507	4098	-524	4338	-544	4581	-562	4817	-582	5042	-605
ST	6	5558	-643	6189	-672	6211	-682	6212	-681	6228	-681	6370	-688
ST	6	6760	-719	7332	-772	7557	-794	7764	-820	7980	-831	8217	-847
ST	6	8661	-880	8882	-894	9108	-911	9337	-927	9545	-931	9772	-940
ST	6	10166	-94910401	-95710634	-96810980	-97811206	-97911463	-98211685	-988				
ST	6	11957	-100012221	-100912509	-102412800	-103713099	-104513373	-104813666	-1050				
ST	6	13968	-106314243	-108114501	-108814764	-109915055	-111015329	-112515805	-1134				
ST	6	16113	-114916452	-116416801	-117117128	-117817475	-118417826	-118618149	-1197				
ST	6	18485	-121218815	-122619130	-123319452	-123419761	-124320092	-125120422	-1265				
ST	6	20782	-127221146	-127721644	-128321946	-130422165	-131322386	-132122537	-1333				
ST	6	22541	-133922541	-133922541	-133922542	-133922542	-133922542	-133922542	-1338				
ST	6	22589	-133922784	-135023002	-136223230	-137223347	-138223347	-138223346	-1382				
ST	6	910805	1730119			3	-12	9	-12	9	-12	12	-12
ST	6	15	-9	16	-9	20	-7	171	-16	378	-36	385	-40
ST	6	866	-97	875	-106	1016	-114	1047	-131	1310	-155	1451	-193
ST	6	1807	-242	1928	-255	2011	-266	2056	-279	2074	-287	2079	-292
ST	6	2095	-297	2115	-307	2164	-358	2216	-370	2278	-384	2392	-411
ST	6	2607	-450	2869	-490	2871	-492	2943	-493	2968	-502	2969	-502
ST	6	3051	-502	3161	-511	3316	-521	3452	-531	3619	-541	3797	-553
ST	6	4180	-572	4381	-586	4581	-595	4844	-615	5039	-624	5237	-636
ST	6	5643	-651	5833	-649	6010	-660	6179	-689	6251	-705	6365	-726
ST	6	6753	-785	6928	-801	7093	-799	7193	-772	7458	-725	7548	-708
ST	6	7835	-707	7991	-713	8174	-807	8407	-761	8665	-806	8935	-852
ST	6	9547	-919	9812	-935	10050	-945	10239	-954	10406	-954	10626	-964
ST	6	11164	-98411383	-98611532	-98611578	-98911584	-98911793	-98912110	-1009				
ST	6	12458	-101712804	-102813126	-104213481	-105213836	-106514187	-107814561	-1090				
ST	6	14764	-110815245	-111815582	-113315888	-114416230	-115816567	-116416912	-1174				
ST	6	17269	-118417650	-119118012	-119818385	-121118765	-122119175	-123619550	-1239				
ST	6	19952	-125120396	-126120829	-127421271	-128521895	-130122287	-131722651	-1342				
ST	6	22992	-136123277	-137623430	-1390								
ST	6	910806	805108-1420			2	-5	3	0	338	-36	660	-78
ST	6	932	-116	1121	-139	1253	-159	1254	-158	1262	-157	1627	-226
ST	6	1703	-211	1790	-240	1994	-256	2044	-282	2045	-281	2046	-281
ST	6	2067	-286	1106	-301	2204	-365	2878	-488	2927	-504	2928	-504
ST	6	3146	-511	3367	-526	3543	-535	3763	-547	3949	-560	4104	-570
ST	6	4365	-583	4547	-591	4743	-602	4941	-618	5153	-625	5795	-646
ST	6	6216	-703	6235	-701	6359	-717	6573	-750	6850	-789	7105	-793
ST	6	7350	-777	7380	-775	7384	-768	7443	-744	7521	-728	7642	-708
ST	6	7926	-701	8120	-713	8303	-738	8481	-769	8664	-801	8893	-844
ST	6	9336	-899	9536	-915	9773	-937	10019	-949	10292	-959	10518	-960
ST	6	11436	-98611705	-99511998	-100112298	-101612453	-102812519	-102612722	-1029				
ST	6	12971	-103813232	-104513592	-105413889	-106614206	-108014534	-108614938	-1102				
ST	6	15106	-112115681	-113316096	-115016526	-116216975	-117217428	-118217873	-1192				
ST	6	18312	-120818718	-122219072	-123119430	-123719772	-124720062	-125320283	-1259				
ST	6	20559	-126820838	-127421209	-128321607	-129722178	-130922579	-133622861	-1353				
ST	6	23159	-136923401	-138323601	-139423766	-140623892	-141723902	-1420					
ST	6	910806	1335112			12	3	196	-18	452	-45	675	-64
ST	6	861	-40	1089	-108	1250	-158	1277	-148	1686	-214	1784	-234
ST	6	1922	-264	1923	-264	1954	-270	2008	-295	2024	-320	2105	-370
ST	6	2223	-412	2376	-447	2504	-470	2611	-484	2705	-488	2717	-494
ST	6	2731	-492	2857	-491	3034	-507	3228	-534	3386	-548	3438	-538
ST	6	3849	-571	4105	-589	4346	-581	4620	-592	4901	-611	5194	-648
ST	6	5734	-671	5957	-675	6157	-681	6157	-682	6157	-683	6158	-676
ST	6	6161	-683	6243	-680	6434	-684	6650	-701	6875	-746	7062	-797
ST	6	7345	-863	7448	-866	7540	-860	7576	-856	7584	-860	7619	-827
ST	6	7700	-803	7727	-779	7836	-759	7887	-726	7971	-698	8110	-685
ST	6	8486	-698	8723	-725	8963	-773	9440	-848	9757	-901	10013	-918
ST	6	10635	-96011006	-98311353	-99411703	-99911988	-100812266	-100512632	-1030				
ST	6	12893	-103513155	-104013481	-105513809	-106614026	-105614101	-107714118	-1082				
ST	6	14157	-107514289	-108014538	-109214796	-110815247	-112015617	-113516015	-1144				
ST	6	16408	-116016826	-117217244	-117917656	-118918069	-119718484	-120918943	-1226				
ST	6	19434	-123619917	-124520403	-126520904	-127121425	-128621959	-130522471	-1323				
ST	6	22159	-135823563	-139023806	-1408								
ST	6	910806	1822 88			6	-3	10	-3	72	0	162	-8
ST	6	255	-13	393	-25	530	-45	725	-67	850	-76	1164	-96
ST	6	1222	-89	1326	-112	1590	-211	2144	-386	2280	-408	2447	-439
ST	6	2773	-487	2943	-508	3114	-523	3282	-539	3456	-553	3635	-566
ST	6	4061	-587	4277	-600	4873	-626	4874	-628	5016	-628	5243	-635
ST	6	5745	-667	6003	-671	6247	-670	6522	-680	6809	-721	6984	-762
ST	6	7139	-779	7300	-802	7425	-809	7544	-797	7686	-787	7844	-785
ST	6	8179	-805	8223	-805	8354	-780	8411	-770	8447	-764	8624	-738
ST	6	9199	-771	9541	-846	10044	-913	10440	-948	10859	-975	11221	-991
ST	6	12008	-100312516	-101813046	-103713563	-105314107	-106814671	-109415252	-1118				
ST	6	15804	-113716349	-115516918	-117417486	-118518046	-120018857	-121719436	-1233				
ST	6	19999	-124520562	-126521061	-127621489	-128821870	-130022248	-131822591	-1334				
ST	6	22873	-135422909	-136322937	-136323016	-136823469	-138323679	-139923696	-1403				

Figure A2. SUPERTANK test data set

# Appendix B

## Installation of *BMAP*

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This appendix describes system requirements for running the Beach Morphology Analysis Package (*BMAP*) and the installation procedure for transfer of the package from the distribution diskette to your computer.

### System Requirements

System requirements for *BMAP* include at minimum a Disk Operating System (DOS) 386-compatible personal computer, Video Graphics Array (VGA) monitor, 1.5 Mb of hard drive space, and 640 K of memory. A mouse is recommended but not required. *BMAP* is supplied on a 3.5-in. (1.44-Mb) diskette. It is recommended that a backup copy of the *BMAP* distribution diskette be made prior to attempting installation.

If hard copy printouts of *BMAP* graphs are desired, the user must have a Hewlett-Packard LaserJet II compatible printer.

### Installation

For installing the software package, it is recommended that *BMAP* be placed into a separate directory called *BMAP*. It will be assumed that your hard drive is the "C" drive. To create this directory and move to it, type:

```
C:\> MKDIR BMAP <ENTER>
C:\> CD BMAP <ENTER>
```

Insert the *BMAP* distribution diskette into the available 3.5-in. drive (A or B). To complete the installation for a target A drive, type:

```
C:\BMAP> COPY A:*. * <ENTER>
```

*BMAP* is now installed on the hard drive. Please store the distribution diskette in a safe place.

## Running *BMAP*

*BMAP* can only be started from within the *BMAP* directory, where *BMAP.EXE* is present. There are two ways to start *BMAP*. For method one, type:

```
C:\BMAP\> BMAP <ENTER>
```

*BMAP* will start and the **PROJECT OPTIONS** menu will be displayed.

To use the second method of starting *BMAP*, a project must already exist. Start *BMAP* with a project file (excluding extension) as a command line option. Following is an example using a project called *OCEANCTY* found in the current directory:

```
C:\BMAP\> BMAP OCEANCTY
```

# Appendix C

## Converting Files

---

This appendix describes the procedure for conversion between the Interactive Survey Reduction Program (ISRP) format files and the Beach Morphology Analysis Package (BMAP) Free-format (FRE) files. The arrangement of a FRE file and an example are given. The FRE format, which is basically a two-column format of distance elevation pairs, is convenient for entry to plotting packages. Two-column format data files are typically generated in numerical simulation models. In the FRE format, the first two lines of each record may be treated as headers for the file containing distance elevation data pairs in two-column format.

### Convert Files

Converting profile data files, either to or from ISRP and FRE format, is accomplished through the Main Menu option **Convert Files**. At the **Convert Files** data entry screen, choose the first option for conversion of ISRP to FRE, or the second option for conversion of FRE to ISRP. When the next screen is displayed, enter the corresponding file names. If the ISRP or FRE data file is currently in another directory, precede the data file name with the complete path for each of the specified file names. BMAP will then proceed with the specified conversion.

### BMAP Free-Format (FRE)

The FRE format is summarized in Table C1. The format is defined by record line number, position on the line, and the content of the information. The BMAP will look for profile survey information in exactly this format; errors in format may produce invalid or erroneous results. Examples of survey data in FRE format are given in the next section.

Table C1 Explanation of <i>BMAP</i> FRE Data Format	
Position	Description of Entry
First Data Line in Each Record	
1 - 5	Profile Location Number (ID)
6	Blank
7 - 11	Date of Survey (year, month, day)
12	Blank
13 - 18	Time of Survey (e.g., 1850 = 6:50 pm )
Second Data Line in Each Record	
1 - 3	Number of coordinate pairs in the survey
4	Blank
5 - 20	Minimum elevation in the survey
Following Data Lines in Each Record	
1 - EOL	One distance elevation pair (e.g., 10.24056 -28.634) delimited by a blank. EOL means end of line

## Example Survey Data

Selected survey data for the Ocean City, Maryland, example project are given in Figure C1. In Figure C1, the entry "OC 37" identifies the survey line as "Ocean City, profile line No. 37." The entry "890117" is the date of the survey (year, month, day), and the "700" indicates the time of the survey (0700). The "59" on the second line of the first record indicates that there are 59 coordinate( distance, elevation) pairs, and the "-28.600000" indicates that the minimum elevation is -28.6 ft. The next entry, "-108.000000 13.400000" on the third line of the first record, is the first coordinate pair, indicating a

```

OC 37 890117 700
59 -28.600000
-108.000000 13.400000
14.000000 12.500000
29.000000 12.100000
...
...
1930.000000 -27.500000
2017.000000 -28.000000
2092.000000 -28.600000
OC 37 890420 1100
54 -31.700001
-108.000000 13.400000
21.000000 12.600000
39.000000 12.000000
...
...
2410.000000 -30.600000
2492.000000 -31.200000
2586.000000 -31.700000

```

Figure C1. Ocean City, Maryland, test data, set Records 1 and 2

horizontal distance of 108 ft behind the baseline, and a profile elevation of 13.4 ft. The other entries follow similarly.

# Appendix D

## Notation

---

$A$	Shape parameter describing the equilibrium beach profile, $m^{1/3}$ or $ft^{1/3}$
$d_{50}$	Median grain size, mm
$D_{ratio}$	Ratio of energy dissipation at the shoreline to energy dissipation in the offshore
$Dx$	Horizontal increment factor
$h$	Water depth
$R^2$	Correlation coefficient squared
$x$	Horizontal coordinate, m or ft
$z$	Vertical coordinate or elevation, m or ft
$\lambda$	Spatial gradient at which the equilibrium energy dissipation the approaches dissipation in the offshore, $m^{-1}$ or $ft^{-1}$



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