UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Program Kolor-Map & Section

Amiga Version 1.0

By

Adel A.R. Zohdy *

Open-File Report 93-13

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93-13 Manual and program listing (paper copy)
93-13 Disk with program, source code, and examples.

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* U.S. Geological Survey, MS 964, Box 25046, Denver, Colorado 80225

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SYSTEM REQUIREMENTS

Hardware and Operating System:

The minimum hardware requirement is an Amiga computer with at least 5 Mb of memory (4 Mb Fast RAM and 1 Mb Chip RAM) running under AmigaDOS 1.3 or higher. A math coprocessor is strongly recommended but not required. For multitasking purposes, 10 Mb of RAM are recommended.

The program was developed and tested on an Amiga 3000 running under AmigaDOS 2.04 with 10 Mb of RAM (8 Mb Fast RAM and 2 Mb of Chip RAM) and a math coprocessor. The program was also tested on an Amiga 2000 (running under AmigaDOS 1.3, the Motorola 68000 chip, and no math coprocessor), and on the Amiga 4000 (running under AmigaDOS 3.0 and the Motorola 68040 chip which has a builtin math coprocessor).

A Super-VGA (1024x768) monitor is strongly recommended but not required (for example the Sony Multiscan HG). Running under AmigaDOS 2.04 or 2.05 it is possible to display a *Hires-Interlaced screen mode with a visible size of 722 x 482 pixels*. AmigaDOS 1.3 and AmigaDOS 3.0 display a smaller visible area. In spite of that, all the necessary information in the program (menus, requesters, images, etc) will be completely visible.

Software:

For duplication and distribution purposes by the USGS, the program is provided on a 3.5 inch, DS/DD (double-sided double-density) disk which is formatted as an MS-DOS 720 Kb disk. In order to read or to copy the program from an MS-DOS disk into an Amiga computer, a utility program such as CrossDOS (Consultron, 1990) is needed. CrossDOS is included in AmigaDOS 2.1 and 3.0 and it is transparent to the user.

Users who do not have CrossDOS or an equivalent program may contact the author directly for a copy of the program on an Amiga formatted disk.

Important Note: Two files: **arp.lib** and **extend.lib** are provided on the disk, under a directory named Library. These two files **must be copied** to the System's Libs directory, **and renamed to arp.library and extend.library**, respectively. Otherwise, the program will not run.

DISK CONTENTS

This open-file report is composed of two parts: (a) the manual you are reading now (including the program code, given in the appendix), and (b) a 3.5 inch DS/DD disk with the following files:

1) The executable-program named KolorMap (as an abbreviation to the name: Kolor-Map & Section program).

2) A utility program named MakeVist (abbreviation for MakeVista).

3) A file named header.dem (used with MakeVista).

4) A directory named Library containing two files: arp.lib and extend.lib (abbreviations for arp.library and extend.library). Normally, two other files named arp.bmap and extend.bmap are required when compiling the program, but since these two files are not required to run the program, they are not included on the disk.

5) A directory named Examples which contains examples of data files and images of colored maps and cross sections that were generated using the Kolor-Map & Section program.

Note that all the file names have been abbreviated to conform with MS-DOS requirements, since the distribution of the disk is made on an MS-DOS formatted disk.

The Kolor-Map & Section program is written in HiSoft BASIC Professional version 1.05 (HiSoft, 1989) which is a fast interactive BASIC compiler for the Amiga computer. Commands to load and save IFF-ILBM (Interchange File Format-InterLeaved Bit Map) images are implemented in the program using the Extend Library (Sunsmile Software, 1989; Hisoft,1992). Since the KolorMap program is an executable program, you do not need HiSoft BASIC Professional to run it. However, as mentioned in the system requirements, before you can run the program, you must first copy the two files: arp.Lib and extend.Lib, from the Library Directory (on disk) to your Amiga System's Libs directory and rename them to arp.library and extend.library. More on this in the Getting Started Section.

The utility-program MakeVista converts calculated z-data files generated by the Kolor-Map & Section program into digital-elevation-model (DEM) files that can be loaded into VistaPro 2.0 (Virtual Reality Laboratories Inc, 1992a). The MakeVista program was kindly provided in AmigaBASIC by Mr. Clint Woeltjen of Virtual Reality Laboratories Inc (VRLI). I modified the program and compiled it using HiSoft BASIC Professional because AmigaBASIC does not run on the Amiga 3000. The MakeVista program is included on the disk with Mr.

Woeltjen's written permission. A utility program that performs the same function, is available from VRLI for a nominal fee. **Note: To run the MakeVista program, the "header.dem" file must be in the same directory as the MakeVista program.**

A NOTE ABOUT COMMERCIAL PROGRAMS

In this manual, I will refer to the name of the publisher of a commercial software only when the product is mentioned for the first time. A complete list of the names of the publishers and the software products that can be used in conjunction with this program is given at the end of the manual in standard reference form. The mention of a particular commercial product is intended only as an example of the kind of product that I used and tested, other products may be available on the market that can perform the same functions. For brevity, no mention of the possibility of other products will be made when I refer to a particular product that I used.

GETTING STARTED

If you have obtained a copy of this program on an MS-DOS formatted disk (as opposed to an Amiga formatted disk) then please do the following.

Using CrossDOS, click the mouse pointer on the MountMF icon to mount the floppy drive(s) as MS-DOS drive(s). To activate the drive type di0: (for drive 0) or di1: (for drive 1). Do this either in the Shell or CLI (command line interface) or in a utility program that may help you copy such files. Create a directory and name it KolorMap (this is optional). Now copy program KOLORMAP and the file KOLORMAP.INF (and all other programs and files, and the EXAMPLE directory but not the LIBRARY directory) to the new directory on your Amiga's hard disk. Once the program is under AmigaDOS, it is a good idea to rename these two files to KolorMap and KolorMap.info for easier readability (note: you must change .inf to .info). The (.info) file contains the necessary information to generate the proper icon that can be clicked on twice to start the program.

On the MS-DOS formatted disk there is the LIBRARY directory. There are two files in that directory: arp.lib and extend.lib. These are MS-DOS style file names (limited to an extension of 3 characters). Copy these two files into the Amiga System's Libs directory and rename them to: arp.library and extend.library. **It is very important to copy (and to rename) these two files in the Libs directory otherwise the program will not run.**

If you acquired the program on an Amiga formatted disk, then the file names will be spelled out in their entirety and you would not need to rename them.

The arp.library is a public domain library file and it is needed to generate the File Requester. The extend.library was originally published by Sunsmile Software in the United States but later it was sold and became part of the HiSoft BASIC Professional package (version 1.05) developed and published by HiSoft in England. The inclusion of the extend.library on the disk is made with permission from Sunsmile and from HiSoft.

To start the program, **double click** on the icon of the program named **KolorMap.**

INTRODUCTION

The Kolor-Map & Section program is designed to be a user-friendly, menu-driven, and a multitasking program (that is, under AmigaDOS, it allows you to run other programs at the same time as the program itself is running). For example, you may use a word processor to write a memo or you may edit a map in Deluxe Paint (Electronic Arts, 1989) while the program is computing or coloring a map with several thousand stations.

The purpose of the Kolor-Map & Section program is to enter, save, and load map or cross section data files; and to generate, display, save, and load map or cross section image data in color. In writing this program I attempted to satisfy two conditions: (1) The resulting map or cross section will honor, or at least display, the values of the original data; that is, the original data will not be "lost" as a result of the gridding routines; and (2) The resulting map or cross section will resemble what an experienced person might have produced contouring the data by hand. For example, no contour levels or closures are generated with values that are higher or lower than the maximum or minimum values in the original data. This is valid within the boundaries of the data on the map or cross section; at very large distances from the nearest station, the calculated values will decrease in amplitude. Furthermore, for cross sections, I incorporated a stretch factor in the horizontal direction (Xstretch) to help generate images that look more like cross sections than images that look like maps. Thus, the program generates horizontally-extended features on cross sections as opposed to more rounded features on maps. **The Xstretch routine does this without altering the original data points, it only affects the interpolated values.**

Cross sections may be generated using a variety of vertical exaggerations. Simplified topography (elevation of each station) forms the top of the cross section and the locations of the stations are shown as small triangles on the

surface of that topography.

The displayed maps/sections on the screen will show not only the colored map or cross section based on the gridding of the data but also the colors of the station values of the original data (optional), thus honoring or at least showing all the values of the original data. These features allow you to make decisions about: (i) The quality of the map or cross section as it is displayed on the screen before saving it and printing it; (ii) The necessity of recalculating the map or cross section (using different options); and (iii) The amount of any editing that you may wish to do later in Deluxe Paint. The generated color maps/sections are saved as standard Amiga IFF-ILBM files and, therefore, can be loaded into Deluxe Paint to be edited, annotated, and printed.

The maps/sections may be edited in Deluxe Paint, saved, and then may be reloaded into a structured-drawing program for higher quality annotations. A structured drawing program is based on calculating vectors as opposed to a paint program which is based on calculating a bit-map (also known as raster representation). The structured drawing program **must be** capable of **loading and printing** the ILBM map or cross section after annotating it with high quality scalable fonts. Professional Draw (Gold Disk, 1992) provides this facility. Furthermore, with Professional Draw the final map can be saved as a color Encapsulated PostScript File for printing on high-end, color, Post Script printers or for transferring the file to other computer platforms.

The maps computed in the Kolor-Map & Section program can be automatically scaled, and the z-values saved, for input into VistaPro 2.0. The resulting z-values file must be converted into another file that can be read by VistaPro 2.0. This is done using the MakeVista program provided on the disk. Once this is done, then 3-D shaded relief renderings in 24-bit color, or in other Amiga graphic modes can be produced. Impressive renderings by VistaPro 2.0 may be viewed in three to four million colors using DCTV (Digital Creations, 1990). Furthermore, using VistaPro 2.0, it is possible to drape geophysical maps on top of DEM (Digital Elevation Model) maps and it is also possible to generate several types of computer animations including "fly by" using the program MakePath (Virtual Reality Laboratories, 1992b).

GENERAL FEATURES

The Kolor-Map & Section program was primarily developed for generating interpreted-resistivity maps and cross sections but it can be used to generate other geophysical, topographic, isopach, isobath, or geochemical maps from any (x,y,z) ASCII file (text-only file) that is written in a free form (with spaces to separate the values of x, y, and z and a carriage

return to delimit the end of each line). The maximum number of randomly-located stations for a given map is 10,000 stations. Maps in portrait form (height greater than width) can be optionally rotated 90 degrees and automatically scaled into landscape form in order to fill a larger portion of the screen. The station locations for maps may be plotted as points, squares, or may not be plotted at all (your choice).

The generation of cross sections is particularly suited to interpreted elecrical-sounding data (depths and resistivities) which result from the automatic interpretation method that I developed for direct-current resistivity soundings (Zohdy, 1989; Zohdy and Bisdorf, 1989). The depths increase logarithmically and the last layer is theoretically infinitely thick. The program accepts a maximum of 30 stations per cross section, with up to 50 layers beneath each station. Cross sections may be drawn at various vertical exaggerations (from no vertical exaggeration up to 20 times vertical exaggeration). The program provides options to generate either the top part of a vertically exaggerated section or to generate the whole vertically exaggerated section. The purpose of the first option is to combine two cross sections on a single page (using Deluxe Paint) with an upper figure showing the upper portion of the vertically exaggerated section and a lower figure showing the complete section with no vertical exaggeration. As mentioned earlier, simplified topography reflecting the station elevation forms the top line of the portrayed cross section and the location of each station is shown as a triangle on top of the simplified topography line.

USER-FRIENDLY FEATURES

A considerable amount of effort went into making this program a user friendly program. The program is menu driven, and most responses require a single key stroke such as pressing a number, pressing Y or the <ENTER> key for (Yes), or pressing N for (No), pressing-any-key to continue, and pressing the <Esc> key to return to Main Menu. Where an input is required, the word: "Type" is used (instead of Press) and <ENTER> is shown at the end of the prompt statement (to indicate that an input is required and that it must be followed by pressing the <ENTER> key after each entry).

In order to load or save files, an Amiga-style File Requester is used. The use of the File Requester and its properties are described in the next section.

You will notice that at any part of the program you can almost always go back to a previous menu or to the Main Menu if you wish to do so. Note, however, that once the calculation and color display of a given map or cross section have started you cannot return to the Main Menu to exit the

program until the map or cross section is completed. The reason for this is to avoid slowing down the program during calculations.

When saving a file that already exists you will be prompted with a message as to Replace it, Append it, or Cancel. This protects against accidentally writing a new file over an existing file with the same name. If you select "Replace it", the old file will be completely replaced by the new file and no backup file is generated. If you select "Append it", the new file will be appended to the old file. This means that when entering a large data set, you do not have to complete entering the whole data set in one session because you can always append one segment of the data set to a previously entered one. If you select "Cancel", you return to the File Requester to save the file under a different file name.

The following several sections (The File Requester, Multitasking, ..., etc) are presented here to help you understand their general features before describing the actual flow of the Kolor-Map & Section program, which appears under "Starting the Program" section on page 15.

THE FILE REQUESTER

I modified and implemented a File Requester routine which was provided as a separate utility program on the HiSoft BASIC Professional disks. This File Requester is used to load and to save data- and image-files in a style familiar to Amiga users. The File Requester is composed of a header window at the top, a main window, a vertical slider on the right with two arrows at the bottom (for automatically sorting and for scrolling names in the main window), two horizontal windows near the bottom (named Drawer and File), and four buttons at the bottom (named OK, Drives, Parent, and Cancel). *The names of files and directories that exist in the same drawer as the Kolor-Map & Section program will be displayed in the main window when the File Requester is accessed for the first time.*

To start, click the mouse on the **Drives** button to display the available drives. Drive and Directory names are displayed in red with a blue background. Click in the vertical slider to alphabetize the drive names shown in the main window of the requester. Use the bottom arrows on the vertical slider to scroll up and down the alphabetized list of drives. In the main window, click on the name of the drive you wish to access then click on the name of the directory of your choice to open it. Files that have the extension (.info) are files with information related to icons of the actual files; ignore them.

The two-horizontal windows (near the bottom of the File Requestor) are labelled **Drawer** and **File**, respectively. A

yellow cursor indicates which of these two windows is active. To activate one of these windows, click the mouse pointer in the required window. The **Drawer** window shows the names of selected drives, directories, and subdirectories whereas the **File** window shows the name of the selected file. You may **double click** on the name of a file (in the main window) to load it. If you know the name of a directory or a file, you may click in the **Drawer** or **File** window and type the name of the directory or file *without waiting* for the program to load all the directories or files and press <ENTER> or click on the **OK** button.

As you gain expertise in using this File Requester you will find that a combination of mouse clicks and some typing or editing in the **Drawer** and **File** windows is the fastest way to load or save files.

I modified the original File Requester code so that it will remember and display the drive, directory, and file that were used last. The original code always displayed the default directory where the program resided, and the user had to start "from the top" every time.

Useful tips about the File Requester:

1) Note that each File Requester displays a heading to remind you of what you are supposed to be doing. Example: Load XYZ, or Load Contours, etc.

2) Remember that clicking in the vertical slider sorts the file or directory names in the main window of the File Requester.

3) Clicking the mouse in the **File** window and editing the name of the previous file name will cause the main window to display the file name you just typed. In fact, sometimes it is not necessary to type the whole name. For example, if the last file name was named xyz.data and now you wish to load xyz.contours then (instead of scrolling up and down) just click in the File window delete the letters "data" and type c (for contours). If the file name xyz.contours exists, it will be displayed near the top of the main window. **Double click** on xyz.contours in the main window to load it. Thus, by editing a few characters of a file name, you force the main window to quickly scroll and display the set of files that are closest to what is being edited in the File window. In this way, you will avoid typing errors and see whether the file name was xyz.contour or xyz.contours.

The above feature is particularly useful in loading a succession of layering files (depths and resistivities), for constructing a cross section. This is done by successively

editing the sounding number as it appears in the File window and pressing <ENTER>. If you mistype the name of a file and the file does not exist or if a file is corrupt and cannot be loaded, you will get an error message and then you return to the File Requester to continue from where you were before the error occurred. You do not have to start over. However, if you misspell the name of a file and that misspelled name does exist as a file name then the wrong file will be loaded.

4) To move up a directory, click on the **Parent** button near the bottom of the requester. **Click once** if the yellow cursor is in the **Drawer** window, and **click twice** if the yellow cursor is in the **File** window (the first click will put the yellow cursor in the Drawer window and the second click will move the "event" up to the parent directory).

5) If you click the **CANCEL** button when you were about to save an ASCII file of a data set that you just entered, you will get the message: "Do you wish to discard the data you just entered! (Y/N)". If you press Y, you lose all the data you entered and return to the previous data-entering menu. If you press N, then you get the File Requester back to save the data. If you click the **CANCEL** button when you were about to save a map or cross section as an image (IFF file), but then you change your mind, you will return to a menu to regenerate the map or cross section at a different scale without having to reload the original data.

6) Do not use "/" in a file name. The "/" is a reserved delimiter for subdirectories in AmigaDOS .

7) Pressing the Shift and Left-Arrow keys, or the Shift and Right-Arrow keys, moves the yellow cursor (in the **Drawer** window or in the **File** window) to the beginning or to the end of the text, respectively.

MULTITASKING

The program allows easy multitasking, memory permitting. There are three methods to access the Workbench (the Amiga's visual operating system) and hence launch other programs while the Kolor-Map & Section program continues to run. These three methods are well known to most Amiga users. The first method is to hold down the Left-Amiga key and press the m key (this applies to AmigaDOS 2.04 and higher; some utility programs running under AmigaDOS 1.3 use the n key instead of the m key). By doing this repeatedly, you successively display the stack of open screens and finally you get back to the program screen. This is the fastest and most foolproof method. The second method is to pull down the program screen by placing the mouse pointer at the top-horizontal screen bar (not the window bar), hold down the left mouse and drag the screen down to expose the screen behind it. The third method is to click

in the upper right-hand gadget of the screen to place the present screen behind the one immediately behind it. If you are not using a SVGA monitor and AmigaDOS 2.04 then this third method may not be available, because the required gadget will be off the screen to the right.

Note: If you use multitasking and you return to the program screen and window, you may have to click the left mouse button anywhere in the window to activate it (unless you have selected AutoPoint from the Utilities Drawer in AmigaDOS 2.04). The program window is active when its border is white.

ENTERING DATA, AN OVERVIEW

The Kolor-Map & Section program allows you to enter a variety of data sets suitable for making a map or a cross section. However, with the limited editing facilities provided in the program, you may wish to enter large data sets of (x,y,z) values by using a word processor or a spread-sheet program that allows you to save data as an ASCII file, and then load these files into the Kolor-Map & Section program. If you use an external program (a word processor or a spread sheet) then make sure that there are no page breaks or extra carriage returns in the file before saving it. Any of these will prevent the file from being loaded in the Kolor-MAp & Section program. ProWrite version 3.1 or higher (New Horizons, 1990) is a word processor for the Amiga that can show invisible delimiters and help edit them out if necessary. Make sure to save the edited file as a text-only file when using ProWrite.

Data entered using MS-DOS programs should be saved on MS-DOS formatted DS/DD 720 Kb disks. Such data can be read into the Amiga using CrossDOS. High-density disks can be used with the Amiga 4000.

For entering cross-section data, it is recommended that you do use the Kolor-Map & Section program.

Data entry via the Kolor-Map & Section program is comprised of:

1) Entering and saving an (x,y,z) data set.

2) Entering and saving (x,y) data and (z) data as two separate files. This is particularly useful for generating interpreted-resistivity maps at various depths. Where the (x,y) file remains unchanged and only the (z) data files change as the depth changes.

3) Entering and saving sounding numbers, successive distances between sounding stations (delta-X) and elevation of each sounding station, along a given profile.

4) Entering and saving a variety of contour levels (up to 13 values) to be used in contouring the maps and cross sections. Different sets of contour levels may be generated and saved as separate files. The 13 contour levels will separate 14 contour intervals. This generates maps/sections composed of 14 colors plus black and white for a total display of 16 colors. The black and white colors are reserved for background and foreground colors.

All data files, entered via the Kolor-Map & Section program, are saved as ASCII files and may be edited using any word processor that is capable of reading **and saving** ASCII files.

LOADING DATA, AN OVERVIEW

1) All data files must be ASCII (text only) files. All files must be in free form; that is, spaces separate xyz values and carriage returns delimit the end of each xyz line.

2) For making maps, the program allows you to load either (x,y,z) files, or (x,y) files and associated (z) files.

3) For making a resistivity-cross section, you need to load the "Sounding Number, X-distance and Elevation" file that you would have entered using the Kolor-Map & Section program (or a word processor). You should also have the layering files (depths and resistivities) that would have been generated using the resistivity automatic interpretation program (Zohdy, 1989; Zohdy and Bisdorf, 1989) ready to use and preferably all placed under a single directory. Inasmuch as such layering files would have been generated on an IBM or compatible computer, the files should be copied from the floppy disk into the Amiga hard disk (using CrossDOS) to increase access speed.

Layering-File Format:

Layering files generated by other programs (such as for audio magneto-telluric data) must contain the sounding title on one line, followed by the depth units (meters, feet, etc) on a second line, and the number of layers on a third line. These three lines must be followed by a list of depths and corresponding resistivities separated by a space and a carriage return at the end of each line. This is the file format generated by the Zohdy-Bisdorf programs. The depths should increase logarithmically and the last layer should be theoretically infinite in thickness. These last two data properties are recommended but not required.

SAVING AND LOADING IFF IMAGES

The Kolor-Map & Section program saves the generated maps and cross sections as standard overscan (704x480) 4-bit plane (16 color) images.

The program can load any standard IFF-ILBM image for viewing. Images loaded for viewing are not limited to the 4-bit plane (16 color) format, you can load 32 color images, HAM (Hold and modify) images, and DCTV images provided you have the DCTV hardware (Digital Creations, 1990) to display them. The DCTV must be hooked up to an NTSC (National Television Standards Committee) monitor or to a proper television set with a connector **and** a switch for video displays (as in most Sony television sets).

If you load a Superbit map (provided the screen size does not exceed 704x480 pixels), the image will not be viewed in its entirety (only the upper left corner will be shown). No on screen scrolling facility is offered in this program.

Do Not attempt to load a 24-bit IFF file or an image made on a screen larger than 704x480 pixels; they will crash the program.

SCREEN MODE AND COLOR PALETTES

The color maps or cross sections are generated on a screen of 704 x 480 pixels (standard high-resolution overscan). In this resolution, up to 16 colors can be used on an Amiga 3000 or earlier. The AGA (Advanced Graphic Architecture) chips, in the Amiga 4000, which can display 256 colors at any screen resolution are not supported in this version of the program. The contour-interval values: above, between, and below the contour levels are colored using 14 colors. Color-registers 0 and 1 (which are usually black and white), in the 16 color palette, are deliberately not used in coloring the map or cross section; instead, they are uniquely used as foreground and background colors (to show the station locations, the map frame, and for later annotations using Deluxe Paint).

For screen display, the background color is black and the station locations are shown in white, which makes viewing the map on the screen more pleasing and reduces eye-strain (as compared to a white background). However, when the map or cross section is completed, the two colors (0 and 1) may be switched (optional), to provide a white background and black station-location symbols before saving and printing (after all, using a white background for printing is much more preferred than using a black background). This color switch could have been done later in Deluxe Paint; however, this

option in the Kolor-Map & Section program, saves you a step and you do not have to remember to make the switch in Deluxe Paint.

The color palette is generated by the program and you can not modify it (except later when you use Deluxe Paint). The highest z value on a map or cross section is colored with color number 3 (Dark Red) and the lowest is colored with color number 15 (Dark Blue), with a rainbow-color spread for intermediate color numbers. The association of **low** color numbers with **high** z values is *numerically* not very logical but it is *visually* more logical when using the Deluxe Paint III Palette display, where color 3 is third from the **top** (high z values) and color 15 is at the **bottom** (low z values). The colors generated by the program can be changed to any other colors using Deluxe Paint. In fact, it is usually recommended to use somewhat lighter blues and greens before printing.

Although the display screen in the program is in overscan mode (704 x 480 pixels), the map or cross section area is limited to a size of 615 x 365 pixels, this leaves adequate space around the map or cross section for annotation without having to change the page size in Deluxe Paint. You do not have to remember any of these numbers, the program will automatically scale the map or cross section to fit it appropriately within the display area.

STARTING THE PROGRAM

When you double click on the program icon, you will open the first window which states the name of the program, the version, the author, the date and a brief description of what the program does. To continue, press any key (as indicated at the bottom of the window).

The second window is the Main Menu which is comprised of nine items numbered from 1 to 9. In this program there are no pull down menus, selections are made from the Main Menu (or other menus) by pressing appropriate numbers. However, as mentioned above, an Amiga style File Requester is used to load and save data or image files, where almost everything can be done with a click of the left-mouse button.

In the following sections I will briefly describe the items under the Main Menu, what each one does, and what subsequent menus it leads to, even though all the menus and submenus contain instructions that are very much self explanatory. There are several similarities, albeit some minor differences, in the menus, submenus, and options presented after the selection of each options in the Main Menu. Features that are similar will be described only once to avoid redundancy.

It is important to remember, before you start using the program, that if after loading data files, you press the <Esc> key to return to the Main Menu, the data in memory is cleared and you must reload the required data files. The Return-to-Main-Menu message has a warning to that effect.

MAIN MENU

The main menu is comprised of 9 selections. These are grouped into 3 categories: Enter data, Load data, and Quit. The Main Menu looks like this:

```
ENTER DATA:
   1) Enter MAP (x,y,z) data.
   2) Enter MAP (x,y) data.
   3) Enter MAP (z) data corresponding to above (x,y) data.
   4) Enter CONTOUR levels.
   5) Enter CROSS-SECTION data (VES-Nmbrs,Distances,Elevations)
   ------------------------------------------------------

LOAD DATA:
   6) Load MAP data.
   7) Load CROSS-SECTION data.
   8) Load IFF image.
   ------------------------------------------------------

   9) Quit.

Please press appropriate number.
```

Pressing a number will take you into a subsequent menu (when entering data) or will usually display the File Requester (when loading data).

(1) Enter MAP (x,y,z) data

In this section, I will describe several features that also apply to the next 3 sections and so I will not redescribe those features later on for brevity.

If you press 1 on the Main Menu, you get a new window that shows a station entry number and three successive prompts to enter X-data, Y-data, and Z-data. Start entering your data by typing the values for x, y, and z. When done entering your data, type 00 (Zero Zero) at the next X-data prompt. You will get the File Requester; it will have the heading (Save X,Y,Z) to remind you of what you are about to do.

If you realize that you do not have a directory already created (to save your files under) and assuming you are using

AmigaDOS 2.04 or higher, *do not* click on the CANCEL button, instead use multitasking as described earlier to access the Workbench screen, create a new drawer (directory) by using the Workbench "Icons" pull-down menu. When done, hold down the Left-Amiga key and press m to return to the Kolor-Map & Section program. Activate the File Requester window with a mouse click, click on **Drives** button, select the appropriate drive and see the name of your newly created directory displayed in the main window.

You need not enter your data all in one session. You can type 00 (Zero Zero) at any time at the X-data prompt, save the data, and later enter some more data and append it to the previous data set. If you type 00 (Zero Zero) in the Y-data or Z-data prompt, the values entered in the immediately preceding X-data (or the preceding X-data and Y-data prompts) will be ignored. When saving a subsequent portion of the same data set, use the same file name in the File Requester you used previously (click on the **Ok** button or press <Enter>) and then select "Append it" from the next menu.

You may edit any entry before you press <ENTER>. If you think you made a mistake after entering a number and pressing <ENTER>, you may: (a) Continue entering the data and fix the mistake later using a text editor. (b) Type 00 (Zero Zero), save what you have entered, then without exiting the program, use multitasking (as described earlier) to launch a word processor, fix the mistake, save the results as an ASCII file, exit the word processor, get back to the program and continue from the Main Menu by pressing 1. Enter and save the next part of the data under the same file name and use the Append option as described above. (c) Type mm to return to the Main Menu (lose the data you entered) and start over!.

(2) Enter MAP (x,y) data

If you press 2 on the Main Menu, you get a new window that shows an entry number and a prompt to enter X-data followed by a prompt to enter Y-data. The rest of the data entry procedure is the same as described in the above section for entering (x,y,z) data. When you are ready to save your data, note that the heading of the File-Requestor window now shows "Save XY-Data" .

(3) Enter MAP (z) data

If you press 3 on the Main Menu, you get a new window for entering z data. The rest of the data entry procedure is the same as described in the section on entering (x,y,z) data. The File Requester will show the heading "Save Z-data".

(4) Enter CONTOUR levels

If you press 4 on the Main Menu, you get a new window for entering contour levels. The contour levels can be entered in **any order** you wish and their values can be anything you think is appropriate to the map or cross section you wish to generate later. The contour values will be displayed in the order you enter them. If you wish to enter less than 13 contour values type 00 (Zero Zero) and press <ENTER> to exit. If you enter all 13 values then you need not type 00 (Zero Zero) as the program will automatically exit the Contour menu, sort these values from high to low, and redisplay them in a new window for your inspection.

The window displaying the list of the sorted contour values will also display the prompt "Contour values look OK? (Y/N)". If you press Y or <ENTER> you will get the File Requester to save the contour values. The File Requester will show the heading "Save Contour". If you press N, you will go back to the Contour menu to reenter the contour levels from the start.

(5) Enter CROSS-SECTION data (VES-Nmbrs,Distances,Elevations)

In the above title, VES is the abbreviation for Vertical Electrical Sounding, which is somewhat old terminology but still in use. If you press 5 on the Main Menu, you get a new window in which you select the units (meters, kilometers, feet, etc) that you will use for entering the distances and elevations between the sounding stations. Press the appropriate number to select the units and proceed to the next window.

It is strongly recommended that the units for distances between sounding stations be the same as those used for elevations and for layer depths (used in the layering file). There are no provisions in this version of the program to convert one set of units to the other. If the units are different (for example, feet for distances and elevations and meters for layer depths), then the vertical exaggeration (to be selected later on) will be incorrect and you will have to recalculate it when annotating the map in Deluxe Paint.

The instructions in the next window fully describe what is needed: Enter the sounding numbers along the cross section from left to right, enter the distances between the successive sounding stations (designated as distance to previous sounding) and enter the elevation of each sounding station. If you entered this menu by mistake and you wish to return to the Main Menu, type mm and press <ENTER>.

For the distance of the first sounding station always enter 0 (Zero). When done entering the sounding numbers, the successive distances, and successive elevations, type 00 (Zero Zero) and press <ENTER>. You will get the File Requester to save your file as described earlier. The File Requester will show the heading "Save NmbrDistnElevation". Usually, I save the file in a Drawer (directory) with the name of the survey area (e.g. Barstow); I may use a subdirectory called Sections and then for the name of the file I may use the word "Sectn" followed by the numbers of the first sounding station (e.g. 22) and last sounding station (e.g. 44) on the cross section followed by a designation like EW for east west. For an extension (or suffix), I use data. For Example, the file name may be written as "Sectn-22-48-EW.data". Such long file names are allowed under AmigaDOS. Make sure however (when you use such long file names) that you are saving them to an Amiga disk and not to an MS-DOS formatted floppy disk, otherwise CrossDOS will chop the file name down to an 8 charcter long name plus an extension of only 3 characters to make it conform to MS-DOS format. As mentioned earlier do not use "/" in a file name.

To abort the File Requester and start over, click on the **CANCEL** button. If you do, you will get a message (see section on File Requester) as to whether you wish to discard the data you just entered!.

If at any time you think you made a mistake in entering the data, save the data you entered, edit it in a word processor, and resume entering the data.

(6) Load MAP data

If you press 6 on the Main Menu, you get a new window with two options:

1) Load (x,y,z) file then load contour values.

2) Load (x,y) file, then load (z) file, then load contour values.

(1) Loading an xyz file and generating a map:

To load an (x,y,z) file, press 1 to display the File Requester and load the file you need as described earlier in the File Requester section .

The next window will show the number of stations in the file you loaded, the map width and height, the maximum and minimum values of z (Zmax and Zmin), and a suggested value for the contour interval based on the values of Zmax and Zmin.

Furthermore, as indicated on the window, if you have not already created a file for the contour levels, you may press C on the keyboard to open the form for entering the 13-contour levels. You may use the suggested contour interval or you may use any other suitable interval. Otherwise, if you already have a file for the contour levels, press any key to continue; later a File Requester will be automatically displayed for you to load the contour-levels file .

The next window prompts you as to whether the y-axis of your data is positive upward or positive downward. For most data sets the y-axis is positive upward and the x-axis is positive to the right, but occasionally you may have entered your data with the y-axis positive downward. Press the appropriate number to continue on.

Map Rotation:

The next window may or may not be displayed depending on whether your map dimensions represent a portrait form or a landscape form. If the map height is larger than the map width (portrait form) then the next window will state that, and ask you if you wish to rotate the map in order to maximize its size on the window (because the painting-area width of 615 pixels is larger than the painting-area height of 365 pixels). The displayed-map height in this window is not the absolute map height displayed in the previous window, instead it is an adjusted map height that takes into account the screen aspect ratio (which makes the display and the printing of the map have the correct proportions). This is a result of the fact that the pixels in this screen resolution are not square. You need not be concerned with the displayed numbers for width and height. All you need to do is to decide whether you wish to rotate the map or not.

Helpful tips regarding map rotation:

1) Keep in mind that if you rotate the map, the map will be larger and therefore the computations will take a little longer.

2) Later on, when you edit the map in Deluxe Paint, you will have to rotate all the labels to conform to the map orientation. Do not attempt to rotate the map in Deluxe Paint. If you do, the resulting image will not have the correct aspect ratio.

3) Consider the fact that you may wish to keep the map in the portrait display because perhaps you may compute another map to be placed next to this map on the same page using Deluxe Paint.

4) Remember that if you rotate a map and later you change your mind, you will have to reload the (x,y,z) file. Reloading the data does not apply to other scaling choices in the program which will be discussed below.

Load Contours:

The next step is to load the Contour values. The Requester File will be automatically displayed and it will show the heading "Load ... Contours" to remind you of what you are supposed to do next. Simply double click on the appropriate contour-file name. The contours will be loaded and displayed with the prompt "Contours look OK? (Y/N)" which gives you the opportunity to make sure you loaded the correct set of contour values.

Scale Menu:

The next window displays a Scale Menu with three options and it also shows the width and height of the map in the original units of x and y. The three options briefly are:

1) Auto Scale.
2) Specify Scale Factor multiplier.
3) Generate a map and a Z-data file for VistaPro.

Note: if you are generating a cross section instead of a map then: option 3) above will not be displayed, and the Scale Menu will show the length of the cross section and the previously-selected vertical exaggeration.

Normally, you would select option 1 to automatically scale the map to fit within 615 x 365 pixels (or to fit in one fourth that size as explained in the next section).

If you select option 2, then you will be prompted to enter a number (equal to the scale factor multiplier) that will be multiplied by the map width and height to generate a specific map size in pixels. If the resulting map dimensions (in pixels) are too small or too large to fit on the screen, the program will let you know with a message to that effect. If the resulting map dimensions are reasonable, you will get a window that displays the map dimensions in pixels and a prompt asking you if this size is acceptable.

The main purpose of option 2 is to generate a map or cross section in which the present set of (x,y,z) data represents a subset or segment of a larger map or cross section data set. Later you may load another subset of (x,y,z) data set that compliments (or better yet, overlaps) the first set and then combine the two maps in a superbit map

using Deluxe Paint. If this is what you plan to do, then **the same scale-factor multiplier must be used for both maps, so** that the two maps will have the same scale. For extra long cross sections that may be split in two or more parts, it is important to use the the last sounding on the first cross section as the first sounding on the second cross section.

If you press 3, you will generate a map in which the largest side is scaled to 258 pixels and you will have the opportunity to save a file of z-values that can be entered into VistaPro 2.0 after using the utility program: MakeVista. During the course of generating a file of z-values for VistaPro 2.0, you will encounter a window that states **the width and height of the map in pixels (as it is scaled for VistaPro 2.0), with a message to copy these numbers down for later use in the MakeVista program.** Do just that.

Regardless of which option you select from the **Scale Menu**, some or all of the following menus will be displayed. Furthermore, *some or all of the following menus will be used when you are making a cross section and (for brevity) their function will not be repeated in the section on loading and displaying cross-section data.*

Map or Cross Section Size:

If you select Auto-scale, then the next window will present a choice of making the map or cross section at:

1) Full size.
2) 1/4 size (... good for testing).
3) Return to previous menu.

The prompts on this window are self explanatory. If you select option 2 from the above menu, you can later generate the full size map or cross section without reloading the data.

Radius of Influence:

The next window will display a recommended value for the Radius of Influence and a prompt asking whether you wish to use the recommended value or to enter another value. If you press <ENTER>, then this means you wish to use the recommended value. The Radius of Influence is here defined as the radius around a grid point that is not a data point and hence does not have a z-value assigned to it yet. Z-values of stations that fall within this radius are used to compute an interpolated z-value at that point.

To speed up computations, the distance from a given grid point to a station is based on a diamond-shaped figure (rather

than a circle) where only the absolute value of the distances in the x and y directions are used (rather than the square root of the sum of the squares).

The recommended radius of influence for maps (as opposed to cross sections) is equal to the square root of the ratio of the scaled-map area (in pixels) to the total number of stations; the result (average number of pixels around each station) is multiplied by a factor of 3.3. The 3.3 factor was determined empirically by computing several maps of different types and different station distribution patterns. For cross sections, the recommended radius of influence is equal to the ratio of the length of the cross section to the number of sounding stations, and the result is multiplied by a factor of 2.5. Here, again, the 2.5 factor was determined empirically.

The smaller the radius of influence the faster the computations (and conversely). Also, the smaller the radius of influence the greater the chance that no stations (or an inadequate number of stations) will be used to calculate a representative interpolated value at the required point. If the radius of influence is so small that no stations were used, a void with zero-color value (black) will be created at that point on the map or section. Also, if an inadequate number of stations was used then an unusual-diagonal pattern of colored contour intervals will be displayed in that area of the map or section. This unusual-diagonal pattern may show in parts of the map or cross section even when the recommended value for radius of influence is used. Do not be alarmed by the appearance of voids or diagonal patterns, because this simply indicates lack of data in that area of the map or cross section, and these voids and patterns should be edited and deleted from the map or cross section using Deluxe Paint. It is better to have irregular patterns using a reasonable radius of influence to generate a map quickly, than to use a very large radius of influence, spend a longer time in computation, generate smooth contours everywhere on the map, only to delete these areas later (using Deluxe Paint) because of a lack of nearby stations.

For greater speed, you may use a radius of influence that is as small as half the recommended one provided the station distribution is dense enough and provided the stations are nearly spatially distributed on a grid. Later, after calculating and displaying the color map or cross section on the screen, if you do not like the results you can always "Redo" the map using different options without reloading the original data.

Grid Size

The next window displays several choices for a grid size ranging from 11x11 pixels to a 1x1 pixel grid. The window will also display a recommended grid size. The grid size of 11x11 is the coarsest and fastest, whereas the 1x1 grid is the finest and slowest.

A grid size of 1x1 pixel honors each original data point that can be represented within the pixel resolution of the scaled map or cross section. This grid size may be used when the number of stations is not very large (about 50 stations) and the stations are randomly distributed on the map. Even then, it is recommended to use a grid size of 3x3 pixels so that the computation of the map (including regridding) will be completed in a shorter period of time. If the data is already in a tightly gridded form (with the scaled distance between data points being only a few pixels apart), a grid size 1x1 may not produce the best results. For this type of data it is recommended to use either a coarser grid interval than the scaled data grid (which will act as a spacial filter) or to divide the original data set into two or more data subsets, each of which will not crowd the screen as much as the entire data set, and then recombine them into a single superbit map in Deluxe Paint.

The recommended grid size is based on the station density on the map or cross section. Generally you should *use the recommended grid size or some smaller value (except for tightly gridded data as mentioned above)*. The recommended grid size for maps (as opposed to cross sections) is based on the square root of the ratio of the scaled-map area (in pixels) divided by the number of stations. For cross sections, the recommended grid size is based on the scaled length of the cross section (in pixels) divided by the number of soundings.

Calculation and Display of a Color Map or Cross Section:

A grid with square elements is calculated on the basis of the selected grid size in pixels. The calculation of z values at each grid point is based on the z-values of all stations that fall within the radius of influence; the z-value at each of these stations is divided by the distance (from the station to the given point) raised to the fourth power. The sum of all these weighted z-values determines the interpolated value at the grid point. If a grid point coincides with the location of an actual station, then no calculations are made and the actual station z-value is used at that point.

I experimented with several inverse distance power values (see Ldvill.iff file in the EXAMPLES directory on the disk) . I used the inverse of the distance, the inverse of the square of the distance, the inverse of the cube of the distance, the inverse of the distance raised to the fourth power, as well as other in between values. I found that using the inverse of the cube of the distance or the inverse of the distance raised to the fourth power gave the best results, where separate but spatially small anomalies will tend to combine into one spatially significant anomaly. For speed of computations, I selected using the distance raised to the fourth power.

Subsequent to the calculation of the gridded data, I use a bilinear interpolator to compute a smoothed (regridded) version of the gridded data at the single pixel level. Thus an interpolated value is calculated at every pixel in the area of the scaled map or cross section.

Prior to the calculation and display of a color map or cross section (provided you selected a grid size other than 1x1), you will be prompted "Do you wish to see the color representation of the gridded data? (Y/N)". If you press Y, you get a pixelized display of the "coarsely" gridded map in color. Next you will be asked if you wish to Smooth it (i.e. regrid it)? (Y/N). If you press Y, you will see the pleasing results of using the bilinear interpolator on the gridded data. The smoothing will progress from the bottom to the top of the map or cross section.

When the coloring of the map or the cross section is completed, you may superimpose the color-coded values of the original station z-values and see how well the gridding routine did in honoring the original z-values. You may also superimpose the station locations on the map. For cross sections the station locations and the topography are automatically displayed.

For maps, the station locations may be plotted as points, squares, or may not be plotted at all. It is recommended not to plot the stations, if you wish to use the map in VistaPro 2.0 and convert the map colors into elevations, or if you wish to drape the map on top of the corresponding DEM model. If you plan to convert the map colors into elevations using VistaPro 2.0 then you must first use Deluxe Paint to reverse the color registers (using the Fill function) because VistaPro 2.0 associates high elevations with high color numbers.

For cross sections, the digitized points beneath each sounding will be shown as points and the sounding stations will be shown as triangles at the top of the simplified topography.

All of the above options are presented as prompts on a separate small window which also serves to let you know of what is going on during calculations. You may move this small

window around even during calculations or during the coloring of the map or cross section in order to see what is behind it. In standard Amiga style, you may move the small window by placing the mouse pointer at the top-horizontal bar of the window, hold down the left mouse button, and drag the small window to a different location, and then release the mouse button. While you drag this window, the calculation or coloring of the map will pause until you release the mouse button.

When the coloring of the map or cross section is completed and you have responded to the subsequent prompts, you will be asked if you wish to reverse the black and white colors before saving, and finally you will be prompted to save the image. If you press Y, you will get a message instructing you to exit all other programs that you may be running in a multitasking environment and to close their windows before saving the image. The reason for this is that if you do not close them, the Kolor-Map & Section program might save the contents of a window of another program instead of saving the map or cross section you just generated (even though the map or cross section is in the front screen!). This minor short coming will hopefully be eliminated in a future version of the program. When ready to save, press any key to continue. Next, a window will appear with information regarding the width of the map or cross section in the original units you used. For cross sections, the vertical exaggeration will be stated in the same window. Copy this information down as it may be needed in Deluxe Paint to construct a scale. Press any key to continue, and you get the File Requester to save your map or cross section. You may use the extension (.iff) in the file name to indicate that this an image file.

If you press N to the saving prompt, or if you click on the **CANCEL** button on the File Requester, you will be asked if you wish to "Redo" the map or cross section at a different scale. If you press Y you will return to the Scale Menu (when making a map) or you will return to the Vertical Exaggeration Menu (described in a subsequent section) when making a cross section. At this point, you may select different options and recalculate the map or cross section. If you press N to the "Redo" prompt you return to the Main Menu.

2) Loading an xy-file and corresponding z-file:

As mentioned earlier, this option is useful for making interpreted resistivity maps at several depths. There are only three prompts that are different from loading an xyz file; the first one is a prompt that queries you as to whether the program should adjust the aspect ratio in the y-direction. The instructions on the window state that you should press N only if you used a digitizing tablet to enter the station locations in Deluxe Paint and then used the coordinate

function in Deluxe Paint to determine the x and y values (in pixels) on the map. A second prompt queries you as to whether you wish to take the logarithm of the z-values and a third prompt queries you about converting the z-values from depths to elevations above a certain datum. The second and third prompts are particularly suited for interpreted-resistivity data and interpreted depth-to-basement data.

7) Load CROSS-SECTION data

If you press 7 on the Main Menu, you will get the File Requester to load the data file for sounding numbers, distances between soundings, and sounding-station elevations. The File Requester will show the heading "Load VesNmbr, Xdist, Elevtn" to remind you of what is needed. Use the features of the File Requester (described earlier) to load the desired data file. The next window will display a table of the data you loaded for your inspection. Next, the File Requester will be displayed so that you may load layering files of the successive sounding stations (Layering files and their formats were described earlier in the section on "LOADING DATA, AN OVERVIEW"). The heading of the File Requester will prompt you with the message "Load Layering of: [30]". Here, the number [30] is just an example of what the number of the sounding station may be. This will be the first sounding on the left side of the cross section.

The File Requester will successively prompt you to load layering files of the successive sounding numbers until all the soundings on the cross section are accounted for. The reason for following this procedure is that on occasion you may have two-layering files for the same sounding station: one based on the interpretation of the original sounding, and one based on the interpretation of a smoothed or extended version of the sounding curve, and you may wish to construct two different cross sections for comparison.

When done loading the layering files, the next window will display the largest and smallest z-values in the cross section, and will ask about the existance of a file with appropriate contour levels. If you already have such a file, press Y, otherwise press N and the program will take you to the Contour Entry menu.

Vertical Exaggeration:

The next window displays the Vertical Exaggeration Menu. The available options are as follows: None (No vertical exaggeration), times 2, times 3, times 4, times 5, times 10, and times 20. Select the vertical exaggeration you wish.

The next window will have a menu prompting you to select 1) a Full Screen display, or 2) Upper Half Screen Display. If

you press 1, then this means you wish to calculate and display the entire vertically exaggerated section. If you press 2, then this means you wish to calculate and display only the upper part of the vertically exaggerated cross section, and to display it in the upper part of the screen. For either selection, the cross section will be computed so that its length will fill the allocated width (615 pixels) of the display window. Thus all exaggerated cross sections will have the same horizontal scale. However, for some cross sections (with large depths and relatively short widths), even the selection of: no vertical exaggeration, may result in displaying less than the entire depth of the cross section. A message to that effect will be displayed. You may direct the program (by following the displayed prompts) to rescale the cross section so that its width does not fill the entire width of the display window (615 pixels) and thus enable the entire depth of the cross section to be displayed.

Note that when displaying only the upper portion of the cross section, if the selected vertical exaggeration is large and the depth of the cross section is significant then you may get a message indicating that only a given percentage of the cross section will be displayed in the vertical direction.

The purpose of calculating and displaying only the upper portion of a vertically-exaggerated section is that it is often desirable to magnify (vertically exaggerate) only the upper portion of a cross section in order to see more of the detail at shallow depths, and at the same time leave enough space below that section on the screen for placing a non-vertically exaggerated version of the cross section (using Deluxe Paint).

If you select a vertical exaggeration of 20 times and if you select the Half-Screen representation, and if the topography along the cross section is pronounced, then the calculated depth surface may intersect the topographic surface. If this happens, you will get a warning message that the width of the cross section may be truncated, and that those soundings that lie at an elevation below the maximum calculated depth will not be shown on the cross section.

Xstretch:

Xstretch is a parameter that attempts to stretch the subsurface anomalies in a horizontal direction so that cross sections will look like cross sections rather than look like maps. The manipulation of the shape of the subsurface anomalies only affects the interpolated values between the actual layering data. It does not change the original data points. I have implemented two Xstretch values: XstretchTop and XstretchBtm to define Xstretch at the top and at the bottom of the section, respectively. I use a linear

interpolator between the top and bottom values of Xstretch to generate a spread of Xstretch values which are then applied from the top to the bottom of the map or cross section. The larger the value of Xstretch the greater the stretch in the horizontal direction.

The next window will display two recommended values for the Spread of Xstretch and a message that if you wish to change them then you should use values between 1 and 20. Usually you should use larger values of Xstretch for the top of the section and smaller values for the bottom of the section. However the reverse is possible, and for a uniform stretch throughout the section, you should make the two Xstretch values the same (XstretchTop = XstretchBtm). The Xstretch.iff image in the EXAMPLES directory shows a top figure using a uniform Xstretch Spread with XstretchTop = XstretchBtm = 1 (thus forming rounded anomalies, which look odd on a cross section), whereas the bottom figure shows a uniform Xstretch Spread with XstretchTop = XstretchBtm = 5 (thus forming horizontally elongated anomalies which look like what one would expect to see on a cross section). The image displays two "equivalent" cross sections, both cross sections honor the original data but one is more realistic than the other.

When generating your own cross sections, you may wish to experiment with different values of XstretchTop and XstretchBtm as they can have a significant effect on the shape of subsurface anomalies in a cross section. Generally the default values are a good choice but depending on the cross section a better or more pleasing representation may be generated by selecting different Xstretch values.

The next sequence of windows and options (Scale Menu, etc) have already been discussed earlier and will not be repeated here.

The Completed Cross Section:

When a cross section is completed, it will have a top line of variable height representing the topography and the location of the sounding stations will be shown as triangles located above of the topographic line. Furthermore, beneath each sounding, there will be points which represent the sampling points from the layering file. The bottom point beneath each sounding station shows the maximum probing depth for that sounding. These bottom points can be used as a guide in Deluxe Paint to erase (whiten out) those parts of the cross section at depths that are deeper than the maximum probing depth of shallow probing soundings. You may also place question marks (?) at appropriate parts of the cross section.

8) Load IFF Image

If you press 8 on the Main Menu, you will get a window with instructions regarding: how to return to the Main Menu **after** viewing an image. As mentioned earlier, several types of images can be loaded for viewing, including those that were not generated using the Kolor-Map & Section program (see section on SAVING AND LOADING IFF IMAGES). This option can be used to view examples of maps and cross sections that were generated using this program (see EXAMPLES section below for further details).

9) Quit

If you press 9 on the Main Menu, you will get a screen with the message "Are you sure you want to Quit? (Y/N)". If you press Y, you will exit the program, and if you press N you will return to the Main Menu. This is a useful message in case you press 9 by mistake.

EXAMPLES

On the program disk, there is a drawer (directory) called EXAMPLES. This drawer contains small data files that you may load to practice generating maps and cross sections; there is also a variety of examples of IFF images that were generated using the Kolor-Map & Section program. Some of these IFF images were edited and annotated in Deluxe Paint. One of the IFF files shows depth to basement in 3-D shaded relief using VistaPro 2.0. The complete annotated version of this example is in Zohdy and Bisdorf (1991) where VistaPro 2.0 was used to generate the 3-D shaded relief and ProDraw was used to annotate the figure with high quality scalable fonts. You may view these IFF images using option 8 on the Main Menu.

PROGRAM MAKEVISTA

As mentioned earlier, MakeVista is a separate utility program that converts z-values generated by the Kolor-Map & Section program into a file that is readable by VistaPro 2.0. Before you run the MakeVista program, make sure that the file called "header.dem" is in the same directory as MakeVista. Also make sure that you have the map width and map height in pixels available for input into MakeVista. These values were specifically displayed in the Kolor-Map & Section program for this purpose.

To run MakeVista, double-click on its icon. This will open a window in which you are prompted for the path to the input file of z-values generated by the Kolor-Map & Section program, and a second prompt for the path and name of the output file. It is recommended that the output-file name have an extension of ".DEM". Also you will be prompted to input the map height and map width in pixels (one or both of these numbers will be equal to 258). Once you successfully generate the DEM file, you may load that file into VistaPro 2.0, but before rendering in VistaPro 2.0, you **must load a color map.** A **color map** in VistaPro 2.0 terminology is equivalent to a color Palette. One of VistaPro 2.0 features is the ability to load, modify, and save color maps. You may have to use the vertical exaggeration function in VistaPro 2.0 to generate reasonable "topography" on the loaded z-values surface. Now you can render 3-D shaded reliefs. When satisfied with the results, resave the DEM file (i.e. use the same name) using VistaPro 2.0. In this way, you generate a smaller file size and that file will also have the color-map information stored in it. Once this is done, you may delete the z-value file generated earlier.

The listing of program MakeVista in HiSoft BASIC Professional is given at the end of the appendix.

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Appendix

Kolor-Map & Section Program Listing

```
' Program Kolor-Map & Section
' By
' Adel A.R. Zohdy
' Last compiled on January 7, 1993

OPTION BASE 1
REM $OPTION k3100

DEFINT i-n

DIM Xd (10000), Yd(10000), Zd(10000), ContourLvl(13),ContourLvlTemp(13)
DIM VesNmbr(30), Xdist(30), Elevation(30), ElevationTemp (30),DN(13)
DIM XdTemp (10000), YdTemp(10000), ZdTemp(10000), YdTemp2(50), ZdTemp2(50)
DIM Zcalc(630,380), HZcalc(630,380)
DIM ZcalcY(630,380)

ON ERROR GOTO ChkError

LIBRARY "extend.library"

' When compiling I get several warning messages because of arp.library
' duplicate commands with the extend.library,
' ignoring the warnings and pressing Yes to continue .. works!
' Note: To Compile this program: the arp.library, arp.bmap, extend.library,
'       and extend.bmap must be placed in the System Libs directory.
' Note: Window Size is made smaller than could be to make it look OK on
'       Amiga 4000 and Amiga 2000!  Screen Size is bigger than what
'       Amiga 4000 under AmigaDOS 3.0 can show under HiResInterlaced!.

 SCREEN 1,704,480,4,4
 WINDOW 1,"",(15,15)-(640,400),16,1
 GOSUB Palet1
 COLOR 1,2

 CLS
 a$ = " P r o g r a m  K o l o r - M a p & S e c t i o n "
    Center 4, a$
 a$ = " By "
    Center 8, a$
 a$ = " Adel A.R. Zohdy "
    Center 10, a$
 a$ = " U.S. Geological Survey, Denver, Colorado. "
    Center 12, a$
 a$ = " Amiga Version 1.0 "
    Center 16, a$
 a$ = " Compiled January 7, 1993. "
    Center 18, a$
 a$ = " Program for Entering, Saving, Loading, Computing, and "
    Center 22, a$
 a$ = " Displaying: Map (up to 10000 stations) and Cross-Section data."
    Center 24, a$
 a$ = "  Computed-color images are saved as standard IFF files. "
    Center 26, a$
 PRINT
```

```
  PRINT
  GOSUB PrsAnyKey

MainMenu:
  GOSUB Initlz
  CLS
  PRINT
  a$ = " Main Menu "
     Center 2, a$
  LOCATE 6,10
     PRINT " ENTER DATA: "
  LOCATE 8,10
     PRINT "    (1) Enter MAP (x,y,z) data."
  LOCATE 10,10
     PRINT "    (2) Enter MAP (x,y) data. "
  LOCATE 12,10
     PRINT "    (3) Enter MAP (z) data corresponding to above (x,y)."
  LOCATE 14,10
     PRINT "    (4) Enter CONTOUR levels. "
  LOCATE 16,10
     PRINT "    (5) Enter CROSS-SECTION data (VesNmbrs,Distances,and Elevtns)."
  LOCATE 17,10
     PRINT " ----------------------------------------------------------"
  LOCATE 20,10
     PRINT " LOAD DATA:"
  LOCATE 22,10
     PRINT "    (6) Load MAP data."
  LOCATE 24,10
     PRINT "    (7) Load CROSS-SECTION data."
  LOCATE 26,10
     PRINT "    (8) Load IFF image. "
  LOCATE 27,10
     PRINT " ----------------------------------------------------------"

  LOCATE 30, 10
     PRINT "    (9) Quit. "
  LOCATE 34,10
     PRINT " Please press appropriate Number."

  PrsNmbr 9, a$
  IF a$ = CHR$(27) THEN MainMenu
  Nmbr = VAL(a$)
  IF Nmbr = 9 THEN Kwit

ON Nmbr GOTO EnterXYZ,EnterXY,EnterZ,EnterContour,EnterXnID,MakeMap,MakeSection,IFFLoad


EnterXYZ:
  CLS
  i = 1
  a$ = " Enter XYZ-data "
  Center 6,a$

  LOCATE 10,5
```

```
    PRINT " Type X-data <ENTER>, Y-data <ENTER>, and Z-data <ENTER> "
  LOCATE 12,5
    PRINT " * When done, type 00 (ZeroZero) for X-data "
  LOCATE 14, 5
    PRINT " * To Return to MainMenu and Discard Data ... type MM <ENTER> "
  XdRow = 20 : XdColumn = 20
  YdRow = 20 : YdColumn = 38
  ZdRow = 20 : ZdColumn = 56


EnterXdXYZ:
  LOCATE 20,2
    PRINT "Entry Number =";i
  LOCATE XdRow, Xdcolumn + 9
    PRINT STRING$(7, " ")
  LOCATE XdRow, YdColumn
    PRINT " Xdata = "
  LOCATE YdRow , YdColumn
    PRINT " Ydata = "
  LOCATE ZdRow, ZdColumn
    PRINT " Zdata = "
  LOCATE XdRow, XdColumn
    LINE INPUT " Xdata = ", Xd$
  IF Xd$ = "MM" OR Xd$ = "mm" THEN MainMenu
  IF Xd$ = "" THEN BEEP: GOTO EnterXdXYZ
  IF Xd$ = "00" THEN ExitXYZ
  IF Xd$ = "0" THEN GOTO EnterYdXYZ
  IF VAL(Xd$) = 0 THEN BEEP: GOTO EnterXdXYZ


EnterYdXYZ:
  LOCATE YdRow, YdColumn + 9
    PRINT STRING$(7," ")
  LOCATE YdRow , YdColumn
    LINE INPUT " Ydata = ", Yd$
  IF Yd$ = "MM" OR Yd$ = "mm" THEN MainMenu
  IF Yd$ = "" THEN BEEP : GOTO EnterYdXYZ
  IF Yd$ = "00" THEN ExitXYZ
  IF Yd$ = "0" THEN GOTO EnterZdXYZ
  IF VAL(Yd$) = 0 THEN BEEP: GOTO EnterYdXYZ


EnterZdXYZ:
  LOCATE ZdRow, ZdColumn + 9
    PRINT STRING$(7," ")
  LOCATE ZdRow , ZdColumn
    LINE INPUT " Zdata = ", Zd$
  IF Zd$ = "MM" OR Zd$ = "mm" THEN MainMenu
  IF Zd$ = "" THEN BEEP : GOTO EnterZdXYZ
  IF Zd$ = "00" THEN ExitXYZ
  IF Zd$ = "0" THEN GOTO Evaluate
  IF VAL (Zd$) = 0 THEN BEEP: GOTO EnterZdXYZ
```

```
Evaluate:
  Xd(i) = VAL (Xd$)
  Yd(i) = VAL (Yd$)
  Zd(i) = VAL (Zd$)


ExitXYZ:
  IF Xd$ = "00" OR Yd$ = "00" OR Zd$ = "00" THEN
     i = i-1


SaveXYZ:
     Work$ = "SaveXYZ"
     CLS
     ReqMsg$ = "Save XYZ-data"
     GOSUB GetReq
     IF Worked% = 0 THEN     ' Worked% = 0 means Cancel button was clicked
        CLS
        LOCATE 10,10
           PRINT " Do you wish to discard the data you entered! (Y/N)"
        YsNo a$
        IF a$ = "Y" THEN
           GOTO EnterXYZ
        ELSE
           GOTO SaveXYZ
        END IF
     END IF
     CLS
     FileExists% = -1
     OPEN File$ FOR INPUT AS #1
     CLOSE #1


WriteXYZ:
     IF FileExists% = -1 THEN
        LOCATE 10,10
           PRINT File$
        LOCATE 14,10
           PRINT " Above File Exists."
        LOCATE 18,10
           PRINT " Append it (A),  Replace it (R), or Cancel (C) ?"
        GOSUB wayt
        a$ = UCASE$(a$)
        IF a$ = "R"  THEN OPEN File$ FOR OUTPUT AS #1
        IF a$ = "A" THEN OPEN File$ FOR APPEND AS #1
        IF a$ = "C" THEN GOTO SaveXYZ
        IF a$ < > "R" AND a$ < > "A" AND a$ < > "C" THEN BEEP : GOTO WriteXYZ
     END IF

     IF FileExists% = 0 THEN
        OPEN File$ FOR OUTPUT AS #1
     END IF

     FOR j = 1 TO i
```

```
            PRINT #1, Xd(j), Yd(j), Zd(j)
        NEXT j
        CLOSE #1
        CLS
        LOCATE 20,20
            PRINT "(x,y,z) File saved!"
        GOSUB PrsAnyKey
        GOTO MainMenu
    END IF
    i = i + 1
    GOTO EnterXdXYZ


EnterXY:
    CLS
    i = 1
    a$ = " Enter XY-data"
    Center 6,a$
    LOCATE 10,5
        PRINT " Type X-data <ENTER> and Y-data  <ENTER> "
    LOCATE 12,5
        PRINT " * When done, type 00 (ZeroZero) for X-data and Y-data <ENTER> "
    LOCATE 14, 5
        PRINT " * To Return to MainMenu and Discard Data ... type MM <ENTER> "
    XdRow = 20 : XdColumn = 30
    YdRow = 20 : YdColumn = 50


EnterXd:
    LOCATE 20,5 : PRINT "Entry Number = "; i
    LOCATE XdRow, Xdcolumn + 9 : PRINT STRING$(5, " ")
    LOCATE XdRow, YdColumn
    PRINT " Xdata = "
    LOCATE YdRow , YdColumn
    PRINT " Ydata = "
    LOCATE XdRow, XdColumn
    LINE INPUT " Xdata = ", Xd$
    IF Xd$ = "MM" OR Xd$ = "mm" THEN MainMenu
    IF Xd$ = "" THEN BEEP: GOTO EnterXd
    IF Xd$ = "00" THEN ExitXd


EnterYd:
    LOCATE YdRow, YdColumn + 9 : PRINT STRING$(5," ")
    LOCATE YdRow , YdColumn
    LINE INPUT " Ydata = ", Yd$
    IF Yd$ = "MM" OR Yd$ = "mm" THEN MainMenu
    IF Yd$ = "" THEN BEEP : GOTO EnterYd
    Xd(i) = VAL (Xd$)
    Yd(i) = VAL (Yd$)


ExitXd:
    IF Xd$ = "00" OR Yd$ = "00" THEN
```

```
    i = i-1

SaveXY:
    Work$ = "SaveXY"
    CLS
    ReqMsg$ = "Save XY-data"
    GOSUB GetReq

    IF Worked% = 0 THEN     ' Worked% = 0 means Cancel button was clicked
       CLS
       LOCATE 10,10
          PRINT " Do you wish to discard the data you entered! (Y/N)"
       YsNo a$
       IF a$ = "Y" THEN
          GOTO EnterXY
       ELSE
          GOTO SaveXY
       END IF
    END IF
    CLS
    FileExists% = -1
    OPEN File$ FOR INPUT AS #1
    CLOSE #1


WriteXY:
    IF FileExists% = -1 THEN
       LOCATE 10,10
          PRINT File$
       LOCATE 14,10
          PRINT " Above File Exists."
       LOCATE 18,10
          PRINT " Append it (A),  Replace it (R), or Cancel (C) ?"
       GOSUB wayt
       a$ = UCASE$(a$)
       IF a$ = "R" THEN OPEN File$ FOR OUTPUT AS #1
       IF a$ = "A" THEN OPEN File$ FOR APPEND AS #1
       IF a$ = "C" THEN GOTO SaveXY
       IF a$ < > "R" AND a$ < > "A" AND a$ < > "C" THEN BEEP : GOTO WriteXY
    END IF

    IF FileExists% = 0 THEN
       OPEN File$ FOR OUTPUT AS #1
    END IF

    FOR j = 1 TO i
          PRINT #1, Xd(j), Yd(j)
    NEXT j
    CLOSE #1
    CLS
    LOCATE 20,20
       PRINT "(x,y) File saved!"
    GOSUB PrsAnyKey
    GOTO MainMenu
```

```
 END IF
 i = i + 1
 GOTO EnterXd
EnterZ:
 i = 1
 CLS
 LOCATE 10,10
    PRINT " Please type values of Z-data."
 LOCATE 12,10
    PRINT " When done ..... Type 00 (ZeroZero)"
 LOCATE 13,10
    PRINT " * To Return to Main Menu and Discard Data ... type MM <ENTER>. "

Wait4Z:
 LOCATE 16,27
 PRINT STRING$(10," ")
 LOCATE 16,10
    PRINT " Station Number =  ";i
 LOCATE 16,49
 PRINT STRING$(10," ")
 LOCATE 16,40
    LINE INPUT "Z-data =  "; Zd$
 IF Zd$ = "" THEN BEEP : GOTO Wait4Z
 IF Zd$ = "MM" OR Zd$ = "mm" THEN MainMenu
 IF Zd$ = "00"  THEN
    i = i-1

SaveZ:
    Work$ = "SaveZ"
    CLS
    ReqMsg$ = "Save Z-data"
    GOSUB GetReq
    IF Worked% = 0 THEN      ' Worked% = 0 means Cancel button was clicked
       CLS
       LOCATE 10,10
          PRINT " Do you wish to discard the data you entered! (Y/N)"
       YsNo a$
       IF a$ = "Y" THEN
          GOTO EnterZ
       ELSE
          GOTO SaveZ
       END IF
    END IF
    CLS
    FileExists% = -1
    OPEN File$ FOR INPUT AS #1
    CLOSE #1


WriteZ:
    IF FileExists% = -1 THEN
       LOCATE 10,10
          PRINT File$
       LOCATE 14,10
```

```
            PRINT " Above File Exists."
         LOCATE 18,10
            PRINT " Append it (A), Replace it (R), or Cancel (C) ?"
         GOSUB wayt
         a$ = UCASE$(a$)
         IF a$ = "R"  THEN OPEN File$ FOR OUTPUT AS #1
         IF a$ = "A" THEN OPEN File$ FOR APPEND AS #1
         IF a$ = "C" THEN GOTO SaveZ
         IF a$ < > "R" AND a$ < > "A" AND a$ < > "C" THEN BEEP : GOTO WriteZ
      END IF
      IF FileExists% = 0 THEN
         OPEN File$ FOR OUTPUT AS #1
      END IF
      CLS
      FOR j = 1 TO i
         PRINT #1, Zd(j)
      NEXT j
      CLOSE #1
      LOCATE 20,20
         PRINT "(z) File Saved!"
      GOSUB PrsAnyKey
      GOTO MainMenu
   END IF

   Zd(i) = VAL (Zd$)
   IF Zd(i) = 0 THEN BEEP : GOTO Wait4Z
   i = i + 1
   GOTO Wait4Z


EnterContour:
   CLS
   a$ = " Enter Contour Values "
   Center 4,a$
   IF b$ = "C" THEN
      LOCATE 6,10
      PRINT " Reminder ... Zmax = "; Zdmax, "Zmin = "; Zdmin

   END IF
   i = 1
   LOCATE 10,10
      PRINT " Please type up to 13 Contour Values. "
   LOCATE 12,10
      PRINT " * ANY ORDER IS OK! I will sort them out later .. Hi2Lo."
   LOCATE 14,10
      PRINT " * If done at less than 13 values ... type 00 to exit."
   LOCATE 16,10
      PRINT " * To Return to Main Menu and Discard Data ... type MM. "


Wait4Contour:
   LOCATE 18,27
   PRINT STRING$(10," ")
   LOCATE 20,10
```

```
    PRINT " Contour Number =  ";i
  LOCATE 20,49
    PRINT STRING$(20," ")
  LOCATE 20,40
    LINE INPUT "Contour Level =  "; ContourLvl$
  LOCATE 22+i,40
    PRINT ContourLvl$

  IF ContourLvl$ = "" THEN BEEP : GOTO Wait4Contour
  IF ContourLvl$ = "MM" OR ContourLvl$ = "mm" THEN MainMenu
  DN(i) = VAL (ContourLvl$)        ' DN(i) = ContourLvls before sorting
  IF ContourLvl$ = "00" THEN i= i-1
  IF i = 0 THEN GOTO MainMenu
  IF ContourLvl$ = "00" OR i = 13 THEN
    CALL QwickSort (i, DN())
'   Now sort them from high to low
    FOR j  = 1 TO i
      ContourLvl(j) = (DN(i-j+1))
    NEXT j
    CLS
    FOR j = 1 TO i
      PRINT j, ContourLvl(j)
    NEXT j
    PRINT
    PRINT " Contour values Look Ok ? (Y/N) "
    YsNo a$
    IF a$ = "N" THEN GOTO EnterContour


SaveContour:
    Work$ = "SaveContour"
    CLS
    ReqMsg$ = "Save Contour"
    GOSUB GetReq
    IF Worked% = 0 THEN      ' Worked% = 0 means Cancel button was clicked
      CLS
      LOCATE 10,10
        PRINT " Do you wish to discard the data you entered! (Y/N)"
      YsNo a$
      IF a$ = "Y" THEN
        GOTO EnterContour
      ELSE
        GOTO SaveContour
      END IF
    END IF
    CLS
    FileExists% = -1
    OPEN File$ FOR INPUT AS #1
    CLOSE #1


WriteContour:
    IF FileExists% = -1 THEN
      LOCATE 10,10
```

```
            PRINT File$
        LOCATE 14,10
            PRINT " Above File Exists."
        LOCATE 18,10
            PRINT " Replace it (R), Append it (A), or Cancel (C) ?"
        GOSUB wayt
        a$ = UCASE$(a$)
        IF a$ = "R"  THEN OPEN File$ FOR OUTPUT AS #1
        IF a$ = "A" THEN OPEN File$ FOR APPEND AS #1
        IF a$ = "C" THEN GOTO SaveContour
        IF a$ < > "R" AND a$ < > "A" AND a$ < > "C" THEN BEEP : GOTO WriteContour
    END IF
    IF FileExists% = 0 THEN
        OPEN File$ FOR OUTPUT AS #1
    END IF

    FOR j = 1 TO i
        PRINT #1, ContourLvl(j)
    NEXT j
    CLOSE #1
    NmbrOfContours = i
    LOCATE 20,20
    PRINT "Contours Saved!"
    GOSUB PrsAnyKey
    IF nd < > 0 AND MakeSectn = 0 THEN
        GOTO LetsGo
    ELSEIF MakeSectn = 1 THEN
        GOTO VrtExg
    ELSE
        GOTO MainMenu
    END IF
 END IF
 i = i + 1
 GOTO Wait4Contour


EnterXnID:
 CLS
 LOCATE 8,10
    PRINT " What units will you use for DISTANCES, between sounding stations:"
 LOCATE 12,20
    PRINT " (1) Meters."
 LOCATE 14,20
    PRINT " (2) Kilometers."
 LOCATE 16, 20
    PRINT " (3) Feet. "
 LOCATE 18, 20
    PRINT " (4) Miles."
 LOCATE 20,10
    PRINT " Please press appropriate Number. "
 LOCATE 24, 10
    PRINT " Note: Distances, Elevations, and Layering Depths "
 LOCATE 26,10
    PRINT "       should all be the same units. "
```

```
 GOSUB MainMenuEsc

 PrsNmbr 4, a$
 IF a$ = "1" THEN XUnit$ = "METERS"
 IF a$ = "2" THEN XUnit$ = "KILOMETERS"
 IF a$ = "3" THEN Xunit$ = "FEET"
 IF a$ = "4" THEN XUnit$ = "MILES"
 IF a$ = CHR$(27) THEN GOTO MainMenu


EnterVesNmbrnDist:
 CLS
 i = 1
 LOCATE 8,10
    PRINT " Type Sounding Numbers along Xsection from Left to Right"
 LOCATE 10,10
    PRINT " Type Distances between successive Sounding Stations. "
 LOCATE 12, 10
    PRINT " Type Elevations of successive soundings <ENTER> "
 LOCATE 26,10
    PRINT " * When done, type 00 (ZeroZero) for Sounding Number <ENTER> "
 LOCATE 28, 10
    PRINT " * To Return to Main Menu and Discard Data ... type MM <ENTER> "


EnterVesNmbr:
 LOCATE 14, 10
    PRINT " Entry Number ..... = ";i
 LOCATE 16, 60
    PRINT STRING$(10," ")
 LOCATE 16, 10
    PRINT " Sounding Number <ENTER> ..... = "
 LOCATE 18, 60
    PRINT STRING$(10, " ")
 LOCATE 18, 10
    PRINT " Distance from Previous Sounding <ENTER>  = "
 LOCATE 20, 60
    PRINT STRING$(10, " ")
 LOCATE 20, 10
    PRINT " Station Elevation <ENTER> ..... = "
 LOCATE 22,10
    PRINT " * Enter 0 for First distance. "
 LOCATE 24, 10
    PRINT " * Enter distances in " + XUnit$ + "."
 LOCATE 16,60
    LINE INPUT a$
 IF a$ = "" THEN BEEP: GOTO EnterVesNmbr
 IF a$ = "00" THEN GOTO ExitNmbrnDist
 IF a$ = "MM" OR a$ = "mm" THEN MainMenu

 VesNmbr(i) = VAL(a$)
EnterXDist:
 LOCATE 18, 60
```

```
  LINE INPUT a$
  IF a$ = "00" THEN GOTO ExitNmbrnDist
  IF a$ = "MM" OR a$ = "mm" THEN MainMenu
  IF a$ = "" THEN BEEP : GOTO EnterXDist
  Xdist(i) = VAL (a$)
  IF VAL (a$) = 0 AND a$ < > "0" THEN
     BEEP
     GOTO EnterXDist
  END IF


EnterElevation:
  LOCATE 20, 60
  LINE INPUT a$
  IF a$ = "00" THEN GOTO ExitNmbrnDist
  IF a$ = "MM" OR a$ = "mm" THEN MainMenu
  IF a$ = "" THEN BEEP : GOTO EnterElevation
  Elevation(i) = VAL (a$)
  IF VAL (a$) = 0 AND a$ < > "0" THEN
     BEEP
     GOTO EnterElevation
  END IF
  i = i + 1
  GOTO EnterVesNmbr


ExitNmbrnDist:
  i = i-1

SaveNmbrnDist:
  Work$ = "SaveNmbrnDist"
  CLS
  ReqMsg$ = "Save NmbrnDistnElvtn"
  GOSUB GetReq
  IF Worked% = 0 THEN      ' Worked% = 0 means Cancel button was clicked
         CLS
         LOCATE 10,10
            PRINT " Do you wish to discard the data you entered! (Y/N)"
         YsNo a$
         IF a$ = "Y" THEN
            GOTO EnterVesNmbrnDist
         ELSE
            GOTO SaveNmbrnDist
         END IF
  END IF
  CLS
  FileExists% = -1
  OPEN File$ FOR INPUT AS #1
  CLOSE #1


WriteNmbrnDist:
  IF FileExists% = -1 THEN
     LOCATE 10,10
```

```
        PRINT File$
    LOCATE 14,10
        PRINT " Above File Exists."
    LOCATE 18,10
        PRINT " Append it (A),  Replace it (R), or Cancel (C) ?"
    GOSUB wayt
    a$ = UCASE$(a$)
    IF a$ = "R"  THEN OPEN File$ FOR OUTPUT AS #1
    IF a$ = "A" THEN OPEN File$ FOR APPEND AS #1
    IF a$ = "C" THEN GOTO SaveNmbrnDist
    IF a$ < > "R" AND a$ < > "A" AND a$ < > "C" THEN BEEP : GOTO WritenmbrnDist
 END IF
 IF FileExists% = 0 THEN
    OPEN File$ FOR OUTPUT AS #1
 END IF
 FOR j = 1 TO i
    PRINT #1, VesNmbr(j), Xdist(j), Elevation(j)
 NEXT j
 CLOSE #1
 CLS
 LOCATE 20,20
    PRINT "Sounding Numbers, Distances and Elevations saved!"
 GOSUB PrsAnyKey
 GOTO MainMenu


MakeSection:
 MakeSectn = 1


LoadNmbrnX:
 Work$ = "LoadNmbrnX"
 CLS
 ReqMsg$ = " Load VesNmbr,Xdist,Elevtn"
 GOSUB GetReq
 IF Worked% = 0  THEN  MainMenu       ' Worked% = 0 means Cancel
 i = 1
 VesSection$ = File$
 OPEN File$ FOR INPUT AS #1


ReadNmbrnX:
 INPUT #1, VesNmbr(i), Xdist(i), Elevation (i)
 PRINT i,VesNmbr(i), XDist(i), Elevation (i)

 IF EOF (1) THEN
    CLOSE #1
    GOTO DoneNmbrnX
 END IF
 i = i+1
 GOTO ReadNmbrnX


DoneNmbrnX:
```

```
  NmbrofVES = i          'NmbrofVES = Nmbr of VES soundings
  PRINT
  PRINT "Done Loading VES Nmbrs, Distances, and Elevations!"
  GOSUB PrsAnyKey


LoadLayering:
  CLS
  k = 1
  NmbrofPts = 0
  Counter = 1
  SumXdist = XDist (1)

  FOR j = 1 TO NmbrofVES


ResumeItHere:
     Work$ = "LoadLayering"
     CLS
     ReqMsg$ =  "Load Layering of: " + STR$(VesNmbr(j))
     GOSUB GetReq
     IF Worked% = 0  THEN  MainMenu
        OPEN File$ FOR INPUT AS #1


ReadLayering:
        CLS
        LOCATE 15,20
        PRINT "Loading Layering ... "
        LINE INPUT #1, VesName$
        LINE INPUT #1,  Units$
        INPUT #1, NmbrofLayers

        FOR i = 1 TO NmbrofLayers
           INPUT #1, YdTemp(i), ZdTemp(i)
        NEXT i

        CenterDepth = SQR(YdTemp(2) * YdTemp(1))/YdTemp(2)

        M = 1

        FOR i = 1 TO NmbrofLayers - 1
           YdTemp2 (M) = YdTemp (i) * CenterDepth
           ZdTemp2 (M) = ZdTemp (i)

           M = M + 1
           YdTemp2 (M) = YdTemp (i)
           CenterZ = SQR (ZdTemp (i+1) * ZdTemp (i)) / ZdTemp (i+1)
           ZdTemp2 (M) = ZdTemp (i+1) * CenterZ

           M = M + 1
        NEXT i

        YdTemp2 (M) = YdTemp (NmbrofLayers - 1) * 1.2
```

```
        ZdTemp2 (M) = ZdTemp (NmbrofLayers)

        M = M + 1
        YdTemp2 (M) = YdTemp2 (M - 1) * 1.1
        ZdTemp2 (M) = ZdTemp2 (M - 1)

        M = M + 1
        YdTemp2 (M) = YdTemp2 (M - 1) * 1.1
        ZdTemp2 (M) = ZdTemp2 (M - 1)

        FOR i = 1 TO M-1
                Xd (Counter) = SumXdist
                Yd (Counter) = YdTemp2 (i)
                Zd (Counter) = ZdTemp2 (i)
                Counter = Counter + 1
        NEXT i


        CLOSE #1
        k = k + 1
        SumXdist  = SumXdist + Xdist(k)

 NEXT j


DoneLayering:
 nd = Counter - 1
 GOSUB MaxMin
 SectionLength = Xdmax-XdMin
 GOSUB Origin
 GOSUB FixAspect
 CLS
 LOCATE 10, 10
 PRINT "Done Loading Layering                "
 LOCATE 14, 10
    PRINT " Zmax = " ZdMax, "Zmin = " ZdMin
 LOCATE 18,10
    PRINT " Do you have a File of Contour Values "
 LOCATE 20, 10
    PRINT " ready to be used in making the "
 LOCATE 22, 10
    PRINT " Cross Section?  (Y/N)"
 YsNo a$
    IF a$ = "N" THEN
        MakeSectn = 1
        b$ = "C"
        GOTO EnterContour
    END IF


VrtExg:
 GOSUB Palet1
 GOSUB RestoreAll
 CLS
```

```
LOCATE 10,10
PRINT " Which Vertical Exaggeration do you want: "
LOCATE 12,10
   PRINT " (1) None."
LOCATE 14, 10
   PRINT " (2) Two    times. "
LOCATE 16,10
   PRINT " (3) Three  times. "
LOCATE 18, 10
   PRINT " (4) Four   times. "
LOCATE 20, 10
   PRINT " (5) Five   times. "
LOCATE 22, 10
   PRINT " (6) Ten    times. "
LOCATE 24, 10
   PRINT " (7) Twenty times. "
LOCATE 26, 10
   PRINT "    Please press appropriate number. "
GOSUB MainMenuEsc
PrsNmbr 7, a$
IF a$ = CHR$(27) OR a$ ="" THEN GOTO MainMenu
VertExg = VAL(a$)
IF VertExg = 6 THEN VertExg = 10
IF VertExg = 7 THEN VertExg = 20


MaximumDepth:
    CLS
    LOCATE 10,10
    PRINT " Vertical Exaggeration =  " +STR$(VertExg) + " times"

    LOCATE 12,10
    PRINT " Do You Wish to see: "
    LOCATE 14,10
    PRINT "  (1) Full Screen display."
    LOCATE 16, 10
    PRINT "  (2) Upper-Half Screen display."
    LOCATE 18,10
    PRINT "  (3) Previous Menu."
    LOCATE 20, 10
    PRINT " Please press appropriate Number"
    LOCATE 22, 10
    PRINT " * In either display mode, the cross section will "
    LOCATE 23, 10
    PRINT "   fill the screen width, unless (without vertical "
    LOCATE 24, 10
    PRINT "   exaggeration) the depth is greater than the width."
    GOSUB MainMenuEsc
    PrsNmbr 3, c$
    IF c$ = CHR$(27) THEN MainMenu
    IF c$ = "3" THEN GOTO VrtExg


Exaggerate:
```

```
    IF VertExg < 3 THEN
       XstretchTop = 10
    END IF
    IF 3 < = VertExg AND VertExg < =10 THEN
       XstretchTop = 5
    END IF
    IF VertExg = 20 THEN
       XstretchTop = 2
    END IF


XstretchOpt:
    CLS
    XstretchBtm = 2
    LOCATE 10,10
    PRINT " Recommended Xstretch-Spread  = ";XstretchTop; "to";XstretchBtm
    LOCATE 12,10
    PRINT " Do you wish to use it? (Y/N)"
    LOCATE 16,10
    PRINT " * The larger the value of Xstretch the greater the stretch of the "
    LOCATE 17, 10
    PRINT "   contours in the horizontal direction."
    LOCATE 18, 10
    PRINT "   First value  = Xstretch at  Top   of Section."
    LOCATE 19, 10
    PRINT "   Second value = Xstretch at Bottom of Section."
    LOCATE 20,10
    PRINT "   Xstretch values should be > =1 and < =20."
    LOCATE 22, 10
    PRINT " * If you make XstretchTop = Xstretch Bottom then"
    LOCATE 23, 10
    PRINT "   Xstretch will be the same throughout the section."
    YsNo a$
    IF a$ ="N" THEN
       LOCATE 25,10
       LINE INPUT " Please type value of Xstretch at   Top  of section: ", a$
       IF VAL (a$) < 1 OR VAL(a$) > 20 THEN BEEP: GOTO XstretchOpt
       XstretchTop = VAL(a$)
       LOCATE 27, 10
       LINE INPUT " Please type value of Xstretch at Bottom of section: ", a$
       IF VAL (a$) < 1 OR VAL(a$) > 20 THEN BEEP: GOTO XstretchOpt
       XstretchBtm = VAL(a$)
    END IF

    FOR i = 1 TO nd
       Yd(i) = Yd(i) * VertExg
    NEXT i

    FOR j = 1 TO NmbrOfVES
       Elevation (j) = Elevation (j) * VertExg
    NEXT j
    GOSUB MaxMin
    DepthMax = YdMax/VertExg
```

```
    GOSUB AdjstElevn
    GOSUB MaxMin
    IF c$ = "1" THEN ShowScreen = 1
    IF c$ = "2" THEN ShowScreen = .5
    GOTO LogZee


MakeMap:
 Xstretch = 1
 MakeMp = 1
 CLS
 LOCATE 8,10
    PRINT " Do you wish to: "
 LOCATE 12,10
    PRINT " 1) Load XYZ file, then load Contours."
 LOCATE 14, 10
    PRINT " 2) Load XY file,  then load Z file, and then load Contours"
 LOCATE 18,10
    PRINT " Please Press Appropriate Number."
 GOSUB MainMenuEsc
 PrsNmbr 2, a$
 IF a$ = "1" THEN LoadXYZ
 IF a$ = "2" THEN LoadXY
 IF a$ = CHR$(27) THEN MainMenu
 BEEP
 GOTO MakeMap


LoadXY:
 Work$ = "LoadXY"
 CLS
 ReqMsg$ =  "Load XY-data"
 GOSUB GetReq
 IF Worked% = 0  THEN  MakeMap
 i = 1
 OPEN File$ FOR INPUT AS #1


LoadXnY:
 INPUT #1, Xd(i), Yd(i)
 IF EOF (1) THEN
    CLOSE #1
    GOTO DoneLoading
 END IF
 i = i+1
 GOTO LoadXnY


DoneLoading:
 CLS
 FOR j = 1 TO i
    LOCATE 10,10
       PRINT "StnNmbr = ", j
    LOCATE 12,10
```

```
        PRINT "X-data  = ", Xd(j)
      LOCATE 14,10
        PRINT "Y-data  = " , Yd(j)
  NEXT
  LOCATE 20,10
  PRINT " Done Loading X- & Y-data."
  nd = i   'nd = Nmbr of stations
  GOSUB MaxMin
  XMapWidth = Xdmax - Xdmin
  XMapHight = YdMax - YdMin
  GOSUB PrsAnyKey
  GOSUB Origin
  IF a$ = "3" THEN GOTO MakeMap
  IF a$ = "4" THEN GOTO MainMenu
  GOSUB FixAspect


LoadZ:
  Work$ = "LoadZ"
  CLS
  ReqMsg$ = "Load Z-data"
  GOSUB GetReq
  IF Worked% = 0 THEN MakeMap
  i = 1
  OPEN File$ FOR INPUT AS #1


LoadZee:
  INPUT #1, Zd(i)
  IF EOF (1) THEN
     CLOSE #1
     CLS
     FOR j = 1 TO i
        LOCATE 10,10
        PRINT j, Zd(j)
     NEXT
     LOCATE 15,10
     PRINT " Done Loading Z-values."
     GOSUB PrsAnyKey
     ndz = i              ' ndz = NmbrofzDatapoints
     IF nd < > 0 AND ndz < > nd THEN
        BEEP
        PRINT " Number of Z data points is not equal to Number of XY data points!!!"
        GOSUB PrsAnyKey
        GOTO LoadZ
     END IF
     GOTO LogZee
  END IF
  i = i+1
  GOTO LoadZee


LogZee:
```

```
 LogZ$ = "N"
 CLS
 LOCATE 10,10
    PRINT " Do you wish to take LOG of the Z Values ? (Y/N)"
 YsNo a$
 IF a$ = "Y" THEN
    FOR i = 1 TO nd
       LOCATE 18,10
       PRINT i, Zd(i)
       Zd(i) = LOG10 (Zd(i))
    NEXT
    LogZ$ = "Y"
    LOCATE 20,20
       PRINT " Done, Log Z values taken!"
    GOSUB PrsAnyKey
 END IF
 IF nd < > 0 THEN GOTO LoadContour
 GOTO MakeMap


LoadXYZ:
 Work$ = "LoadXYZ"
 CLS
 ReqMsg$ =  "Load XYZ-data"
 GOSUB GetReq
 IF Worked% = 0  THEN  MakeMap
 CLS
 LOCATE 20,20
 PRINT " Loading XYZ ..."
 i = 1
 OPEN File$ FOR INPUT AS #1


LoadXYnZ:
 INPUT #1, Xd(i), Yd(i), Zd(i)
 IF EOF (1) THEN
    CLOSE #1
    GOTO DoneLoadXYZ
 END IF
 i = i+1
 GOTO LoadXYnZ


DoneLoadXYZ:
 CLS
 LOCATE 8,10
 PRINT " Done Loading XYZ"
 nd = i   'nd = Nmbr of stations
 LOCATE 12, 10
    PRINT " Total Number of stations = ";nd
 GOSUB MaxMin
 XMapWidth = Xdmax - Xdmin
 XMapHight = YdMax - YdMin
 LOCATE 14,10
```

```
    PRINT " Map Width  = " XMapWidth " (m, km, etc). "
  LOCATE 16, 10
    PRINT " Map Height = " XMapHight " (m, km, etc). "

  LOCATE 19,10
    PRINT " Zmax = "Zdmax, " Zmin = "Zdmin
  SugstContrIntrvl = (Zdmax - Zdmin)/13
  LOCATE 21,10
    IF SugstContrIntrvl >= 1 THEN
       PRINT " FYI: Contour interval should be about  " INT(SugstContrIntrvl)
    ELSE
       PRINT " FYI: Contour interval should be about  " SugstContrIntrvl
    END IF
  LOCATE 23, 10
    PRINT " If you wish to enter contour levels now, Press C, otherwise .."
  GOSUB PrsAnyKey
  a$ = UCASE$ (a$)
  IF a$ = "C" THEN
    b$ = a$
    GOTO EnterContour
  END IF


LetsGo:
  GOSUB Origin
  IF a$ = "3" THEN GOTO DoneLoadXYZ
  IF a$ = "4" THEN GOTO MainMenu
  IF XMapWidth < XMapHight*.86 THEN
    CLS
    LOCATE 10,10
       PRINT " Map Width ("; XMapwidth;")"; " is less than adjusted Map Height (";
XMapHight*.86;") "
    LOCATE 12,10
       PRINT " * Adjusted Map Height = Map Height x Screen Aspect Ratio."
    LOCATE 14,10
       PRINT " Do you wish to ROTATE the map side ways"
    LOCATE 16,10
       PRINT " to maximize its size on the screen? (Y/N)"
    YsNo a$
    IF a$ = "Y" THEN
       GOSUB Rotate
       GOSUB Origin
    END IF
  END IF
  GOSUB FixAspect


LoadContour:

  IF NmbrOfContours < > 0 THEN GOTO LogCntrLvls
  CLS
  Work$ = "LoadContour"
  ReqMsg$ = "Load .. Contours"
  GOSUB GetReq
```

```
IF Worked% = 0 THEN
    CLS
    LOCATE 10,10
        PRINT " Discard Loaded data and return to Main Menu? (Y/N)"
    YsNo a$
    IF a$ = "Y" THEN MainMenu
    IF a$ = "N" THEN LoadContour
END IF
i = 1
OPEN File$ FOR INPUT AS #1


LoadCL:
INPUT #1, ContourLvl(i)
IF EOF (1) THEN
    CLOSE #1
    NmbrOfContours = i
    CLS
    FOR j = 1 TO NmbrOfContours
        PRINT j, ContourLvl(j)
    NEXT j

    LOCATE 22,10
    PRINT " Contour values look OK? (Y/N)"
    YsNo d$
    IF d$ = "N" THEN
        CLS
        LOCATE 10,10
            PRINT " Do you wish to:"
        LOCATE 12,10
            PRINT " 1) Load a different set of contours"
        LOCATE 14,10
            PRINT " 2) Enter a new set of contours."
        PrsNmbr 2, a$
        IF a$ = "1" THEN
            NmbrOfContours = 0
            GOTO LoadContour
        END IF
        IF a$ = "2" THEN
            GOTO EnterContour
        END IF
    END IF
    IF d$ = "Y" THEN
        FOR j = 1 TO NmbrOfContours
            ContourLvlTemp (j) = ContourLvl (j)
        NEXT j
        GOTO LogCntrLvls
    END IF
    GOTO LoadContour
END IF
i = i+1
GOTO LoadCL
```

```
LogCntrLvls:

 IF LogZ$ = "Y" THEN
    IF ContoursLogged = 1 THEN GOTO Specs

    FOR i = 1 TO NmbrOfContours
       IF ContourLvl(i) < = 0 THEN
          i = NmbrOfContours
          CLS
          BEEP
          LOCATE 10,10
             PRINT " Contours have zero or negative values."
          LOCATE 12,10
             PRINT " Cannot take LOG of < = 0 contour values"
          LOCATE 14,10
             PRINT " Please load a proper set of contour levels."
          NmbrOfContours = 0
          GOSUB PrsAnyKey
          GOTO LoadContour
       END IF
    NEXT i
    FOR i=1 TO NmbrOfContours
       ContourLvl(i) = LOG10(ContourLvl(i))
    NEXT
    ContoursLogged = 1
 END IF

ChkLogCont:
' Restore Contours
 IF LogZ$ = "N" AND ContoursLogged = 1 THEN
    FOR i = 1 TO NmbrOfContours
       ContourLvl (i) = ContourLvlTemp (i)
       PRINT i, ContourLvl (i)
    NEXT i
    ContoursLogged = 0
    GOSUB Wayt
 END IF

Specs:
 CLS
 GOSUB MaxMin


ScaleXY:
 Scalem$ = ""
 Size = 0
 IF MakeMp = 1 THEN GOSUB RestoreAll
 GOSUB Palet1
 COLOR 1,2


ScaleMenu:
 CLS
    COLOR 2,1
```

```
    a$ = " SCALE MENU "
    Center 2, a$
    COLOR 1,2
LOCATE 5,20
    IF MakeMp = 1 THEN
        PRINT " Length Units in X-direction =   ", XMapWidth
    ELSE
        PRINT " Length of Cross Section     =   ", SectionLength, Unit$
    END IF
LOCATE 6,20
    IF MakeMp = 1 THEN
        PRINT " Length Units in Y-direction =   ", XMapHight
    ELSE
        PRINT "  Vertical Exaggeration      =   ", VertExg
    END IF
LOCATE 10, 10
    PRINT " Do you wish to: "
LOCATE 12,10
    PRINT " 1) ";
    COLOR 2,1
    PRINT " Auto-Scale ";
    COLOR 1,2
    PRINT " map/section to fit nicely within a 640x400 window. "
LOCATE 15,10
    PRINT " 2) ";
    COLOR 2,1
    PRINT " Specify Scale Factor multiplier. ";
    COLOR 1,2
    PRINT " Good for merging two maps/sections and making them the same scale."
LOCATE 17,10
    PRINT "    Use above Length Units as a guide to decide on a Scale Factor."

IF MakeMp = 1 THEN
    LOCATE 20, 10
        PRINT " 3) Make map for ";
        COLOR 2,1
        PRINT " VistaPro ";
        COLOR 1,2
        PRINT " with largest side = 258 pixels"
END IF
LOCATE 25,10
    PRINT " Please press appropriate number. "
GOSUB MainMenuEsc
IF MakeMp = 1 THEN
    PrsNmbr 3, a$
ELSE
    PrsNmbr 2, a$
END IF
IF a$ = CHR$(27) THEN GOTO MainMenu
IF a$ = "1" THEN
    CLS
    PixMaxX% = 615
    PixMaxY% = 365
```

```
ChngPixMax:
    ScaleFactorX = PixMaxX% / (Xdmax - XdMin)
    ScaleFactorY = PixMaxY% / (YdMax - YdMin)
    IF MakeSectn = 1 THEN
       IF ScaleFactorX * (YdMax-YdMin) > 365 AND VertExg = 1 AND ShowScreen = 1 THEN
          CLS
          LOCATE 8,10
          PRINT " With No Vertical Exaggeration and a full Screen Display,"
          LOCATE 10, 10
          PRINT " the bottom part of this cross section can not be displayed"
          LOCATE 12,10
          PRINT " unless you select option 1 below ."
          LOCATE 16,10
          PRINT " Do you wish to:"
          LOCATE 18,10
          PRINT " 1) Display the FULL section (at less than full screen width)."
          LOCATE 20, 10
          PRINT " 2) Display only UPPER part of section (at full screen width)."
          LOCATE 22, 10
          PRINT "    Upper part = ";INT(365/((YdMax-YdMin)*ScaleFactorX)*100);"%";
          PRINT " of section."
          LOCATE 24, 10
          PRINT " Please press the appropriate Number."
          PrsNmbr 2, a$
          IF a$ = "1" THEN
             ScaleFactor = ScaleFactorY
             AdjustWidth = 1
          END IF
          IF a$ = "2" THEN
             ScaleFactor = ScaleFactorX
             AdjustWidth = 0
          END IF
       ELSE
          ScaleFactor = ScaleFactorX
          AdjustWidth = 0
       END IF

       FOR i = 1 TO nd
          Xd(i) = INT ((Xd(i) - XdMin) * ScaleFactor)
          Yd(i) = INT ((Yd(i) - YdMin) * ScaleFactor)
       NEXT i
       GOSUB MaxMin

       IF ShowScreen = 1 THEN DepthMax = 365
       IF ShowScreen = 0.5 THEN DepthMax = 180

       IF YdMax > DepthMax AND VertExg < > 1 THEN
          CLS
          LOCATE 12,10
          PRINT " For your information:"
          LOCATE 14,10
          PRINT " At a Vertical Exaggeration of ";VertExg
          LOCATE 16,10
```

```
            PRINT " and a vertical-screen display of "; INT(ShowScreen*100);"%."
            LOCATE 18,10
            COLOR 2,1
            PRINT " [Only] the upper "; INT(DepthMax/YdMax*100) ;"% of the section will be
displayed "
            COLOR 1,2
            LOCATE 20 ,10
            PRINT " Is this OK? (Y/N) [if not, use smaller vertical exaggeration]."
            YsNo a$

            IF a$ = "N" THEN GOTO VrtExg
        END IF
        GOSUB ChopDpth
        GOSUB MaxMin

        IF XdMax - XdMin < 615 AND AdjustWidth = 0 THEN
            CLS
            LOCATE 10,10
            PRINT " WARNING! With Vertical Exaggeration = "; VertExg
            LOCATE 12, 10
            PRINT "         and a vertical-screen display of "; INT(ShowScreen*100);"%"
            LOCATE 14,10
            PRINT "         the maximum-depth surface will intersect the "
            LOCATE 16, 10
            PRINT "         topographic surface. The width of the cross section "
            LOCATE 18,10
            PRINT "         will be incomplete and some soundings will be missing!!"
            LOCATE 20, 10
            PRINT " Do you wish to: "
            LOCATE 22, 10
            PRINT " (1) Return to Vertical Exaggeration Menu."
            LOCATE 24, 10
            PRINT " (2) Go on, let's see how it looks. "
            PrsNmbr 2, a$
            IF a$ = "1" THEN GOTO VrtExg
            IF a$ = "2" THEN GOTO ScaleZ
        END IF

        GOTO ScaleZ

    END IF
'    The following is used with MakeMap = 1 since MakeSectn < > 1
    IF ScaleFactorX * (YdMax - YdMin) < = 365 THEN
        ScaleFactor = ScaleFactorX
        FOR i = 1 TO nd
            Xd(i) = INT ((Xd(i) - XdMin) * ScaleFactor)
            Yd(i) = INT ((Yd(i) - YdMin) * ScaleFactor)
        NEXT i
        GOSUB MaxMin
        GOTO ScaleZ
    END IF

    IF ScaleFactorY * (XdMax -XdMin) < =615 THEN
        ScaleFactor = ScaleFactorY
```

```
        FOR i = 1 TO nd
            Xd(i) = INT ((Xd(i) - XdMin) * ScaleFactor)
            Yd(i) = INT ((Yd(i) - YdMin) * ScaleFactor)
        NEXT i
        GOSUB MaxMin
        GOTO ScaleZ
    END IF

    PixMaxX% = PixMaxX% - XdMax
    PixMaxY% = PixMaxY% - YdMax
    IF PixMaxX% < 10 OR PixMaxY% < 10 THEN
        PRINT " We Have trouble scaling!! bug in program!"
        GOSUB PrsAnyKey
    END IF
    GOTO ChngPixMax
END IF


IF a$ = "2" THEN
    LOCATE 27,10
        COLOR 2,1
        PRINT " Scale Factor (multiplier for above Length Units) = ";
        COLOR 1,2
        LINE INPUT " ", a$
    IF a$ = "" OR VAL(a$) <= 0 THEN
        BEEP
        GOTO ScaleMenu
    END IF
    ScaleFactor = VAL(a$)
    IF ScaleFactor * (YdMax - YdMin) <= 365 AND ScaleFactor * (XdMax -XdMin) <= 615 THEN
        FOR i = 1 TO nd
            Xd(i) = INT ((Xd(i) - XdMin) * ScaleFactor)
            Yd(i) = INT ((Yd(i) - YdMin) * ScaleFactor)
        NEXT i
        GOSUB MaxMin
        CLS
        LOCATE 10,10
            PRINT " Using a Scale Factor of  " + a$
        LOCATE 12,10
            PRINT " will result in a map/section of: ";
            PRINT XdMax "x" YdMax " pixels."
        LOCATE 14, 10
            PRINT " Is this size OK? (Y/N)"
        LOCATE 16, 10
            PRINT " Note: maximum map/section size = 615 x 365 pixels "
        YsNo a$
        IF a$ = "N" THEN GOTO VrtExg
        GOSUB MaxMin

            IF ShowScreen = 1 THEN DepthMax = 365
            IF ShowScreen = 0.5 THEN DepthMax = 180

            IF YdMax > DepthMax THEN
                CLS
```

```
                LOCATE 12,10
                PRINT " For your information:"
                LOCATE 14,10
                PRINT " At a Vertical Exaggeration of ";VertExg
                LOCATE 16,10
                PRINT " and a vertical-screen display of "; INT(ShowScreen*100);"%."
                LOCATE 18,10
                COLOR 2,1
                PRINT " [Only] the upper "; INT(DepthMax/YdMax*100) ;"% of the section will
be displayed "
                COLOR 1,2
                LOCATE 20 ,10
                PRINT " Is This OK? (Y/N)"
                YsNo a$
                IF a$ = "N" THEN GOTO VrtExg
            END IF
            GOSUB ChopDpth
            GOSUB MaxMin
        Scalem$ = "ScaleFactor"
        GOTO ScaleZ
    ELSE
        CLS
        LOCATE 10,10
            PRINT " Scale Factor of " ScaleFactor  " is too big ... "
        LOCATE 12, 10
            PRINT " Map/Section is too big to fit in window with a size of:"
        LOCATE 14, 10
            PRINT "              ";
            PRINT INT(ScaleFactor * (XdMax - XdMin));
            PRINT "x";
            PRINT INT(ScaleFactor * (YdMax - YdMin)) "pixels"
        LOCATE 16, 10
            PRINT " Maximum size = 615 x 365 pixels"
        LOCATE 18,10
            PRINT " Please choose a smaller Scale Factor!"
        GOSUB PrsAnyKey
        GOTO ScaleXY
    END IF
END IF

IF a$ = "3" THEN
    PixMax% = 258

    GOSUB AspectOut
    GOSUB MaxMin

    ScaleFactorX = (PixMax% - 1)/(XdMax-XdMin)
    ScaleFactorY = (PixMax% - 1)/(YdMax-YdMin)

    IF ScaleFactorX >= ScaleFactorY THEN
        ScaleFactor = ScaleFactorY
    ELSE
        ScaleFactor = ScaleFactorX
    END IF
```

```
    FOR i = 1 TO nd
       Xd(i) = ((Xd(i) - XdMin) * ScaleFactor)
       Yd(i) = ((Yd(i) - YdMin) * ScaleFactor)
    NEXT i
    Scalem$ = "VistaPro"
    GOSUB MaxMin

    CLS
    LOCATE 8,10
       PRINT " Done!... Map scaled for VistaPro."
    LOCATE 12,10
       PRINT " Please write down these two numbers:"
    LOCATE 14,10
       PRINT " Map Width  = "; INT((XdMax - XdMin) + 1)
    LOCATE 16,10
       PRINT " Map Height = "; INT((YdMax - YdMin) + 1)
    LOCATE 19,10
       PRINT " You will need the values of Map Width and Map Height in the"
    LOCATE 20,10
       PRINT " MakeVista program to convert z-values file into VistaPro format."
    LOCATE 22,10
       PRINT " Note: Screen aspect ratio is not adjusted when you select"
    LOCATE 23,10
       PRINT "       map for VistaPro. This is better scaling for VistaPro."
    LOCATE 28,10
       PRINT " To return to Previous Menu press P, otherwise ..."
    GOSUB PrsAnyKey
    a$ = UCASE$ (a$)
    IF a$ = "P" THEN ScaleXY
 END IF


ScaleZ:
 IF LogZ$ = "Y" AND Scalem$ = "VistaPro" THEN
    IF ZdMin < 0 THEN
       CLS
       LOCATE 5,10
          PRINT " Smallest (Z) Value = "; 10^ZdMin
       LOCATE 7, 10
          PRINT " Do you wish to scale Z values "
       LOCATE 8, 10
          PRINT " so that smallest value is greater than 1 (for VistaPro) (Y/N) "
       YsNo a$
       IF a$ = "Y" THEN
          LOCATE 12,10
             LINE INPUT " Please type factor to multiply by (10, 100, etc.) "; Zfactor$
          Zfactor = VAL(Zfactor$)
          FOR i = 1 TO nd
             Zd(i) = 10 ^ Zd(i)
             Zd(i) = Zd(i) * Zfactor
             Zd(i) = LOG10 (Zd(i))
             LOCATE 14, 10
```

```
                PRINT Zd(i)
            NEXT i
            FOR i = 1 TO NmbrOFContours
                ContourLvl(i) = 10^ContourLvl(i)
                ContourLvl(i) = INT(ContourLvl(i) * Zfactor)
                LOCATE 16,10
                    PRINT ContourLvl(i)
                    ContourLvl(i) = LOG10 (ContourLvl(i))
            NEXT i
            LOCATE 18, 10
                PRINT "Done! Contours also scaled."
            GOSUB PrsAnyKey
        END IF
    END IF
END IF

IF MakeMp = 1 AND LogZ$ = "N" THEN
    CLS
    LOCATE 8,10
    PRINT " If Z values represent depths, do you wish to"
    LOCATE 10,10
    PRINT "  change them to elevations above a certain datum? (Y/N)"
    YsNo a$
    IF a$ = "Y" THEN
        LOCATE 12, 10
            PRINT " Greatest depth (ZMax) = " , ZdMax
        LOCATE 14,10
            LINE INPUT " Please type value for datum (> = ZMax) ", Datum$
        Datum = VAL(Datum$)
        FOR i = 1 TO nd
            Zd(i) = Datum - Zd(i)
        NEXT i
        LOCATE 16,10
        PRINT "Done! Depths converted to elevations above datum."
        GOSUB PrsAnyKey
    END IF
    IF Scalem$ = "VistaPro" THEN
        CLS
        LOCATE 5, 10
            PRINT "XdMax - XdMin  = ", (XdMax - XdMin)/ScaleFactor
        LOCATE 6, 10
            PRINT "Ydmax - YdMin  = ", (YdMax - YdMin)/ScaleFactor
        LOCATE 7, 10
            PRINT "ZdMax - ZdMin  = ", (ZdMax - ZdMin)
        LOCATE 14,10
            PRINT "For VistaPro type 10."
        LOCATE 12, 10
            LINE INPUT "Please type Vertical Exaggeration (for VistaPro)? ", a$
        VertExg = VAL(a$)
        IF VertExg = 0 THEN VertExg = 1

        ' For VistaPro we must multiply by 10 !!!
        FOR i = 1 TO nd
            Zd(i) = Zd(i) * ScaleFactor * VertExg
```

```
        NEXT i
        FOR i = 1 TO NmbrOFContours
            ContourLvl(i) = ContourLvl(i) * ScaleFactor * VertExg
        NEXT i
        GOSUB MaxMin
        PRINT ZdMax, ZdMin
        GOSUB PrsAnyKey
    END IF
END IF


MapSize:
 IF Scalem$ = "VistaPro" OR Scalem$ = "ScaleFactor" THEN GOTO ShiftXnY
 CLS
 LOCATE 10,10
    PRINT " Do you wish the Map/Section to be: "
 LOCATE 12, 10
    PRINT "   (1) Full Size. "
 LOCATE 14, 10
    PRINT "   (2) 1/4  Size (... good for testing). "
 LOCATE 16, 10
    PRINT "   (3) Return to Previous Menu."
 GOSUB MainMenuEsc
 PrsNmbr 3, a$
 IF a$ = CHR$(27) THEN GOTO MainMenu
 IF a$ = "2" THEN
    size = .5
    GOSUB Shrink
 END IF
 IF a$ = "3" AND MakeSectn = 1 THEN GOTO VrtExg
 IF a$ = "3" THEN GOTO ScaleXY


ShiftXnY:
'  purpose of shift is to avoid painting at Xd or Yd = 0 and
'  overshooting top of page when paining coarse grids.
 FOR i = 1 TO nd
    Xd(i) = Xd(i) + 5
    Yd(i) = Yd(i) + 15
 NEXT i


RadiusOfInfluence:
 GOSUB MaxMin
 CLS
 IF MakeMp = 1 THEN
    AreaofMap = (XdMax-XdMin)*(YdMax-YdMin)
    PixelsPerStn = INT(SQR(AreaofMap/nd))
    Radius = INT (3.3 * (PixelsPerStn))
 ELSE
    PixelsBtwnVES = INT((XdMax-XdMin)/NmbrofVES)
    Radius = INT (2.5 * (PixelsBtwnVES))
 END IF
 IF Radius = 0 THEN Radius = 1
```

```
LOCATE 10,10
   PRINT " Recommended Radius of influence = ";Radius
LOCATE 14,10
   PRINT " Use above Recommended Radius? (Y/N)"
LOCATE 16,10
   PRINT " To return to Previous Menu press P "
GOSUB Wayt
a$ = UCASE$(a$)
IF a$ = "P" THEN GOTO ScaleXY
IF a$ = "Y" OR a$ = CHR$(13) THEN GOTO CoarseFine
IF a$ = "N" THEN
   LOCATE 14, 10
   PRINT " To return to Previous Menu type P <ENTER>          "
   LOCATE 16,10
   LINE INPUT " Please type new value for Radius              ", a$
   IF a$ = "" THEN GOTO Radiusofinfluence
   a$ = UCASE$(a$)
   IF a$ = "P" THEN GOTO ScaleXY
   NewRadius = VAL (a$)
   Radius = NewRadius
   GOTO CoarseFine
END IF
GOTO RadiusOfInfluence


CoarseFine:
 CLS
 LOCATE 10,1
 PRINT " Do you wish the map/section to be gridded:"
 PRINT
 PRINT " Extra Coarse  (11x11 pixels) ..... 11 ?"
 PRINT " Coarse        ( 9x9 pixels) ..... 9 ?"
 PRINT " MediumCoarse  ( 7x7 pixels) ..... 7 ?"
 PRINT " Medium        ( 5x5 pixels) ..... 5 ?"
 PRINT " Fine          ( 3x3 pixels) ..... 3 ?"
 PRINT " Extra Fine    ( 1x1 pixels) ..... 1 ?"
 PRINT
 PRINT
 IF PixelsperStn = 0 THEN PixelsperStn = 1
 IF PixelsBtwnVES = 0 THEN PiexelsBtwnVES = 1
 IF PixelsperStn >= 11 THEN PixelsperStn = 11
 IF PixelsperStn = 11 AND size = 0.5 THEN PixelsperStn = 5
 IF PixelsBtwnVES >=11 THEN PixelsBtwnVES = 11
 IF PixelsBtwnVES = 11 AND size = 0.5 THEN PixelsBtwnVES = 5
 IF Scalem$ = "VistaPro" THEN PixelsperStn = 3
 IF MakeMp = 1 THEN
    PRINT " Note: Recommended grid size for this map should be <= "; PixelsperStn
 ELSE
    PRINT " Note: Recommended grid size for this section should be <= "; PixelsBtwnVES
 END IF
 PRINT
 PRINT
 PRINT "     To use recommended grid size press <ENTER>. "
 PRINT
```

```
PRINT "     To Return to Previous Menu type P <ENTER>. "
PRINT
PRINT
PRINT "     Please press <ENTER>, type P, or type a grid size <ENTER> "
LOCATE 28,65
LINE INPUT " ", a$
a$ = UCASE$(a$)
IF a$ = "P" THEN GOTO RadiusofInfluence
IF a$ = "" AND MakeMp = 1 THEN a = PixelsperStn
IF a$ = "" AND MakeSectn = 1 THEN a = PixelsBtwnVES
IF a$ < > ""    THEN a = VAL(a$)
IF a = 11 OR a = 10 THEN stp = 11: pix = 5 : GOTO DoIt
IF a = 9 OR a = 8 THEN stp = 9 : pix = 4 : GOTO DoIt
IF a = 7 OR a = 6 THEN stp = 7 : pix = 3 : GOTO DoIt
IF a = 5 OR a = 4 THEN stp = 5 : pix = 2 : GOTO DoIt
IF a = 3 OR a = 2 THEN stp = 3 : pix = 1 : GOTO DoIt
IF a = 1 THEN stp = 1 : pix = 0 : GOTO DoIt
BEEP
GOTO CoarseFine


DoIt:
 GOSUB Palet2
 COLOR 1,0
 CLS
 Xmax = Xdmax + stp
 YMin = YdMin - stp
 Xmin = XdMin
 Ymax = Ydmax

 IF stp >1 THEN
    CLS
    WINDOW 2,"",(100,200)-(600,300),2,1
    LOCATE 2,2
       PRINT " Show coarse Map/Section being Painted? (Y/N)"
    LOCATE 4,2
       PRINT " It may be faster if you type N "
    YsNo a$
    CLS
    IF a$ = "Y" THEN PaintIt$ = "Y"
    IF a$ = "N" THEN
       PaintIt$ = "N"
       WINDOW 2,"",(300,200)-(600,240),2,1
       LOCATE 2,7
          PRINT " Gridding ...."
    END IF
 END IF

 IF MakeSectn = 1 THEN
    DeltaXstretch = (XstretchTop - XstretchBtm)  / (Ymax - Ymin)
 END IF

 FOR iy = Ymax TO Ymin  STEP -stp
    IF MakeSectn = 1 THEN
```

```
        Xs = 1 / XstretchBtm
    END IF
    FOR ix = XMin TO  XMax  STEP stp
        Zsum = 0 : Zwts = 0: Zvalu = 0
        FOR i = 1 TO nd
            IF ABS(ix - Xd(i))+ ABS(iy - Yd(i)) < Radius THEN
                IF ABS(ix - Xd(i))= 0 AND ABS(iy- Yd(i))= 0 THEN
                    Zvalu = Zd(i)
                    i  =  nd
                    GOTO PlotIt
                END IF
                IF MakeSectn = 1 THEN
                    Zdst = 1/(((ix-Xd(i))*Xs)^2 + ((iy-Yd(i)))^2)^2
                ELSE
                    Zdst = 1/((ix-Xd(i))^2 + (iy-Yd(i))^2)^2
                END IF
                Zsum = Zsum + Zdst * Zd(i)
                Zwts = Zwts + Zdst
                Zvalu = Zsum/Zwts
            END IF
        NEXT i

PlotIt:
    Zcalc(ix,iy) = Zvalu
    IF PaintIt$ = "N" THEN GOTO nxt
    WINDOW CLOSE 2
    WINDOW OUTPUT 1
    FOR j = 1 TO NmbrOfContours
        IF Zvalu >= ContourLvl(j) THEN
            Kolor = j + 1
            j = NmbrOfContours
        ELSE
            Kolor = j + 2
        END IF
    NEXT j
    IF Zcalc(ix,iy) = 0 THEN Kolor = 0
    IF pix = 0 THEN
        PSET (ix,iy),Kolor
        GOTO nxt
    END IF
    LINE (ix-pix,iy-pix)-(ix+pix,iy+pix),Kolor,bf
nxt:
  NEXT ix
  IF MakeSectn = 1 THEN
      XstretchBtm = XstretchBtm + (DeltaXstretch * stp)
  END IF
NEXT iy


SmoothIt:
  IF stp = 1 THEN GOTO SaveZcalc
  IF PaintIt$ = "Y" THEN
      GOSUB ColorStns
      GOSUB CleanUp
```

```
 END IF
 IF PaintIt$ = "N" THEN GOTO SmoothX
 WINDOW 2,"",(300,200)-(600,240),2,1
 LOCATE 2,2
    PRINT " Smooth It (i.e. regrid it)? (Y/N)"
 YsNo a$
 IF a$ = "Y" THEN
    GOTO SmoothX
 END IF

 IF a$ = "N" AND Scalem$ = "VistaPro" THEN
        CLS
        WINDOW 2,"",(200,200)-(600,250),2,1
        LOCATE 2,7
           PRINT "For VistaPro you must Smooth image to get"
        LOCATE 3,7
           PRINT "correct Zcalc values.  Smooth It? (Y/N)"
        YsNo a$
        IF a$ = "Y" THEN GOTO SmoothX
        IF a$ = "N" THEN GOTO Redo
 END IF
 IF a$ = "N" THEN GOTO PlotStation


SmoothX:
 Smoothing = 1
 WINDOW OUTPUT 2
 CLS
 LOCATE 2,2
 PRINT " Computing ... Coarse Horizontal      "


HrzntlSweep:
 FOR iy = Ymax TO Ymin STEP -stp
    FOR ix = Xmin TO Xmax-stp STEP stp
        Slope = (Zcalc(ix+stp,iy) - Zcalc(ix,iy))/stp
        XIntercept = Zcalc(ix,iy) - (Slope*ix)
        FOR X = ix TO ix+stp
           HZcalc(X,iy) = (X * Slope) + XIntercept
        NEXT X
    NEXT ix
 NEXT iy


DetailY:
 LOCATE 2,2
    PRINT " Computing ... Fine Vertical          "
 FOR ix = Xmin TO Xmax-stp
    FOR iy = Ymax TO Ymin+stp STEP -stp
        Slope = (HZcalc(ix,iy) - HZcalc(ix,iy-stp))/stp
        YIntercept = HZcalc(ix,iy) - (Slope*iy)
        FOR Y = iy TO iy-stp STEP -1
           ZcalcY(ix,Y) = (Y * Slope) + YIntercept
        NEXT Y
```

```
    NEXT iy
  NEXT ix


PaintIt:
  LOCATE 2,2
    PRINT " Smoothing and Painting ...                "
  WINDOW OUTPUT 1
  FOR iy = Ymax TO Ymin+stp STEP -1
  FOR ix = Xmin TO Xmax-stp
        Zcalc (ix,iy) = ZcalcY(ix,iy)
        Zvalu = Zcalc(ix,iy)
           FOR j = 1 TO NmbrOfContours
              IF Zvalu > = ContourLvl(j) THEN
              Kolor = j + 1
                 j = NmbrOfContours
              ELSE
                 Kolor = j + 2
              END IF
              PSET (ix,iy),Kolor
           NEXT j
    NEXT ix
  NEXT iy


SaveZcalc:
  IF MakeSectn = 1 THEN GOTO PlotStation
  IF Scalem$ < > "VistaPro" THEN GOTO PlotStation
  IF Smoothing = 0 AND stp < > 1 AND Scalem$ = "VistaPro" THEN GOTO PlotStation
  Work$ = "SaveZcalc"
  WINDOW 2,"",(200,200)-(500,240),2,1
  LOCATE 2,7
    PRINT "Save Zcalc? (Y/N)"
  YsNo a$
  IF a$ = "N" THEN GOTO PlotStation
  IF a$ = "Y" THEN
    IF LogZ$ = "Y" THEN
       FOR iy = YdMax TO YdMin STEP -1
          FOR ix = XdMin TO XdMax
             Zcalc(ix,iy) = 100 * Zcalc(ix,iy)
          NEXT ix
       NEXT iy
    END IF
    WINDOW CLOSE 2
    GOSUB Palet1
    ReqMsg$ = "Save .. Zcalc"
    GOSUB GetReq
    IF Worked% = 0 THEN
       GOSUB Palet2
       GOTO SaveZcalc
    END IF
    GOSUB Palet2
    WINDOW 2, "", (200,200)-(500,240),2,1
    LOCATE 2,7
```

```
        PRINT " Saving Zcalc ..."
      OPEN File$ FOR OUTPUT AS #1
      FOR iy = YdMax TO YdMin STEP -1
        FOR ix = XdMin TO XdMax
          PRINT #1,Zcalc(ix,iy);
        NEXT ix
        PRINT #1,
      NEXT iy
      CLOSE #1
      WINDOW CLOSE 2
  END IF


PlotStation:
  WINDOW 2,"",(100,200)-(600,240),2,1
  IF stp < > 1 THEN
      LOCATE 2,7
        PRINT " Color the Station locations with their values? (Y/N)"
      YsNo a$
      IF a$ = "Y" THEN GOSUB ColorStns
  END IF
  IF MakeSectn = 1 THEN
      WINDOW OUTPUT 1
      FOR i = 1 TO nd
        PSET (Xd(i),Yd(i)), 1
      NEXT i
      GOSUB DrawTopo
      GOTO SwitchColor
  END IF

  WINDOW 2,"",(100,200)-(600,240),2,1
      LOCATE 2,7
        PRINT " PLOT stations as: Squares, Points, or None? (S/P/N)     "

WaitHere:
  GOSUB Wayt
  a$ = UCASE$ (a$)
  IF a$ = "N" THEN
      WINDOW CLOSE 2
      GOTO SaveImg
  END IF
  WINDOW CLOSE 2
  IF MakeMp = 1 THEN
      LINE (Xdmin-1,Ydmin-1)-(Xdmax+1,YdMax+1),1,b
  END IF
  IF a$ = "S" THEN
      FOR i = 1 TO nd
        LINE (Xd(i)-2,Yd(i)-2)-(Xd(i)+2,Yd(i)+2),1,b
      NEXT i
      GOTO SwitchColor
  END IF
  IF a$ = "Y" OR a$ = "P" OR a$ = CHR$(13) THEN
      FOR i = 1 TO nd
```

```
        PSET (Xd(i),Yd(i)), 1
    NEXT i

    GOTO SwitchColor
 END IF
 BEEP
 GOTO PlotStation


SwitchColor:
 WINDOW 2,"",(150,200)-(600,240),2,1
 LOCATE 2,2
    PRINT" Switch Black and White colors before saving? (Y/N)"
 YsNo a$
 IF a$ = "Y" THEN
    WINDOW OUTPUT 1
    GOSUB Palet3
    Switch = 1
 END IF


SaveImg:
 WINDOW 2,"",(200,200)-(500,240),2,1
 LOCATE 2,7
    PRINT" Save Image? (Y/N)"
 YsNo a$
 WINDOW CLOSE 2


IffSave:
 IF a$ = "Y" THEN
    WINDOW 2,"",(100,100)-(600,300),2,1
    LOCATE 4,2
       PRINT "Close Windows and Screens of other programs that may be"
    LOCATE 6,2
       PRINT "running or active.  Workbench Windows are OK."
    LOCATE 8,2
       PRINT "Press Any Key When Ready."
    GOSUB PrsAnyKey
    CLS
    IF MakeSectn = 1 THEN
       LOCATE 4,2
          PRINT " The Cross Section you wish to save is from File:"
       LOCATE 6,2
          PRINT " ";VesSection$
       LOCATE 8,2
          PRINT " Section Length       = " SectionLength; Units$
       LOCATE 10,2
          PRINT " Vertical Exaggeration = " VertExg
    ELSE
       LOCATE 4,2
          PRINT " Map Width = " XMapWidth  " Length Units (Kilometers, etc)"
       LOCATE 8,2
          PRINT " Copy this number for making a Map Scale when  "
```

```
        LOCATE 10,2
            PRINT " using Deluxe Paint to annotate the map later."
    END IF
    LOCATE 12,2
        PRINT " Press Any Key When Ready. "
    GOSUB PrsAnyKey
    WINDOW CLOSE 2
    GOSUB Palet1
    work$ = "SaveIFF"
    ReqMsg$ = "Save .. IFF image"
    GOSUB GetReq
    IF worked% = 0 THEN Redo
    FileExists% = -1
    OPEN File$ FOR INPUT AS #1
    CLOSE #1

    IF FileExists% = -1 THEN
        WINDOW 2,"File Exists",(100,200)-(600,240),2,1
        LOCATE 2,2
        PRINT File$ "-File exists, Replace it? (Y/N)"
        YsNo a$
        IF a$ = "Y" THEN
            WINDOW CLOSE 2
            GOSUB Palet2
            IF switch = 1 THEN
                switch = 0
                GOSUB Palet3
            END IF
            WINDOW OUTPUT 1
            SetWindow WINDOW(7)
            SaveIFF SADD(File$+CHR$(0))
            GOTO Redo
        END IF
        IF a$ = "N" THEN GOTO SaveImg
    END IF


WriteIFF:
    GOSUB Palet2
    IF switch = 1 THEN
        switch = 0
        GOSUB Palet3
    END IF
    WINDOW OUTPUT 1
    SetWindow WINDOW(7)
    SaveIFF SADD(File$+CHR$(0))
 END IF


Redo:
    GOSUB Palet2
    WINDOW 2,"",(100,200)-(600,240),2,1
    LOCATE 2,7
    PRINT "Redo the Map/Section using different options? (Y/N)"
```

```
    YsNo a$
    WINDOW CLOSE 2
    GOSUB Palet1
    IF a$ = "Y" AND MakeMp = 1 THEN GOTO ScaleXY
    IF a$ = "Y" AND MakeSectn = 1 THEN
       AdjustWidth = 0
       GOTO VrtExg
    END IF
    GOTO MainMenu


' ************** Subroutines and SubPrograms follow *************

Palet1:
' This Palet is for colors in the windows, reqesters, etc
'  ForeGround and BackGround colors are determined by COLOR command.
 PALETTE 0, 0.1, 0.1,.6   ' Outside boundary and requestor typein bars
 PALETTE 1, 1, .95, .95   ' Foreground Color (off white)
 PALETTE 2, 0, 0, .8      ' BackGround Color (dark blue)
 PALETTE 3, 1, 0, 0
 PALETTE 4, 1, .4, 0
 PALETTE 5, 1, .6, 0
 PALETTE 6, 1, 0.8, 0
 PALETTE 7, 1, 0.9, 0
 PALETTE 8, 0, .9, 0
 PALETTE 9, 0, .7, 0
 PALETTE 10, 0,.5, 0
 PALETTE 11, 0, 1, 1
 PALETTE 12, 0,.7, 1
 PALETTE 13, 1, 1, 1   ' color of "vertical bar" cursor (White)
 PALETTE 14, 0, 0, 0
 PALETTE 15, 1, 1, 0   ' color of cursor in file-requester (Yellow)
RETURN

' This palette is for painting the Image
Palet2:
 PALETTE 0, 0, 0, 0
 PALETTE 1, 1, 1, 1
 PALETTE 2,.8, 0, 0
 PALETTE 3, 1, 0, 0
 PALETTE 4, 1, .4, 0
 PALETTE 5, 1, .6, 0
 PALETTE 6, 1, .8, 0
 PALETTE 7, 1, .9, 0
 PALETTE 8, 0, .9, 0
 PALETTE 9, 0, .7, 0
 PALETTE 10, 0,.5, 0
 PALETTE 11, 0, 1, 1
 PALETTE 12, 0,.7, 1
 PALETTE 13, 0,.5, 1
 PALETTE 14, 0, 0, 1
 PALETTE 15, 0, 0, .75
RETURN
```

```
Palet3:
    PALETTE 0,1,1,1
    PALETTE 1,0,0,0
RETURN


Wayt:
 a$ = INKEY$
 IF a$ = "" THEN Wayt
RETURN
PrsAnyKey:
 a$ = " Press Any Key to continue ... "
 Center 30, a$

Wait4Prss:
 a$ = INKEY$
 IF a$ = "" THEN Wait4Prss
RETURN


MainMenuEsc:
 a$ = " To Return to Main Menu and Discard Data press <Esc> "
 Center 30, a$
RETURN


RestoreAll:
 IF Restorem = 0 THEN
    FOR i = 1 TO nd
       XdTemp(i) = Xd(i)
       YdTemp(i) = Yd(i)
       ZdTemp(i) = Zd(i)
    NEXT i
    FOR j = 1 TO NmbrOfVES
       ElevationTemp(j) = Elevation (j)
    NEXT j
    ndTemp = nd
    Restorem = 1
    RETURN
 END IF
 IF Restorem = 1 THEN
    nd = ndTemp
    FOR i = 1 TO nd
       Xd(i) = XdTemp(i)
       Yd(i) = YdTemp(i)
       Zd(i) = ZdTemp(i)
    NEXT i

    FOR j = 1 TO NmbrOfVES
       Elevation (j) = ElevationTemp (j)
    NEXT j
    GOSUB MaxMin
 END IF
```

```
RETURN


ColorStns:
 WINDOW 2,"",(100,200)-(500,240),2,1
 CLS
 LOCATE 2,7
 PRINT " Superimposing station colors"
 WINDOW OUTPUT 1
 FOR i = 1 TO nd
    Zvalu = Zd(i)
    FOR j = 1 TO NmbrOfContours
       IF Zvalu > = ContourLvl(j) THEN
          Kolor = j + 1
          j = NmbrOfContours
       ELSE
          Kolor = j + 2
       END IF
       IF size = .5 THEN
          PSET (Xd(i),Yd(i)),Kolor
       ELSE
          LINE (Xd(i)-1,Yd(i)) - (Xd(i)+1,Yd(i)), Kolor
          LINE (Xd(i),Yd(i)-1) - (Xd(i),Yd(i)+1), Kolor
       END IF
    NEXT j
 NEXT i
 WINDOW OUTPUT 2
RETURN


CleanUp:
 WINDOW 2,"",(200,200)-(500,240),2,1
 CLS
 LOCATE 2,2
 PRINT " Trimming and Cleaning up .... "
 WINDOW OUTPUT 1
 LINE (Xdmin-1,Ydmin-1)-(Xdmax+1,YdMax+1),1,b
 PAINT (Xdmax+3,Ydmax+3),0,1
 LINE (Xdmin-1,Ydmin-1)-(Xdmax+1,YdMax+1),0,b
RETURN


Rotate:
 FOR i = 1 TO nd
    XdRotate = Xd(i)
    Xd(i) = Yd(i)
    Yd(i) = XdRotate
 NEXT i
RETURN


Origin:
 IF MakeSectn = 1 THEN RETURN
 IF XdRotate < > 0 THEN
```

```
    a$ = "1"
    GOTO FlipY
  END IF
  CLS
  LOCATE 8,10
  PRINT " Is the Y-axis of your data:"
  LOCATE 12, 10
  PRINT " (1)  Positive Upward."
  LOCATE 14, 10
  PRINT " (2)  Positive Downward."
  LOCATE 16,10
  PRINT " ------------------------"
  LOCATE 18,10
  PRINT " (3)  Return to Previous Menu."
  LOCATE 20,10
  PRINT " (4)  Return to Main Menu. "
  LOCATE 24,10
  PRINT "      Please Press Appropriate Number. "
  PrsNmbr 4, a$

FlipY:
  IF a$ = "1" THEN
     GOSUB MaxMin
     FOR i = 1 TO nd
           Yd(i) = YdMax - Yd(i)
     NEXT i
  END IF
RETURN


FixAspect:
  IF MakeMp = 1 AND Work$ = "LoadXY" THEN
     CLS
     LOCATE 10,10
     PRINT " Adjust Screen-Aspect Ratio in Y direction ? (Y/N)"
     LOCATE 14,10
     PRINT " In general Press  Y"
     LOCATE 16,10
     PRINT " Press  N  only if (X,Y) data were entered in pixels using"
     LOCATE 18,10
     PRINT "                    a digitizing tablet and Deluxe Paint."
     YsNo a$
     IF a$ = "Y" THEN
        FOR i = 1 TO nd
           Yd(i) = Yd(i) * 0.855
        NEXT i
     END IF
  ELSE
     FOR i = 1 TO nd
           Yd(i) = Yd(i) * 0.855
     NEXT i
  END IF
'  I use an aspect ratio correction of 0.855 instead of 0.9.
'  I am using a Sony Monitor with 0.25 pitch. Using 0.855 gives a more
```

```
'  correct ratio of width to Height on both HP-Laser and Xerox 4020 printers.
'  Graphics printer options in Amiga DOS set at Absolute to maximize print size.
RETURN

AspectOut:
 FOR i = 1 TO nd
    Yd(i) = Yd(i)/0.855
 NEXT i
RETURN



ChopTop:
    Counter = 1

    TopChop = DepthMax/50
    FOR i = 2 TO nd
       IF Yd(i) >= TopChop THEN
          Counter = Counter + 1
          Xd(Counter) = Xd(i)
          Yd(Counter) = Yd(i)
          Zd(Counter) = Zd(i)
       END IF
    NEXT i
    nd = Counter
RETURN


AdjstElevn:
 j = 1
 FOR i = 1 TO nd
    IF Xd (i) = Xd (i+1) THEN Yd(i) = Yd(i) - Elevation (j)
    IF Xd(i) <> Xd (i + 1) THEN
       Yd(i) = Yd(i) - Elevation (j)
       j = j + 1
    END IF
 NEXT i
RETURN


DrawTopo:
 WINDOW 2,"",(100,200)-(600,240),2,1
 CLS
 LOCATE 2,2
 PRINT " One moment .. adding topography, soundings, and cleaning up. "
 WINDOW OUTPUT 1
 J = 1
 K = 1
 GOSUB Triangle
 FOR i = 1 TO nd-1
    IF Xd(i) = Xd(i+1) THEN K = K + 1
    IF Xd(i) <> Xd(i+1) THEN
       GOSUB Triangle
       LINE (Xd(J), Yd(J)) - (Xd(K+1), Yd(K+1))
```

```
        K = K + 1
        J = K
    END IF
  NEXT i
  GOSUB Triangle
  LINE (XdMax+1,Yd(J)) - (XdMax+1, YdMax+1)
  LINE (XdMax+1, YdMax+1) - (XdMin-1, YdMax+1)
  LINE (XdMin-1, YdMax+1) - (XdMin-1,Yd(1))
  PAINT (Xdmax+3,Ydmax+3),0,1
  WINDOW CLOSE 2
RETURN
Triangle:
  PSET (Xd(J), Yd(J)-2)
  PSET (Xd(J), Yd(J)-3)
  LINE (Xd(J)-1, Yd(J)-4) - (Xd(J)+1, Yd(J)-4)
  LINE (Xd(J)-1, Yd(J)-5) - (Xd(J)+1, Yd(J)-5)
  LINE (Xd(J)-1, Yd(J)-6) - (Xd(J)+1, Yd(J)-6)
  LINE (Xd(J)-2, Yd(J)-7) - (Xd(J)+2, Yd(J)-7)
  LINE (Xd(J)-2, Yd(J)-8) - (Xd(J)+2, Yd(J)-8)
  LINE (Xd(J)-2, Yd(J)-9) - (Xd(J)+2, Yd(J)-9)
  LINE (Xd(J)-2, Yd(J)-10) - (Xd(J)+2, Yd(J)-10)
RETURN


ChopDpth:
    YdCounter = 0
    FOR i = 1 TO nd
        IF Yd(i) < = DepthMax THEN
            YdCounter = YdCounter + 1
            Xd(YdCounter) = Xd(i)
            Yd(YdCounter) = Yd(i)
            Zd(YdCounter) = Zd(i)
        END IF
    NEXT i
    nd = YdCounter
RETURN


Shrink:
  FOR i = 1 TO nd
    Xd(i) = INT(Xd(i)/2)
    Yd(i) = INT(Yd(i)/2)
  NEXT i
  XdMin = INT(XdMin/2)
  XdMax = INT(XdMax/2)
  YdMin = INT(YdMin/2)
  YdMax = INT(YdMax/2)
RETURN


MaxMin:
  XdMax = Xd(1)
  XdMin = Xd(1)
  YdMin = Yd(1)
```

```
  YdMax = Yd(1)
  ZdMax = Zd (1)
  ZdMin = Zd(1)
  FOR i = 2 TO nd
     IF XdMin > Xd(i) THEN XdMin = Xd(i)
     IF XdMax < Xd(i) THEN XdMax = Xd(i)
     IF YdMin > Yd(i) THEN YdMin = Yd(i)
     IF YdMax < Yd(i) THEN YdMax = Yd(i)
     IF ZdMin > Zd(i) THEN ZdMin = Zd(i)
     IF ZdMax < Zd(i) THEN ZdMax = Zd(i)
  NEXT i
RETURN


Initlz:
  Scalem$ = ""
  LogZ$ = ""
  a$ = ""
  b$ = ""
  c$ = ""
  d$ = ""
  nd = 0
  ndz = 0
  AdjustWidth = 0
  Restorem = 0
  Size = 0
  Smoothing = 0
  XdRotate = 0
  MakeSectn = 0
  MakeMp = 0
  NmbrOfContours = 0
  ContoursLogged = 0
  GOSUB Palet1
  COLOR 1,2
RETURN


SUB QwickSort (md,DN()) STATIC

  SA=1
  U(1)=1
  R(1)=md       ' md = number of elements to be sorted
10 UA=U(SA)
  RA=R(SA)
  SA=SA-1
20 UZ=UA
  RZ=RA
  RR=(UA+RA)/2
  X=DN(RR)
30 C=C+1
  IF DN(UZ)>=X THEN 40
   UZ=UZ+1
  GOTO 30
40 C=CA
```

```
  IF X> =DN(RZ) THEN 50
  RZ=RZ-1
  GOTO 40
50 IF UZ>RZ THEN 60
  S=S+1
  TZ=DN(UZ)
  DN(UZ)=DN(RZ)
  DN(RZ)=TZ
  UZ=UZ+1
  RZ=RZ-1
60 IF UZ< =RZ THEN 30
  IF UZ> =RA THEN 70
  SA=SA+1
  U(SA)=UZ
  R(SA)=RA
70 RA=RZ
  IF UA<RA THEN 20
  IF SA>0 THEN 10

END SUB


SUB Center (y, a$) STATIC
  X = (80 - LEN(a$))/2
  LOCATE y,x
     PRINT a$
END SUB


SUB PrsNmbr (Nmbr, a$) STATIC
Wait4Nmbr:
     a$ = INKEY$
     IF a$ = "" THEN Wait4Nmbr
     IF a$ = CHR$(27) THEN EXIT SUB
     b = VAL (a$)
     IF  b < 1  OR b > Nmbr THEN BEEP : GOTO Wait4Nmbr
END SUB


SUB YsNo (a$) STATIC
Wait4YsNo:
  a$ = INKEY$
  IF a$ = "" THEN Wait4YsNo
  a$ = UCASE$(a$)
  IF a$ = CHR$(13) THEN a$ = "Y"
  IF a$ = "Y" OR a$ ="N" THEN EXIT SUB
  BEEP
  GOTO Wait4YsNo
END SUB


Kwit:
  CLS
  LOCATE 10,10
```

```
 PRINT " Are you sure you want to Quit? (Y/N)"
 YsNo a$
 IF a$ = "Y" THEN LIBRARY CLOSE : SYSTEM
 IF a$ = "N" THEN GOTO MainMenu


ChkError:
 ON ERROR GOTO ChkError   'This is needed to keep on error active after resume!

'  ERR code 53 is for file not found
 IF ERR = 53 AND Work$ = "SaveXYZ" THEN FileExists% = 0 : RESUME WriteXYZ
 IF ERR = 53 AND Work$ = "SaveXY" THEN FileExists% = 0 : RESUME WriteXY
 IF ERR = 53 AND Work$ = "SaveZ"  THEN FileExists% = 0 : RESUME WriteZ
 IF ERR = 53 AND Work$ = "SaveContour" THEN FileExists% = 0 : RESUME WriteContour
 IF ERR = 53 AND Work$ = "SaveNmbrnDist" THEN FileExists% = 0 : RESUME WriteNmbrnDist
 IF ERR = 53 AND Work$ = "SaveIFF" THEN FileExists% = 0 : RESUME WriteIFF
 BEEP
 WINDOW 2,"",(50,150)-(600,300),16,1
 CLS
 PRINT
 PRINT " Error Number ", ERR
 PRINT
 IF ERR = 49 THEN PRINT " Error - Volume not found. Check drive name."
 IF ERR = 53 THEN PRINT " Error - Path not found. Check Drive, Directory, and File Names!"
 IF ERR = 64 THEN PRINT " Error - Directory not found "
 PRINT " ";Work$
 IF ERR = 23 OR ERR = 62 THEN
    PRINT
    PRINT "    Are you Loading the right file?"
    PRINT "    Are there extra carriage returns in the file you are loading?"
 END IF
 IF ERR = 11 THEN
    PRINT
    PRINT "   Can't Read this File, may be some non-ASCII stuff in it?"
 END IF
 PRINT
 PRINT " Press Any Key to Continue ..."
 GOSUB Wayt
 WINDOW CLOSE 2
 GOSUB Palet1
 IF Work$ = "LoadXYZ" THEN RESUME LoadXYZ
 IF Work$ = "LoadXY" THEN RESUME LoadXY
 IF Work$ = "LoadZ" THEN RESUME LoadZ
 IF Work$ = "LoadContour" THEN RESUME LoadContour
 IF Work$ = "LoadNmbrnX" THEN RESUME LoadNmbrnX
 IF Work$ = "LoadLayering" THEN RESUME ResumeitHere
 IF Work$ = "SaveZ" THEN RESUME SaveZ
 IF Work$ = "SaveContour" THEN RESUME SaveContour
 IF Work$ = "SaveXYZ" THEN  RESUME SaveXYZ
 IF Work$ = "SaveXY" THEN  RESUME SaveXY
 IF Work$ = "SaveNmbrnDist" THEN RESUME SaveNmbrnDist
 IF Work$ = "SaveZcalc" THEN RESUME SaveZcalc

 RESUME MainMenu
```

```
GetReq:
  OPTION BASE 0
  DEFINT a-z
  LIBRARY "arp.library"
  DECLARE FUNCTION FileRequest&(buffer&) LIBRARY
  DECLARE FUNCTION BaseName&(pathptr&) LIBRARY
  DECLARE SUB TackOn(path&,file&) LIBRARY
  FUNCTION GetFile%(fname$,message$,VAL scrnum%)
  LOCAL path$,file$,buffer&(11),result&,term%,scr&,buf&
' split up the pathname as required
  path$=SPACE$(80)
  LSET path$=fname$+CHR$(0)
  file$=SPACE$(40)
  result&=BaseName(SADD(path$))
  POKEB result&,0                    'into path$
  term%=result&-SADD(path$)
  LSET file$=RIGHT$(fname$,LEN(fname$)-term%)+CHR$(0)
' get the fr_buffer nset up and call ARP
  buf&=VARPTR(buffer&(0))
  POKEL buf&,SADD(message$+CHR$(0))
  POKEL buf&+4,SADD(file$)
  POKEL buf&+8,SADD(path$)
  POKEL buf&+12,0
  POKEW buf&+16,0                'flag
  POKEL buf&+18,0                'function
  POKEL buf&+22,0                'reserved
' handle custom screens (this is a bit messy, but it works...)
  IF scrnum% THEN
     scr&=PEEKL(SYSTAB+8+4*scrnum%)
     IF (scr&=0) OR (scrnum%<1) OR (scrnum%>4) THEN PRINT "Error":STOP
     POKEW buf&+26,&h217C
     POKEL buf&+28,scr&
     POKEL buf&+32,&h001E317C
     POKEL buf&+36,&h000F002E
     POKEW buf&+40,&h4E75
     POKEL buf&+18,buf&+26
     POKEB buf&+16,8
  END IF
  result&=FileRequest(buf&)
  IF result&=0 THEN
     GetFile%=0
  ELSE
     TackOn SADD(path$),SADD(file$)
     fname$=LEFT$(path$,INSTR(path$,CHR$(0))-1)
     GetFile%=-1
  END IF
  END FUNCTION

' file$=""
'   By Commenting above line the file requestor stays at the last place it was.

  DO
```

```
    worked = GetFile(file$,ReqMsg$,1)  '0=on Workbench screen
  LOOP UNTIL worked <=  0       'until selected or  cancelled
RETURN


IFFLoad:

' Note: Label changed from LoadIFF to IFFLoad to avoid conflict with LOADIFF command
  SetWindow WINDOW(7)
  CLS
  LOCATE 16,5
  PRINT "  AFTER viewing the IFF image: "
  LOCATE 18, 5
  PRINT "  Press Any Key. If nothing happens, Click Mouse in UpperLeft Corner. "
  LOCATE 19, 5
  PRINT "  ------------------------------------------------"
  LOCATE 22, 5
  PRINT "  Note: Images saved under AmigaDOS (<2.04) may be unstable."
  LOCATE 23, 5
  PRINT "        DO NOT Load images on screens larger than 704x480, and "
  LOCATE 24,5
  PRINT "        DO NOT Load 24-bit images, you may lock up the computer!."
  LOCATE 26,5
  PRINT "  Note: If you load a non-image file, nothing will be displayed!"
  GOSUB PrsAnyKey
  Work$ = "IFFLoad"
  ReqMsg$ = "Load .. IFF image"
  GOSUB GetReq
  IF Worked% = 0 THEN MainMenu
  LOADIFF SADD(File$+CHR$(0))
  GOSUB wayt
  GOSUB Palet1
  COLOR 1,2
  GOTO MainMenu
```

MakeVista Program Listing

```
' Program MakeVista

DIM lline!(258), nline!(258)
COLOR 2,1
item% = 0
LINE (0,0)-(630,180),1,bf
LOCATE 2,2
PRINT "Type path and Input-file  name:  ";
LINE INPUT infile$
LOCATE 3,2
PRINT "Type path and Output-file name: ";
LINE INPUT outfile$
OPEN "i",#2,infile$
OPEN "r",#1,outfile$,2048
OPEN "r",#3,"header.dem",2048
FIELD #1, 2048 AS ohead$
FIELD #3, 2048 AS ihead$
GET #3,1
LSET ohead$ = ihead$
PUT #1,1
CLOSE #3
CLOSE #1
OPEN "r",#1,outfile$,2
FIELD #1, 2 AS nword$
LOCATE 4,2
PRINT "Map Width  = ";
LINE INPUT x$
LOCATE 5,2
PRINT "Map Height = ";
LINE INPUT y$
yy% = VAL(x$)
xx% = VAL(y$)
FOR i% = 1 TO 258
  lline!(i%) = 0!
  nline!(i%) = 0!
NEXT i%
xnum& = 1025
IF xx% > 258 THEN xx% = 258
FOR i% = 1 TO xx%
  LOCATE 6,2
  PRINT xnum&, i%

  FOR j% = 1 TO yy%
    INPUT #2,a!
      ax% = a!
      nline!(j%) = a!
  NEXT j%
  FOR j% = 1 TO 258
    a! = nline!(j%)
    ax% = a!
    LSET nword$ = MKI$(ax%)
    IF Xnum& = 1025 THEN
      PUT #1, Xnum&
```

```
          Xnum& = Xnum& + 1
          GOTO nxtj
        END IF
        PUT #1
        Xnum& = Xnum& + 1
nxtj:
      NEXT j%
    NEXT i%
    FOR i% = xx% + 1 TO 258
      FOR j% = 1 TO 258
        LSET nword$ = MKI$(0)
        PUT #1
        Xnum& = Xnum& + 1
      NEXT j%
    NEXT i%
    CLOSE #1
    CLOSE #2
    STOP
```