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ENVIRONMENTAL
CENTER**

User's Manual for
ProbeCorder (Version 1.0)
Data Collection Software

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with Appendices by
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Developed by
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U.S. Army Construction Engineering Research Laboratories
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13. ABSTRACT *(Maximum 200 words)*
 ProbeCorder is a pen-based software tool designed to maximize the logistical efficiency of subsurface soil testing by automating the routine collection, integration, and storage of probe data in the field. It is especially targeted at intensive landscape scale investigations related to archaeology, pedology, and/or soils geomorphology. This user's manual provides complete documentation for implementing the software on a pen computing platform either as a "stand-alone" program or as an application module within the "mobile GIS/GPS" software environment known as FieldNotestm (PenMetrics, Inc., Corvallis, OR). It contains ten chapters that provide detailed instructions for electronic recording of sediment profile data using a linked series of Windows dialog boxes, and for utilizing other ProbeCorder features such as pick list customization, SQL querying, and report generation. Separate appendices cover the topics of pen-based hardware and software selection and the data requirements typically involved in sediment profile description.

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Foreword

This technology was developed for the Conservation Office of the Technology Demonstration and Transfer Branch, U.S. Army Environmental Center; Work Unit 001D8V, "ProbeCorder: Pen-Based Software for the Field Recovery of Subsurface Testing Data." The technical monitor was Kim Michaels, SFIM-AEC-ETD.

The work was performed by the Planning and Mission Impact Division (LL-P) of the Land Management Laboratory (LL), U.S. Army Construction Engineering Research Laboratories (USACERL). The USACERL principal investigator was Dr. James A. Zeidler, Research Archaeologist, Cultural Resources Research Center. Dr. Harold E. Balbach is Acting Chief, CECER-LL-P, Dr. William D. Severinghaus is Operations Chief, CECER-LL, and William Goran is Technical Director, Conservation and Environmental Quality.

COL James A. Walter is Commander of USACERL and Dr. Michael J. O'Connor is Director.

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Chapter One

Introduction

Congratulations, and thank you for using **ProbeCorder**! For more information about ProbeCorder, please contact:

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This guide is designed for users who may be using ProbeCorder on a desktop or pen-based laptop computer. Instructions are given for installing and operating ProbeCorder so both mouse and pen users can easily create ProbeCorder projects.

Topics discussed in this chapter:

- About This Manual
- Overview of the User's Manual
- Subsurface Testing in Archaeological and Pedological Investigation
- What is ProbeCorder?
- Registering Your ProbeCorder Product

About This Guide

This guide utilizes a specific formatting style to help you recognize and find particular information in a minimal amount of time.

Formatting Style Defined

Bold type indicates pen gestures to execute, or menu items to select.

Example: To close the window, **tap** on the [**Cancel**] button.

Example: **Tap** on **Survey Unit** from the main menu.

Bold type surrounded by brackets [] indicates a button that appears in the application that is "pushed."

Example: [**Save**]

CAPITALIZED type surrounded by arrows <> indicates a key that is pressed on the keyboard.

Example: <ENTER>

Italicized type indicates a special note or warning message.

Disclaimer

Throughout this document, and especially in Appendix A, commercial computer hardware and software products are discussed by trade name in conjunction with the ProbeCorder data collection software. Any discussion of specific products or any views or opinions expressed herein are solely those of the authors and do not represent either the views or policies of any agency of the federal government, including the U.S. Army, the U.S. Army Environmental Center (USAEC), or the U.S. Army Corps of Engineers, Construction Engineering Research Laboratories (USACERL).

Furthermore, selection of a particular product or brand name for review or discussion does not imply that it is the only suitable product available, nor does it constitute an endorsement of said product by the federal government or the U.S. Army. Likewise, exclusion of a particular product or brand name from the discussion does not imply that these products may not be suitable for use. Those products selected for discussion were determined by the limited funds available to conduct this research.

Overview of the User's Guide

Chapter 1 -- Introduction. This introduction provides a summary of ProbeCorder and a brief description of the guide's contents. It also covers the formatting convention used throughout the guide, and contains technical support and registration information.

Chapter 2 -- General Information. This chapter describes the system requirements, database structure, and on-line help for ProbeCorder. It also provides easy-to-follow instructions for installing ProbeCorder on your computer. If you are using the ProbeCorder application on a pen-based computer, you will also find helpful information regarding pen gestures in this chapter.

Chapter 3 -- Integrating ProbeCorder with "Mobile GIS" Software. This chapter provides instructions for integrating ProbeCorder with "mobile GIS/GPS" software packages such as FieldNotes[™] (PenMetrics, Inc.), GeoLink[™] (GeoResearch, Inc.), and Mobile[™] (GeoFirma, Inc.).

Chapter 4 -- ProbeCorder's User Interface. This chapter explains the elements that make up ProbeCorder's user interface.

Chapter 5 -- Getting Started with ProbeCorder. This chapter presents an overview of the typical operational environment within which ProbeCorder is applied. There are three examples that you can use as a prototype for your own applications: (a) subsurface probing for purposes of *archaeological site discovery* in arbitrary spatial units (e.g., quadrats, etc.); (b) subsurface probing for purposes of *archaeological site assessment* within an intra-site grid system; and (c) deep coring for purposes of geomorphological/pedological investigation.

Chapter 6 -- Module Number One -- Survey Unit Record. This chapter discusses the first of the four modules that constitute the ProbeCorder system. It focuses on the purpose and functionality of the Survey Unit Record module and also presents detailed instructions of how to use it for recording administrative information on the arbitrary spatial units within which subsurface probing is commonly conducted for purposes of site discovery.

Chapter 7 -- Module Number Two -- Site Record. This chapter describes the Site Record module of the ProbeCorder system. It focuses on the purpose and functionality of the module and also presents detailed instructions of how to use it for recording administrative information on these archaeological localities within which subsurface probing is commonly conducted for purposes of site assessment.

Chapter 8 -- Module Number Three -- Probe Information. This chapter describes ProbeCorder's Probe Information module. It focuses on the purpose and functionality of the module and also presents detailed instructions of how to use it for detailed recording of sediment profiles and, where present, the associated artifactual content from individual subsurface probes.

Chapter 9 -- Module Number Four -- Query. This chapter describes the Query module of ProbeCorder. It focuses on the purpose and functionality of the module and also presents detailed instructions of how to use it for retrieving and reporting probe data.

Chapter 10 -- Customization. As the creator of field projects, you need the flexibility of customizing the contents of some pick lists to best fit your recording activities. ProbeCorder allows you to achieve this flexibility through the use of a customization option which is described in this chapter.

Appendix A: Selecting Pen-based Hardware and Software. This appendix, by Dr. James A. Zeidler (Cultural Resources Research Center, U.S. Army CERL) provides comparative information on various pen-based computers and pen-based "mobile GIS/GPS" software packages currently on the market and available for use in field recovery applications. All of the hardware platforms (5) and software packages (3) examined herein have been tested for their relative compatibility with the ProbeCorder data collection software and are assessed for their user-friendliness in field situations.

Appendix B: How to Record a Soil Profile. This appendix, by Professor Donald L. Johnson (Department of Geography, University of Illinois, Urbana-Champaign) provides a step-by-step guide to the field procedures and descriptive terminology involved in recording a sediment profile. It follows the standards and recommendations of the Soil Survey Manual of the USDA Natural Resources Conservation Service (Soil Survey Staff 1984, 1993) and is consistent with the terminology and conventions employed by the ProbeCorder system.

Subsurface Testing in Archaeology and Pedology

Background

Systematic subsurface testing procedures, such as shovel-probing, postholing, or bucket augering, are an increasingly necessary solution to the problem of discovering archaeological sites obscured by dense ground cover or those that have been buried by depositional geomorphic processes. They are also commonly used in comprehensive significance assessments of archaeological sites where extensive testing of site depth, internal stratigraphy, and integrity is desirable. Depending on their size, depth, and spacing, these procedures can be extremely labor-intensive and costly when compared to traditional survey methods involving pedestrian surface inspection. They also generate enormous amounts of standardized paper forms which require additional steps of post-field data integration and digital transformation before final reports can be prepared.

Soil scientists and geomorphologists must also rely on subsurface testing for the study of regional landscape evolution, site-specific sedimentary sequences, or for the detection of deeply buried archaeological sites. These probes are often much deeper than the one-meter limit commonly employed in most archaeological testing and are carried out with a variety of mechanical excavation or probing techniques including augering, backhoe trenching, and deep coring. Due to the logistical constraints of mobilizing this equipment for repetitive probing and the longer data retrieval time per probe, field costs are quite high when compared to archaeological testing. Recordkeeping is carried out in essentially the same manner. Verbal descriptions and scaled drawings of sediment profiles are recorded on paper forms or notebooks in the field, and extensive lists are maintained for soil samples (or complete sediment cores) recovered for subsequent laboratory analysis.

The sheer volume of pedological and archaeological information normally recovered during intensive subsurface testing programs has often impeded the synthesis of this material in a timely manner and the detailed results are rarely incorporated into final reports. Long-term data storage is commonly accomplished through curation of the original paper forms, with little or no conversion to a digital database format. Subsequent information retrieval for management purposes is hindered by the inability of end-users to utilize these hand-written field notes due to their variable quality, consistency, and legibility. This situation has created a need for maximizing efficiency and consistency both in field data recording and in post-field data processing and integration.

In order to reduce the high costs and increase the efficiency of subsurface testing, the Cultural Resources Research Center of the U.S. Army Construction Engineering Research Laboratories (Champaign, IL) has developed ProbeCorder as an automated pen-based computer program for more efficient field collection, integration, and storage of subsurface probe data. The project was initiated with funds from the Legacy Resource Management Program and supports its broader goal of establishing cost effective, standardized methodologies for the collection, storage, and retrieval of cultural

resource information on Department of Defense landholdings. It is currently being supported by the U.S. Army Environmental Center's Technology Transfer and Demonstrations Branch (Aberdeen Proving Ground, MD) for final product enhancement and for distribution and implementation within the Department of the Army.

ProbeCorder was designed as a fully automated and highly efficient one-step system for field recording, sketch mapping, and computer database entry of subsurface testing data. It is a mobile recording system that employs ruggedized, portable, pen-based computer hardware and a pen-based, Windows[™] operating system. Resulting data sets are directly stored in an internal relational database with full querying capabilities to facilitate report generation in the field. Finally, the system has drawing capabilities so that field sketch maps and profile drawings can be readily stored as bitmaps and downloaded in a file format compatible with AutoCAD's[™] .DXF standard. Mobile pen-based computing provides substantial benefits for field data collection in that it combines the functionality of GIS and CADD in a mobile environment. By automating the recording and data storage process, considerable gains can be made in efficiency and accuracy when compared to traditional methods of field recording with paper forms and penciled sketch maps.

Pen-based computers function as handheld, battery-powered, "electronic clipboards" designed for maximum portability and rugged outdoor use. ProbeCorder has been developed for use with TelePad[™], Telxon[™], and Husky[™] brand pen-based computers with an Intel 80486 processing chip running Microsoft's Windows-for-Pen[™] operating system. These units also support internal Global Positioning System (GPS) technology such as Trimble Mobile GPS[™] PCMCIA card. The ProbeCorder module is a customized interface which operates either as a stand-alone program accessed directly from the Windows for Pen operating system or as an "applications" module in a "mobile GIS/GPS" software environment such as PenMetrics' FieldNotes[™]. Programs such as FieldNotes bring much of the functionality of GIS to the pen-based computer by allowing manipulation of drawings, images, and database records in the same environment. It combines efficient field data recording with powerful graphic display and storage capabilities which effectively integrate GIS, GPS, and CADD functions. Data collection and validation, inventory management, field mapping, and work order processing can all be carried out quickly, easily, and accurately.

Data Collection Requirements

The full automation of field data collection procedures for subsurface sediment probes requires that *all* of the data sets collected through the use of traditional field forms and gridded metric paper be retrievable in an electronic pen-based format. Moreover, it is crucial that this format be standardized, yet still allow for a modicum of descriptive customization to suit end-user needs and the archaeological and pedological particularities of a given region or locality. The ProbeCorder system was designed with these data collection requirements in mind.

Four kinds of field data can be recovered by the ProbeCorder data collection software, each of which has implications for automated recording and digital database

storage. The first involves basic locational and administrative information relating to the subsurface probes. It is important that this information be tied to specific UTM coordinates where possible, and that locational referencing be combined with mobile Global Positioning System (GPS) capability. With ProbeCorder, GPS data can be gathered either with a stand-alone unit or with an internal GPS PCMCIA card and related GPS software (e.g., Trimble's Mobile GPS™) installed on the pen-based computer. In either case, the UTM data must be entered into the ProbeCorder system with the pen stylus or keyboard and a separate log of all GPS readings should be maintained in the original GPS software. Once this coordinate data is entered into the ProbeCorder system, it can be used to interface with Geographic Information Systems (GIS) software for geospatial display and data analysis.

The second data set recovered by the ProbeCorder system involves detailed sediment descriptions for the individual sedimentary units exposed in a given probe. This is the core feature of ProbeCorder and one that justifies the complexity of its internal relational database. Its level of comprehensiveness in terms of sediment description recording capability falls somewhere in between that typically used in archaeological shovel-testing projects and the full-blown sediment descriptions employed by pedologists and geomorphologists. In order to provide the end-user with immediate guidance on the proper way to fully record a sediment profile, this manual includes an appendix entitled "How to Record a Soil Profile" by Professor Donald L. Johnson (Department of Geography, University of Illinois). Both that document and the ProbeCorder software conform to the descriptive standards and notational conventions established by the U.S. Department of Agriculture Natural Resources Conservation Service (formerly the Soil Conservation Service) as set forth by their Soil Survey Staff (1984, 1993).

ProbeCorder Version 1.0 has been designed to record the following items: Maximum Depth of the sedimentary unit below surface, Texture, Horizon, Sediment Structure, Unit Boundary, and Munsell™ Color. A Comments field is also included to record additional pedological features in an abbreviated format using a character string of up to 254 characters. The Texture and Horizon categories are fully customizable pick lists that can be modified to suit the end-user's preferences or to conform to conventional descriptive categories employed in a given region. Sediment Structure, Unit Boundary, and Munsell are each subdivided into component pick lists from which items are selected to form a unique code in accordance with Soil Survey Staff (1984, 1993) conventions. Sediment Structure is subdivided into Grade, Class, and Type; Unit Boundary is subdivided into Distinctness and Topography; and Munsell Color is subdivided into Value, Hue, and Chroma for dry and moist states. Other descriptive categories commonly used by pedologists and geomorphologists, such as color mottling, consistence, pH reaction, inclusions, bioturbation, pores, clay films, roots, etc. (see Appendix B), can only be accommodated in ProbeCorder Version 1.0 through use of the Comments field, or through customization of the Feature function in the Probe Content screen (see below). However, it is anticipated that future versions of ProbeCorder will expand the sediment description capability to permit full recording of these categories through structured pick lists.

The third kind of data recovered by the ProbeCorder system is a scaled sketch of the sediment profile, whether it is exposed in the sidewall of a shovel test or a backhoe trench, or reconstructed from a deep core or auger hole. Profile sketches are standard features of traditional recording forms, yet they take an inordinate amount of time to convert to electronic format. The ProbeCorder "sketch pad" feature was explicitly designed to provide this capability by permitting profile sketching in 1 meter increments up to a maximum depth of 20 meters. The ProbeCorder report-generation feature can then print out this 1 meter sketch and its associated sediment and artifact/feature information on a single page of output. The sketch is saved in the ProbeCorder database as a bitmap file that can be immediately downloaded into AutoCAD's .DXF format standard for later manipulation and graphic enhancement in illustration software packages such as Adobe Illustrator™.

The fourth and final data set recovered by the ProbeCorder system involves information on associated archaeological artifacts and/or cultural features recovered in the probes. Both of these categories are recorded using lists from customizable pick lists and both can be recorded in association with a specified depth below surface. In addition, for artifacts, the number of items recovered can also be specified and entered into the database along with the artifact category and its depth within the probe. The customization capability is essential here so that regional variability in the archaeological record can be accommodated as well as the level of analytical detail desired by the investigator. For example, an archaeologist may only be concerned with recording the presence of general artifact categories such as prehistoric ceramics, prehistoric flakes, historic ceramics, historic metal, etc. Others, however, may have an interest in recording fine-grained typological or temporal distinctions within these general categories, such as specific ceramic types or projectile point types. All of these possibilities can be accommodated. The customization capability of the Feature pick list can also be put to broader use by geomorphologists and pedologists for recording pedological inclusions or other geomorphological features commonly encountered in the sediments of a given study area such as clay films, crotonas, caliche layers, known paleosol horizons, etc. This is especially important for deep coring and augering where the recovery of archaeological artifacts and cultural features is less likely, but where detailed recording of "pedological features" is desirable.

Cost-Effectiveness

Systematic subsurface testing over an extensive landscape, whether it is carried out for archaeological, geomorphological, or pedological investigations, is extremely expensive and labor-intensive. While there is little that can be done to lower the high costs associated with the manpower requirement and equipment costs of the probing itself, considerable savings can be realized in field recording, data integration, and data analysis through the automation of field data collection. ProbeCorder has been developed with these considerations in mind. The cost effectiveness of the system is achieved by elimination of tedious and error-prone database entry and digitizing required by the use of

paper field forms and sketch maps. In many archaeological studies these data are not even synthesized for inclusion in final reports due to the laborious and expensive nature of the post-field data integration and analysis it entails. Thus, by establishing an *electronic format specification* for these kinds of data, and by providing a software module that can be easily implemented for field retrieval of such data, archaeological and geomorphological contractors can provide the requisite data in a more timely and cost-effective manner. In this way, the archaeological and pedological data recovered from positive subsurface probes can be incorporated into the digital record of their associated archaeological sites, rather than be consigned to long-term storage as an unutilized paper record. Perhaps more importantly, installation managers would have this information at their disposal in an automated digital format for incorporation into GIS-based decision support systems at a landscape scale.

What is ProbeCorder?

The ProbeCorder software program is written in Microsoft's Visual Basic™ programming language and provides a user-friendly Windows™ environment for the complete field recording of subsurface testing data. It operates either as a stand-alone system accessed directly from the Windows Program Manager, or as an internal application module within a pen-based "mobile GIS" software environment such as Penmetrics' FieldNotes™.

How ProbeCorder Works

ProbeCorder consists of an integrated series of Windows dialog boxes which record administrative and locational references, sediment profile descriptions, and artifact/feature content for each probe within a user-defined survey unit and sampling geometry. The system permits a small sketch of each sediment profile to be drawn and saved as a bitmap file; each sedimentary unit identified in the profile can then be fully described in terms of its maximum depth, texture, horizon, structure, boundary, Munsell soil color, and artifact/feature content. All field data are then stored in an internal relational database which uses Microsoft's FoxPro™ .DBF format.

The module has full querying and report-generation capabilities. Querying can be conducted either with pre-defined database categories or with Structured Query Language (SQL) expressions. Report-generation capabilities include queried data tables or complete records of individual probes, and final output can be displayed on the screen or sent to a printer. Queried data tables can also be saved in Microsoft's Excel™ .XLS format for further manipulation, analysis, and display in a spreadsheet environment. Alternatively, the entire database record of a ProbeCorder recording session can be downloaded to the FoxPro program for more advanced data manipulation, analysis, and display in a relational database management system.

Finally, the ProbeCorder program has detailed context-sensitive, on-line Help screens to guide the user through the entire recording, querying, and report-generation process.

Chapter Two
General Information

This chapter provides general information about the ProbeCorder software, such as system requirements, installation instructions, database structure, and data management tips. Also included in this chapter is a description of ProbeCorder's convenient on-line Help features.

Topics discussed in this chapter:

- System Requirements
- Installing ProbeCorder
- Database Structure
- Data Management and File Transfer Issues
- On-line Help

System Requirements

ProbeCorder is designed to run on all computers that support Microsoft's Windows 3.1 or Microsoft's Windows for Pen Computing. It has NOT been fully tested for compatibility with Microsoft's Windows 95 so use of that operating system is not recommended at this time.

ProbeCorder is not computing intensive. We do, however, suggest that you run all Windows applications on at least a 486-based. The system should be equipped with 4 MB of RAM, although 8 MB or more is highly recommended. Appendix A provides useful information on five commercially available pen-based computers that have been used to test the ProbeCorder software. All five have at least 8 MB of RAM as a standard feature.

Finally, you should also ensure that your computer's CONFIG.SYS or AUTOEXEC.BAT files contain the MS-DOS[™] file SHARE.EXE, as the ProbeCorder program needs this for file-sharing purposes. If SHARE.EXE does not reside in either of these files, consult your MS-DOS manual to install it.

Monitor Requirements

Even though ProbeCorder can be run on any monitors that support Windows 3.1, Super VGA is usually recommended for the best resolution and color.

Disk Storage Requirements

The ProbeCorder program requires about 5MB of available disk space. However, each database created by ProbeCorder will have its own unique disk space requirements. Empirical testing is the only reasonable way to determine the amount of space required for your field recording needs. The following items will have a direct effect upon the disk space requirements for a ProbeCorder database:

- the number of database records;
- the number of completed fields in each record; and
- the number of images or bitmap files.

In view of this uncertainty in the disk storage requirements, it is strongly recommended that the user periodically check the available disk space on the hard drive by accessing the Windows 3.1 File Manager or by using the **dir** or **chkdsk** commands in MS-DOS. If and when the hard drive becomes full, the ProbeCorder databases can simply be downloaded to floppy diskettes or directly to another computer via the MS-DOS Interlnk program. Instructions for carrying out these file transfers will be given in a subsequent section of this chapter.

Windows for Pen Operating System

Windows for Pen Operating System is not required to run ProbeCorder. However, it is strongly recommended, especially for those who wish to conduct field data recovery with pen-based computer systems in remote outdoor settings.

When ProbeCorder is used with a pen-based computer, the pen is used to initiate commands, select menu items, move and resize windows, and to input character data and standardized pen gestures. Alphanumeric character data are input by writing with the pen stylus on the computer's screen in the same way you use a conventional pen. Pen gestures are easy to learn pen strokes that are used for entering special editing commands in a text field. For more information about handwriting recognition and pen gestures, refer to the *Microsoft Windows For Pen Computing User's Guide*.

Before actually implementing pen-based data recording with ProbeCorder, it is strongly recommended that you thoroughly familiarize yourself with the Windows for Pen operating system by doing the Microsoft tutorial entitled **Learning Pen Basics**. To access this directly from the Windows Program Manager, **tap** the pen stylus twice on the **Microsoft Pen Tools** icon. It is a self-paced tutorial specially designed to introduce the novice user to pen-based computing. It is divided into four sections:

- Basic Skills
- Basic Gestures
- More Gestures
- More Hints

After completing the **Learning Pen Basics** tutorial, it is strongly recommended that you use the **Trainer** module to create and formally name a handwriting recognition set for your own handwriting style. This can be easily loaded every time you use the same computer and other users of the same machine can likewise create and store their own recognition set. By fine tuning your recognition set, a handwriting interpretation rate approaching 100% can be achieved. The **Trainer** module is accessed directly from the **Microsoft Pen Tools** window in the Windows Program Manager. Simply **tap** the icon twice with the pen stylus and select the **Pen Palette** tool by double **tapping** its icon. When the **Pen Palette** window appears, locate the **[A]** button on the tool bar and double **tap** it with the pen stylus.

The **Pen Palette** also contains two important aids for entering pen data on the computer screen. First, in cases where the text fields don't have letter guides (tic marks) or in any applications that have little writing space, the **Writing Window** tool can be used to clearly write a character string within letter guides and then insert the string into a text field in the application. To access this tool, simply double **tap** the **Writing Window** icon in the **Pen Palette** tool bar (the second button from the left). This will open up an expandable writing window below the **Pen Palette** for character entry. To insert the text into the text field of your application, double **tap** the **[OK]** button on the **Pen Palette** tool

bar (the sixth button from the left). This will insert the text in the **Writing Window** at the current location of the cursor in your application. To clear the **Writing Window**, double **tap** the [X] button (the fifth button from the left).

Second, in cases where keyboard entry is desirable but an actual keyboard accessory is not available, the **On-Screen Keyboard** feature can be used to input data with the pen stylus. To call up the **On-Screen Keyboard**, double **tap** the keyboard icon on the **Pen Palette** tool bar (the third button from the left). A miniature keyboard appears on the computer screen and can be used for character entry in the same way as you would use an actual keyboard.

For more information about all of these features, refer to the *Microsoft Windows For Pen Computing User's Guide*.

Finally, whether you use a pen stylus or a keyboard, you may execute your alphabetic characters in either upper case or lower case. However, the ProbeCorder program will automatically convert all entries into upper case characters for purposes of standardization. This is especially important for conducting consistent and error-free querying of the database.

Installing ProbeCorder

Installation Instructions

The ProbeCorder system is contained on four installation diskettes. It can be installed on all IBM-compatible desktop and pen computers running Windows 3.1. It will also run in Windows 95, but has not been thoroughly tested in that operating system. To install ProbeCorder, follow the seven steps below:

- Step 1 Select **R**un from: the **F**ile pull-down menu from the Program Manager menu bar (or from the **[Start]** button in Windows 95).

The Run dialog box opens.

- Step 2 Insert Installation Disk 1 in the floppy disk drive.

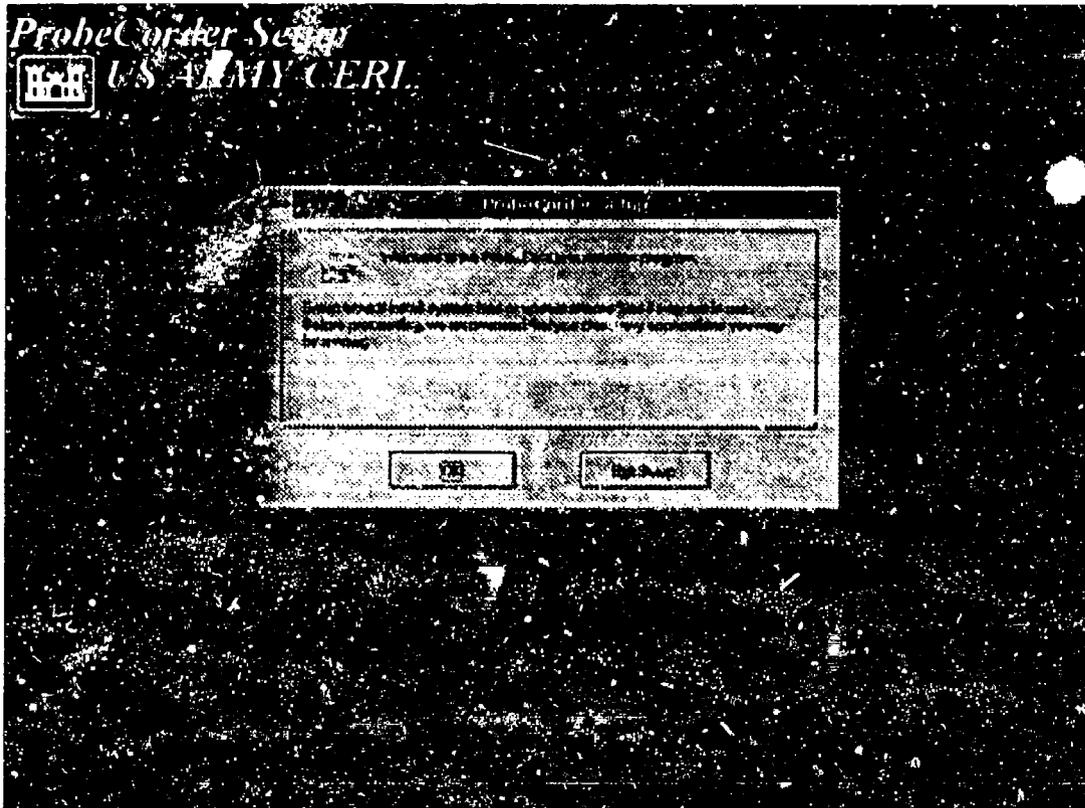
- Step 3 Enter the following text in the **C**ommand Line field in the Run dialog box:

A:SETUP

Note: Replace the above command line with "B:SETUPB" if you are installing from drive B: on your computer. However, we still assume that your WINDOWS directory resides in your C: drive.

- Step 4 Select **[OK]** in the Run dialog box.

The ProbeCorder Setup window opens accompanied by the ProbeCorder Setup dialog box, as shown below.



Step 5 Follow the prompts on the screen

The default directory for the installation is C:\PROBCORD.
If you prefer to designate another directory, you can click on the [Change Directory] button and make the necessary change. Then click the Installation Icon to install ProbeCorder.

Step 6 Follow the prompts on the screen for inserting Installation Discs 2, 3, and 4.

Step 7 Select [OK] in the Installation Complete message box.



Starting ProbeCorder

To start ProbeCorder:

- Step 1 If necessary, switch to the Windows environment.
- Step 2 Select the program group icon where ProbeCorder is installed.
- Step 3 Select the **ProbeCorder** icon.

The cursor changes to an hourglass indicating that the system is working. A brief title window appears followed by ProbeCorder's main menu.

At this point, you can start using ProbeCorder to record subsurface testing data.

Database Structure

There are a total of six (6) FoxPro database tables in the ProbeCorder system. Although detailed knowledge of these database tables is not required to use ProbeCorder, a basic familiarity with their internal structure is still helpful for understanding how the data are organized and stored in ProbeCorder.

Survey Unit Table

The SU.DBF is a database table that organizes the information recorded under the Survey Unit Record module. It includes the following 11 fields:

Field Name	Field Type	Length
SU	Character	4
SIZE	Character	10
ISSITE	Character	5
ZONE	Character	2
EASTING	Character	6
NORTHING	Character	7
TEMPLATE	Character	20
PROBETYPE	Character	10
TOTALEXE	Character	5
NEGAPROBES	Character	5
POSIPROBES	Character	5

Site Table

The SL.DBF is a database table that organizes the information recorded in the Site Record module. It includes the following 11 fields:

Field Name	Field Type	Length
SITE	Character	5
SITETYPE	Character	20
CULTAFFIL	Character	20
ZONE	Character	2
EASTING	Character	6
NORTHING	Character	7
TEMPLATE	Character	20
PROBETYPE	Character	10
TOTALEXE	Character	5
NEGAPROBES	Character	5
POSIPROBES	Character	5

Probe Table

The PROBE.DBF is a database table that stores the information recorded on the Probe Information screen. It consists of the following 7 fields:

Field Name	Field Type	Length
SU	Character	4
SITE	Character	5
PROBEID	Character	5
RECORDER	Character	20
DATE	Character	10
POSI_NEGA	Character	8
PROV_NO	Character	20

Artifact and Feature Tables

The ARTIFACT.DBF and FEATURE.DBF are the database tables that store the information recorded on the Probe Content screen. Each of them contains 4 fields, as follows:

Field Name	Field Type	Length
SU	Character	4
SITE	Character	5
PROBEID	Character	5
ARTIFACTS	Character	30

Field Name	Field Type	Length
SU	Character	4
SITE	Character	5
PROBEID	Character	5
FEATURES	Character	30

Deposit Table

The DEPOSIT.DBF organizes the information recorded on the Probe Deposit Entry screen. It contains the following 12 fields:

Field Name	Field Type	Length
SU	Character	4
SITE	Character	5

PROBEID	Character	5
LEVELID	Character	4
MAX_DEPTH	Character	10
TEXTURE	Character	20
HORIZON	Character	20
STRUCTURE	Character	20
BOUNDARY	Character	20
COMMENTS	Character	254
COLOR(DRY)	Character	20
COLOR(MOIST)	Character	20

Profile Sketch .BMP Files

In addition to the six database tables listed above, the ProbeCorder database also contains a series of graphic (.BMP) files associated with each probe for which a profile sketch is executed and saved on the ProbeCorder sketch pad. As these .BMP files are created, they are assigned filenames which tag them to a particular Survey Unit/Probe Number or Site/Probe Number. Thus the filename R15130.BMP indicates that this bitmap file pertains to Survey Unit R15, Probe No. 13, and the 0-100 cm increment displayed on the sketch pad. The filename R15131.BMP indicates the 100-200 cm increment on the sketch pad corresponding to the same Probe Number and Survey Unit. As another example, the filename WHC3512.BMP would correspond to the coring site WHC, Probe Number 35, and the 1200-1300 cm increment of the sediment column.

As long as these files remain in the ProbeCorder software program, there is no need to track their filenames. However, as soon as the ProbeCorder files are transferred to other software programs, this becomes an important issue. For example, while the database files may be transferred to FoxPro or another relational database program, the .BMP files might be transferred to a drawing program such as AutoCAD[™], Adobe Illustrator[™], or CorelDraw[™]. In this case, the association or electronic link between a given profile sketch and its corresponding probe is lost. The .BMP filename then becomes the key to linking these sketches with their original probe information in the context of post-field data integration and analysis.

It is important to remember that the length of the .BMP filename is limited to 8 characters, following the file naming conventions of the Windows 3.1 operating system. Thus in some cases it may be difficult to include in a single filename a Survey Unit or Site number, a Probe number, and an increment designation number to refer to the specific 100 cm increment. An extreme example would be a four-character SU number, a three-character Probe number, and an increment depth beyond 10 m. This would produce a illegal filename nine characters long. In such cases it is clearly the Survey Unit or Site number and the associated Probe number that are most important to preserve in the filename. Since each increment is labeled with the appropriate deposit entry number on each sedimentary unit, the reordering of multiple sketches for a single sediment column

should not be a problem. It is imperative, however, that both the Survey Unit or Site number and the Probe number appear as part of the eight-character filename. Thus the user should always ensure that the *combination* of characters that make up the Survey Unit or Site number *and* the Probe number do not exceed eight characters in length.

In most field recording situations, this should not be an issue. However, if it should become an intractable problem in certain field situations, then a viable alternative would be to simply label the sketch electronically with the Survey Unit or Site number and the corresponding Probe number (e.g., R36/16). This could be conveniently added to the top or bottom of the sketch with the pen stylus as recording proceeds. If all sketches are so labeled, then the constraints on filename length become a moot point.

Data Management and File Transfer Issues

In the course of a given field recording project, it will become necessary to transfer or "download" the ProbeCorder data files to another computer or to floppy diskettes. The most compelling reason to do this on a regular basis is to maintain backup copies of all field data. Because of the rugged outdoor nature of sediment profile recording with portable pen-based computers, data can be easily lost if accidents occur or if, for climatic or other reasons, the pen computer malfunctions. Thus backing up the ProbeCorder data files should become a "standard operating procedure" in all field recording projects.

Another reason for downloading may be to avoid filling up the disk storage capacity of the pen computer's hard drive. As mentioned previously in this chapter, the disk storage requirements of the ProbeCorder software vary with the nature and intensity of the field recording procedures themselves (i.e., the number of probes recorded, the completeness with which they are recorded, and the number of bitmap images recorded) and the storage capacity of the hard drive installed in a given pen computer. Determining the disk storage limits while running the ProbeCorder program is thus an empirical matter that must be continuously monitored for a given project and a given hardware configuration. It is strongly recommended that the user periodically check the existing disk capacity by accessing the Windows File Manager, clicking on the C: drive icon in the menu bar, and verifying the available storage capacity displayed on the status bar at the bottom of the screen. Alternatively, the MS-DOS operating system can be used to check disk space. At the C: prompt, simply type **dir** or **chkdsk** and the available disk space will be displayed.

If and when the disk storage capacity becomes full, it may be necessary to download the ProbeCorder files either to a floppy diskette or directly to the hard drive of another computer. Periodic downloading of the pen computer data files is a good idea anyway if all records are eventually destined for a master project database on a desktop computer. Once these data files have been transferred, they can be accessed either in the ProbeCorder program running on a desktop computer, in Microsoft's FoxPro relational database program, or any other database program that recognizes the .DBF file format. It is important to note, however, that prior to importing the files into a relational database program, the database structure must be set up to accommodate the ProbeCorder database files.

The "db_d" subdirectory contains the six ProbeCorder .DBF files discussed in the previous section, while the "bitmap_d" subdirectory contains all of the accompanying profile sketches. In order to transfer or download your ProbeCorder data files to floppy diskettes, follow the steps listed below:

- Step 1 Select File Manager from the Windows Program Manager and display the contents of the PROBCORD (default) directory.

- Step 2 Then highlight the "db_d" subdirectory.
- Step 3 Click on **File** in the File Manager tool bar.
- Step 4 Then select **M**ove from the pull-down menu. Note: For backing up files to a diskette or another computer, select **C**opy from the pull-down menu instead.
- Step 5 When the Move (or Copy) dialog box appears, enter the destination (pathname) of the ProbeCorder directory in the To: box.
- Step 6 Click [OK].
- Step 7 If the **M**ove command was used to transfer the entire database, then follow a similar procedure and copy all of the files in the "db_d_ini" subdirectory under the PROBCORD (default) directory to the "db_d" subdirectory. Then add the .DBF file extension to each file in this subdirectory using the Windows **R**ename command.

*Note: This step is required in order to restructure the ProbeCorder database after using the **M**ove command, since moving the files essentially removes not only the data content but the file structure itself. If the files are simply copied to a diskette or hard drive using the Windows **C**opy command, then Step 7 is not needed.*

- Step 8 Repeat Steps 1-6 for transferring the graphic data files in the "bitmap_d" subdirectory.

For the direct transfer of ProbeCorder data files from a pen based computer (client) to the hard drive of desktop computer (server), the same procedure can be followed using the MS-DOS[™] Interlnk program or commercial programs such as LapLink[™] by Traveling Software, Inc. For more information on these utility programs, consult the documentation provided by the corresponding software developer.

On-Line Help

Context-Sensitive Help

ProbeCorder has no comprehensive Help function. Instead, all of the on-line Help screens are "context-sensitive" in that they are accessed directly from the window or dialog box to which they pertain. Where the Help function appears, it is accessed by **tapping** a small button labeled [**H**ELP] which is usually located in the lower right corner of the window. This will either bring up a single Help screen with the desired information, or a menu containing a series of nested Help screens each providing information on a different topic.

For example, by **tapping** the [**H**ELP] button in the lower right corner of the Survey Unit Record screen, a Help window entitled **Help-Survey Unit Record** appears. This single screen contains all of the information on the Survey Unit Record module. By **tapping** the [**H**ELP] button on the Probe Information screen, however, a menu entitled **Probe Help** appears. This menu provides access to a nested series of Help screens dealing with different topics related to probe recording.

In both the single screen configurations and the final screens in the nested configurations, the Help information is provided in two sections:

- General Information
- Function Description

Working with the Help Windows

In cases where a Help menu appears after tapping a [**H**elp] button, the menu items containing additional information are all underlined. The corresponding Help screens can be accessed by **tapping** once on the underlined topic of interest. To exit a Help menu, it is recommended that the [**b**ack] function be used. This is located on the lower right portion of the Help menu, accompanied by a left arrow. To return to the original window, **tap** once on [**b**ack].

Probe Help

Help on this window:

 Probe Information

Help on the associated windows:

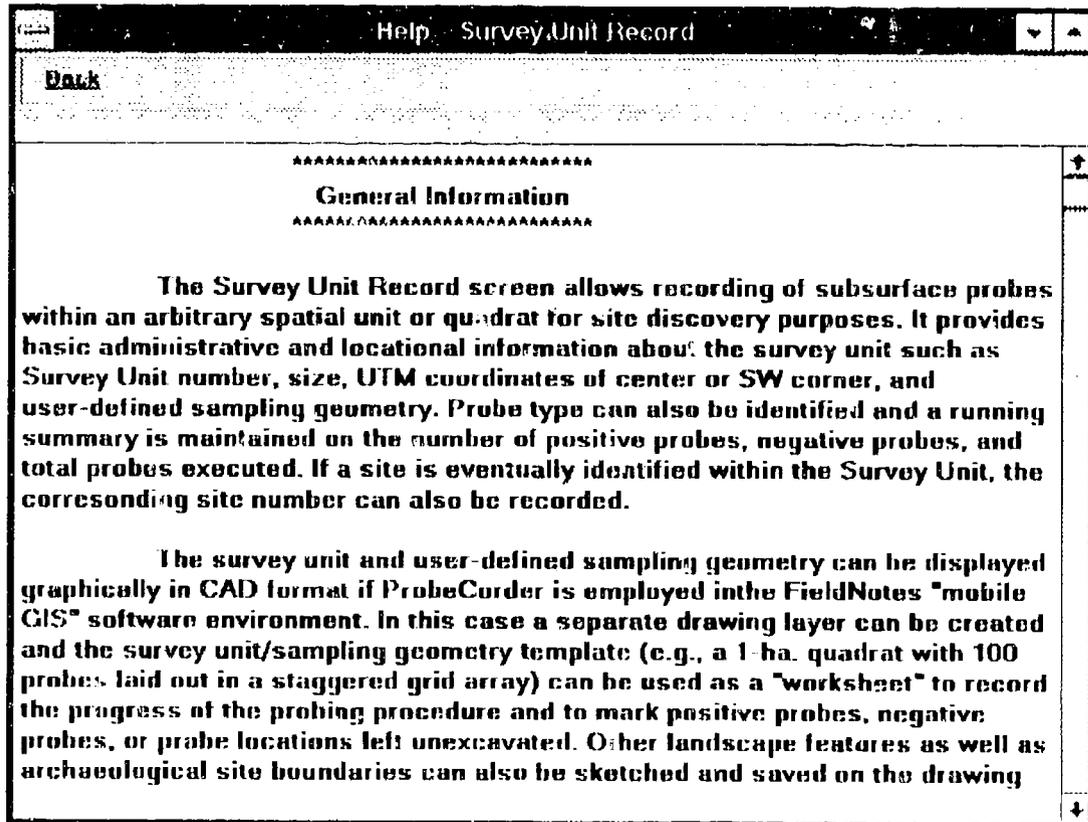
 Shallow or Deep Profile

- Deposit Entry
- Structure
- Boundary
- Color

 Probe Content

back 

The Help screens function like any standard Windows text box. A scroll bar is provided along the right side of the window to scroll through text that is longer than the minimal text box size. A tool bar also appears under the title bar, but in this case it contains only one item: [**back**]. To return to either the Help menu (in the nested configuration) or the original window (in the single screen configuration), tap this item once.



Chapter Three

Integrating ProbeCorder
with
“Mobile GIS/GPS” Software

This chapter provides instructions for integrating ProbeCorder with "mobile GIS/GPS" software packages such as PenMetrics' FieldNotestm, GeoFirma's FieldPack Mobiletm, and GeoResearch's GeoLinktm.

Topics discussed in this chapter:

- The Benefits of "Mobile GIS" Software
- PenMetrics' FieldNotestm
- GeoFirma's FieldPack Mobiletm and FieldPack Designertm
- GeoResearch's GeoLinktm

The Benefits of "Mobile GIS" Software

Chapter One introduced the topic of pen-based computing for field data collection and also made brief mention of "mobile GIS/GPS" software as a means of maximizing efficient locational referencing of field recording activities. While ProbeCorder has been developed to run in stand-alone mode directly from the Windows Program Manager, its functionality is significantly enhanced if it is interfaced with a "mobile GIS/GPS" software environment and all probe locations can be georeferenced with GPS technology and placed directly on a map of the study area. Where full GIS capability exists, the field locations become linked in a spatial database with the attribute data corresponding to a given location. The most powerful pen-based software tool on the market that has this capability is PenMetrics' FieldNotes. FieldNotes is a Windows-based geographic information system (GIS) and AM/FM (mapping and CAD) software package specially designed for field operation on pen computers. It brings much of the functionality of a GIS to desktop, laptop, and pen computers by allowing the user to work with drawings, images, and database records all in the same environment. The immediate benefits of this capability can be described in the following terms:

It offers an elegant solution to the problem of keeping complex GIS databases both current and accurate. The software lets mobile workers carry subsets of a host GIS into the field on a small personal computer. Using FieldNotes, field personnel can browse, validate, and update maps, engineering drawings, and databases in real time. The data captured in the field can then be transferred electronically to the host GIS, significantly reducing the cost of field data collection, conversion, and map updates (PenMetrics 1994:14).

FieldNotes also includes a software development kit, FieldForms[™], that allows the user to create customized electronic forms for field data recording. Once the recording form and subsequent database are created, the data can be viewed, analyzed, and queried using FieldNotes. Databases can be linked to either points or objects on a map.

As we shall see below, this linkage of a database to a point or object on a map is an important feature of "mobile GIS" field data recording and one that is extremely useful for archaeological, geomorphological, and/or pedological data collection over a regional landscape. For this reason, the ProbeCorder "stand-alone" version was also supplemented by an "extended" version that interfaces directly with the FieldNotes software environment (termed *ProbeCorder version 1.0 with FN extensions*). Its application within FieldNotes is treated in the next section of this chapter.

It should be noted that several "mobile GPS" software packages are currently on the market that permit field mapping with a pen computer using GPS data. Two of these, Geofirma's FieldPack Mobile[™] software package (by All Points Software) and GeoResearch's GeoLink[™] software package, will be discussed later in this chapter.

However, these are not true geographic information systems that allow spatial data to be linked to associated attribute data. Thus their utility for purposes of ProbeCorder applications is limited. Since ProbeCorder cannot be interfaced with them, they are best utilized as complementary data recording systems that run in parallel with ProbeCorder and generate separate databases of ancillary project information such as administrative data, locational (GPS) references, electronic sketch maps or field drawings, and related data logs (e.g., photographic records, etc.).

PenMetrics' FieldNotestm

Installation Instructions

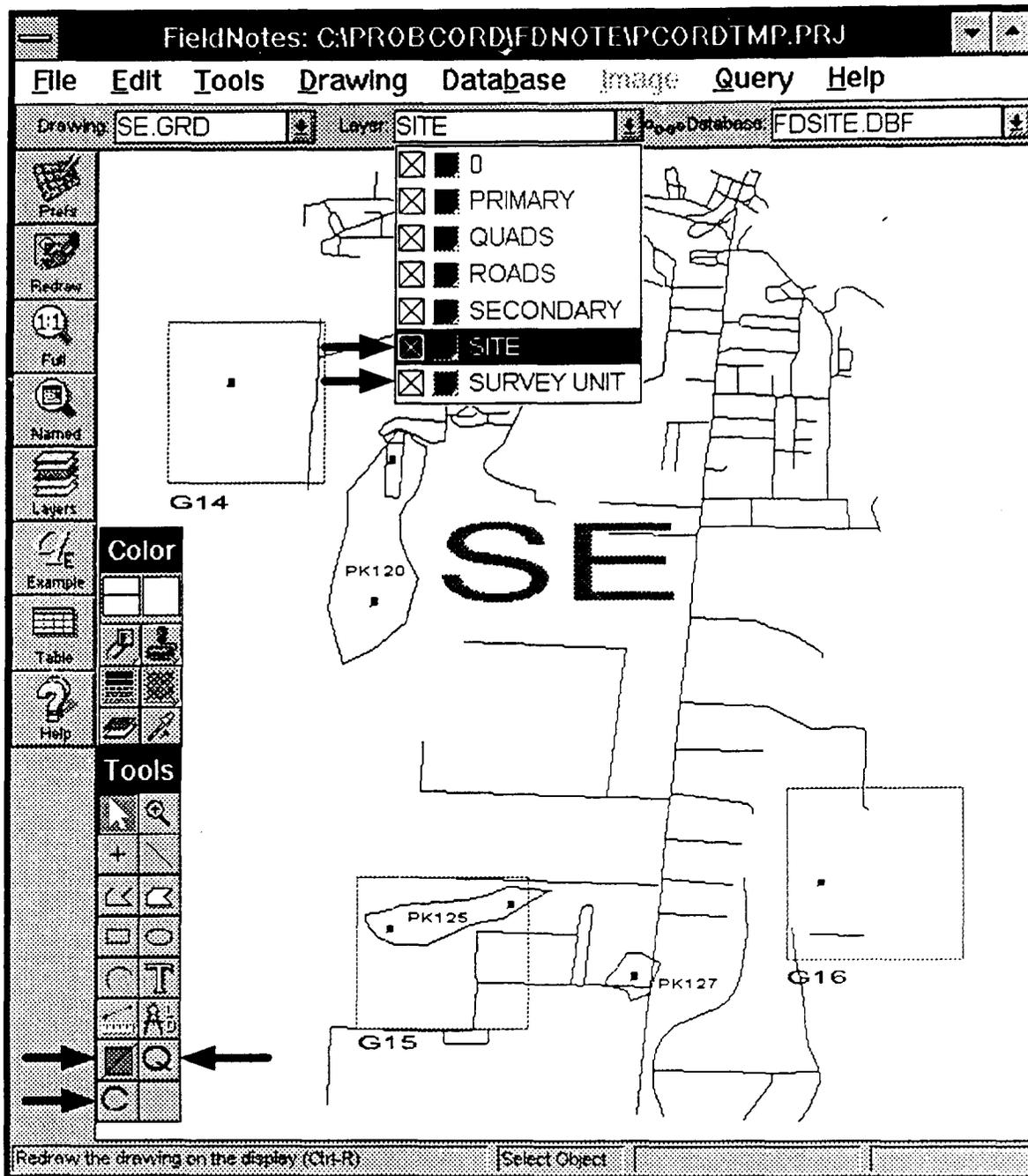
There are no special instructions necessary for installing either ProbeCorder or FieldNotes. The ProbeCorder system should be installed following the same set-up procedures outlined in Chapter 2 of this manual. The ProbeCorder (Version 1.0) system disks will permit the program to run either as a stand-alone application accessed directly from the Windows Program Manager or as an application within the FieldNotes software environment. The FieldNotes program should be installed according to the set-up procedures specified in Chapter 1 of the *FieldNotestm User's Manual* (PenMetrics, Inc. 1995).

Starting ProbeCorder within FieldNotes

Once you have installed both programs, ProbeCorder can be accessed from within the FieldNotes software environment by implementing the following steps:

- Step 1 Be sure that you are sufficiently familiar with the FieldNotes file menu and the way in which FieldNotes allows you to create a Project using associated drawing files, database files, and image files. These topics are described in Chapter 2 of the *FieldNotestm User's Manual* (PenMetrics, Inc. 1995)

- Step 2 Open a new Project by selecting **File/Open/Project** from the FieldNotes Main Menu. Then select the filename titled "PCORDTEMP.PRJ" from the PROBCORD directory on the C: drive. This is the ProbeCorder template file which sets up the ProbeCorder features within FieldNotes and allows them to be used as part of a given project. The immediate result will be the addition of three ProbeCorder icons to the bottom of the FieldNotes toolbar. These are as follows: (1) a small square with a diagonal line through it indicating the Probe Information module; (2) an upper case "Q" indicating the Query module; and (3) an uppercase "C" indicating the Customization feature.



Step 3

Open a user-defined drawing to display a project-specific background map as a .GRD file, e.g., a CAD-based topographic map of the user's study area. Then create new drawing layers for the ProbeCorder "Survey Unit" and "Site" categories by clicking the Layer Attributes function on the FieldNotes icon bar (or **Ctrl-L**). This will allow these objects to be created as a drawing layer and georeferenced to the map coordinates.

--When the Layer Attributes dialog box appears, click the "New" button to add the desired layers.

- When the "Define New Layer" prompt appears, type "Survey Unit" to create the Survey Unit layer and assign it a color.
- Repeat this procedure for the Site layer by typing "Site" and assigning a color.

Step 4

- Open Database by selecting **File/Open/Database** in the Main Menu. Then select the file FDSU.DBF and click **[OK]**.
- When the Object Database dialog box appears, create a Layer Link to "Survey Unit".
 - Repeat the procedure for the Site layer by selecting the file FDSITE.DBF and clicking **[OK]**.
 - When the Object Database dialog box appears, create a Layer Link to "Site".

Note: When accessing the PCORDTMP.PRJ file, the point databases corresponding to ProbeCorder's Probe, Query, and Customization modules will automatically be loaded in FieldNotes. The associated filenames are FDPROBE.DBF, FDQUERY.DBF, and FDCUST.DBF, respectively. The two object databases corresponding to ProbeCorder's Survey Unit and Site modules (FDSU.DBF and FDSITE.DBF, respectively) must be set up by the user for each project because they are linked to drawings. For more information on the distinction between point databases and object databases, consult Chapter 3 of the FieldNotes User's Manual (Version 4.0).

Step 5

- Change the template filename PCORDTMP.PRJ to a project-specific filename using the **File/Save As/Project** option in the Main Menu. This will enable you to create a project file which groups multiple files that can then be loaded as a unit. **Save As/Project** enables you to select a file name, directory, drive, file type, save type, or save options before saving a project. When all of these selections have been made in the Save As dialog box, click **[OK]** to save the new .PRJ file and create the Project, (e.g., TRACT5.PRJ, AREA32.PRJ, FLW_SU16, etc.).

*Note: Using the **File/Save As** option at the end of these set up procedures allows you to retain the ProbeCorder template file PCORDTMP.PRJ for future use.*

Other Integrating Notes

Once a specific ProbeCorder project has been created in FieldNotes, all of the tools available in the FieldNotes environment can be used for recording field data from subsurface testing operations and for creating and labeling drawings and maps related to the probe locations, archaeological sites encountered, etc. The ProbeCorder recording forms pertaining to Survey Unit Record and Site Record are accessed by simply tapping the pen (or clicking the mouse) on the mapped object (polygon) that represents these

records in the FieldNotes database. For example, in the illustration above, a pen tap anywhere inside the color-coded polygon labeled G14 will immediately bring up a blank Survey Unit Record screen that can then be filled out with the required administrative and locational information pertaining to it. When the blank form appears on the screen, you will note that it contains an additional button that does not appear on the Survey Unit Record screen when operated in "stand-alone" mode. When running ProbeCorder in FieldNotes "extended" mode, a **[Link]** button with red type appears in the lower central portion of the screen (see illustration below). When the cursor passes over this button, a short message appears on the screen to explain its function. Tapping or clicking on this button as soon as the blank form appears will ensure that all of the data recorded on the form will be electronically "linked" with the mapped object that represents it on the map (in this case, a Survey Unit designated G14). The Survey Unit Record can then be filled in as usual (see Chapter 6 for more details). After saving the information, it is stored in the ProbeCorder SU.DBF data table and is linked to the FDSU.DBF object database in FieldNotes. Once this information is saved, the complete record can always be accessed for review or editing by simply tapping on the G14 survey unit depicted on the map. The same procedure applies to the Site Record screen. A pen tap anywhere inside the color-coded polygon labeled PK120 will bring up a blank Site Record form that can then be

Survey Unit Record

<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">SU</td> <td><input style="width: 80%;" type="text" value="G14"/></td> </tr> <tr> <td>Size</td> <td><input style="width: 80%;" type="text" value="1HA"/></td> </tr> <tr> <td>Site?</td> <td><input style="width: 80%;" type="text"/></td> </tr> </table>	SU	<input style="width: 80%;" type="text" value="G14"/>	Size	<input style="width: 80%;" type="text" value="1HA"/>	Site?	<input style="width: 80%;" type="text"/>	<table style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2" style="text-align: center;">UTM Coordinates</td> </tr> <tr> <td>Zone</td> <td><input style="width: 80%;" type="text" value="15"/></td> </tr> <tr> <td>Easting</td> <td><input style="width: 80%;" type="text" value="523087"/></td> </tr> <tr> <td>Northing</td> <td><input style="width: 80%;" type="text" value="3433689"/></td> </tr> </table>	UTM Coordinates		Zone	<input style="width: 80%;" type="text" value="15"/>	Easting	<input style="width: 80%;" type="text" value="523087"/>	Northing	<input style="width: 80%;" type="text" value="3433689"/>				
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<table style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2" style="text-align: center;">Probe Type</td> </tr> <tr> <td><input checked="" type="radio"/></td> <td>Shovel</td> </tr> <tr> <td><input type="radio"/></td> <td>Posthole</td> </tr> <tr> <td><input type="radio"/></td> <td>Core/Auger</td> </tr> <tr> <td><input type="radio"/></td> <td>Exposure</td> </tr> </table>	Probe Type		<input checked="" type="radio"/>	Shovel	<input type="radio"/>	Posthole	<input type="radio"/>	Core/Auger	<input type="radio"/>	Exposure	<table style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2" style="text-align: center;">Probe Summary</td> </tr> <tr> <td>Total Excavated</td> <td><input style="width: 80%;" type="text" value="0"/></td> </tr> <tr> <td>Negative Probes</td> <td><input style="width: 80%;" type="text" value="0"/></td> </tr> <tr> <td>Positive Probes</td> <td><input style="width: 80%;" type="text" value="0"/></td> </tr> </table>	Probe Summary		Total Excavated	<input style="width: 80%;" type="text" value="0"/>	Negative Probes	<input style="width: 80%;" type="text" value="0"/>	Positive Probes	<input style="width: 80%;" type="text" value="0"/>
Probe Type																			
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<input type="radio"/>	Core/Auger																		
<input type="radio"/>	Exposure																		
Probe Summary																			
Total Excavated	<input style="width: 80%;" type="text" value="0"/>																		
Negative Probes	<input style="width: 80%;" type="text" value="0"/>																		
Positive Probes	<input style="width: 80%;" type="text" value="0"/>																		
<input type="button" value="Entry"/> <input type="button" value="Browse"/>	<div style="border: 1px solid black; padding: 2px; font-size: small; margin-bottom: 5px;">Link current record to FieldNotes current Survey Unit</div> <input type="button" value="Link"/>	<table style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2" style="text-align: center;">Sampling Geometry</td> </tr> <tr> <td><input style="width: 80%;" type="text" value="HA36/SQR"/></td> <td style="text-align: right;">↓</td> </tr> </table>	Sampling Geometry		<input style="width: 80%;" type="text" value="HA36/SQR"/>	↓													
Sampling Geometry																			
<input style="width: 80%;" type="text" value="HA36/SQR"/>	↓																		
<input checked="" type="button" value="Save"/> <input checked="" type="button" value="Cancel"/>	<input type="button" value="Exit"/> <input type="button" value="Help"/>																		

Status: Data Entry.

linked to the mapped object that represents it on the map, filled out with the desired information, and saved (see Chapter 7 for more details). This information is then stored in the ProbeCorder SI.DBF data table and is linked to the FDSITE.DBF object database in FieldNotes.

After defining either of these mapped objects in FieldNotes, the user can assign probe locations within them by grabbing the "point database symbol" in the FieldNotes Tools Palette and dragging it to the appropriate location on the map and tapping the pen. In this case, ProbeCorder uses the small square with a diagonal line through it to signify a probe location on the screen. This is the FieldNotes default icon signifying "Insert Database Record" (PenMetrics 1996:75). However, this icon can be replaced with a user-defined symbol if desired. Note that the size of the "point icon" can be reduced to the desired scale by using the Scalable Point Size function in the Preferences option of FieldNotes (Penmetrics 1996: 96). The database record tool places point database symbols on the screen. As soon as this point is tapped or clicked, the point becomes fixed on the map and a blank Probe Information screen appears. As in the case of the Survey Unit Record and Site Record screens, Probe Information also contains a [Link] button that should be immediately tapped or clicked to link the blank form to the point that represents it on the map. The series of nested screens that comprise Probe Information are then filled out as usual (see Chapter 8 for more details) and the information is then saved to the ProbeCorder PROBE.DBF data table and is linked to the FDPROBE.DBF point database in FieldNotes. Once the administrative information on the probe is saved, it can always be accessed for review and editing by simply tapping the pen on that point (probe) location.

By incorporating the ProbeCorder data collection software within a "mobile GIS" software environment such as PenMetrics' FieldNotes, its functionality is considerably enhanced because the sediment profile data can be immediately georeferenced and plotted on a study area map as fieldwork proceeds. PenMetrics also has a GPS software module that interfaces with FieldNotes (FieldNotes GPS) and provides integrated GPS data logging and mapping within the FieldNotes environment. The electronic field data can then be uploaded to a parent GIS system in a post-field setting for more sophisticated spatial analysis and graphic display. Other related graphic data can also be recorded such as electronic sketch maps and digital photographs. Administrative control is facilitated by grouping related files from a single project into a Project database.

Finally, for those who wish to practice operating ProbeCorder within the FieldNotes environment before creating a real project, a demonstration file is provided for this purpose in the ProbeCorder directory. The file is called PROBDemo.PRJ. It is fully executable and contains the hypothetical map data illustrated on page 3-6. The corresponding data files for the Survey Units (G14, G15, and G-16), Sites (PK120, PK125, and PK127), and associated Probes are empty and can be used for practicing data entry procedures. It is also recommended that additional Survey Units, Sites, and Probe locations be added so that the user becomes completely familiar with these procedures.

GeoFirma's FieldPack Mobiletm and Designertm

Using Geofirma's FieldPack Mobile and Designer with ProbeCorder

As mentioned previously, there are a number of software packages currently on the market that allow the user conduct field data collection on a mobile pen computing platform. While these packages are not "mobile GIS" systems in the strict sense of the term, they do permit field collection, data logging, and mapping of Global Positioning System (GPS) information, and they provide a link between GPS data and desktop GIS and CAD systems. Unfortunately, the complex data recording and storage requirements of ProbeCorder do not permit it to be incorporated into these systems as an internal application. Thus, their utility for purposes of recording sediment profile data with ProbeCorder would be as parallel software packages for recording ancillary administrative and locational data pertaining to survey units, sites, and individual probes.

Geofirma's FieldPack software, by All Points Software, Inc., provides a good example of "mobile GPS" data collection software using a pen computing platform. It consists of two separate, but related products: FieldPack Designer and FieldPack Mobile. The former permits the creation of customized recording screens and databases templates that permit users to integrate text, ink data (e.g., signatures, sketch maps, etc.), digital images, and GPS information into a single electronic record (All Points Software 1995, 1996). FieldPack Mobile is the field data collection product that implements the customized databases and screens previously designed with FieldPack Designer. FieldPack Mobile allows the field data collectors to gather textual field notes, sketches, signatures, digital images, and GPS data on a mobile pen-computing platform (All Points Software, Inc. 1995, 1996).

The illustration below shows a potential use for FieldPack Mobile if implemented in tandem with ProbeCorder's stand-alone version. In essence, it can function as a separate Project Record in which a series of survey units and/or sites are recorded on the ProbeCorder Project Record form and related administrative and/or locational field data can be grouped together as a complement to the sediment profile data provided by ProbeCorder. These data categories include drawings, GPS information (latitude, longitude, altitude, date, and time), digital camera logs, a "film strip" function that permits groups of digital images to be associated with a given record, and a notepad function to record text. The illustration below shows the FieldPack icons that correspond to these categories of information. For example, FieldPack Mobile has a useful drawing tool (FieldPack Drawtm) that can be used to create an electronic sketch map of a survey unit or site and an associated array of probe locations. Other landscape features can also be sketched and saved on the same sketch.

The GPS function could be used in tandem with ProbeCorder to take GPS readings on survey unit, site, and/or individual probe locations to create a georeferenced

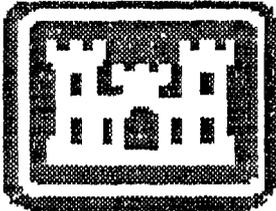
USER WINDOW

field.dbf

PROBECORDER PROJ CT 14 COND

SITE:

SURVEY UNIT:


US ARMY CLERK

DRAWING: 

GPS: 

CAMERA: 

FILM STRIP: 

NOTES: 

Enter text into field.

map of these locations (points and polygons) segregated by attribute for uploading to a GIS system. It is important to note, however, that the resulting map would not contain the detailed record of sediment attributes collected with the ProbeCorder software; rather, it would provide only the corresponding locational information for these data.

GeoResearch's GeoLink™

Using Geolink with ProbeCorder

The Geolink software by GeoResearch, Inc. can also be characterized as a GPS mapping tool which acts as a link to GIS or CAD-compatible formats. It consists of a Data Collection and a Data Management module. It is not itself a "mobile GIS" tool. It is a DOS-based program for pen-based or notebook computers whose primary operations include the following: (a) *recording* GPS position data and attributes entered in the field for automatic map creation or updating; (b) *displaying* the user's current position overlaid on a background map for purposes of navigation; (c) *editing* of previously collected position and attribute data; and (d) *translating* collected data into GIS or CAD-compatible formats (GeoResearch, Inc. 1995).

Geolink also supports other extension tools and modules of use to the field data collector. These include an External Data Source extension for connecting other measurement devices, a Raster Background Map module that prepares an image for use with the Data Collector and Data Manager products, and linking digital camera and video recorders to the system.

As in the case of GeoFirma's FieldPack Mobile, the primary Geolink GPS function could be used in tandem with ProbeCorder to take GPS readings on survey unit, site, and/or individual probe locations to create a georeferenced map of these locations segregated by attribute for uploading to a GIS system. It is important to note, however, that the resulting map would not contain the detailed record of sediment attributes collected with the ProbeCorder software; rather, it would provide only the corresponding locational information for these data.

Chapter Four

ProbeCorder's User Interface

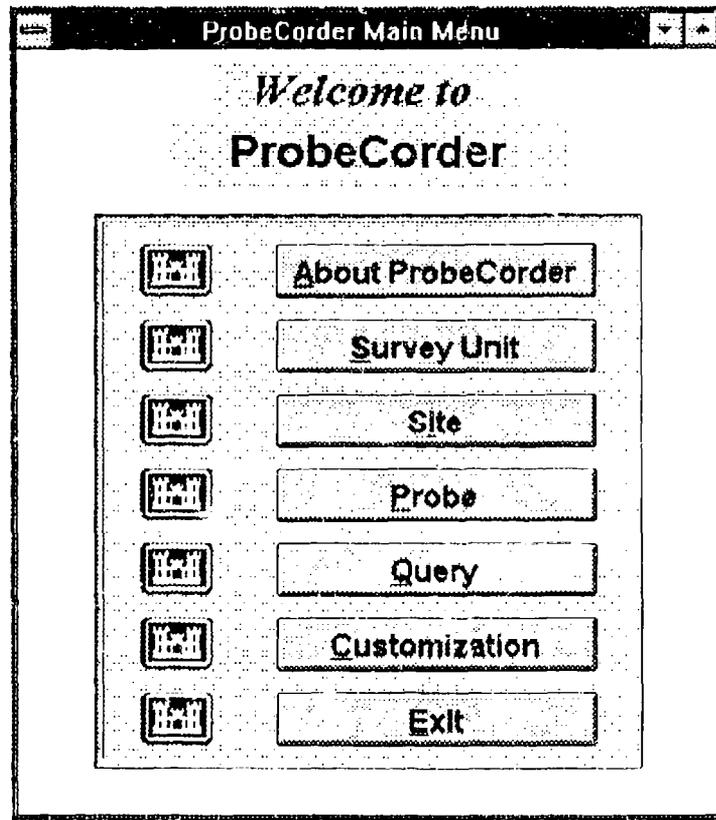
This chapter describes ProbeCorder's basic user interface. It explains the elements of ProbeCorder's Main Menu screen and how to use them. It also briefly reviews conventional features of the Windows 3.1 operating system that are employed by the ProbeCorder system.

Topics discussed in this chapter:

- ProbeCorder's Main Menu
- ProbeCorder's Window Basics

ProbeCorder's Main Menu

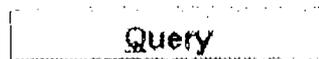
When ProbeCorder is started, the ProbeCorder **Main Menu**, or "main screen", is opened. This is the screen that controls access to different ProbeCorder modules. It is also the starting and ending point of a ProbeCorder data recording session.



Basically, there are three ways to activate the command buttons, which are usually three-dimensional, gray-colored rectangles with black captions in the center. The alternative selected depends on whether you are using a pointing device (e.g., a mouse or pen stylus) or a keyboard.

- Option 1 Use the mouse to point to the command button and **click** the left-hand mouse button, or use the pen to **tap** the command button.

- Option 2 Press **<ALT>** and the underlined letter of the caption simultaneously on the keyboard. For example, for the command button, **Q**uery:



Press and hold <ALT> and press Q.

- Option 3 Use <TAB> to highlight the command button and then **press** <ENTER> on the keyboard.

The seven command buttons on the main menu represent the seven options that comprise the different modules and features within the ProbeCorder system. These are described in greater detail in subsequent chapters. The options are as follows:

About ProbeCorder provides background information about ProbeC order, including:

- The developer name, year, and current version of ProbeCorder.
- ProbeCorder-at-a-Glance, which presents a general flowchart of the ProbeCorder system and recording procedure.
- ProbeCorder Overview, which provides a comprehensive description of the ProbeCorder system.

Survey Unit allows recording of subsurface probes within an arbitrary spatial unit (e.g., quadrat, transect, etc.) for site discovery purposes. It provides basic administrative and locational information about the survey unit such as Survey Unit number, size, UTM coordinates of center or SW corner, user-defined sampling geometry, and whether or not an archaeological site or isolated find(s) have been located there.

Site allows recording of subsurface probes within a known archaeological locality for site assessment purposes. It provides the same information as Survey Unit Record screen except that the Survey Unit number, Survey Unit size, and Site? fields are replaced with Site Number, Site Type, and Cultural Affiliation fields.

Probe permits recording of administrative details of each probe. The **Probe Information** screen also acts as a nested series of submenus for probe recording. These include the following descriptive categories:

- Profile Sketch
- Deposit Entry
 - Maximum Depth
 - Texture
 - Horizon
 - Structure
 - Boundary
 - Comments
 - Munsell Color (Dry)
 - Munsell Color (Moist)

- Probe Content
 - Artifacts Present (Number, Depth, and Category)
 - Features Present (Depth and Category)

Query allows you to query the ProbeCorder database and generate a report based upon the query results. Querying can be conducted either with pre-defined database categories or with Structured Query Language (SQL) expressions. Report-generation capabilities include queried data tables or complete records of individual probes.

Customization allows customization of certain pick lists used by ProbeCorder to suit specific data recording needs related to variations in the regional archaeological and/or pedological record, or to satisfy investigator preferences or project requirements.

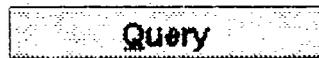
Exit exits the ProbeCorder system and returns you to the Windows Program Manager.

ProbeCorder Windows Basics

This section presents the basic elements of ProbeCorder's Graphic User Interface (GUI), which also closely follows the standards set by Microsoft Windows.

Command Button is a visible object that you can choose to perform a task such as display another window or exit an application. In ProbeCorder, command buttons are usually designed as three-dimensional, gray-colored rectangles with a black caption in the center. The caption on the command button illustrates the task this button performs. Examples of command buttons are:

Query button on the main menu



OK button



Extension Button is a special command button that opens a second-level window and allows you to define the current field using the options in the new window. In ProbeCorder, extension buttons only appear on the Probe Deposit Entry screen and appear as follows:



Option Buttons represent a group of "radio buttons" displaying multiple choices from which you can choose only one. They either assign the selected value to a database field or perform a corresponding task. An example of the former is the selection of the Probe Type employed, as follows:

Probe Type	
<input checked="" type="radio"/>	<u>Shovel</u>
<input type="radio"/>	Posthole
<input type="radio"/>	Core/Auger
<input type="radio"/>	Exposure

Pick List Box displays a list of items from which you may choose only one. The list can be scrolled if it has more items than can be displayed at one time. Certain pick lists in ProbeCorder can be customized with a Windows Text Editor to suit your own specific needs (see Chapter 10 for detailed information on this feature).

Example:

Sampling Geometry	
	2
HA36/SQR	
HA100/STG	
TR1010/LIN	

Text Box is used to accept user input and to display output. It holds text which you can either enter with the pen stylus, the on-screen keyboard, or an accessory keyboard. It can also be edited and/or changed at a later date.

Example:

UTM Coordinates	
Zone	<input type="text"/>
E. ng	<input type="text"/>
Northing	<input type="text"/>

Chapter Five

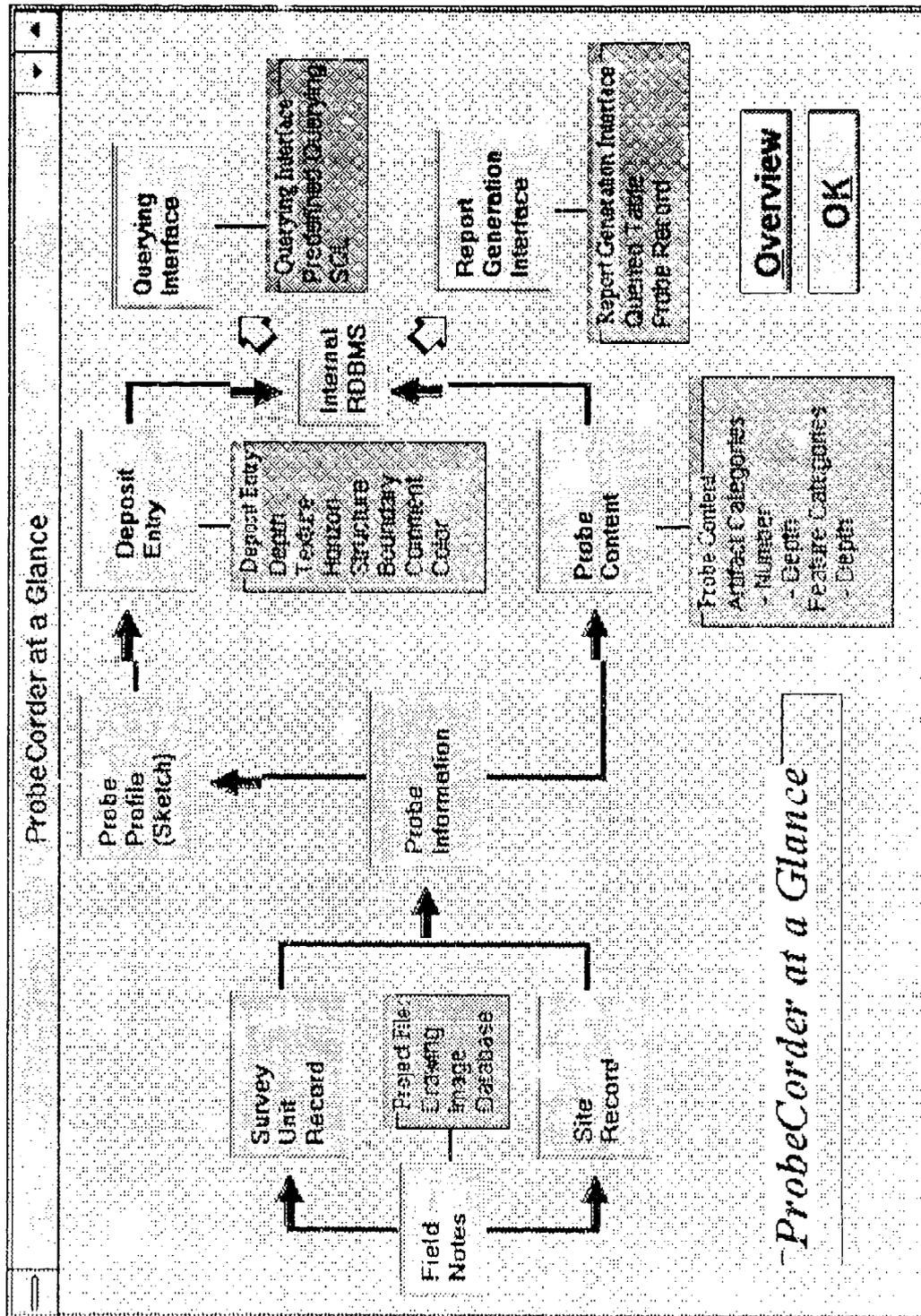
*Getting Started With
ProbeCorder*

This chapter provides an overview of ProbeCorder's internal structure by means of an operational flowchart and presents two hypothetical scenarios for the actual implementation of the software in field data collection tasks related to sediment profile recording, whether for archaeological or strictly pedological investigations.

Topics discussed in this chapter:

- ➔ Operational Flowchart (ProbeCorder-at-a-Glance)
- ➔ Typical Recording Procedure with ProbeCorder

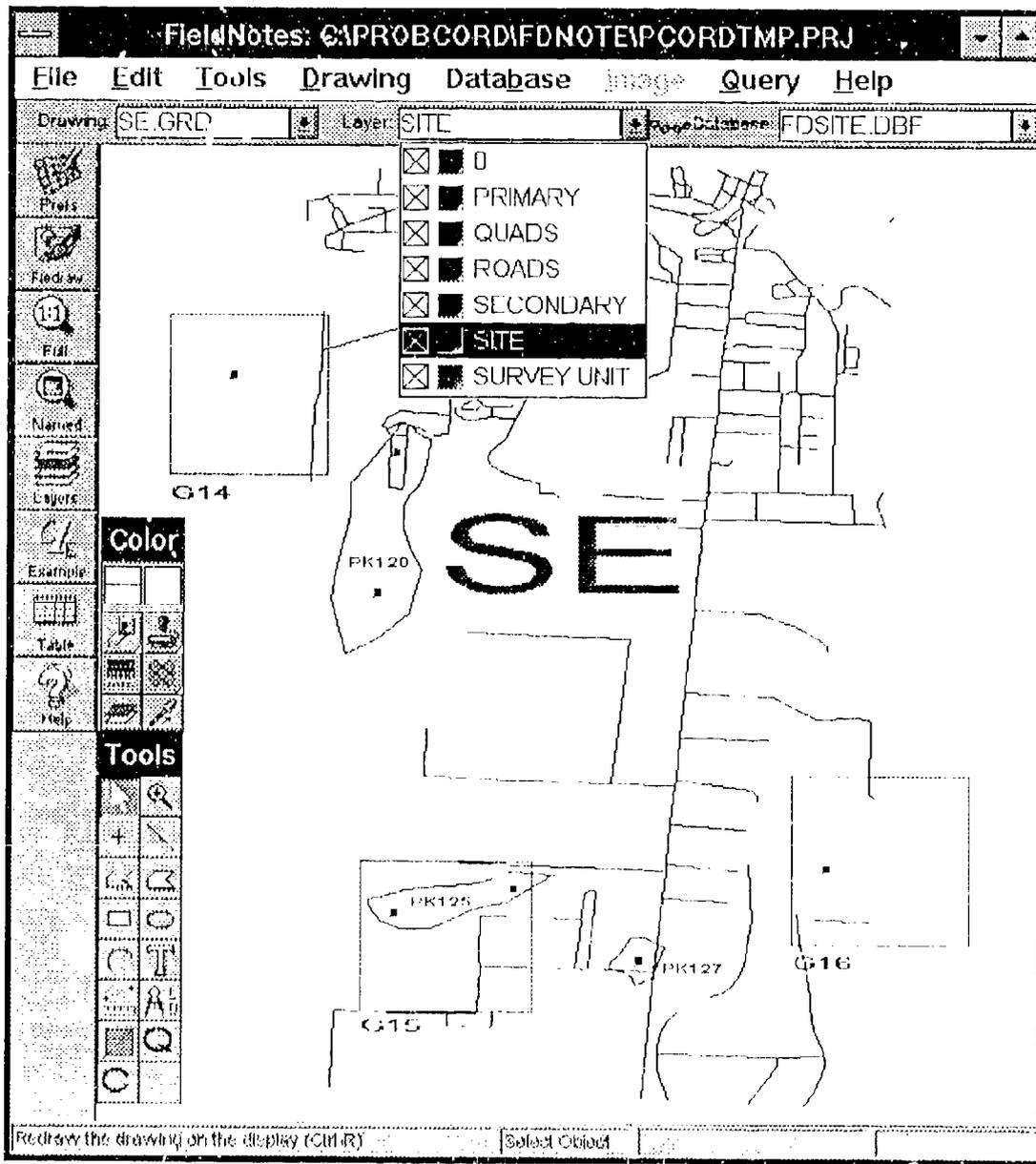
Operational Flowchart (ProbeCorder-at-a-Glance)



The "ProbeCorder-at-a-Glance" flowchart appearing on the previous page is a general information screen that can be accessed from the **Main Menu** by tapping on the **About ProbeCorder** button (see Chapter 4). Note that the **Main Menu** only appears when ProbeCorder is running in "stand-alone" mode. It does not appear when ProbeCorder is run as an application within the FieldNotes software environment. "ProbeCorder-at-a-Glance" illustrates in graphic form how the different components of the ProbeCorder system are configured and used for routine field recording of sediment profile data. It is largely self-explanatory and allows the novice user to become familiar with the program quickly and easily. It is also supplemented by a textual overview of the system that is accessed by tapping on the **Overview** button on the lower right of the screen. Much of the information provided in the overview is also covered in Chapter 1 of this manual. To return to the **Main Menu**, simply **tap** or **click** on **[OK]**.

Typical Recording Procedure with ProbeCorder

The "ProbeCorder-at-a-Glance" flowchart moves from left to right beginning with the FieldNotes software environment and its use of Project Files that include drawings, images, and databases (see Chapter 3). If the user wishes to implement ProbeCorder in this "mobile GIS" environment, then the Survey Units and/or Sites to be investigated can be defined spatially with reference to a background map, as described in Chapter 3. Once this is completed, the administrative and locational field data can then be recorded on the appropriate electronic form (Survey Unit Record or Site Record) by tapping or clicking



anywhere inside the polygons defined for a given Survey Unit or Site. Note that the latter can be drawn to approximate the irregular shape of a given site boundary (e.g., Sites PK120, PK125, and PK127 in the above figure). The former can be represented by any regular shape commonly used as an spatial sampling unit such as a square, rectangular, or circular quadrat or a long, linear transect (e.g., Survey Units G14, G15, and G16 in the above figure). Where transects are employed, they should not be represented as a line but rather as a polygon (rectangle) with a defined width. Alternatively, if ProbeCorder is implemented in "stand-alone" mode, then these electronic forms are simply accessed from ProbeCorder's **Main Menu**. The Survey Unit Record and Site Record forms are fully described in Chapters 6 and 7, respectively, and detailed instructions are provided on procedures used to record the required administrative and locational data. Multiple sediment profiles can then be recorded within these spatial units using the Probe Information module.

It should also be noted that FieldNotes has a Sketch function that permits the user to zoom into a Survey Unit or Site on the background map, create a specific sampling geometry of individual probe locations (e.g., 30-m spacing on a staggered grid, 25-m spacing on a square grid, 10-m spacing along a 100-m transect, etc.), and save it as a drawing overlay. This is an extremely useful tool for the fieldworker because it can be used as a "worksheet" to sketch landscape features on the site or survey unit map or to annotate the probe results with symbols indicating "positive", "negative", or "not excavated" as field work proceeds. It thus replaces the graph paper sketch map used in traditional field recording of subsurface probes.

After these records are completed and the necessary spatial context is defined for recording individual sediment profiles, the user proceeds to the first subsurface probe to be recorded within an Survey Unit or Site and accesses the Probe Information screen. In FieldNotes, this is accomplished by dragging and clicking the "point icon" in the lower left of the Tool Palette (the small square with diagonal line) to the desired location on the map. This brings up the Probe Information screen. When running in "stand-alone" mode, this screen is simply accessed from ProbeCorder's **Main Menu**. Probe Information provides the necessary administrative information on a given probe and functions as the gateway to all of the recorded data associated with it. It is fully described in Chapter 8 where detailed instructions are provided on procedures used to record the sediment data, archaeological artifact data, and any associated archaeological or pedological features of interest.

As the operational flowchart indicates, two sequential steps are involved in the sediment profile recording procedure: (1) describing the basic pedological properties of the sedimentary units themselves; and (2) describing associated archaeological information or other pedological features of interest. The first of these requires that the user also create a sketch of the profile using the drawing pad on the Probe Profile screen. The user can use this feature to execute a sketch a sediment column up to 20 meters in depth in successive increments of 1 meter. For subsurface testing involving shovel probing or postholing, depths usually range from 30 to 60 cm, and rarely exceed 100 cm. For deeper

testing in which bucket augers or coring instruments are employed, much greater depths can be attained but for archaeological purposes, they usually don't exceed 20 meters. In this case, the drawing pad automatically advances in 100 cm increments. The boundaries of each sedimentary unit or soil horizon are "inked" on to the drawing pad at the appropriate depth and then each unit or deposit is assigned an Arabic numeral from top to bottom and the number is inked on to the drawing pad. The numbering of each deposit in the sediment column is an essential step in the recording procedure as this becomes its principal "tag" in the database. If desired, different fill patterns or texturing symbols can also be added to the sketch to signify different sediment textures or soil horizons.

Once this profile sketch has been drawn and labeled, the sketch is saved and the user proceeds to the Deposit Entry screen. Here each of the sedimentary units defined and numbered in the profile sketch is characterized by its essential pedological properties using a series of nested pick lists and open fields for pen entry. It allows description of maximum depth, texture, horizon, sediment structure, unit boundary, Munsell soil color, and other comments (limited to a 254 character string). Both the texture and horizon pick lists are fully customizable allowing the user to employ a preferred system of texture description or horizon nomenclature.

After each of the sedimentary units is described in this fashion, the information is saved and the user proceeds to the second step in the recording process: the Probe Content screen. Probe Content permits recording of associated archaeological material selected off of a customizable pick list, including the specification of number of specimens recovered and an associated depth or depth range. It also permits recording of archaeological or pedological features by depth or depth range, again by selecting these items from a customizable pick list. This function is extremely useful for the pedologist or soils geomorphologist in that descriptive items not covered by the basic recording features of the Deposit Entry screen can be recorded in a more flexible way by customizing the Feature pick list (e.g., named paleosol horizons, clay films, pores, pebble layers, etc.).

At this point, probe recording is complete and the user repeats the above procedures for each probe in the Survey Unit or Site. At any point in the recording process, ProbeCorder's internal relational database can be queried using predefined categories (e.g., Survey Unit information, Site information, Probe Information, etc.) or by using SQL (Structured Query Language) strings. Report-generation capabilities provide two output options: Queried Table output and for a complete Probe Report. Queried tables can be generated on the screen, sent to a printer, or saved for transfer to Microsoft's Excel[™] spreadsheet software for subsequent manipulation and analysis. A Probe Report provides all of the data recorded for a particular probe and can be generated for screen display or hard copy output on a printer. Both the Querying feature and the Report-Generation feature are fully described in Chapter 9.

It should also be noted that when ProbeCorder is running as an application within FieldNotes, both systems have querying functions but yield different kinds of data. Querying the FieldNotes databases will generate lists of X, Y coordinates for the mapped

polygons defined as object databases (i.e., Survey Unit and Site locations) and for the point locations defined as point databases (i.e., Probe locations). Any administrative or substantive information associated with any of these three categories should be queried using the Query function of the ProbeCorder system. This can be accessed by tapping or clicking on the "Q" button found at the bottom of the Tool Palette. When ProbeCorder is running in "stand-alone" mode, the Query function is accessed from the **Main Menu**.

Finally, it was noted in the above discussion that several pick lists in the ProbeCorder system are customizable. It is recommended that the user contemplate the data categories he or she wishes to use and customize all pick lists as part of the project setup procedures before field work begins. In "stand-alone" mode, the Customization feature is accessed from the **Main Menu**, while in "extended" mode within the FieldNotes software environment, it is accessed by tapping or clicking the "C" button on the bottom of the Tool Palette. This feature is fully described in Chapter 10.

Chapter Six
Module Number One:
Survey Unit Record

This chapter describes the first of the four modules that constitute the core features of the ProbeCorder system. It focuses on the purpose and functionality of the Survey Unit Record module and presents detailed instructions on its use.

Topics discussed in this chapter:

- About Survey Unit Record Module
- How to Use Survey Unit Record Module
- Function Summary

About Survey Unit Record Module

The Survey Unit Record module allows recording of subsurface probes within an arbitrary spatial unit (such as a quadrat or transect) for site discovery purposes. It provides basic administrative and locational information about the survey unit such as Survey Unit number, size, UTM coordinates of center or SW corner, and user-defined sampling geometry of probe layout within the unit. Probe type can also be identified and a running summary is maintained on the number of positive probes, negative probes, and total probes executed. If a site is eventually identified within the Survey Unit, that result can be indicated by entering a Y (Yes) in the appropriate field or by entering the corresponding site number. By recording the site number in the Survey Unit data table, the positive probes that resulted in the site's initial discovery can be cross-referenced at a later date with subsequent probing executed as part of the intrasite assessment of the same archaeological site. The illustration below depicts a blank Survey Unit Record screen.

The screenshot shows a window titled "Survey Unit Record". The interface is organized into several sections:

- UTM Coordinates:** Fields for "Zone", "Easting", and "Northing".
- Probe Type:** Radio buttons for "Shovel", "Posthole", "Core/Auger", and "Exposure".
- Probe Summary:** Fields for "Total Excavated", "Negative Probes", and "Positive Probes".
- Sampling Geometry:** A field with a dropdown arrow.
- Buttons:** "Entry", "Browse", "Edit", "Save", "Cancel", "Exit", and "Help".
- Fields:** "SU", "Size", and "Site?" on the left side.

At the bottom of the window, a status bar reads "Status: Data Entry.".

The Survey Unit Record screen also has a convenient **Browse** function that allows the user to examine the existing Survey Unit information contained in the database. It also allows editing of previously recorded data, after which the edited information is automatically saved to the database. Note that in the illustration on the previous page that the **Entry** and **Edit** buttons are not enabled. They can only be enabled by first tapping or clicking on the **Browse** button. Likewise, the **Save** button is not enabled, but in this case it is not enabled because the Survey Unit Record screen is blank. It becomes enabled as soon as data is entered on the screen.

The survey unit and user-defined sampling geometry can be displayed graphically in CAD format if ProbeCorder is employed in the FieldNotes "mobile GIS" software environment. In this case a separate drawing layer can be created and the survey unit/sampling geometry template (e.g., a 1 ha quadrat with 100 probes laid out in a staggered grid array) can be used as a "worksheet" to record the progress of the probing procedure and to mark positive probes, negative probes, or probe locations left unexcavated. See Chapter 3 for detailed information on the use of "mobile GIS" software packages with ProbeCorder.

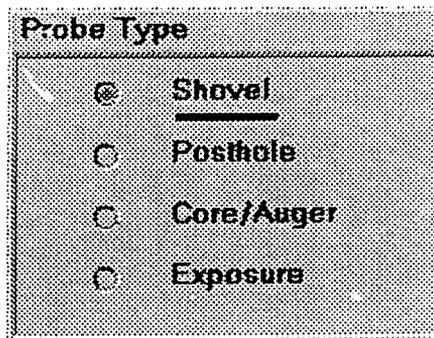
How to Use Survey Record Unit Module

Using the Survey Unit Record module is quite simple and straightforward. However, there are still some minor points that should be mentioned before you use it to record field data.

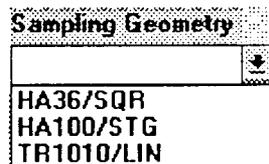
- The value for the 'SU' text box can be alphanumeric, but must not exceed 4 characters. Ideally you should be as parsimonious as possible and use the least number of characters that can be accommodated by your data requirements.
- The 'Size' text box also accepts alphanumeric values and has a length limit of 10 characters. Ideally it should represent a single value for the area of the Survey Unit (e.g., a quadrat measuring 1 hectare), but could also represent length and width values (e.g., a transect measuring 100 x 10 meters). In all cases, the unit of measurement should be abbreviated and placed flush against the numerical value to save space, (e.g., 1ha or 100x10m).
- The 'Site?' text box asks whether a site has been identified in this Survey Unit. If so, a site number designation may be entered in the text box. This site number can be alphanumeric (e.g., PK125), but it must not exceed 5 characters. Alternatively, the user may not wish to enter the entire site number, but only indicate that a site was or was not found. In this case a simple Y (Yes) or N (No) can be entered.

Note: If you wish to use the Smithsonian Trinomial Site Designation system, it is recommended that only the alphabetic County designation (2 characters) and the Site Number (up to 3 characters) within that county be used, and that the numeric designation for the state be eliminated. If a site number greater than 999 must be recorded, then the county designation would have to be shortened to a single initial to allow for the 5 character limit on site designations. This constraint will be remedied in future versions of ProbeCorder.

- For the 'UTM Coordinates,' we adopt the convention of using 2 digits for the **Zone** value, 6 digits for **Easting**, and 7 digits for **Northing**.
- To record 'Probe Type', **tap** or **click** one of the four option buttons under 'Probe Type'. The selected Probe Type should be underlined and only one type can be selected.
For Example:



- In the 'Probe Summary' text box, **Total Excavated = Negative Probes + Positive Probes**. As the individual probes are registered on the Probe Information screen (see Chapter 8 below) as either negative or positive, the Survey Unit screen provides a running tally of the results as the probe recording proceeds.
- To record the information for 'Sampling Geometry', **tap** or **click** the down arrow of the pick list and **select** the desired item. To modify this pick list for your own needs, use the ProbeCorder Customization feature. See Chapter 10 for more information on Customization.



- To activate the **Browse/Edit/Entry** functions, simply **tap** or **click** on the **Browse** button, as shown on page 6-3. In addition to enabling the **Entry** and **Edit** buttons, this action also temporarily replaces the **Save** and **Cancel** buttons (located below the **Browse** button) with a scroll feature. To edit a displayed database record, simply **tap** or **click** the **Edit** button and make the appropriate modification(s) in any of the data fields. Once the editing is completed, the modifications are immediately saved to the database (without using the **Save** button). To exit the Browse/Edit mode, simply **tap** or **click** on the **Entry** button. This will return you to the normal Data Entry mode and a new blank Survey Unit Record screen will be displayed. The Survey Unit Record screen also has a status bar at the bottom that indicates whether you are in Data Entry mode or Data Browsing mode.

The scroll feature is comprised of a caption indicating the database that is being browsed and a series of four scrolling arrows to the left and right of the caption (see illustration on page 6-7). In this case it is the Survey Unit Data, but the Browse feature is also included on the Site Record screen (see Chapter 7), Probe Information screen (see Chapter 8), and on the Probe Report screen (see Chapter 9). By **tapping** or **clicking** on the exterior arrows, the first database record (left

arrow) or the most current database record (right arrow) can be displayed. By **tapping** or **clicking** on the interior arrows, the browse feature advances in a single increment to either the previous database record (left arrow) or the next database record (right arrow).

It should be noted that the database records are stored *in the order in which they are recorded*. ProbeCorder does not allow you to sort these records and place them in a different order, except as an output file after querying (see Chapter 9). ProbeCorder is a data collection tool and does not contain a fully functional relational database management system. In order to carry out advanced data manipulation on these records, they must be transferred to Microsoft's Foxpro database management program (or a similar software program), as discussed in Chapter 2. Alternatively, queried database tables can be generated in the Query module and saved as Excel .XLS files for manipulation in a spreadsheet format.

Survey Unit Record											
<table border="1"> <tr> <td>SU</td> <td>R1</td> </tr> <tr> <td>Size</td> <td>1HA</td> </tr> <tr> <td>Site?</td> <td></td> </tr> </table>		SU	R1	Size	1HA	Site?					
SU	R1										
Size	1HA										
Site?											
<table border="1"> <tr> <td colspan="2">UTM Coordinates</td> </tr> <tr> <td>Zone</td> <td>13</td> </tr> <tr> <td>Easting</td> <td>243675</td> </tr> <tr> <td>Northing</td> <td>4763425</td> </tr> </table>		UTM Coordinates		Zone	13	Easting	243675	Northing	4763425		
UTM Coordinates											
Zone	13										
Easting	243675										
Northing	4763425										
<table border="1"> <tr> <td colspan="2">Probe Type</td> </tr> <tr> <td><input checked="" type="radio"/></td> <td>Shovel</td> </tr> <tr> <td><input type="radio"/></td> <td>Posthole</td> </tr> <tr> <td><input type="radio"/></td> <td>Core/Auger</td> </tr> <tr> <td><input type="radio"/></td> <td>Exposure</td> </tr> </table>		Probe Type		<input checked="" type="radio"/>	Shovel	<input type="radio"/>	Posthole	<input type="radio"/>	Core/Auger	<input type="radio"/>	Exposure
Probe Type											
<input checked="" type="radio"/>	Shovel										
<input type="radio"/>	Posthole										
<input type="radio"/>	Core/Auger										
<input type="radio"/>	Exposure										
<table border="1"> <tr> <td colspan="2">Probe Summary</td> </tr> <tr> <td>Total Excavated</td> <td>1</td> </tr> <tr> <td>Negative Probes</td> <td>0</td> </tr> <tr> <td>Positive Probes</td> <td>1</td> </tr> </table>		Probe Summary		Total Excavated	1	Negative Probes	0	Positive Probes	1		
Probe Summary											
Total Excavated	1										
Negative Probes	0										
Positive Probes	1										
<table border="1"> <tr> <td>Entry</td> <td>Browse</td> <td>Edit</td> </tr> </table>		Entry	Browse	Edit							
Entry	Browse	Edit									
<table border="1"> <tr> <td colspan="2">Sampling Geometry</td> </tr> <tr> <td></td> <td>HA100/STG</td> </tr> </table>		Sampling Geometry			HA100/STG						
Sampling Geometry											
	HA100/STG										
<table border="1"> <tr> <td>◀</td> <td>◀</td> <td>Survey Unit Data</td> <td>▶</td> <td>▶</td> <td>Exit</td> <td>Help</td> </tr> </table>		◀	◀	Survey Unit Data	▶	▶	Exit	Help			
◀	◀	Survey Unit Data	▶	▶	Exit	Help					
<p>Status: Data Browsing.</p>											

Function Summary

- Select [Save] button (or Alt-S) to save the information recorded on the Survey Unit Record screen to SU.DBF, a FoxPro database table, and to return to the Main Menu.
- Select [Cancel] button (or Alt-C) to clear all the text boxes on the screen.
- Select [Exit] button (or Alt-E) to return to the Main Menu. If data has been entered on the screen but not saved, then you will be prompted to either save the information before exiting or exit without saving it.
- Select [Help] button (or Alt-H) to get help.
- Select [Browse] button (Alt-B) to permit scrolling through the existing Survey Unit Record database. This button also enables the **Edit** and **Entry** buttons.
- Select [Edit] button (Alt-D) to modify existing data entries on the Survey Unit Record screen.
- Select [Enter] button (Alt-T) to exit the Browse/Edit mode and return to normal Data Entry mode.

Chapter Seven

*Module Number Two:
Site Record*

This chapter describes ProbeCorder's Site Record module. It focuses on the purpose and functionality of the module and presents detailed instructions on its use.

Topics discussed in this chapter:

- About Site Record Module
- How to Use Site Record Module
- Function Summary

About Site Record Module

The Site Record screen is designed for recording subsurface probes within a known archaeological locality for site assessment purposes. It provides the same information as Survey Unit Record screen except that the Survey Unit number is replaced with the Site number field, the Survey Unit Size field is replaced with a Site Type field, the Site? field is replaced with a Cultural Affiliation field.

As in the Survey Unit Record screen, the Site Record screen also has a convenient **Browse** function that allows the user to examine the existing Site information contained in the database. It also allows editing of previously recorded data, after which the edited information is automatically saved to the database. Note that in the illustration below that the Edit and Entry buttons are not enabled. They can only be enabled by first tapping or clicking on the **Browse** button. Likewise, the **Save** button is not enabled, but in this case it is not enabled because the Site Record screen is blank. It becomes enabled as soon as data is entered on the screen.

The screenshot shows a software interface titled "Site Record". It contains several sections:

- Site Information:** Three text input fields labeled "Site No.", "Site Type", and "Cult Affil".
- UTM Coordinates:** Three text input fields labeled "Zone", "Easting", and "Northing".
- Probe Type:** A list of four radio button options: "Shovel", "Posthole", "Core/Auger", and "Exposure".
- Probe Summary:** Three text input fields labeled "Total Excavated", "Negative Probes", and "Positive Probes".
- Sampling Geometry:** A text input field with a dropdown arrow.
- Buttons:** A row of buttons including "Entry", "Browse", "Edit", "Save" (with a checkmark icon), "Cancel" (with an X icon), "Exit", and "Help".
- Status:** A status bar at the bottom left displays "Status: Data Entry".

The archaeological site and user-defined sampling geometry can be displayed graphically in CAD format if ProbeCorder is employed in the FieldNotes "mobile GIS" software environment, and if a site map has been previously prepared in CAD format. In this case a separate drawing layer can be created and the survey unit/sampling geometry template can be used as a "worksheet" to record the progress of the probing procedure and to mark positive probes, negative probes, or probe locations left unexcavated. Landscape features, revised archaeological site boundaries, and other archaeological characteristics of the site can also be sketched and saved on the drawing layer. See Chapter 3 for detailed information on the integration of ProbeCorder with "mobile GIS" software packages.

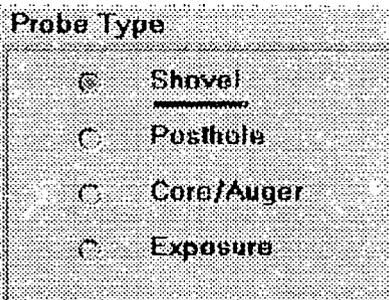
How to Use Site Record Module

Using the Site Record module is quite simple and straightforward. However, there are still some minor points that should be mentioned before you use it to record field data.

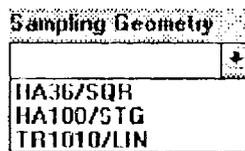
- The value entered in the '**Site No**' text box can be alphanumeric, but must not exceed 5 characters.

Note: If you wish to use the Smithsonian Trinomial Site Designation system, it is recommended that only the alphanumeric County designation (2 characters) and the Site Number (up to 3 characters) within that county be used, and that the numeric designation for the state be eliminated. If a site number greater than 999 must be recorded, then the county designation would have to be shortened to a single initial to allow for the 5 character limit on site designations. This constraint will be remedied in future versions of ProbeCorder.

- The '**Site Type**' text box allows the user to record a basic descriptive term for the nature of the archaeological site under study. This field is entirely a user-defined category and could be as simple as "open" versus "closed" (rockshelter/cave) sites, or it could include more complex functional site typologies, (e.g., lithic scatters, small camps, large camps, hamlets, small villages, large villages, caves/rockshelters, quarries, kill sites, etc.). It allows a maximum number of 20 characters, if necessary. However, project-specific codes or abbreviations should be used wherever possible to maximize data storage space.
- The '**Cultural Affiliation**' text box is also a user-defined category that allows recording of the temporal or cultural affiliation(s) of an archaeological site. These could be general period designations (e.g., Paleoindian, Archaic, Early Woodland, etc.) or more detailed cultural sequences including phase and/or subphase designations. As in the case of Site Type, a maximum number of 20 characters is allowable, but project-specific codes or abbreviations should be used wherever possible to maximize data storage space. This is especially important for multicomponent sites where more than one phase or cultural designation must be entered for a single site.
- For the UTM Coordinates, we adopt the convention of using 2 digits for the **Zone** value, 6 digits for **Easting**, and 7 digits for **Northing**.
- To record '**Probe Type**', tap or click one of the four option buttons under '**Probe Type**'. The selected Probe Type should be underlined and only one type can be selected.
For Example:



- In the 'Probe Summary' text box, **Total Excavated = Negative Probes + Positive Probes**. As the individual probes are registered on the Probe Information screen (see Chapter 8 below) as either negative or positive, the Survey Unit screen provides a running tally of the results as the probe recording proceeds.
- To record the information for 'Sampling Geometry', tap or click the down arrow of the pick list and **select** the desired item. To modify this pick list for your own needs, use the ProbeCorder Customization feature. See Chapter 10 for more information on Customization.



- To activate the **Browse/Edit/Entry** functions, simply tap or click on the **Browse** button, as shown on page 7-3. In addition to enabling the **Entry** and **Edit** buttons, this action also temporarily replaces the **Save** and **Cancel** buttons (located below the **Browse** button) with a scroll feature. To edit a displayed database record, simply tap or click the **Edit** button and make the appropriate modification(s) in any of the data fields. Once the editing is completed, the modifications are immediately saved to the database (without using the **Save** button). To exit the Browse/Edit mode, simply tap or click on the **Entry** button. This will return you to the normal Data Entry mode and a new blank Site Record screen will be displayed. The Site Record screen also has a status bar at the bottom that indicates whether you are in Data Entry mode or Data Browsing mode.

The scroll feature is comprised of a caption indicating the database that is being browsed and a series of four scrolling arrows to the left and right of the caption. In this case it is the Site Data, but the Browse feature is also included on the Survey Unit Record screen (see Chapter 6), the Probe Information screen (see Chapter 8), and on the Probe Report screen (see Chapter 9). By **tapping** or **clicking** on the exterior arrows, the first database record (left arrow) or the most

current database record (right arrow) can be displayed. By **tapping** or **clicking** on the interior arrows, the browse feature advances in a single increment to either the previous database record (left arrow) or the next database record (right arrow).

It should be noted that the database records are stored *in the order in which they are recorded*. ProbeCorder does not allow you to sort these records and place them in a different order, except as an output file after querying (see Chapter 9). ProbeCorder is a data collection tool and does not contain a fully functional relational database management system. In order to carry out advanced data manipulation on these records, they must be transferred to Microsoft's Foxpro database management program (or a similar software program), as discussed in Chapter 2. Alternatively, queried database tables can be generated in the Query module and saved as Excel .XLS files for manipulation in a spreadsheet format.

Function Summary

- Select [Save] button (or Alt-S) to save the information recorded on the Site Record screen to SI.DBF, a FoxPro database table, and to return to the Main Menu.
- Select [Cancel] button (or Alt-C) to clear all the text boxes on the screen.
- Select [Exit] button (or Alt-E) to return to the Main Menu. If data has been entered on the screen but not saved, then you will be prompted to either save the information before exiting or exit without saving it.
- Select [Help] button (or Alt-H) to get help.
- Select [Browse] button (or Alt-B) to permit scrolling through the existing Site Record database. This button also enables the **E**dit and **E**ntry buttons.
- Select [Edit] button (or Alt-D) to modify existing data entries on the Site Record screen.
- Select [Entry] button (or Alt-T) to exit the Browse/Edit mode and return to normal Data Entry mode.

Chapter Eight

*Module Number Three:
Probe Information*

The Probe Information module is the most complicated module in the ProbeCorder program in that it contains a series of seven nested screens for recording sediment data. In this chapter, we describe the purpose and functionality of the module as well as provide detailed instructions on its use.

Topics discussed in this chapter:

- Probe Information
 - About Probe Information
 - Function Summary
- Sketching a Sediment Profile
 - About Profile Sketch
 - How to Create a Sketch of the Sediment Column
 - Function Summary
- Deposit Entry
 - About Deposit Entry
 - How to Use Deposit Entry
 - Function Summary
- Sediment Structure
 - About Sediment Structure
 - Function Summary
- Unit Boundary
 - About Unit Boundary
 - Function Summary
- Color
 - About Color (Dry and Moist)
 - Function Summary
- Probe Content
 - About Probe Content
 - How to Use Probe Content
 - Function Summary

Probe Information

About Probe Information

The Probe Information screen serves as a main menu for the Probe Information module. It permits recording of administrative details on each probe, including the Survey Unit or Site number, the Probe number, the Recorder, the current date, and an associated Provenience Number if field specimens are recovered. Once the probe has been excavated, the probe outcome (positive or negative) can be selected in the Results box. The illustration below depicts a sample Probe Information screen filled in with hypothetical data.

The screenshot shows a window titled "Probe Information" with the following fields and controls:

- SU:** Text box containing "r1".
- Site:** Empty text box.
- Results:** Radio button selection with "Positive" selected and "Negative" unselected.
- Probe:** Text box containing "1".
- Recorder:** Text box containing "J".
- Date:** Text box containing "1997-05-20".
- Provenience No.:** Text box containing "073".

Buttons at the bottom include: Entry (disabled), Browse (disabled), Edit (disabled), Profile, Content, Save (disabled), Cancel, Exit, and Help.

Status: Data Entry.

The Probe Information screen also has a convenient **Browse** function that allows the user to examine the existing Probe Information contained in the database. It allows editing of previously recorded data, after which the edited information is automatically saved to the database. Note that in the illustration above that the **Edit** and **Entry** buttons are not enabled. They can only be enabled by first tapping or clicking on the **Browse** button. Likewise, the **Save** button is not enabled, but in this case it is not enabled because the data displayed in the Probe Information screen has already been saved.

How to Use Probe Information

Using the Probe Information screen is quite simple and straightforward. However, there are still some minor points that should be mentioned before you use it to record field data.

- Before sediment description can proceed on a given probe, two *required* data fields must be completed: (1) the **'Survey Unit'** or the **'Site'** number under investigation; and (2) the associated **'Probe'** number. Note that you should *never* enter both a Survey Unit number and a Site number on this screen since a given probe must correspond to one or the other of these spatial units, but never both at the same time. If this required data is not entered at the outset, an error message will appear as soon as you try to enter other information using the **Profile** and/or **Content** buttons.
- The value entered in the **'Survey Unit'** or the **'Site'** text box *must* be identical to values previously registered in the Survey Unit Record screen (see Chapter 6) or the Site Record screen (see Chapter 7). If a value is entered on the Probe Information screen that does not correspond to a previously registered SU or Site value, an error message will appear indicating that no record exists and that you must return to either the Survey Unit Record screen or the Site Record screen to complete this administrative task before proceeding with a sediment description. The limitations on field length specified previously for Survey Unit and Site apply here as well: 4 characters for the former and 5 characters for the latter.
- The value entered in the **'Probe'** text box provides a unique identification for a given probe within a particular Survey Unit or Site. The value can be alphanumeric and has a length limitation of 5 characters. Again, however, the smaller the value, the better. It is recommended that simple Arabic numerals be used for this purpose and that no more than three digits are used (i.e., 1-999).
- The **'Recorder'** text box allows identification of the person conducting the field data recording. This could be the individual's entire name, initials, or a separate project-specific code name (e.g., Recorder #7). The field length is limited to 20 characters (to allow for full names), but it is recommended that abbreviations or codes be used wherever possible to maximize storage space.
- The **'Date'** text box automatically provides the current date in YYYY-MM-DD format. This formatting convention is used to facilitate querying on this important field.
- The **'Provenience No.'** text box allows registration of a unique identification for any artifacts or other cultural material found in association with a given probe or

a particular sedimentary unit or depth within a probe. In most cases, a single number can be entered for all of the materials recovered in a single probe. However, the length limitation on this field is set at 20 characters as it may be desirable to have multiple entries in certain cases. For example, the number string 26-1, 2, 3 could be entered in situations where it is desirable to record separate bags within the same probe. The number 26-1 might correspond to materials found in the 0-20cm level of a shovel probe, 26-2 might correspond to materials recovered in the 20-40cm level, and 26-3 might correspond to a projectile point fragment recovered at 47cm.

- The **'Results'** section consists of two radio buttons for recording the outcome of the probe. This is also considered a *required* field and if one of the two options is not selected, you will be prompted to do so before saving the Probe data
- The **Browse/Edit/Entry** functions operate in the same manner as in the Survey Unit Record and Site Record modules discussed in previous chapters. To activate the Browse/Edit mode, simply **tap** or **click** on the **Browse** button, as shown on page 8-3. In addition to enabling the **Entry** and **Edit** buttons, this action also temporarily replaces the **Save** and **Cancel** buttons (located below the **Browse** button) with a scroll feature. To edit a displayed database record, simply **tap** or **click** the **Edit** button and make the appropriate modification(s) in any of the data fields. Once the editing is completed, the modifications are immediately saved to the database (without using the **Save** button). To exit the Browse/Edit mode, simply **tap** or **click** on the **Entry** button. This will return you to the normal Data Entry mode and a new blank Site Record screen will be displayed. The Site Record screen also has a status bar at the bottom that indicates whether you are in Data Entry mode or Data Browsing mode.

The scroll feature is comprised of a caption indicating the database that is being browsed and a series of four scrolling arrows to the left and right of the caption. In this case it is the Probe Data, but the Browse feature is also included on the Survey Unit Record screen (see Chapter 6), the Site Record screen (see Chapter 7), and on the Probe Report screen (see Chapter 9). By **tapping** or **clicking** on the exterior arrows, the first database record (left arrow) or the most current database record (right arrow) can be displayed. By **tapping** or **clicking** on the interior arrows, the browse feature advances in a single increment to either the previous database record (left arrow) or the next database record (right arrow).

It should be noted that the database records are stored *in the order in which they are recorded*. ProbeCorder does not allow you to sort these records and place them in a different order, except as an output file after querying (see Chapter 9). ProbeCorder is a data collection tool and does not contain a fully functional relational database management system. In order to carry out advanced data manipulation on these records, they must be transferred to Microsoft's Foxpro

database management program (or a similar software program), as discussed in Chapter 2. Alternatively, queried database tables can be generated in the Query module and saved as Excel .XLS files for manipulation in a spreadsheet format.

- Sediment descriptions are initiated by clicking on the [**P**rofile] button or the [**C**ontent] at the bottom of the screen. Detailed information on these options are provided in subsequent sections of this chapter.

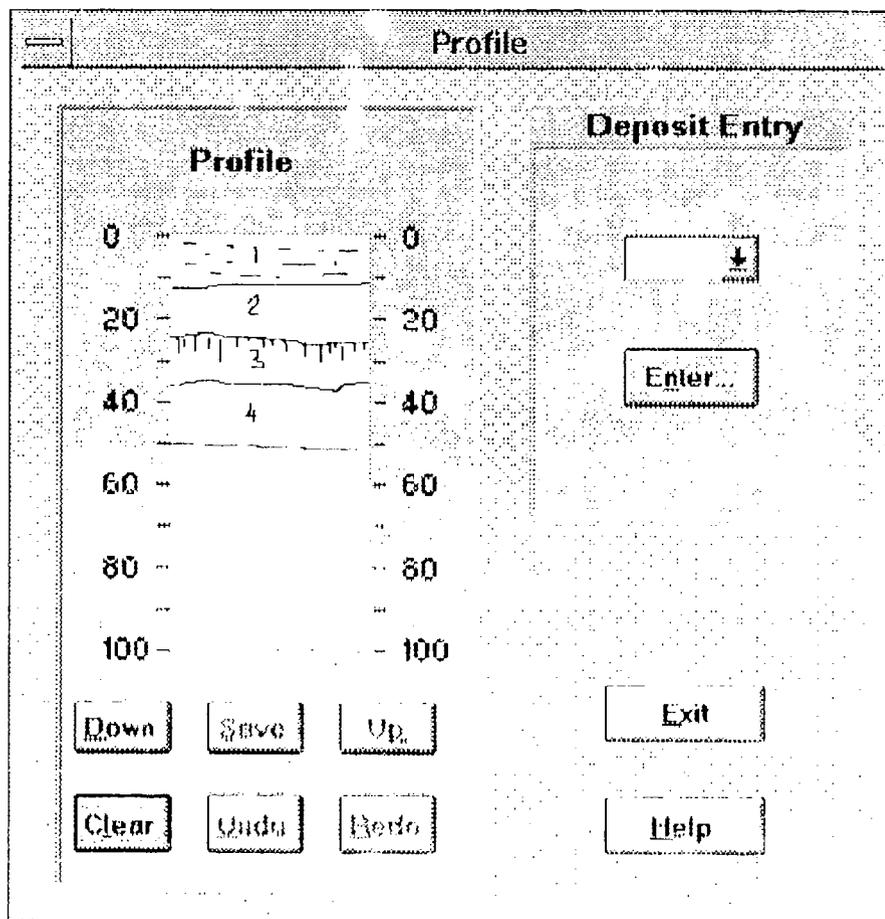
Function Summary

- Select [**S**ave] button (or Alt-S) to save the information recorded on the Probe Information screen (and related screens) to PROBE.DBF, a FoxPro database table, and to return to the Main Menu.
- Select [**C**ancel] button (or Alt-C) button to clear all the text boxes on the screen.
- Select [**E**xit] button (or Alt-E) to return to the Main Menu. If data has been entered on the screen but not saved, then you will be prompted to either save the information before exiting or exit without saving it.
- Select [**H**elp] button (or Alt-H) to get help on the Probe Information screen and related screens.
- Select [**B**rowse] button (or Alt-B) to permit scrolling through the existing Probe database. This button also enables the **E**dit and **E**ntry buttons.
- Select [**E**dit] button (or Alt-D) to modify existing data entries on the Probe Information screen.
- Select [**E**ntry] button (or Alt-T) to exit the Browse/Edit mode and return to normal Data Entry mode.
- Select [**P**rofile] button (or Alt-P) to proceed with the Profile description.
- Select [**C**ontent] button (or Alt-N) to proceed with the Content description.

Sketching a Sediment Profile

About Profile Sketch

The Profile screen allows you to create a sketch of the sediment column and save it as a bitmap file. Each sedimentary unit or deposit identified in the sketch is then assigned a unique number and labeled accordingly. It can then be described in detail by selecting the appropriate number from the **Deposit Entry** pick list in the upper right corner of the screen and tapping or clicking on the **[Enter]** button. This will transfer you to the Deposit Entry screen (see next section) that permits basic pedological description of the deposit. The Profile Sketch screen remains visible on the left side of the computer screen as the Deposit Entry recording proceeds.



The Profile Sketch screen contains a blank sketch pad depicting a 100cm deep profile. This depth is adequate for most shovel probes and posthole probes. However, for subsurface probes carried out by augering or coring, or for exposures made with a backhoe or cleaned from a rivercut or roadcut, much greater depths can be achieved. In these situations the Profile Sketch screen allows you to advance the sketch pad window

downward in increments of 1m to a maximum depth of 20m. The maximum number of sedimentary units is currently set at thirty (30), although this figure can be augmented if necessary. The illustration on the preceding page shows a Profile screen with a simple sketch of a shallow profile. It has been excavated to a depth of 50cm below surface and exhibits four sedimentary units.

How to Create a Sketch of the Sediment Column

A sketch can be drawn either by pressing the pen stylus to the screen inside the sketch area and executing a line segment (when operating in pen mode), or by placing the cursor inside the sketch area, holding down the left button of the mouse, and executing a line segment by moving the mouse (when operating in desktop mode). The process is repeated until the sediment profile sketch is completed within a given 100cm increment. If desired, some or all of the identified deposits can be embellished with fill patterns following a user-defined legend. At this point, it is important to *save* your work since each 100cm increment is contained in a separate .BMP file and assigned a filename that identifies the Survey Unit or Site and the Probe and 100cm increment to which it belongs (see Chapter 2). If necessary, the sketch can be continued through additional 100cm increments, each one of which must be saved as a separate .BMP file.

Execution of the line segments may be awkward at first, especially when using a mouse. However, this initial difficulty rapidly disappears with a little practice. When using the pen stylus to execute a horizontal line across the profile, it is important to ensure that the arrow cursor is located *inside* the edge of the sketch pad window. Sometimes there is a slight discrepancy between the location of the pen stylus and the arrow cursor on the screen, and even if the pen stylus is placed within the sketch pad window, the accompanying cursor may lie outside the window and prohibit execution of the line segment.

It is recommended that each sedimentary unit be labeled with its corresponding number, as in the example illustrated above. This will avoid confusion as you proceed to describe each unit in the Deposit Entry screen. If possible, the drawing should also be labeled with the corresponding Survey Unit and Probe numbers or the Site and Probe numbers. This can be conveniently added in small type to either the top or bottom of the drawing (e.g., R15/36) and will help avoid confusion later when these bitmap files are transferred out of the ProbeCorder database and into a separate drawing package.

The sketch pad feature has a number of buttons associated with it for purposes of navigating, editing, and saving. The [**S**ave] button allows you to save your work after completing the sketch for a 100cm increment. If you try to exit the screen without saving the sketch, a message appears prompting you to do so. The [**U**p] and [**D**own] buttons allow you to scroll through a sediment column in 100cm increments to add new sketches, or to review and edit those already completed. Both buttons are equipped with an automatic 'save' feature that saves a recently executed drawing increment before allowing

you to move up or down. The [**C**lear], [**U**ndo], and [**R**edo] buttons have editing functions. The [**C**lear] button allows you to erase the entire drawing on the 100cm increment displayed on the screen. The [**U**ndo] button allows you to erase previous line segments in reverse order, while the [**R**edo] button allows you to replace them after they are erased.

*Note: You may use the [**C**lear] button to clear the screen after saving a drawing. However in such cases you must execute and save a new drawing to replace the old one. Otherwise, even though the screen has been cleared, the old drawing will still be saved as a .BMP file.*

Once the entire sediment column has been sketched, you may proceed to the sediment descriptions by selecting from the Deposit Entry "pop-down" pick list the number of the deposit to be described and then tapping or clicking on the [**E**nter...] button. This brings up the Deposit Entry screen (see next section). When the sediment description has been completed for that deposit, the next deposit is selected and the process is repeated until all of the identified deposits or sedimentary units have been described.

Function Summary

- Select [**S**ave] button (or Alt-S) to save the profile sketch as a bitmap file.
- Select [**U**p] button (or Alt-P) to move up in the profile sketch by 100 cm increments.
- Select [**D**own] button (or Alt-D) to down in the profile sketch by 100 cm increments.
- Select [**C**lear] button (or Alt-L) to clear the entire sketch within a 100cm increment.
- Select [**U**ndo] button (or Alt-U) to undo the previous line segment. This can be tapped or clicked repeatedly to undo previous line segments in reverse order.
- Select [**R**edo] button (or Alt-R) to replace line segments previously eliminated with the Undo button.
- Select [**E**nter....] button (or Alt-N) to proceed with Deposit Entry recording. But before clicking this button, you must choose a number from the "pop-down" pick list.

- Select [Exit] button (or Alt-E) to return to Probe Information screen. If you have not saved your work, a message will appear prompting you to do so before exiting.
- Select [Help] button (or Alt-H) to get help.

Deposit Entry

About Deposit Entry

The **Deposit Entry** screen allows the recorder to describe in a standardized manner the physical characteristics of each sedimentary unit identified in a given probe. Data categories include maximum depth, texture, horizon, sediment structure, unit boundary, other comments, and Munsell soil color in dry and moist state. Standardized coding procedures are employed for these categories, but customized coding for certain categories is also possible. A sample Deposit Entry screen is illustrated below.

The screenshot shows a software window titled "Deposit Entry". It contains several data entry fields with labels on the left and input boxes on the right. The fields are: "Max.Depth" with the value "20" and a unit dropdown set to "CM"; "Texture" with the value "SILTY CLAY LOAM"; "Horizon" with the value "AP"; "Structure" with the value "1 F PL"; "Boundary" with the value "AS"; "Comments" with the value "roots"; "Color" section with "Dry" set to "10YR4/2" and "Moist" set to "10YR2/2". At the bottom of the window are three buttons: "Save", "Exit", and "Help".

Max.Depth	20	CM
Texture	SILTY CLAY LOAM	
Horizon	AP	
Structure	1 F PL	
Boundary	AS	
Comments	roots	
Color		
Dry	10YR4/2	
Moist	10YR2/2	

Save Exit Help

While each sedimentary unit is normally expected to have a unique item for each data category (e.g., Texture = silty clay loam, or Sediment Structure = 2mgr or moderate, medium, granular), it is recognized that many depositional units or soil horizons may, in fact, exhibit transitions in texture, structure, or color. An example would be a fining

upward sequence in which texture and/or structure may change slightly from the top to the bottom of the same depositional unit. Another example would be inclusions, such as gravels, pebbles, or concretions, that may be more prevalent in an upper or lower portion of a given sedimentary unit. In such cases, it is suggested that the Deposit Entry number be duplicated with the addition of an upper case "U" or "L", (e.g., 3U and 3L representing the "upper" or "lower" portions of Deposit 3, respectively) to suggest this transitional or graduated quality. However, if and when this convention is employed, it is important that all fields completed for one data record also be completed for the other. Thus, the data categories that remain invariant (e.g., Maximum Depth, Horizon, Boundary, Comments, Color) should be repeated in both of the data records for 3U and 3L, and any data categories that change (e.g., Texture, Structure) should have different entries in the records for 3U and 3L. This will ensure that both records are saved and will permit proper querying later.

How to Use Deposit Entry

- **'Maximum Depth'** of the sedimentary unit is entered manually with the pen stylus or keyboard. The unit of measurement is selected from an adjacent pick list and contains four options: centimeters (cm), meters (m), inches (in), and feet (ft).
- **'Texture'** and **'Horizon'** are defined using "pop-down" pick lists, both of which can be customized to suit the user's needs. See Chapter 10 for detailed information on pick list customization. For purposes of brevity and standardization, it is recommended that the user employ the coding system for soil texture terms developed by the USDA Soil Survey Staff (1984, 1993), (e.g., vcos = very coarse sand, sel = sandy clay loam).
- **'Sediment Structure'**, **'Unit Boundary'** and **'Munsell Color'** are defined through additional dialog boxes which allow the user to select the component parts of the description from a series of pick lists. **Sediment Structure** and **Unit Boundary** follow the coding procedures suggested by the Soil Survey Staff (1984, 1993). Sediment color is coded using the well-known Munsell soil color system (Munsell Color 1975) and also includes the codes for gleyed soils.
- The **'Comments'** field can be employed by the user to cover descriptive categories not included in ProbeOrder's Deposit Entry screen, such as color mottling (abundance, size, contrast), consistence (in dry, moist, and wet states), pH reaction, sediment inclusions, bioturbation, etc. In this case, the information is entered manually with the pen stylus or keyboard as a character string up to 254 characters long. It is recommended that the user employ a concise notation system for these categories and consistent ordering of information in order to maximize interpretability and storage space. Alternatively, some of these descriptive categories can be listed on the customizable Feature List in the Probe

Content screen (see below), and their presence within the sedimentary unit can be associated with a specific depth or depth range (e.g., 115-120 cm - gravel).

Function Summary

- Select [**S**ave] button (or Alt-S) to save the information recorded on the Deposit Entry screen to DEPOSIT.DBF, a Fox Pro database table, and to return to the Profile Screen.
- Select [**E**xit] button (or Alt-E) to return to the Profile screen. If data has been entered on the screen but not saved, then you will be prompted to either save the information before exiting or exit without saving it.
- Select [**H**elp] button (or Alt-H) to get help on the Deposit Entry screen.
- Select [**S**tructure...] button to activate **Sediment Structure** screen.
- Select [**B**oundary...] button to activate **Unit Boundary** screen.
- Select [**D**ry...] or [**M**oist...] button to activate **Munsell Color** screen.

Sediment Structure

About Sediment Structure

The **Sediment Structure** screen describes the aggregation of the soil particles. It includes three separate pick lists for **Grade**, **Class (Size)**, and **Type**. **Grade** is subdivided into four categories of distinctness: structureless, weak, moderate, and strong. **Class** is subdivided into five size categories: very fine, fine, medium, coarse, and very coarse (with “thin” and “thick” for platy structures instead of “fine” and “coarse”). **Type** is subdivided into ten distinct forms: platy, prismatic, prismatic columnar, blocky, angular blocky, subangular blocky, granular, crumb, single grain, and massive. By picking one value for each of these three dimensions, a trinomial code is entered into the database using the notation system developed by the Soil Survey Staff (1984,1993). For example, a “medium blocky” structure is coded as 1MBK, and a “moderate very thin platy” structure is coded as 2VFPL, etc. Only the coded values are stored in the database. For example, the codes appear in the ProbeCorder database with a space separating each component (e.g., 1 M BK, 2 VF PL).

The screenshot shows a dialog box titled "Sediment Structure". It is divided into three sections, each with a dropdown menu and a button:

- Grade:** The dropdown menu shows "1 - weak". To its right is an "OK" button with a checkmark icon.
- Class:** The dropdown menu shows "m - medium". To its right is a "Cancel" button with an "X" icon.
- Type:** The dropdown menu shows "gr - granular". To its right is a "Help" button.

Function Summary

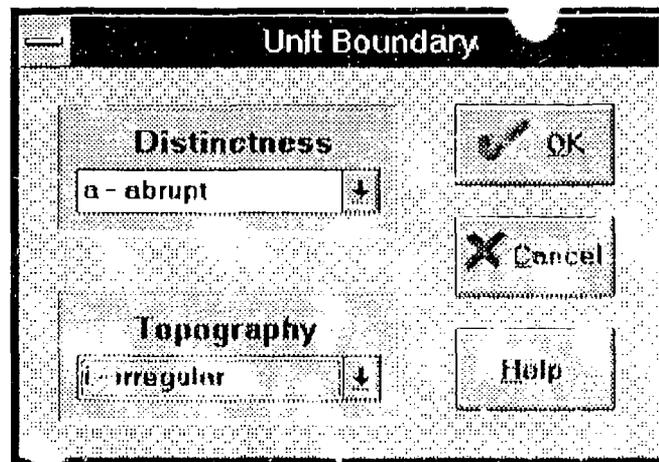
- Select [**OK**] button (or Alt O) to save the information recorded on the Sediment Structure screen to DEPOSIT.DBF, a FoxPro database table, and to return to the Deposit Entry screen.

- Select [Cancel] button (or Alt-C) to return to the Deposit Entry screen without saving any information on the Sediment Structure screen.
- Select [Help] button (or Alt-H) to get help on Sediment Structure.

Unit Boundary

About Unit Boundary

The **Unit Boundary** screen describes the transition from one horizon or sedimentary unit to the one underlying it. It includes two separate pick lists for **Distinctness** and **Topography**. The former is subdivided into four categories: abrupt, clear, gradual, and diffuse. The latter is also subdivided into four categories: smooth, wavy, irregular, and broken. By picking one value from each of these two dimensions, a binomial code is entered into the database following the notation system developed by the Soil Survey Staff (1984, 1993). For example, an “abrupt irregular” boundary is coded as AI, and a “diffuse smooth” boundary is coded as DS. Only the coded value is stored in the database.



Function Summary

- Select [**O**K] button (or Alt O) to save the information recorded on the Unit Boundary screen to DEPOSIT.DBF, a FoxPro database table, and to return to the Deposit Entry screen.
- Select [**C**ancel] button (or Alt C) to return to the Deposit Entry screen without saving any information on the Unit Boundary screen.
- Select [**H**elp] button (or Alt H) to get help on Unit Boundary.

Color

About Color (Dry and Moist)

The **Color** screen follows the notation system of the Munsell Soil Color Charts (Munsell Color 1975) for dry and moist states. As such, it includes three separate pick lists for **Hue**, **Value**, and **Chroma**. Hue is subdivided into seven alphanumeric values; Value is subdivided into seven numerical values; and Chroma is subdivided into seven numerical values. By picking one value from each of these three dimensions, a trinomial code is entered into the database following the notation system of the Munsell Color System. For example, "light yellowish brown" is coded as 10YR6/4. Only the coded value is stored in the database. The pick lists for Hue, Value and Chroma also include the alphanumeric values for recording gleyed soils.

The screenshot shows a dialog box titled "Munsell Color". It has three main sections, each with a pick list and a button to its right. The "Hue" section has a pick list with "10YR" selected and an "OK" button with a checkmark. The "Value" section has a pick list with "6" selected and a "Cancel" button with an X. The "Chroma" section has a pick list with "4" selected and a "Help" button.

Function Summary

- Select [**O**K] button (or Alt-O) to save the information recorded on the Color screen to DEPOSIT.DBF, a FoxPro database table, and to return to the Deposit Entry screen.
- Select [**C**ancel] button (or Alt-C) to return to the Deposit Entry screen without saving any information on the Color screen.
- Select [**H**elp] button (or Alt-H) to get help on Color.

Probe Content

About Probe Content

The Probe Content screen is used to record archaeological artifact and/or feature categories recovered in a given probe. The pick lists provided for the artifact and feature categories can be customized to accommodate regional and local variations in artifact and feature categories commonly discovered, or to suit the individual needs of the archaeological investigator. For example, general artifact categories can be broken down into finer typological units depending on the level of detail required by a given project or desired by the investigator. A sample Probe Content screen is illustrated below.

The screenshot shows a software window titled "Probe Content". At the top left, there is a "Number of Artifacts" section with a text input field and a "+" button. To its right is a "Depth" section with a text input field and a dropdown arrow. Below these are two main panels: "Artifacts Present" and "Features Present". The "Artifacts Present" panel has a large empty list box, a dropdown arrow, and "Add", "Remove", and "Save" buttons. The "Features Present" panel has a list box containing the following items: "50-50CM -(G) CLAY FILMS", "120-125CM -(G) CHERT GRAVEL", "227-235CM -(G) CHERT GRAVEL", "115CM -(G) BRADY PSOL", and "111CM -(G) GILMAN PSOL". It also has a dropdown arrow and "Add", "Remove", and "Save" buttons. At the bottom of the window are "Exit" and "Help" buttons.

The screen permits the user to select specific artifact and feature categories in association with a depth or depth range if desired. For artifact categories, the number of artifacts found can also be recorded. For example, if a shovel probe is excavated as a single provenience unit from 0 to 50 cm. b.s. and 5 prehistoric flakes are recovered, this information can be entered into the ProbeCorder database as 0-50CM - (P) FLAKE - (5). Alternatively, if a probe is excavated in 20 cm arbitrary levels, the cultural remains located in each level can be segregated if desired. For example, suppose the excavator is

operating in an area of high artifact density and wishes to excavate a series of shovel probes in 20 cm levels down to a depth of 60 cm b.s. If one historic potsherd is recovered in the top 20 cm, 2 prehistoric flakes are found in the 20-40 cm level, and one Archaic projectile point is found in the 40-60 cm level, this information can be recorded as follows:

0-20CM - (H) CERAMIC - (1)
20-40CM - (P) FLAKE - (2)
40-60CM - (P) PPT, ARC - (1)

In these cases, the (P) prefix indicates prehistoric artifacts, while (H) designates historic artifacts. However, the user is free to customize this coding to suit personal preferences or needs. The maximum allowable field length is 30 characters. However, it is strongly recommended that short codes or abbreviations be employed wherever possible to maximize both recording efficiency and storage space.

Finally, if it is important only to record the depth of highly significant finds such as a Paleoindian projectile point fragment, the exact depth can be recorded as follows:

37CM - (P) PPT FR, PAL - (1).

The number of artifacts is selected from a pick list which is also customizable. The default settings range from 1 to 25 and >25 artifacts. The depth at which the artifacts are recovered is recorded by entering the desired value (e.g., 37, 0-50, 20-40, etc.) in the corresponding text box with the pen stylus or the keyboard and selecting the corresponding unit of measurement from the adjacent pick list (e.g., cm, m, in, or ft). For purposes of consistency, the unit of measurement should be identical to that used on the Deposit Entry screen to describe the maximum depth of sedimentary units.

The customization capability of the "Feature" pick list can also be put to use by soil geomorphologists and pedologists for recording geomorphological features by depth or depth range with a deep core. For example, inclusions such as pebbles, gravels, biofabric, CaCO₃ concretions or blebs, clay films, krotovinas, etc. can be placed on the customizable Feature pick list and recorded by depth. Other features not normally included in the routine sediment descriptions, such as known paleosol horizons, can also be recorded in this manner. These types of features could be recorded as follows:

50-60CM - (G) CLAY FILMS
75CM - (G) T.C. PSOL
155-180CM - (G) CLAY FILMS
205CM - (G) JOHNSON PSOL
223-260CM - (G) CaCO₃ BLEBS
630-675CM - (G) PEBBLES

Note that the prefix (G) is used in his case to indicate features of geomorphological origin. The features can be associated either with a specific depth or a depth range, and each feature can be repeated as required.

Both the '**Artifacts Present**' and '**Features Present**' text boxes have **Add/Remove/Save** features to facilitate item selection, editing, and saving. For example, after an item is selected from the Artifacts pick list and appears in the pick list text box, it can be provisionally added to the '**Artifacts Present**' box, together with the selected number and depth information associated with it, by clicking on the [**Add**] button. At this point, two options exist. If the selection(s) are in error, the line can be deleted by clicking on the [**Remove**] button. The data may then be re-entered. If the selections are correct, then clicking on the [**Save**] button will save the data in the database permanently.

*Note: Once you save the data entered in the '**Artifacts Present**' and '**Features Present**' text boxes, it cannot be further edited or deleted within the ProbeCorder program. It can only be modified by transferring the files to a relational database management program such as Microsoft's Fox Pro, or a spreadsheet program such as Microsoft's Excel. In view of this constraint, it is recommended that extreme care be taken when making these selections so that the data that you save is error-free.*

How to Use Probe Content:

- To record the artifact information, proceed through the following five steps:
 - Step 1 **Tap** or **Click** the "pop-down" pick list under '**Number of Artifacts**' and **choose** a number.
 - Step 2 **Enter** the depth (or depth range) of the artifact category in the '**Depth**' text box using the pen stylus or keyboard. Then **select** the appropriate unit of measurement from the adjacent pick list.
 - Step 3 **Tap** or **Click** the "pop-down" pick list under '**Artifacts Present**' to select the appropriate artifact category or type.
 - Step 4 **Click** the [**Add**] button under '**Artifacts Present**'. This will transfer your three selections (number, depth, artifact) to a single line item in the '**Artifacts Present**' text box, but will not save it in the ARTIFACT.DBF database table.
 - Step 5 If the information selected is found to be in error, you may **tap** or **click** the [**Remove**] button to delete the entire line item and re-enter the data. If the information selected is correct, **tap** or **click** the [**Save**] button to save the information.

- To record the feature information, proceed through the following four steps:

Step 1 **Enter** the depth (or depth range) of the feature in the '**Depth**' text box using the pen stylus or keyboard. Then **select** the appropriate unit of measurement from the adjacent pick list.

Step 2 **Tap** or **Click** the "pop-down" pick list under '**Features Present**' to select the appropriate feature category.

Step 3 **Tap** or **Click** the [**Add**] button under '**Features Present**'. This will transfer your two selections (depth and feature) to a single line item in the '**Features Present**' text box, but will not save it in the FEATURE.DBF database table.

Step 4 If the information selected is found to be in error, you may **tap** or **click** the [**Remove**] button to delete the entire line item and re-enter the data. If the information selected is correct, **tap** or **click** the [**Save**] button to save the information.

Function Summary

- Select [**Exit**] button (or Alt-E) to return to the Probe Information screen without any change in the current recording. Note that all information should be saved using the [**Save**] buttons associated with the '**Artifacts Present**' and '**Features Present**' text boxes.
- Select [**Help**] button (or Alt-H) to get help on Probe Content.

Chapter Nine

*Module Number Four:
Querying and Report Generation*

This chapter describes ProbeCorder's querying interface. This module includes the querying capability itself as well as the report-generation capabilities for producing hard copy records of queried data tables and/or complete records of individual probes.

Topics discussed in this chapter:

- About Querying and Report Generation
- Querying
 - Querying with Pre-defined Databases
 - Querying with Structured Query Language (SQL)
 - SQL with Single Tables
 - SQL with Multiple Tables
- Report Generation
 - Reporting with Queried Data Tables
 - Reporting with Complete Records of Individual Probes

About Querying and Report Generation

ProbeCorder provides full querying and report-generation capabilities. This chapter describes the query function that permits querying by simple pre-defined database categories or with more complex Structured Query Language (SQL) expressions. It also describes the report-generation function in which queried data tables can be printed and saved, or complete records of individual probes can be generated and printed in a standardized format.

Querying

There are two kinds of querying that can be conducted in ProbeCorder. One uses pre-defined database categories, while the other uses Structured Query Language (SQL).

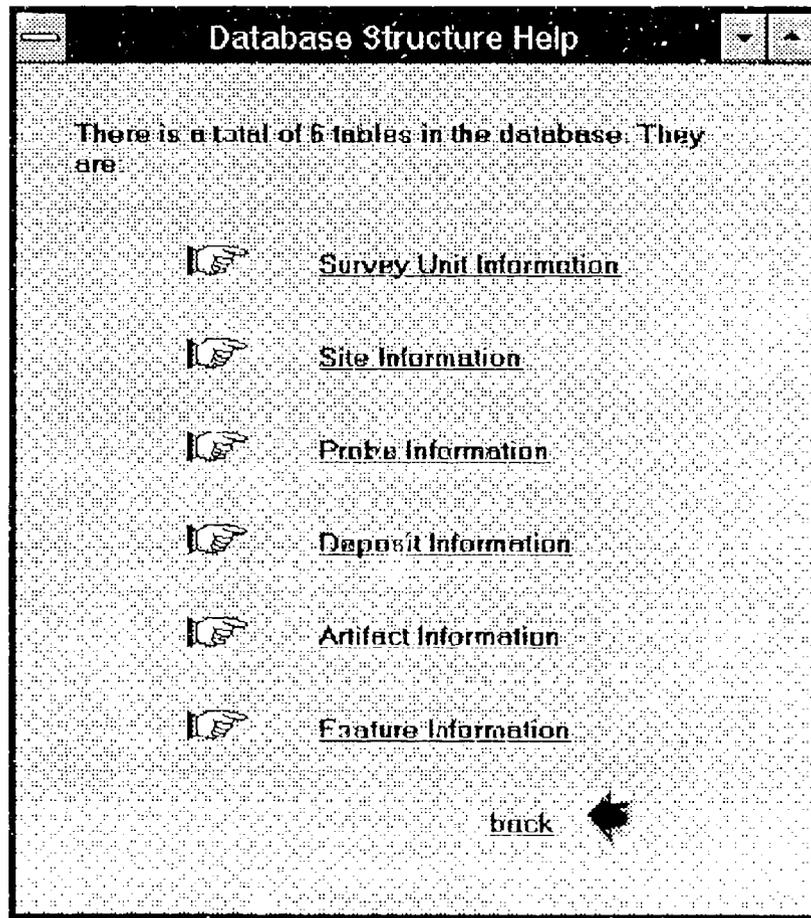
Querying with pre-defined database categories

Once you understand the basic structure of the internal database tables employed by ProbeCorder (see Chapter 2), you may want to conduct your queries using pre-defined database categories. This is done by means of a pick list of different ProbeCorder data categories from which you may select the desired information to create tabular output. There are two major characteristics of querying with pre-defined database categories and they present advantages and disadvantages:

- **Pro:** It is easy to use and does not require a knowledge of SQL. When querying with pre-defined database categories, you will be led through a sequence of three easy-to-follow screens. Hence, you don't have to learn SQL in order to query the ProbeCorder database.
- **Con:** It may not be flexible enough to accommodate your specific querying needs. Unfortunately, because pre-defined querying only allows you to conduct queries on a single table and the result contains all the fields in the table, it may not suit your specific querying needs, especially if precise information is desired from multiple database tables.

How to query with pre-defined database categories

- Step 1 It is recommended that you familiarize yourself with the structure of the six database tables used by ProbeCorder. To do so, tap or click [Help] and then Database Structure.



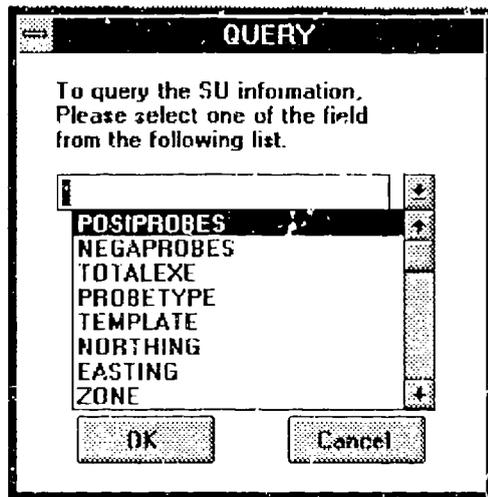
Click each of the underlined table names for information on the corresponding database structure. Alternatively, you can consult the Database Structure section in Chapter 2 of this manual.

Step 2

From the **Query** screen (depicted below), **choose** the table you would like to query by **tapping** or **clicking** one of the six option buttons. As an example, suppose that the Survey Unit Information option is selected.

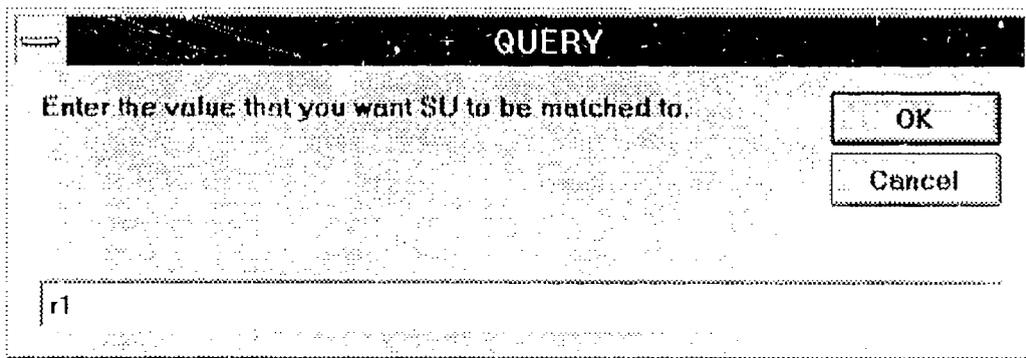
The screenshot shows a window titled "Query". It is divided into two main sections. The top section, "Predefined Querying", contains six radio button options: "Survey Unit Information", "Site Information", "Probe Information", "Deposit Information", "Artifact Information", and "Feature Information". To the right of these options are three buttons: "Print Probe Report" (with a printer icon above it), "Help", and "Exit". The bottom section, "Query with SQL expression", features a large empty text box with up and down arrow icons on its right side, and two buttons below it: "Query" and "Cancel".

The 'Table Fields Box' corresponding to SU Information appears, as shown on the next page. It contains a "pop-down" pick list with the relevant data fields contained in the SU.DBF database file.



Step 3 **Tap** or **Click** the down arrow of the pick list and **select** the field that you would like to query (e.g., POSIPROBES, or positive probes). Then **tap** or **click** **[OK]**.

Step 4 **Enter** the value of the database record you wish to query into the text box. In this case, the user wishes to obtain a listing of all of the positive probes executed in Survey Unit R1. Then **tap** or **click** **[OK]**.



Step 5 For this particular query, a tabular output will then appear on the screen in which all of the positive probes found in Survey Unit R1 are listed, together with their associated administrative information. The illustration on the next page depicts the output for a different query. In this case, the user queried the Probe Information database for a listing of all of the deposit information in a given probe. The requested information appears in tabular format with the Level Numbers listed on the far left and the entire Deposit Entry record for each level listed to the right.

Query			
Save Print Exit			
LEVELID	MAX_DEPTH	TEXTURE	H
1	20	silty clay loam	A
2	40	silty clay loam	A
3	115	clay loam	B
4	141	silty clay loam	2
5	227	silty clay loam	3
6	286	silty clay loam	2

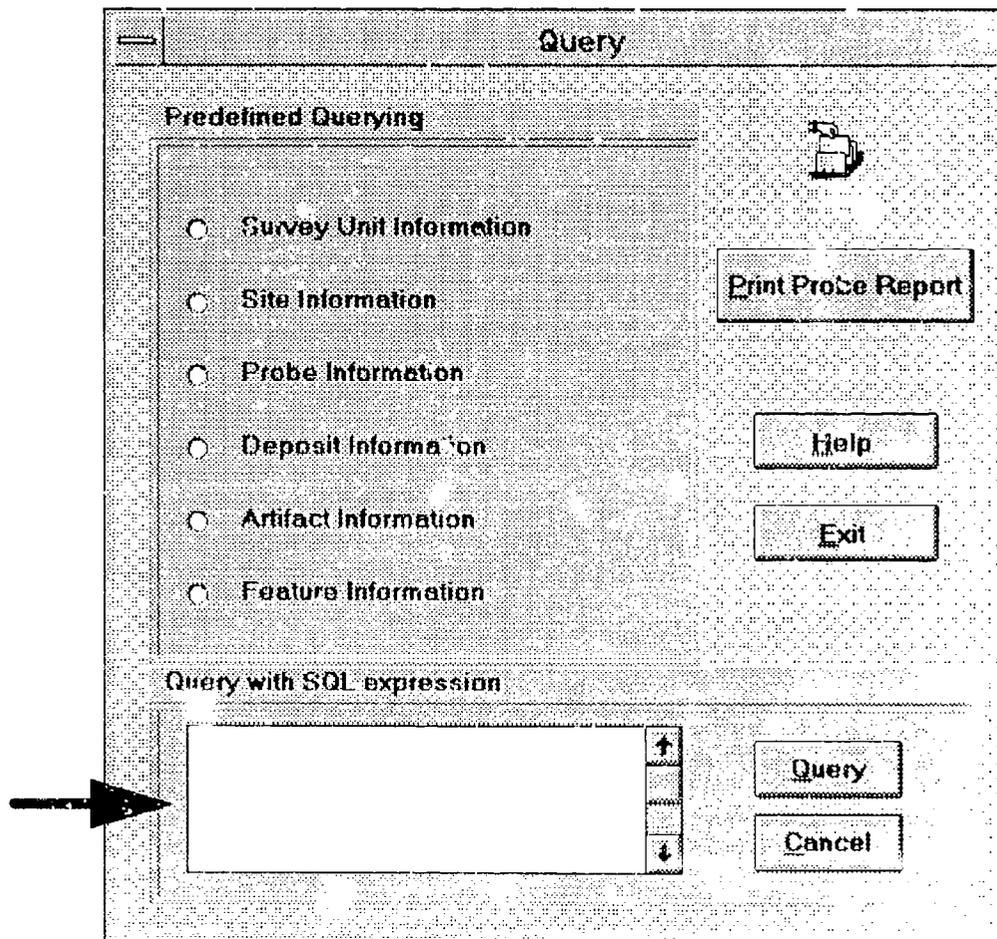
If the resulting data table exceeds the horizontal and/or vertical size of the Query Window, you can use the horizontal and vertical scroll bars to view the records. Other options include (a) printing hard copy output directly to a printer using the [Print] button, or (b) saving the queried data table to a file using the [Save] button. The Save function produces a Windows "Save As" dialog box that allows you to create a filename and save the queried data table either as a text file (.TXT) or as an Excel file (.XLS). The table can then be downloaded to other database or spreadsheet software for data manipulation, analysis, and graphic representation. The dialog box also displays the directories and drives available for saving the file, in which case the appropriate path can be specified.

Querying with Structured Query Language (SQL)

Unlike pre-defined querying, querying with SQL gives you the flexibility and power of conducting queries on multiple tables and selecting only the fields that you are interested in. However, you have to know the basics of SQL before you can use it. Basic introductions to Structured Query Language can be found in Bowman (1993) and Date (1994). Melton and Simon (1993) provide a more advanced discussion appropriate for applications programmers.

How to Query with SQL

- Step 1 **Type your SQL expression into the 'Query with SQL expression' text box on the bottom of the Query screen.**



Step 2 **Tap or Click** the $\sqrt{\quad}$ button to execute the query (or the \times button to clear the text box)

SQL with Single Table

This section introduces the basic format of an SQL command and discusses how the SQL command is used to retrieve data from a single table in the database.

The basic form of an SQL command (also called an SQL query) is:

```
SELECT ... <columns>
FROM ... <tables>
WHERE ... <restrictions>
```

For single table queries, four options are discussed and some simple examples are provided.

Option 1. Retrieve Certain Columns and All Rows:

Since we want all rows, there is no need to use the WHERE clause.

EXAMPLE 1: SELECT recorder, date FROM probe

Option 2. Retrieve All Columns and All Rows:

You can use the wildcard '*' here for all columns

EXAMPLE 2: SELECT * FROM probe

Option 3. Use of Where Clause:

Use of WHERE Clause -- Simple Conditions, e.g., to select all the probes executed by Recorder JZ.

EXAMPLE 3: SELECT * FROM probe WHERE recorder = 'JZ'

Use of the WHERE Clause -- Compound Conditions, e.g., to select all the probes done by Recorder JZ on April 20, 1995.

EXAMPLE 4: SELECT * FROM probe WHERE recorder = 'JZ' and date = '1995-04-20'.

Use of WHERE Clause -- LIKE, e.g., to select all the probes from Survey Units beginning with the letter 'R'.

EXAMPLE 5: SELECT * FROM probe WHERE su LIKE 'R*'

Option 4. Sorting:

To sort all the records in the PROBE.DBF table in the order of Survey Unit (or Site).

EXAMPLE 5: SELECT * FROM probe ORDER BY su (or site)

SQL with Multiple Tables

This section discusses the use of SQL commands to retrieve data from multiple tables in the database. Multiple-table querying with SQL is quite similar to single-table SQL except that:

- we need to denote fields by both the table and field names because different tables may contain the same field.
EXAMPLES: probe.date, deposit.structure, probe.probeid = artifact.probeid
- in the FROM clause, all tables involved in the query must be listed.

The basic form of a multiple-table SQL command is also:

```
SELECT ... <columns>  
FROM ... <tables>  
WHERE ... <restrictions>
```

For multiple-table queries, three options are discussed and some simple examples are provided.

Option 1. Retrieve Certain Columns and All Rows:

To select recorder and date columns from PROBE table and artifacts column from ARTIFACT table for the same site.

EXAMPLE 1: SELECT probe.recorder, probe.date, artifact.artifacts
FROM probe, artifact WHERE probe.site = artifact.site AND
probe.probeid = artifact.probeid

OPTION 2. Retrieve All Columns and All Rows:

To select all columns from ARTIFACT and FEATURE tables from Survey Units, you can use the wildcard '*' for all columns.

EXAMPLE 2: SELECT * FROM artifact, feature WHERE artifact.su
= feature.su AND artifact.probeid = feature.probeid

OPTION 3. Use of the WHERE Clause:

Use of the Where clause--Simple Conditions, e.g., to select all the probes executed by JZ and their associated artifacts.

EXAMPLE 3: SELECT * FROM probe, artifact WHERE probe.recorder = 'JZ' AND artifact.su = probe.su AND artifact.probeid = probe.probeid

Use of the WHERE Clause -- Compound Conditions, e.g., to select all the probes executed by JZ on April 20, 1995 and their associated features

EXAMPLE 4: SELECT * FROM probe, feature WHERE probe.recorder = 'JZ' AND probe.date = '1995-04-20' AND feature.su = probe.su AND probe.probeid = feature.probeid

Use of WHERE Clause -- LIKE, e.g., to select all the probes from Survey Units beginning with "R" and their associated deposit entries.

EXAMPLE 5: SELECT * FROM probe, deposit WHERE probe.su LIKE 'R*' AND deposit.su = probe.su AND deposit.probeid = probe.probeid

Reporting

Reports with Queried Data Tables

To generate a report of a queried data table, simply **tap** or **click** the **[Print]** button at the bottom of the Query screen. It is important to note that the resulting output does not appear in the same data table or spreadsheet format as shown on the Query screen. Rather, the output is generated as a list of all the queried fields grouped by record (i.e., by line in the data table). For example, if the first line of a queried table shows the Deposit Entry information for Level 1 in Probe No. 1 of Survey Unit R1, that same data would appear in the output as follows:

RECORD NO: 1

SU	R1
PROBEID	1
LEVELID	1
MAX_DEPTH	12CM
TEXTURE	SILTY CLAY
HORIZON	AP
STRUCTURE	1 F M
BOUNDARY	AS
COMMENTS	BIOTURBATION
COLOR (DRY)	7.5YR6/4
COLOR (MOIST)	7.5YR4/4

If it is more useful or desirable to maintain the output in a spreadsheet format, then it is recommended that the queried data table be saved as a text file (*.TXT) or as an Excel file (*.XLS) and downloaded to a spreadsheet software package for hard copy output.

Reports with Complete Records of Individual Probes

ProbeCorder also provides a comprehensive report on the data from each individual probe. This can be produced by following the four steps listed below:

- Step 1 **Tap** or **Click** the **[Print Probe Report]** button on the 'Main Query Menu'. The **Report** screen opens, as shown below.

Report

Probe Information Reporter

Print Destination
Window

SU R15

SITE

Probe Number 1

◀ ▶ Probe Data ▶ ▶

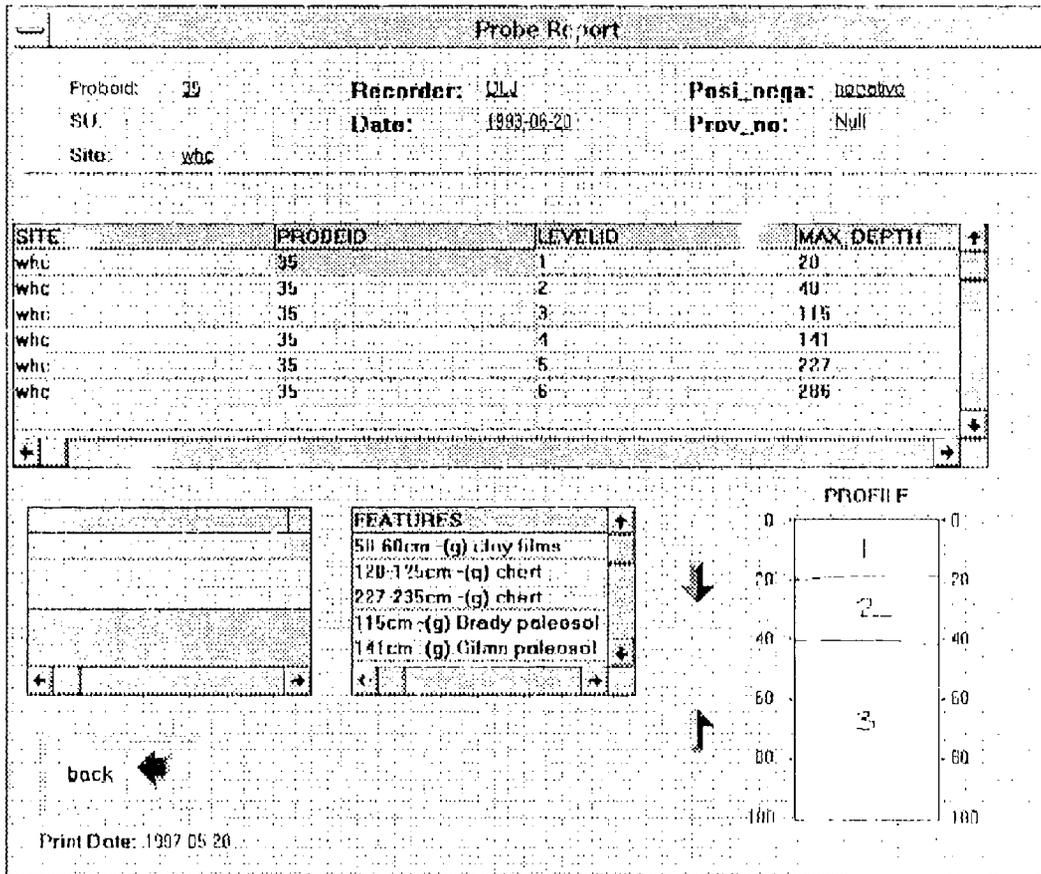
Print Exit

Step 2 **Select** either **Window** or **Printer** from the '**Print Destination**' pick list

Step 3 Using the **Browse** function for Probe Data, **select** either the '**Survey Unit**' (SU) record or **Site** record desired, along with the corresponding '**Probe Number**' of the probe to be reported. Alternatively, this information can be entered directly in the appropriate text boxes with the pen stylus or keyboard.

Step 4 Then **tap** or **click** the [**Print**] button to generate the report.

If you selected the **Window** option, the following screen appears with all of the data recorded for that probe. Note that the Deposit Information, as well as the Artifact and Feature lists, can be scrolled vertically and/or horizontally if the data extends beyond their respective windows. If the probe represents a deep sediment column (>100cm) the associated sketch (lower right) can be scrolled by means of the up and down arrows to the left of the sketch box. This will advance the profile sketch in 100 cm increments.



You can return to the Report screen by tapping or clicking on the **[back]** button located on the lower left of the screen output.

If you selected the **Printer** option in the Print Destination text box, a hard copy version of this same data will be sent to a printer for output in Landscape Mode. The layout of the information will generally approximate that of the Window version.

Note: Before you attempt to print a hard copy version of a Probe Report, remember to enter the Windows Printer Setup option and set your output to Landscape Mode.

Function Summary

Querying:

- Select [**H**elp] button (or Alt-H) to get help on Querying.
- Select [**E**xit] button (or Alt-E) to return to the Main Menu from the main Query screen (or to return to the main Query screen if you are displaying a queried data table).
- Tap or Click on the desired radio button to execute a predefined query.
- Select [**O**K] button on the predefined query prompt screens to select the desired data table to be queried.
- Select [**C**ancel] button on the predefined query prompt screens to cancel the selection and return to the previous screen.
- Select [**√**] button to execute an SQL query (or the [**X**] button to clear the text box).
- Select [**P**rint] button (or Alt-P) from the queried table output screen to print the data to a printer.
- Select [**S**ave] button (or Alt-S) to save a queried data table as a .TXT or a .XLS file.

Report-Generation:

- Select [**P**rint Probe Report] button (or Alt-P) from the Query Menu screen to print a Probe Report to the Window or to a printer.
- Select [**P**rint] button (or Alt-P) from the report screen to print the selected probe data to the Window or to a printer.
- Select [**C**ancel] button on the report screen to cancel the selection and return to the previous screen.

Chapter Ten
Customization

This chapter describes ProbeCorder's Customization feature. It indicates which pick lists are customizable and explains how to use the internal pick list editing tool to customize your own pick lists.

Topics discussed in this chapter:

- Which Pick Lists Are Customizable and Where Are They?
- How to Customize a Pick List?
- Function Summary

Which Pick Lists are customizable and where are they?

ProbeCorder allows you to customize certain pick lists where user-defined categories are desirable. There are six customizable pick lists embedded on four different screens. In the following three dialog boxes, we use arrows and circles to designate the pick lists which can be customized.

On both the Survey Unit Record screen and the Site Record screen, the **'Sampling Geometry'** pick list can be customized to contain the different sampling geometries that a user wishes to employ in conducting subsurface probing within an arbitrary spatial sampling unit or within a known site or locality. These items could be coded to indicate the size and shape of the sampling unit (e.g., a 1 ha quadrat, a 100 x 10m transect, etc.) and the spacing interval between probes. If the user is working within a "mobile GIS" software environment, such as PenMetrics' FieldNotes (see Chapter 3), the items on the **'Sampling Geometry'** pick list could actually represent file names for CAD-derived drawing layers that contain graphic templates of the different geometries. The Survey Unit Record screen shown below indicates the location of the **'Sampling Geometry'** pick list and the three existing options that it contains.

The image shows a screenshot of the "Survey Unit Record" dialog box. The dialog is divided into several sections:

- UTM Coordinates:** Includes input fields for "Zone", "Easting", and "Northing".
- Probe Type:** Features three radio button options: "Shovel", "Posthole", and "Core/Auger".
- Probe Summary:** Includes three input fields for "Total Excavated", "Negative Probes", and "Positive Probes".
- Buttons:** "Entry", "Browse", "Edit", "Save" (with a checkmark icon), and "Cancel" (with an X icon).
- Sampling Geometry:** A pick list box containing three entries: "HA16/SOR", "HA100/SIG", and "TR1010/LIN". An arrow points to this box from the "Browse" button.
- Status:** A label at the bottom left reads "Status: Data Entry".

The Deposit Entry screen contains two customizable pick lists: 'Texture' and 'Horizon'. Their location is indicated by arrows in the sample screen shown below.

Deposit Entry

Max Depth 18 CM

Texture SILTY CLAY LOAM

Horizon silty clay loam

Structure clay loam

Boundary sandy clay loam

Comments silt

loam

very fine sandy loam

fine sandy loam

bioturbation

Color

Dry 10YR4/3

Moist 10YR4/1

Save Exit Help

The Probe Content screen contains three customizable pick lists: 'Number of Artifacts', 'Artifacts Present', and 'Features Present'. Their location is indicated by arrows in the sample screen shown below.

Probe Content

Number of Artifacts
1

Depth
25-50 cm

Artifacts Present
 (P) icr (2)
 25-50 CM - (P) FLAKE (1)
 25-50 CM - (P) FCR (1)

(p) icr
 (p) core
 (p) flake
 (p) flake tool
 (p) grst frag
 (p) grst tool
 (p) icr
 (p) ceramic Miss
 (p) ceramic Other

Add
 Remove
 Save
 Exit

Features Present

Add
 Remove
 Save

Help

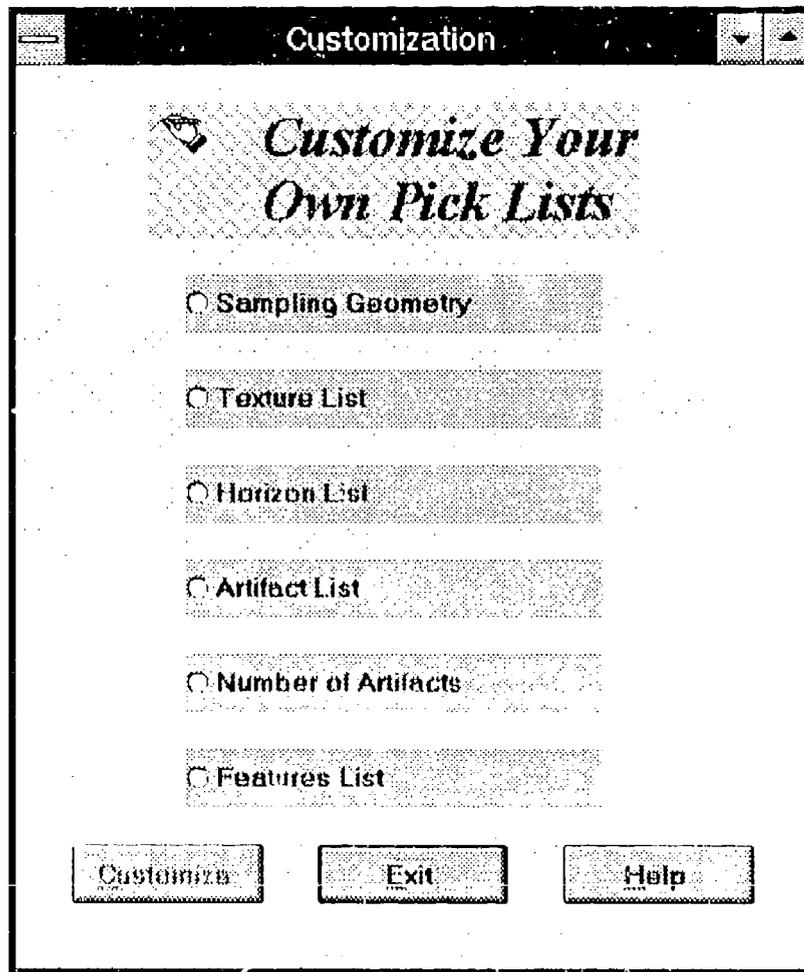
How to customize a pick list?

To customize a pick list, follow the six steps listed below:

Step 1 Tap or Click the [Customization] button or <Alt-C> on the Main Menu.



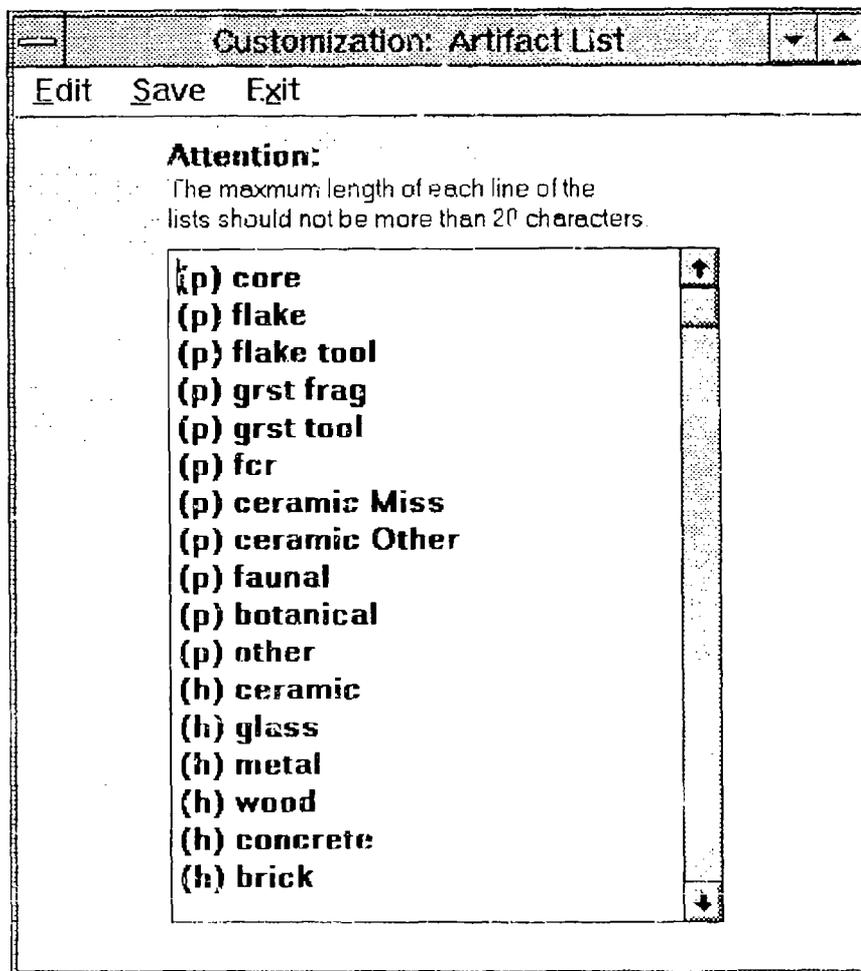
The ProbeCorder Customization window appears as shown below.



Step 2 Choose a pick list from the option button list, and then tap or click the [Customize] command button or <Alt-C>. Notice that when the Customization window first opens, the [Customize] command button is not enabled. But, once you choose a pick list from the option list, the [Customize] command button is immediately

enabled. This prevents you from clicking the [Customize] command button before choosing a list.

Now a pick list editing tool opens with the selected pick list (e.g., artifact list) displayed on the screen. The sample screen depicted below shows the existing pick list for 'Artifacts Present' text box that appears on the Probe Content screen. Note that the title bar of the edit screen shows the name of the file being edited. The edit screen also displays a reminder that the maximum length of each line is limited to 20 characters.



Step 3 Now you may make any modifications you like. The internal editing tool functions like any other word processor text editors, such as the Notepad feature provided by Microsoft's Word™ or Corel's WordPerfect™.

- Step 4 To **Save** your customization, **choose Save** from the **File** menu located on the menu bar. If you attempt to exit without saving your modifications, a message box opens to prompt you to either save all changes before exiting or to exit without saving the changes. **Tap** or **Click [Yes]** to save.
- Step 5 To disregard any changes or to exit the edit screen after saving, **choose Exit** from **File** on the menu bar.
- Step 6 To exit the **Customization** screen, **tap** or **click** the **[Exit]** command button (or <Alt-E>).

Function Summary

- **Tap** or **Click** the option item to choose the list to be customized.
- Select [**C**ustomize] button (or Alt-C) to activate the edit screen for the specified pick list.
- Select [**E**xit] button (or Alt-E) to return to the Main Menu.
- Select [**H**elp] button (or Alt-H) to get help on Customization.

Appendix A

*Selecting Pen-Based Hardware and
Software*

by

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U.S. Army Construction Engineering Research Laboratories
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Selecting a Pen Computer

Pen computers (also known as PC tablet computers) function as handheld, battery-powered, "electronic clipboards" for maximum portability and rugged outdoor use. They operate much like a lap-top or notebook computer with the extra advantage of an electromagnetic digitizer and pen stylus for sketching and single-handed data entry directly on the computer's screen. Like any notebook computer, they run Microsoft Windows 3.1[™] or Windows 95[™] operating system and compatible software packages. In addition they also run the Microsoft Windows-for-Pen[™] pen extensions. These are the electronic pen drivers installed by the manufacturer that permit pen gestures, inking, and handwriting recognition in any Windows-compatible Microsoft software program. There are several pen computers currently on the market and they vary somewhat in their degree of ruggedness and user-friendliness. In general terms, the more ruggedized and portable the platform, the less user-friendly it will be (e.g., no keyboard, no internal floppy drive, smaller screen size, etc.). However, many of these computers make up for their internal limitations through add-on peripheral devices that can be attached when the machine is not in portable field mode and permit operation as a fully functional desktop PC.

Common brand names and models for the ruggedized varieties include the Husky[™] FC-486, the Telxon[™] PTC-1184E, the Kalidor[™] K2500, the Badger[™] GT-486N, and the Teklogix[™] TKX-3000. (The latter two are actually rugged notebook computers with pressure-sensitive touch screens and an optional pen interface). Less ruggedized but still field-worthy brands and models for outdoor work include the TelePad[™] 3 and the Fujitsu[™] Stylistic series. All of these models currently operate on a 80486 microprocessor, but clock speeds range from 33 to 100 MHz. The TelePad Corporation also produced a 80386-based machine called the TelePad[™] SL that can be utilized for field data recording, but it has only 4 MB of RAM, runs at 25 MHz, and is now considered obsolete by current industry standards. For all of the 80486-based machines, eight MB of RAM is now standard, and is usually up-gradable to 24 or 36 MB. Internal hard drive capacity ranges from 170 to 525 MB as standard features but most systems are up gradable. Hard drive capacity is also expandable through standard PCMCIA technology (flash disks) and all of these systems have internal PCMCIA slots offering different combinations of slot types. Internal GPS capability is also added on in this fashion (e.g., the Trimble Gold Card[™]). Pricing on these pen computers ranges from \$2,000 to \$6,000 depending on brand name, and power, speed, and hard drive configuration. As with PC hardware generally, available configurations are constantly changing and new features are frequently added.

For purposes of developing and beta-testing the ProbeOrder data collection software on the pen-computing platform, five different pen computers were purchased and examined for compatibility with ProbeOrder and for overall capability, field reliability, and ergonomic design. The results of this comparative analysis are summarized in Tables A-1 and A-2. The former treats specification criteria while the latter treats end-user application criteria.

Table A-1. Pen-Based Computer Hardware Evaluation: Specification Criteria

<i>Brand:</i>	TelePad	TelePad	Teixon	Husky	Kalidor
<i>Model:</i>	SL	3	PTC-1184E	FC-486	K250C
(1) Power/Speed					
microprocessor	80386SL	80486DX	80486DX-2	80486SLC	80486DX-4-100
clock rate	25 MHz	33/66 MHz	50 MHz	50 MHz	100MHz
math coprocessor	?	?	?	optional	?
(2) Memory					
RAM	8 MB	8 MB (32 MB)	16 MB (20 MB)	8 MB (16 MB)	8 MB (24MB)
CACHE	64 KB	128 KB	n/a	n/a	256 KB
Flash EPROM	n/a	n/a	2 MB (4 MB)	10 MB (40 MB)	10 MB (80 MB)
(3) Display Capability					
screen type	backlit LCD	backlit LCD	backlit LCD	backlit LCD	backlit LCD
screen size	10" diagonal	9.5" diagonal	9.5" diagonal	7.5" diagonal	7.5" diagonal
pixel resolution	VGA, 640 x 480	LBV, 640 x 480	VGA, 640 x 480	VGA, 640 x 480	VGA, 640 x 480
monochrome/color	monochrome	color	monochrome	monochrome	monochrome
other features	transflective	passive matrix	transflective	passive matrix	transflective
(4) Digitizer					
type	electromagnetic	electromagnetic	electromagnetic	electromagnetic	electromagnetic
resolution	unk	unk	1000 ppi	unk	150 dpi
sampling rate	unk	unk	150 pps	unk	unk
(5) HD/Floppy Drive Storage					
HD type	2.5" IDE internal	?	2.5" IDE internal	PCMCIA card	?
HD storage capacity	170 MB	525 MB	170 MB	333 MB	170 MB (340 MB)
internal floppy drive	n/a	3.5" 1.44 MB	n/a	n/a	n/a
external floppy drive	3.5" 1.44 MB EFD	n/a	3.5" 1.44 MB	n/a	3.5" 1.44 MB
(6) Power Supply					
adapter type	AC in (100-260 VAC)	AC in (100-240 VAC)	AC 110/220v	?	AC in 90-260 VAC
battery type	Nickel Cadmium	Nickel Metal Hydride	Nickel Cadmium	Nickel Metal Hydride	Nickel Metal Hydride
battery rating	2.3 Ahr at 7.2 V	?	?	2.4 Ahr at 7.2 V	?
battery life	2.5-3.5 hrs	6 hrs	8 hrs (approx.)	10 hrs	5-8 hrs
recharge time (standard)	~3.0 hrs	~2.0 hrs	2-3 hrs	10 hrs	2 hrs or less
recharge time (fast charger)	n/a	n/a	1.0-1.5 hrs	1.0 hr	n/a
(7) Expansion Options					
PCMCIA slots	2 Type II	2 Type II or 1 Type III	1 Type III, 1 Type III/III	2 Type II	2 Type II or 1 Type III
GPS capability	internal card	internal module/card	PCMCIA card	PCMCIA card	PCMCIA card
GPS type	Trimble	Trimble	Trimble	Trimble	Trimble
digital camera port	yes	yes	yes	?	?
CD-ROM port	n/a	internal module	n/a	n/a	n/a
(8) Communication Capability					
data/fax modem type	2400 BPS/9600 baud	optional	PCMCIA optional	n/a	PCMCIA optional
spread-spectrum capability	n/a	optional	DataSpan 2000	?	?
cellular radio capability	n/a	optional	optional	?	?

Table A-2: Pen-Based Computer Hardware Evaluation: End-User Application Criteria

<i>Brand:</i>	TelePad	TelePad	Teixon	Husky	Kalidor
<i>Model:</i>	SL	3	PTC-1184E	FC-486	K2500
(1) Ease of Use					
ergonomic factors	good	good	good	excellent	excellent
screen visibility	good	excellent	good	good	good
keyboard accessibility	good (peripheral)	excellent (attached)	good (peripheral)	excellent (embedded)	good (peripheral)
pen quality/reliability	good	good	good	good	excellent
pen storage	good	fair	good	fair	good
(2) Portability					
weight	4 lbs 8 oz	5 lbs (tablet)	4 lbs 12 oz	4 lbs 6 oz	3 lbs 11 oz
dimensions	11" x 11" x 1.7"	11" x 10" x 2" (tablet)	12.5" x 9.5" x 2"	11" x 8.4" x 1.7"	7.4" x 10.3" x 2.4"
(3) Ruggedness/Durability					
temperature range	0-45 degrees C	?	min 20-50 degrees C	min 20-60 degrees C	14-122 degrees F
humidity range	0-100%	?	0-95%	unk	unk
sealing	unk	?	moisture/dust	waterproof	rain/mist
shock	+200 g (3" drop)	?	4" drop	6' 6" drop	3' drop
vibration	5-500 Hz @ 0.5 g	?	unk	unk	5-200 Hz @ 1.0 g

In recommending one or another of these machines for use with ProbeCorder, it is important to keep in mind the trade-offs mentioned above between ruggedness and user-friendliness. Relative processing speed is also a major consideration. While the **TelePad SL** can run ProbeCorder and FieldNotes 4.0 on the Windows 3.1 operating system, it is sluggish in comparison to the 80486-based machines and is not recommended unless cost is a major factor. The SL model can now be purchased for less than \$1500.00 but it is not clear how much longer technical support will be available.

If field conditions are not too harsh, then the **TelePad 3** pen computer would be the ideal machine field use because of its greater user-friendliness. Useful features in this regard include the large screen size, color display capability, and its unique design for attaching and detaching numerous peripheral devices (modules) in the field. The hard drive, floppy drive, and PCMCIA modules attach to specially designed bays on the under side of the tablet or screen, while the keyboard is hinged to the bottom of the screen and is fully detachable. It is best employed when the machine is sitting on a table surface or desktop, as it is somewhat awkward (but not impossible) to hold in the arm when attached to the screen. The TelePad 3 proved to be reliable both in field and laboratory applications, but in cases where outdoor conditions are less than optimal, (e.g., excessive dust or moisture), problems could occur. This is because the add-on peripheral devices are not sufficiently protected. Perhaps the most vulnerable area is the PCMCIA module. It is covered by a hinged door of light plastic that is fastened by an ineffective snap device. However, when a GPS PCMCIA card is installed, this door cannot be even be closed because the GPS antenna must be attached directly to the card at this opening. This exposes the interior portion of the PCMCIA module to the elements.

For more rugged outdoor field use in less than optimal environmental conditions, it is recommend that one of the three other machine be employed (i.e., the Telxon, Husky, or Kalidor brands). Even with these three brands, slight differences exist in terms of relative user-friendliness and ergonomic design. For example, if a larger screen size is desired, then the **Telxon PTC-1184E** may be preferable due to its 9.5" screen. It also features a standard IBM PS/2-type connector for peripheral attachment of any PC/AT type keyboard and an adapter cable to attach a parallel device such as a printer and an external floppy disk drive. The ability to attach an external floppy drive is very advantageous for loading software applications and for downloading field data on a routine basis. One disadvantage of the Telxon is the cumbersome procedures required for routine power management and the fact that the machine cannot be powered directly from the AC adapter plugged into a wall outlet.

The Kalidor is an extremely ruggedized unit and the model tested (the **Kalidor K2500**) is the fastest (100 MHz) and most powerful of the five pen computers examined. It is the only one of the five machines tested that is capable of running the Windows '95 operating system. While its small screen (7.5") is a disadvantage in comparison to the previously described models, it makes up for this in power, portability, and ergonomic design. Its small carrying case is also well designed for rugged outdoor use. Like the Telxon PTC-1184E described above, the Kalidor does not have an internal floppy disk

drive, nor does the company manufacture its own external floppy disk drive for peripheral attachment. Instead, they recommend using the DOS INTERLNK utility or commercial products such as LapLink™ (Traveling Software, Inc., Bothell, WA) for communicating with a parent PC. In this way, application software can be loaded onto the pen computer and field data can be routinely downloaded from the pen computer to the parent PC. It is important to point out, however, that the computer's parallel interface includes a special adapter cable that permits connection to external floppy disk drives (assuming that the appropriate device drivers are previously loaded onto the machine via the INTERLNK utility). This alternative is generally much faster and more convenient than using the INTERLNK utility, allowing routine data back up on the floppy disk medium while in the field if necessary.

The **Husky FC-486** is similar to the Kalidor in its ruggedness and portability. While it employs a small screen size like the Kalidor (7.5"), it has the distinct advantage of an embedded mini-keyboard below the screen. The two components are set into the same ruggedized casing at a slight angle, giving the machine a slightly bowed shape that facilitates cradling of the machine on one arm. Many users will highly value this feature, as it circumvents complete reliance on the on-screen keyboard feature or the Pen Palette tool included in the Windows-for-Pen operating system when carrying out field data entry. Thus the pen can be used largely as a mouse device for clicking (tapping) functions or for data entry tasks where it is required such as sketching and inking. Like the Telxon and Kalidor models described above, the Husky has a parallel port that interfaces with external floppy drive devices for loading software applications or downloading data. Alternatively, these operations can be carried out using the INTERLNK utility.

Of the five pen computers examined, the Husky FC-486 and the Kalidor K2500 machines are arguably the best for rugged outdoor use, portability, reliability, and overall performance. The Telxon is a close contender but its power management features are a disadvantage. The TelePad 3 is probably the most user friendly of the five machines, but is less ruggedized and therefore less suitable for outdoor use in suboptimal environmental conditions. Finally, the TelePad SL, while it was state-of-the-art a few years ago, is now considered obsolete because of its 80386 processing chip, low RAM, and smaller hard drive.

For more information on these hardware products, the manufacturers can be contacted at the following addresses and phone/fax numbers:

TelePad Corporation
380 Herndon Parkway, Suite 1900
Herndon, VA 22070
TEL: (703) 834-9000
FAX: (703) 834-1235

Telxon Corporation
3330 West Market Street
Akron, OH 44334
TEL: (216) 867-3700 or
TEL: (800) 800-8010

Kalidor, Inc.
3553 North First Street
San Jose, CA
TEL: (498) 432-6000
FAX: (498) 432-6545

Husky Computers, Inc.
18167 US 19 North, Suite 285
Clearwater, FL 34624
TEL: (813) 530-4141
FAX: (813) 536-9900

Selecting "Mobile GIS/GPS" Software

Several commercial off-the-shelf (COTS) software packages exist for the pen-based hardware platform, most of which are aimed at GPS data collection and map display. Some packages offer separate software development kits which permit the end-user to design customized electronic forms for standardized field data recording, including digital photographs and inked sketch maps or drawings. Geofirma's Mobile[™] and Designer[™] software and GeoResearch's GeoLink[™] and PowerMap[™] software are good examples of these GPS data logging and mapping programs. They are discussed in greater detail in Chapter 3 of this manual.

One of the most powerful of these pen-based programs is PenMetrics' FieldNotes[™] "mobile GIS/GPS" software (currently in version 4.0). This program brings much of the functionality of Geographic Information Systems to the pen-based computing platform by allowing the user to store, analyze, and query spatially referenced attribute data in the same environment. Maps (both raster and vector) and imagery can be imported from a variety of formats and drawing overlays can be created and saved in CAD format. An integrated Global Positioning Systems module is available for GPS data logging and mapping. The FieldNotes program combines efficient field data recording with powerful graphic display and storage capabilities that effectively integrate GIS, GPS, and CAD functions. A software development module (FieldForms[™]) allows the creation of customized field recording forms such that detailed attribute data can be recorded, plotted, and georeferenced in a previously defined map coordinate system. Pen-based mobile GIS computing provides substantial benefits for field data collection. By automating the recording and data storage process, considerable gains can be made in efficiency and accuracy when compared to traditional methods of field recording with paper forms and penciled sketch maps. Routine field data collection and validation, inventory management, and field mapping can all be carried out quickly, easily, and accurately for subsequent conversion to a desktop GIS, CAD, and/or RDBM system. For more information on the use of PenMetrics' FieldNotes with the ProbeCorder data collection software, see Chapter 3 and 5 of this manual. For more information on FieldNotes and other PenMetrics software products, the company can be contacted at the following address and phone/fax numbers:

PenMetrics, Inc.
225 SW Madison Avenue
Corvallis, OR 97333
TEL: (541) 757-3076
FAX: (541) 752-2027

Information on the All Points Software and GeoResearch "mobile GPS" software products can be obtained from the following addresses and phone/fax numbers:

All Points Software, Inc.
1100 University Avenue
Rochester, NY 14607
TEL: (716) 461-3182
FAX: (716) 256-6236

GeoResearch, Inc.
115 North Broadway
Billings, MT 59101
TEL: (406) 248-6771
FAX: (406) 248-6770

Appendix B

*How to Describe a Soil Profile
(Abbreviated Version)*

by

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Introduction

A soil profile may be described in the field or in the lab. A soil profile description in the field is accomplished by digging a soil pit or using a road cut, quarry cut, or other natural exposure. A soil profile description may also be obtained by pulling a large diameter (e.g., 7.6 cm or 3 in) undisturbed cylindrical core in the field with a truck-mounted or foot-operated hydraulic coring device. The cores may be cut open and described in the field, or they can be extruded into metal trays or plastic PVC pipe cut in half (hemispherical), wrapped in saran wrap, labeled with felt-tip markers, and transported to the lab and described (Johnson and Alexander 1975). The following discussion focuses on either field or lab description and sampling of profiles.

Profile Description

A. Equipment Needs:

- Tape (preferably metric 5-10 m long, ¼" wide)
- 16 penny box nails (about 20 or 30)
- Plastic water bottle
- Munsell Soil Color Charts
- Shovel
- Knife (hunting type)
- pH kit
- Sample bags (if sampling is to be done)
- Felt-tip marker
- Field notebook and record sheet
- Hand lens (at least ≥ 10 power)
- Camera

B. Procedure:

Depth of soil pit depends on goals of investigation. Dig the pit so that the wall to be described will be lighted by sunlight (for photographic and viewing purposes). If a natural exposure is used, clean off surface to make sure all slopewashed material is removed (the farther into the cliff and away from the exposed cut wall, the better) Make your cut vertical if possible, or as close to vertical as is feasible.

Identify horizons and drive 16 penny nails into horizon boundaries (i.e., the interfaces between horizons). Drop tape from top of exposure to bottom and secure. Photograph profile when light conditions permit (or use flash). Describe each horizon or sedimentary unit using a standardized description sheet (or electronic recording format). Descriptions should include color, texture, structure, consistence, pH, cementation (if any), carbonates, cutans-silans-managens, concretions, roots, and boundary. Abbreviated information on how to describe and delimit each of these elements is given below. When

you have completely described the profile, fill in as many of the categories as you can at the top of the description sheet.

Profile Sampling

A. Sampling by Horizon:

Take at least a heaping double handful of soil that is representative of the entire horizon and place into pre-labeled (locality, depth, horizon) bags. Repeat for each horizon.

B. Sampling by Equal-Depth Increments:

Take nails and drive into profile at 10 cm depth intervals. Then sample as in A. above, except stay within the 10 cm levels defined by the nails, *but do NOT sample across horizon boundaries*. Ideally you would sample both ways. (You may think this is sampling overkill, but it is sometimes very well worth the time it takes).

The following is a sample Soil Profile Description Sheet that describes, in abbreviated fashion, the categories for which data should be recorded. It is intended as a guide for the field worker in the preparation of soil profile descriptions. This material alone, however, may be insufficient for a complete description of the great variety and complexity of soil profiles and a full understanding of the techniques of profile description. For such understanding, the Soil Survey Manual (Soil Survey Staff 1993) should be consulted regularly and thoroughly.

Sample Soil Profile Description Sheet

- | | |
|-----------------------------------|------------------------------|
| I. Soil: | VI. Plant Material: |
| II. County: | VII. Topography: |
| III. Pedon: | VIII. Soil Drainage: |
| IV. Location: (general and legal) | IX. Use of Vegetation: |
| V. Physiography and Elevation: | X. Described and Sampled by: |
| XI. Classification: | XII. Pedon Description: |

- | | |
|---|-------------|
| 1. Horizon nomenclature: | 2. Depth: |
| 3. Color (matrix): | 4. Texture: |
| 5. Mottles: | |
| Describe: abundance, size, contrast and color: Abundance: few, <2% common, 2-20%; many 20-40%; (give %); Size: fine, <5 mm; medium, 5-15 mm; coarse, >15 mm; Contrast: may omit; Shape: optional, use common terms. | |
| 6. Structure: Describe grade, size, and type. | |

Grade	Size	Type		
		Friable Granular	Blocky	Prismatic & Columnar
Structureless				
(massive or single grain)	very fine	<1	<5	<10
Weak	fine	1-2	5-10	10-20
Moderate	medium	2-5	10-20	20-50
Strong	coarse	5-10	20-50	50-100
	very coarse	10	50	100

Do not use "structureless" as a term. Use massive or single grain

7. Consistence: (Moist) State field moist conditions.
 Loose - non-coherent; Very friable - crushes ... very gentle pressure & recoheres;
 Friable - crushes ... gentle to moderate pressure & recoheres; Firm - crushes ... moderate pressure, but distinct resistance; Very firm - crushes ... strong pressure, barely between thumb and fore finger; Extremely firm - cannot crush between

12. Roots: Describe (if needed): quantity, size and location

Quantity and Size per dm²:

	Very fine 1 mm	Fine 1 - 2 mm	Medium 2 - 5 mm	Coarse 5 - 10
mm				
Few	<100	<100	<1	<1
Common	100 - 500	100 - 500	1 - 5	1 - 5
Many	>500	>500	>5	>5

13. Coarse Fragments: shape, size, kind, and % by volume.

14. Other features:

15. Boundary: Describe distinctness and topography.

Distinctness: abrupt, <2 cm; clear, 2-5 cm; gradual, 5-15 cm; diffuse, >15 cm.

Topography: smooth, nearly a plane; wavy, pocket width > depth; irregular, pocket depth > width; broken, is discontinuous.

XIII. Remarks: Moisture status, etc.

Note: All features may not be described in all cases. Judgement must be exercised in deciding which attributes are important enough to describe and which attributes merely complicate a description without adding useful information.

Sample Description of a Soil Horizon:

Btg 37 - 63 cm Gray (10YR 6/1) silt loam; common medium distinct yellowish brown (10YR 5/4) and few fine prominent light brown (7.5YR 6/4) mottles; weak coarse prisms parting to strong fine angular blocky structure; firm, many thick gray (10YR 6/1) clay skins on vertical and horizontal blocky ped faces; few thin light gray (10YR 7/1), white (10YR 8/1) dry silty skeletons on prism faces; few medium black (10YR 2/1) Fe-Mn concretions <1 mm; many vfine impeded pores; few vfine roots along prism faces; neutral, pH 6.8; clear smooth boundary.

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