

**OEW SITE STATISTICAL  
SAMPLING BASED  
METHODOLOGY (SiteStats)  
VERSION 1.0  
USER'S MANUAL**

**For U.S. Army Engineer Division  
Huntsville, Alabama**

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**OEW SITE STATISTICAL SAMPLING BASED METHODOLOGY**  
**(SiteStats)**  
**USER'S MANUAL**

**1.0 INTRODUCTION**

The OEW Site Statistical Sampling Based Methodology (SiteStats) implements the methodology developed by QuantiTech, Inc., for U.S. Army Engineer Division, Huntsville, in support of the Division's role as the Ordnance and Explosive Waste (OEW) Mandatory Center of Expertise (MCX). The tool is intended to assist the OEW MCX in fully characterizing sites within given statistical bounds with minimal sampling. Additionally, SiteStats provides the Remediation Planning Tool which can be used to determine how remediation can best be performed, given a specified level of work, a specified dollar level, or a specified risk level.

## 2.0 STARTING SiteStats

Written and compiled in Visual Basic, the software does not require any purchased applications support since it was developed as a stand-alone executable. The Remediation Planning Tool database used is in Access 2.0. The user does not need to know anything about Visual Basic or Access for code execution.

### 2.1 System Requirements

- \* A master copy of the SiteStats 1.0 Disk,
- \* An IBM PC or compatible computer,
- \* A graphics card compatible with Microsoft Windows 3.0 or later,
- \* 4 megabytes (MB) of random-access memory (RAM),
- \* MS-DOS version 3.1 or later and Microsoft Windows 3.0 or later,
- \* A mouse or other compatible pointing device,
- \* 10 megabytes (MB) of hard disk storage space.

### 2.2 Installing the Software

- \* Start **Microsoft Windows**.
- \* Insert the master disk into drive A or drive B.
- \* From the **File** menu in either the **Program Manager** or **File Manager**, choose **Run** (A dialog box similar to the one shown in Figure 2.2-1.)
- \* Type **(a:setup)** or **(b:setup)** depending on which drive is in use.
- \* Click **OK**.
- \* Follow any additional instructions provided on the screen.

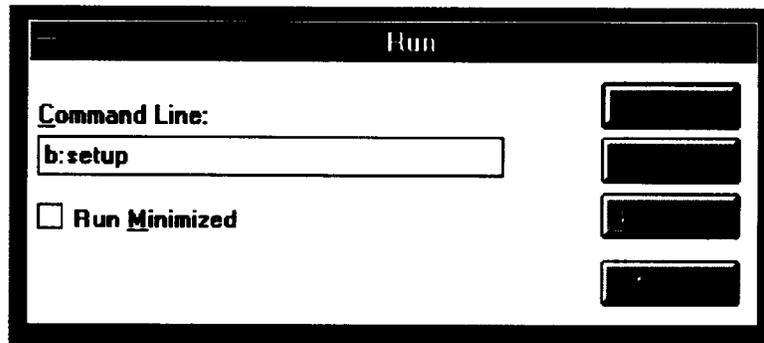


Figure 2.2-1. Run Command Line

### 2.3 Launching SiteStats

- \* In the **Program Manager** window, double-click the **SiteStats** group icon or the group icon that contains **SiteStats 1.0**.
- \* Double-click the **SiteStats** program icon, as shown in Figure 2.3-1.

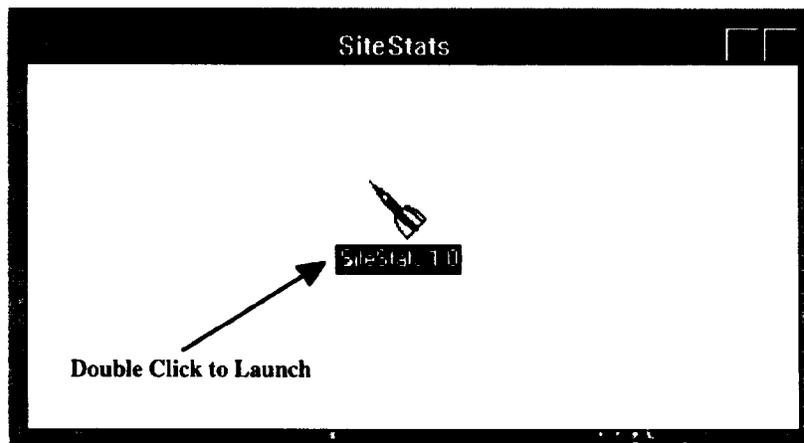


Figure 2.3-1. SiteStats Program Icon

### 2.4 Exiting From SiteStats

- \* From the **SiteStats File** menu choose **Exit**.
- \* A dialog box will appear asking the user to verify the decision to quit, see Figure 2.4-1.
- \* Click **Exit** to quit or **Cancel** to remain in the program.



**Figure 2.4-1. Exit Program**

## **2.5 SiteStats Code Limitations**

SiteStats 1.0 was developed and written in Microsoft Visual Basic for Windows. As such, any limitations imposed in the development language will also restrict the executable code. Presently, users are limited to 30,000 grids within any sector. Additionally, users should avoid the use of punctuation within edit fields as this may cause problems when retrieving data once it has been saved. SiteStats operates within a single site area, or sector, at a time, sampling individual grids one at a time. All sampling grids in SiteStats have the same dimensions.

### 3.0 BASICS OF USING SiteStats

#### 3.1 Commands and Menus

SiteStats offers two ways to choose commands:

- \* From the menu bar,
- \* Using shortcut keys.

For additional instruction about choosing menu commands, refer to the Microsoft Windows User's Guide.

SiteStats commands are grouped on menus, see Figure 3.1-1. Menu names appear in the menu bar across the top of the application windows. Different windows will have different menu bars.

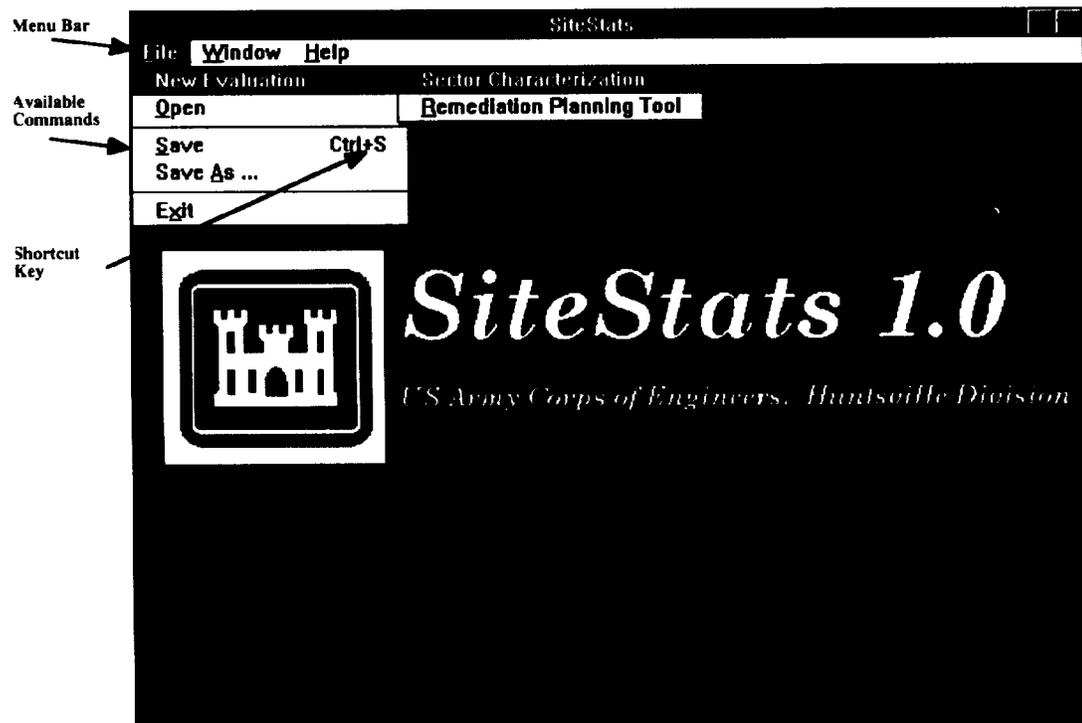


Figure 3.1-1. Sample Menu

Choosing a Command from the Menu Bar:

- \* Point to the menu name in the menu bar that contains the command you want, drag the mouse to that command, and then release it to select the command.
- \* The user may also click the menu name and then click the command.
- \* Use the keyboard (instead of mouse) by typing the underlined letter in the desired command.

### 3.2 Dialog Boxes

SiteStats displays numerous dialog boxes to obtain information from the user, see Figure 3.2-1. These dialog boxes may include areas in which text or numbers are entered. Dialog boxes may also allow settings to be changed or notify the user of some decision. It may also display additional information or request confirmation.

For more information about general dialog box procedures, consult the [Microsoft Windows User's Guide](#).

Site/Sector Designation

Site Location:

Sector ID:

Date:

Sector Type

Dispersed       Localized

Figure 3.2-1. Site/Sector Designation

### 3.3 Opening Saved Data

- \* Choose **Open** from the **File** menu.
- \* A dialog box, similar to the one shown in Figure 3.3-1, appears allowing the user to switch drives and/or directories.
- \* Select the desired file.
- \* Click the **OK** button to open the file.

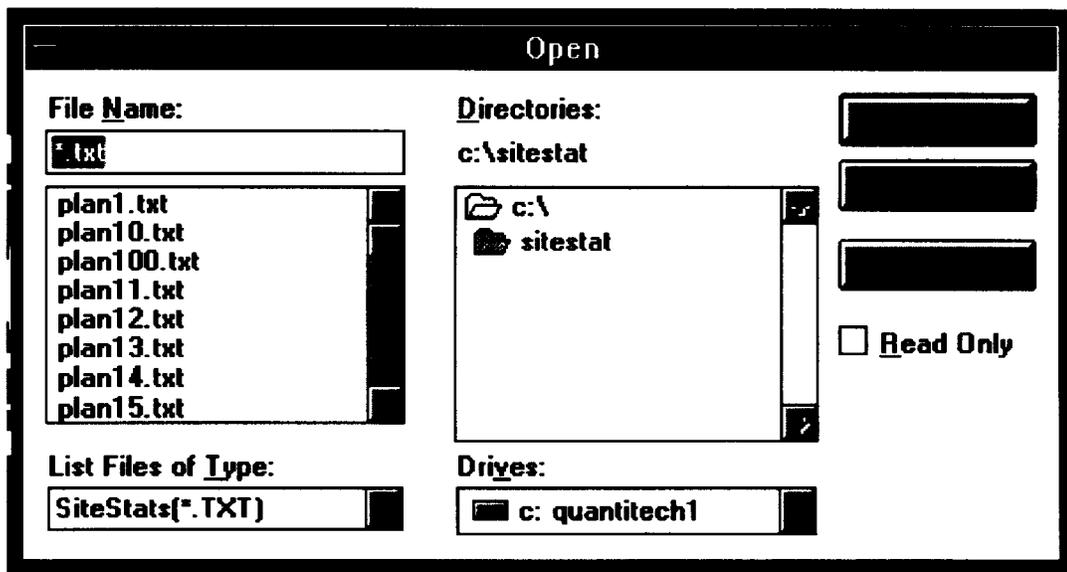


Figure 3.3-1. Opening Saved Data

### 3.4 Saving Data

When you finish a SiteStats session, save your data before you exit the program. Two commands on the **File** menu will allow the user to save the data.

- \* Use the **Save As** command to save your data for the first time and give it a name, see Figure 3.4-1.
- \* Use the **Save** command to save changes to an existing data file.

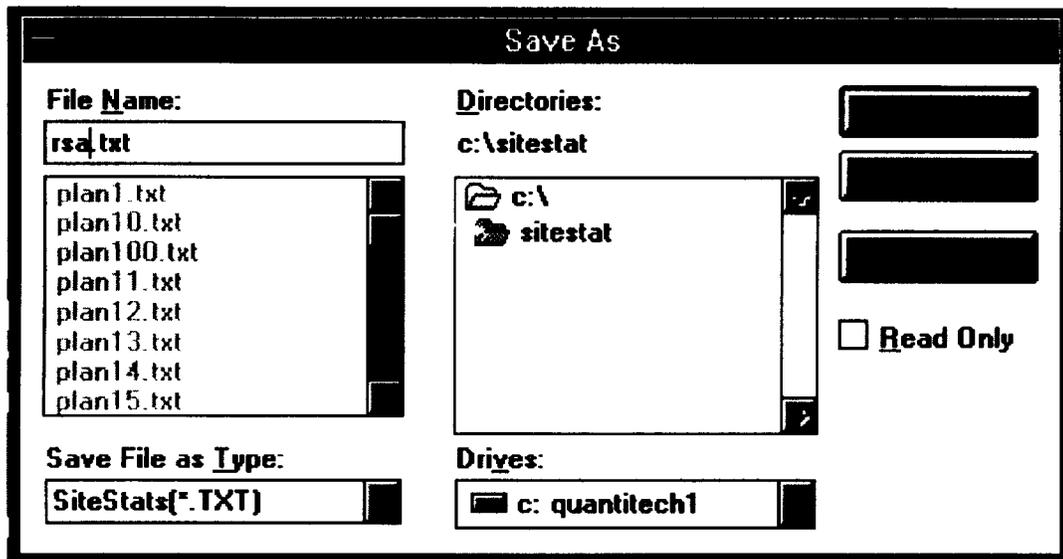


Figure 3.4-1. Saving Files

### 3.5 Beginning a New Evaluation

Two basic types of analysis can be performed with SiteStats: Sector Characterization and Remediation Planning.

Sector Characterization is available for use in site/sector sampling that occurs as part of the Engineering Evaluation/Cost Analysis process. In this mode, SiteStats operates as a real-time field tool. Remediation Planning is available for a site Program Manager's use in evaluating alternative site remediation approaches.

- \* Choose **New Evaluation** from the **File** menu, see Figure 3.5-1.
- \* Select either **Sector Characterization** or **Remediation Planning Tool**.

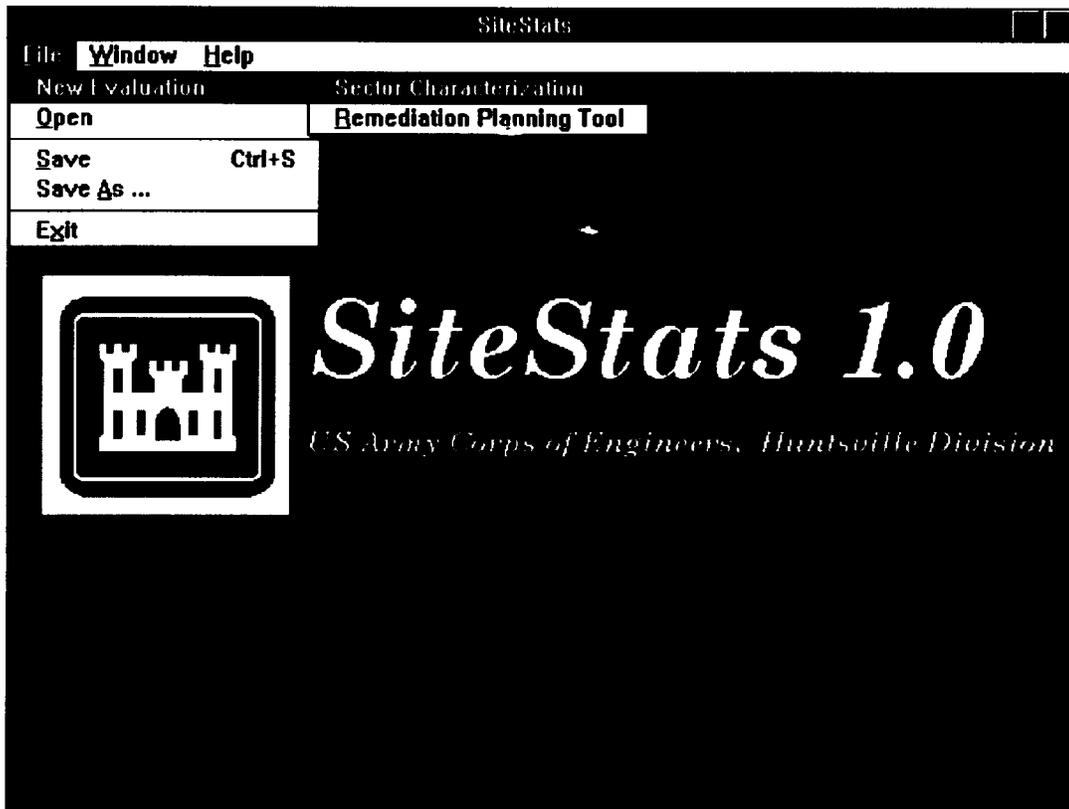


Figure 3.5-1. File Menu

### 3.6 Other Menus on the Main Screen

In addition to the **File** menu, a **Window** menu and **Help** menu exist on the main screen. From the **Window** menu the user may choose **Display Sector** to view the sector map. The **Help** menu allows the user to display information about SiteStats.

### 3.7 Error Messages

SiteStats determines if a user's inputs are valid. If a mistake is made, a message will appear to bring attention to the problem. In the example in Figure 3.7-1, the total percentage of labor hours in the Field Cost Model did not equal 100%.

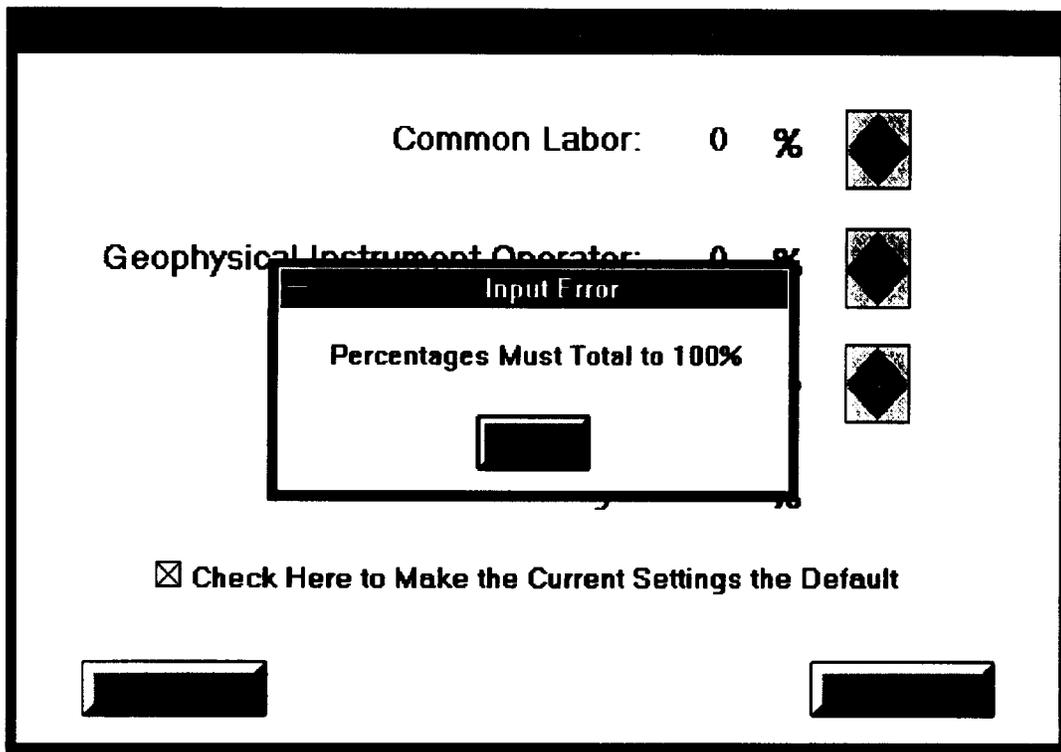
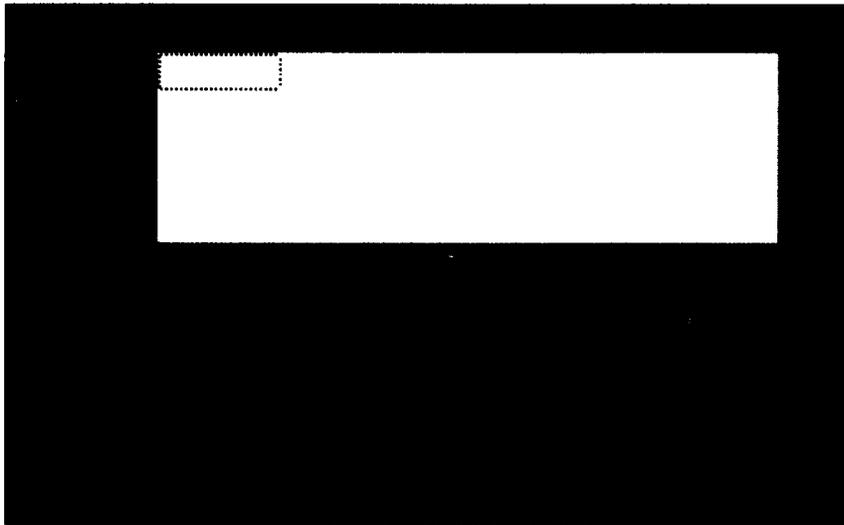


Figure 3.7-1. Input Error Example

#### **4.0 BUILDING A NEW SECTOR (SITE CHARACTERIZATION)**

When a new site characterization evaluation is selected, a unique sector representation will be created by the user. The sector is represented as a rectangular block diagram composed of numerous grids, see example in Figure 4.0-1. Grids are identified by row and column numbers.



**Figure 4.0-1. Example Sector**

#### **4.1 Dispersed vs. Localized**

Dispersed sectors are those where you would expect to find ordnance distributed across the sector. An example of a dispersed sector is an impact area. Localized sectors have isolated concentrations of ordnance. An example of a localized sector is a burial pit which contains some type of hazardous material. The user has the option of selecting either type of sector at the beginning of a new sector characterization. (See Figure 4.2-1.)

#### **4.2 Sector Name and Location**

Each new sector can be described by Site Location and Sector Identification, see Figure 4.2-1. Additionally, a Start Date can be provided. Although these inputs are

optional, it is recommended that the user provide this information. The site location and sector identification fields are unique, meaningful labels assigned by the user.

**Site/Sector Designation**

Site Location:

Sector ID:

Date:

Sector Type

Dispersed       Localized

**Figure 4.2-1. Site/Sector Designation**

### **4.3 Sector Dimensions**

Sector Length and Sector Width measurements must be input by the user as shown in Figure 4.3-1. These values should be determined by visualizing a rectangle that would completely encompass the sector of interest. Although the sector may not be rectangular in shape, the user will have an opportunity to refine the sector representation later.

**Sector Dimensions**

---

**Help**

Enter the Horizontal Length of the Sector:

Enter the Vertical Width of the Sector:

**Units of Measure**

Feet

Yards

Miles

Meters

Enter Appropriate Dimensions Here

Select Unit of Measure

Click to Enter the Dimensions

**Figure 4.3-1. Sector Dimensions**

#### **4.4 Grid Dimensions**

After entering sector dimensions, the user will be prompted to enter the size of the individual grids, see Figure 4.4-1. This grid size will remain constant throughout the sector. Follow the same steps used in entering the sector dimensions.

**Grid Dimensions**

Enter the Horizontal Length of the Grid: 100

Enter the Vertical Width of the Grid: 100

**Units of Measure**

- Feet
- Yards
- Miles
- Meters

[Disabled Button] [Disabled Button]

Figure 4.4-1. Grid Dimensions

#### 4.5 Verifying Dimensions

Once the sector and grid dimensions have been entered, a dialog box asking for verification will appear as shown in Figure 4.5-1. If the dimensions shown are correct, then click **Dimensions Correct**. Otherwise, to change either the sector or grid size, click **Change Dimensions**.

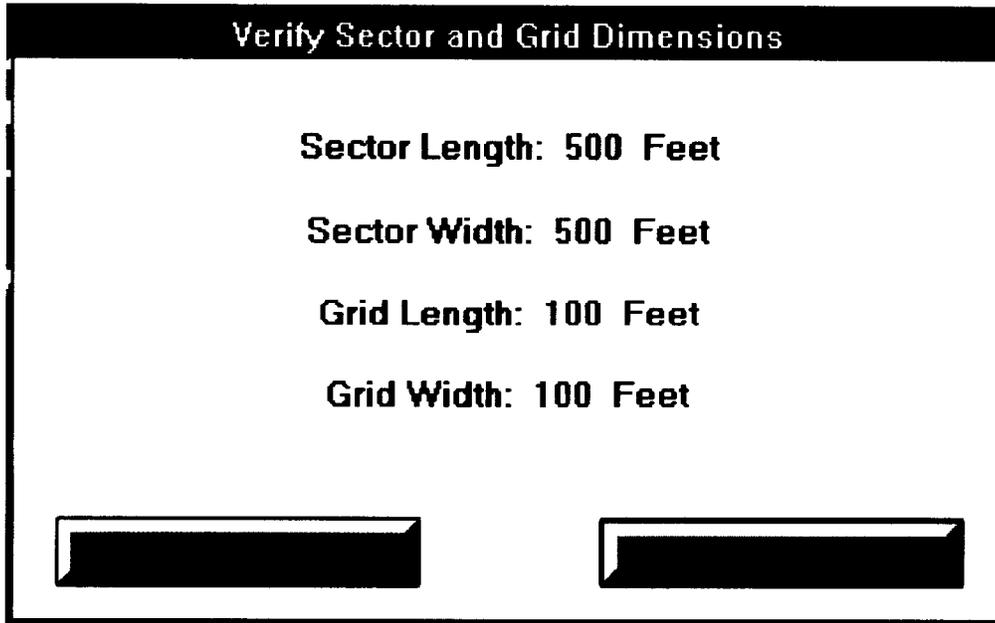


Figure 4.5-1. Sector/Grid Dimension Verification

#### 4.6 Localized Sector Centroid

If a Localized Sector Type was selected earlier, the centroid of the OEW contamination must be specified within the new sector. A dialog box will appear requesting the user to enter the origin (i.e., center) of the localized site as shown in Figure 4.6-1. This location should be the area of expected highest OEW concentration.

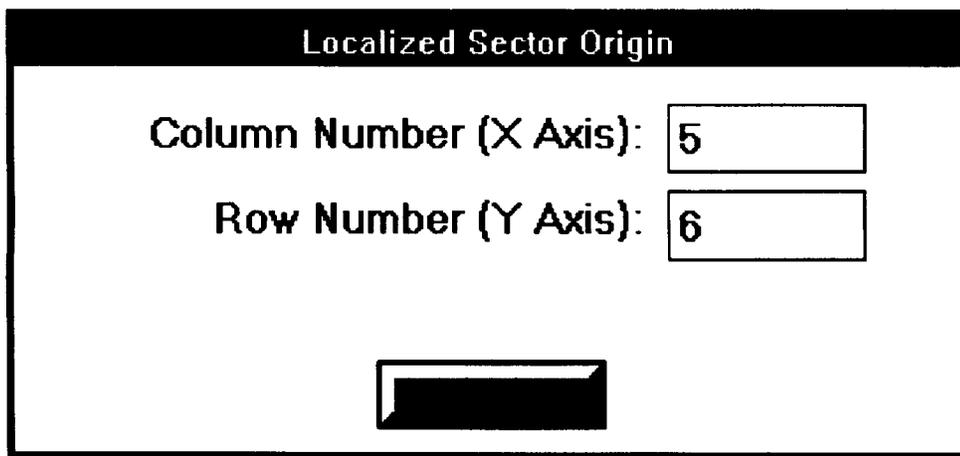


Figure 4.6-1. Localized Sector Origin

When the dialog box appears, the edit fields will already have values. These default values are the exact center of the sector which was created. Should you choose to use these values simply click **OK**, otherwise, identify the location in terms of row and column.

## **5.0 FIELD COST MODEL (SITE CHARACTERIZATION)**

### **5.1 Field Cost Model Usage**

The Field Cost Model is a tool which predicts the cost of sampling a grid within the sector. This cost estimate is based on sector terrain, the number of anomalies in the grid, and the composition of the team performing the sampling (UXO Specialist, GIO Specialist, and Common Laborer). The Field Cost Model executes during the grid sampling portion of SiteStats.

### **5.2 Describing the Terrain**

The user must provide an overall assessment of the terrain within the sector as shown in Figure 5.2-1. This characterization is defined during the construction of a new sector. The terrain description comprises: slope (either 0°-10°, 10°-30°, or >30°); vegetation density (either clear, grass/brush, trees, or marsh); soil type (either light soils - sand or loam, or heavy soils - clay or rock); and footing conditions (either slippery or non-slippery). A sector is assumed to have the same general terrain conditions.

**Field Cost Model - Inputs**

<p><b>Slope of Terrain</b></p> <p><input checked="" type="radio"/> <b>Level (0 - 10)</b></p> <p><input type="radio"/> <b>Moderate (10 - 30)</b></p> <p><input type="radio"/> <b>Steep (&gt;30)</b></p>	<p><b>Vegetation</b></p> <p><input checked="" type="radio"/> <b>Clear</b></p> <p><input type="radio"/> <b>Brush</b></p> <p><input type="radio"/> <b>Trees</b></p> <p><input type="radio"/> <b>Marsh</b></p>
<p><b>Soil Density</b></p> <p><input checked="" type="radio"/> <b>Light - Sand or Loam</b></p> <p><input type="radio"/> <b>Heavy - Clay or Rock</b></p>	<p><b>Other Properties</b></p> <p><input type="radio"/> <b>Slippery</b></p> <p><input checked="" type="radio"/> <b>Not Slippery</b></p>

**Available Funds for Characterization (ex. 10000):**

**Figure 5.2-1. Field Cost Model Inputs**

- \* Select the predominant slope of the sector. (Level, 0-10°; Moderate, 10 - 20°; Steep > 30°.)
- \* Choose the appropriate soil type.
- \* Choose the predominant vegetation density type.
- \* Select the Slippery or Not Slippery factor based upon the footing condition within the sector.
- \* Enter the available funds for characterizing the entire sector. Use only whole dollars with no punctuation. (Note: This input is optional. Provide a value only if you wish for SiteStats to perform the necessary accounting.)

### 5.3 Hours Breakdown

Included in the estimate for sampling a grid is a value for the labor required to identify and investigate the grid's anomalies. The cost of this labor is dependent upon the skill level of the team members. The user can adjust the labor type percentages as shown in Figure 5.3-1. The default provided is 100% UXO Specialist. The total percentage must add to 100% or an error message will appear to prompt the user to adjust accordingly.

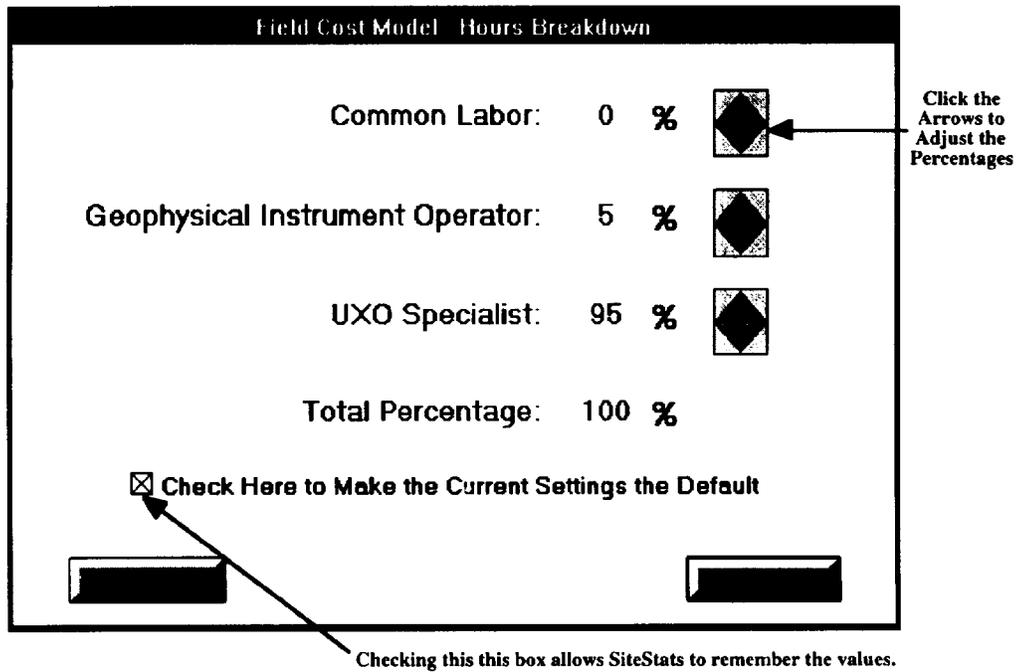
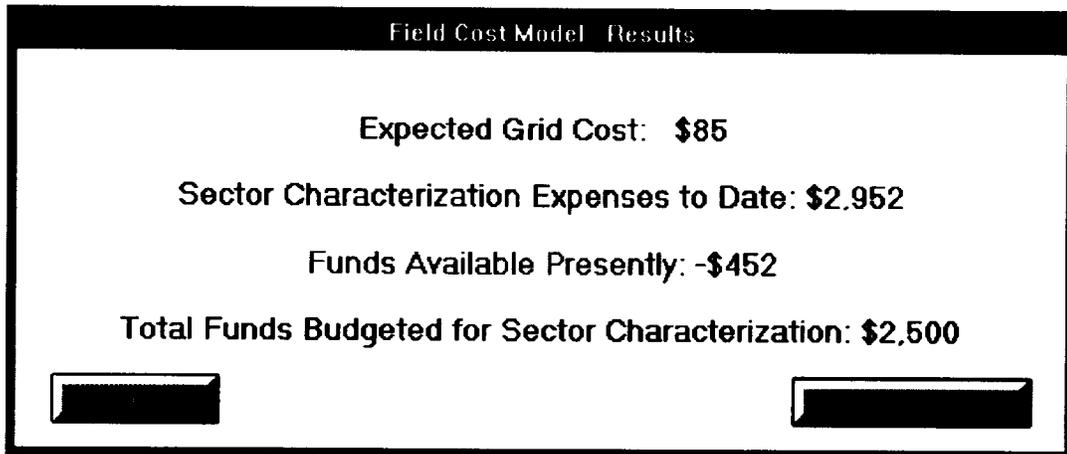


Figure 5.3-1. Field Cost Model - Hours Breakdown

### 5.4 Field Cost Model Results

Using the sector description and team composition identified by the user, the Field Cost Model predicts the expected cost to sample the grid chosen or identified for investigation. The user is informed of the estimated cost to sample each grid as shown by the example in Figure 5.4-1. The cumulative expenses, remaining funds and total budget are also displayed.



**Figure 5.4-1. Field Cost Model - Results**

- \* Click **Continue** to proceed with the grid sampling.
- \* Click **Stop** if the funds required or expended exceed the budget you have identified for investigation of grids within the sector.

## 6.0 SECTOR MAP FEATURES (SITE CHARACTERIZATION)

### 6.1 Map Description

The example sector representation in Figure 6.1-1 is a rectangle defined by the user-supplied sector and grid dimensions. In this particular example a 500' x 500' sector was created with 100' x 100' grids. The total number of grids is 25.

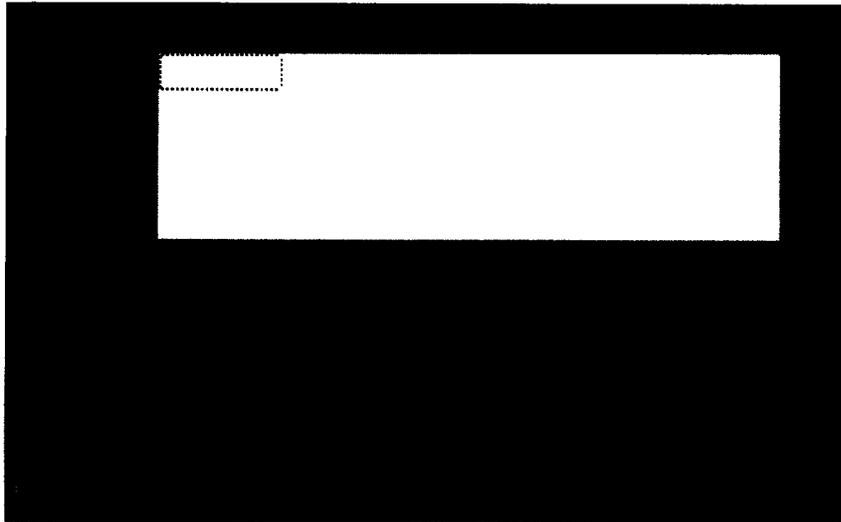
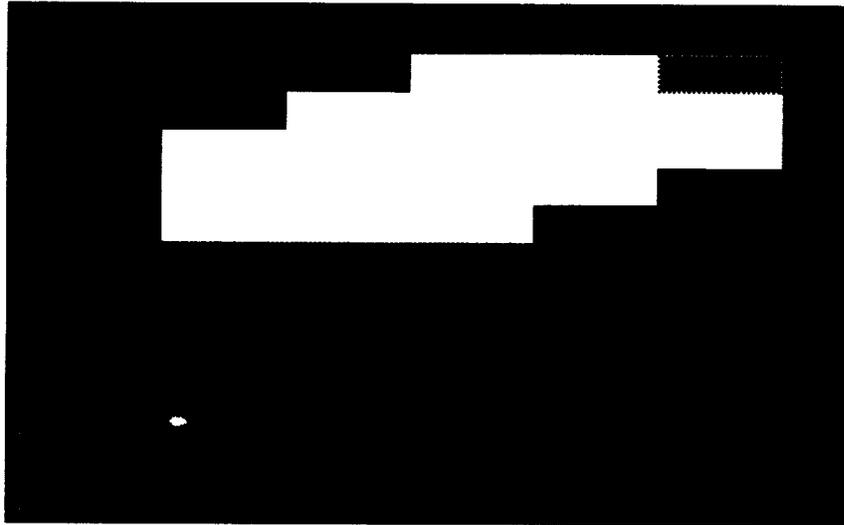


Figure 6.1-1. Example Sector Representation

### 6.2 Refining the Map/Removing Grids

The initial sector map is created based upon the maximum length and width to completely encompass the sector. The user may refine the visual representation of the sector by removing grids which do not belong to the sector ( e.g., lakes, buildings, etc.).

- \* Remove a grid by first clicking in the grid to be removed, then choosing the **Remove/Add Grid From Sector** on the **Tools** menu, see Figure 6.4-1.
- \* The selected grid will be colored black, thereby indicating that it does not belong to the sector.
- \* If you wish to add a grid back to the sector, again, select the grid to be added and choose the **Remove/Add Grid From Sector** command on the **Tools** menu.



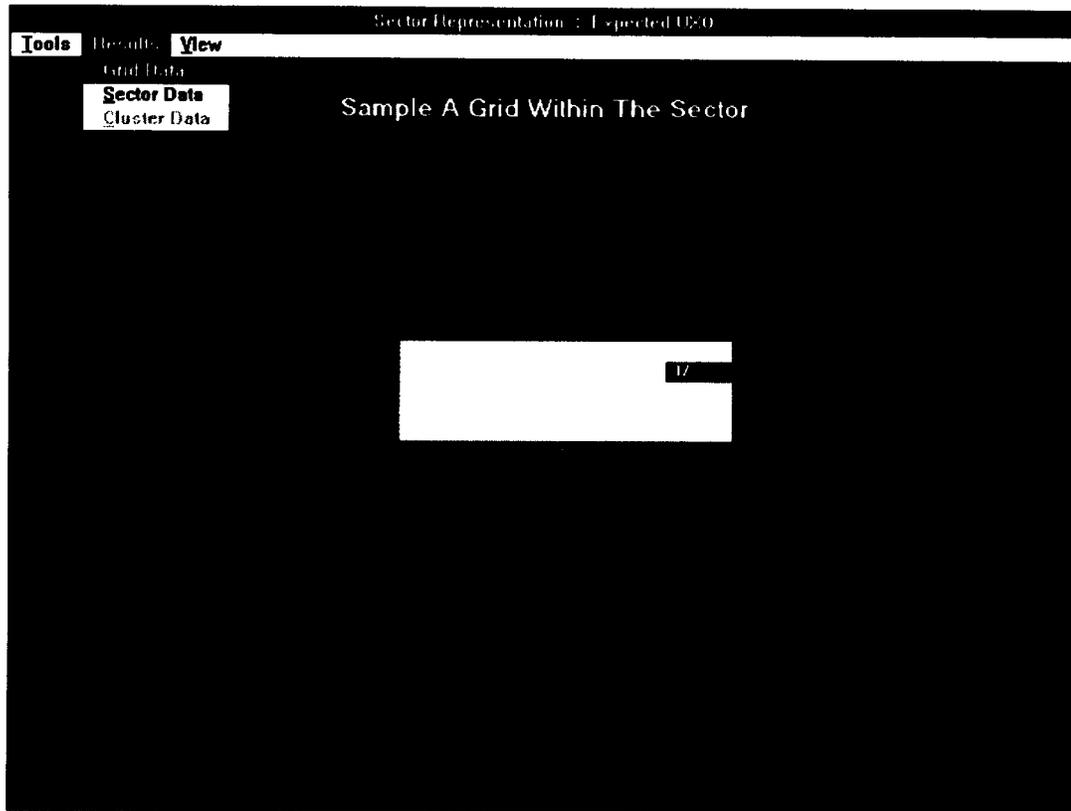
**Figure 6.2-1. Refined Sector Representation**

The sector representation is the portion in white which remains as shown in Figure 6.2-1. The sector cannot be refined after sampling has begun.

### **6.3 Viewing Data**

Three types of data can be displayed within SiteStats: Grid Data, Sector Data, and Cluster Data. Cluster Data will be displayed only after clustering (separating an initial sector into multiple sectors with homogeneous OEW contaminant density) an initial dispersed sector into multiple sectors, and individual grid data will not be displayed for a localized sector.

- \* Select the **Results** menu, see Figure 6.3-1.
- \* Choose the type of data to be displayed.



**Figure 6.3-1. Results Menu**

#### **6.4 Other Menus**

The **Tools** menu, Figure 6.4-1, contains the most frequently used sector map commands. An illustration is provided below. The **View** menu allows the user to display a map of non-UXO items and a map of interpolated UXO values. (Note: The interpolated UXO map will be available only after clustering the sector.)

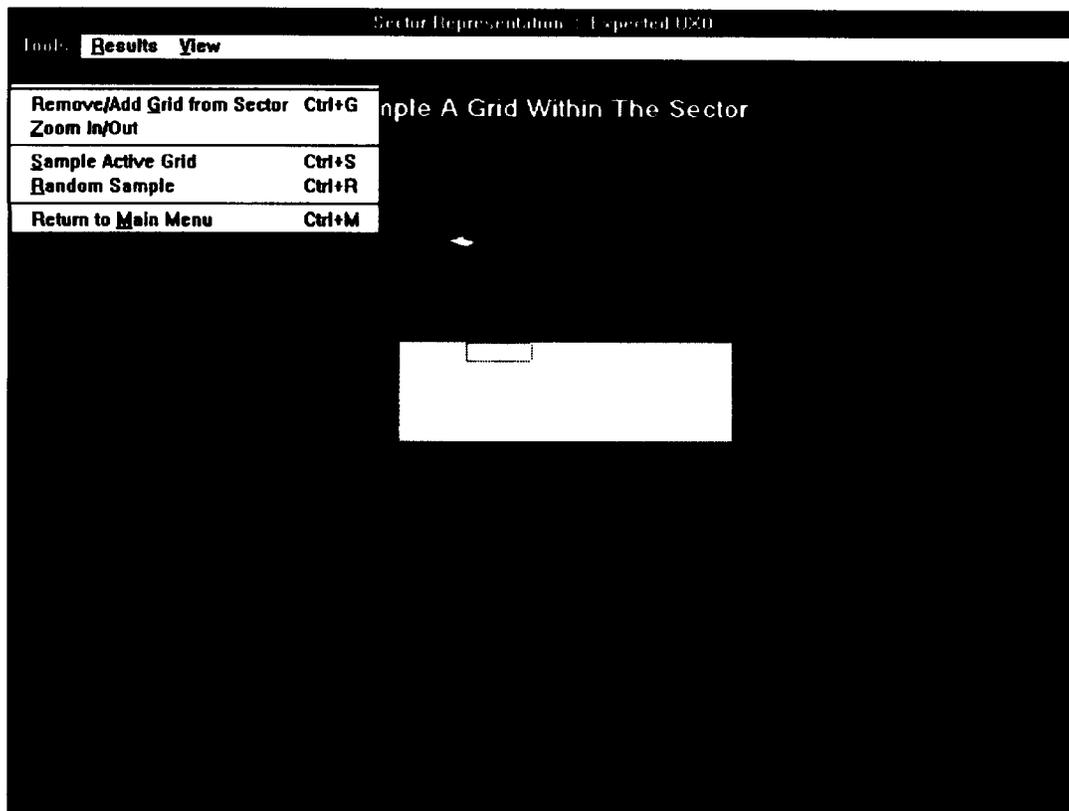


Figure 6.4-1. Tools Menu

## 7.0 GRID SAMPLING OF DISPERSED SECTORS (SITE CHARACTERIZATION)

### 7.1 Random and Non-Random Sampling

After the sector refinement is completed, grid sampling may begin. Once grid sampling has begun no additional sector refinement may be performed.

#### Sampling a Specific Grid

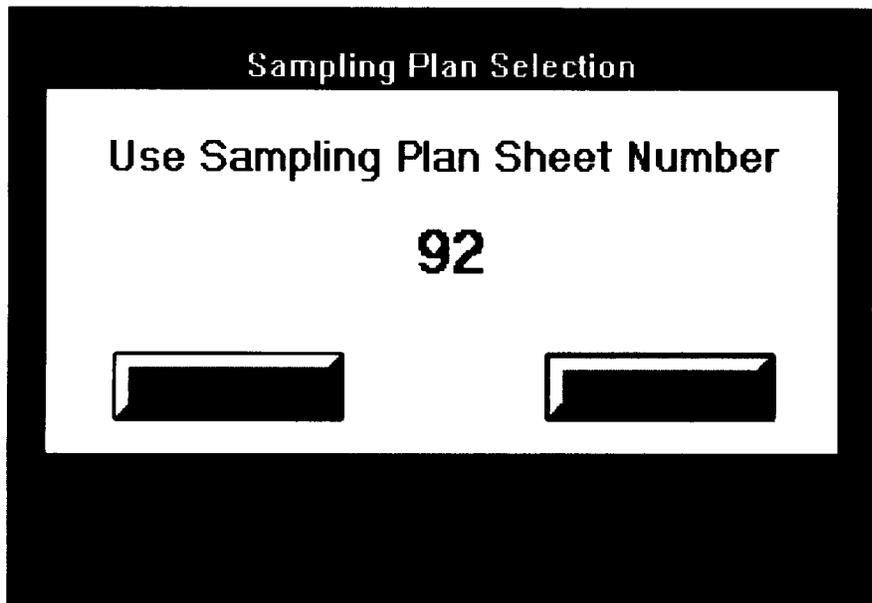
- \* Select the grid on the sector map.
- \* From the **Tools** menu choose **Sample Active Grid**.

#### Random Sampling

- \* From the **Tools** menu choose **Random Sample**.
- \* The location of the grid to sample will be identified.

### 7.2 Sampling Plans

Before sampling a grid within the sector, the software will select a grid sampling plan as shown in the example in Figure 7.2-1. The sampling plans are provided to ensure the anomalies within a grid are investigated in a random process. One hundred pre-defined sampling plans are available for selection, each providing a sequence of 1500 locations for anomaly investigation selection. The sequence list will serve as the grid investigation map.



**Figure 7.2-1. Sampling Plan Number**

- \* Click **Print** to generate a printed copy of the sampling plan. (This is recommended for field use.)
- \* Click **OK** to proceed with sampling.

### **7.3 Entering the Number of Grid Anomalies**

The total number of anomalies within a grid must be known prior to sampling. (This assumes that the entire grid has been swept and anomalies have been flagged.) The total number of anomalies are input directly as shown in the GridStats Initialization screen, Figure 7.3-1.

GridStats Evaluation	
Site Location:	Camp Swampy
Sector ID:	Impact Range
Grid Location:	Row 1 Col 1
Total Anomalies in Grid:	<input type="text" value="200"/>
Date:	<input type="text" value="30 Apr 95"/>
Grid Number:	<input type="text" value="1"/>
<input type="button" value="OK"/>	<input type="button" value="Cancel"/>

Figure 7.3-1. GridStats Initialization

#### 7.4 Interfacing with the Field Cost Model

SiteStats will initiate a Field Cost Model analysis after the number of grid anomalies are entered. The Hours Breakdown dialog will appear as was shown in Figure 5.3-1. Once the hourly percentages have been set, the estimated grid cost will be displayed. (Refer back to Figure 5.4-1.) Use the instructions provided in Section 5.4 to terminate/continue sampling at this point.

#### 7.5 Cost and Risk Error

Current and predicted levels of cost and risk error are displayed prior to sampling a grid, see Figure 7.5-1. Risk Error is the probability of concluding that the grid is insufficiently contaminated when it is sufficiently contaminated. Cost Error is the probability of concluding that the grid is sufficiently contaminated when it is insufficiently contaminated. (Note: This information is not calculated or displayed before sampling the first grid in the sector.) If the values are unacceptable, click **Stop** to halt the sampling. Click **Continue** to proceed.

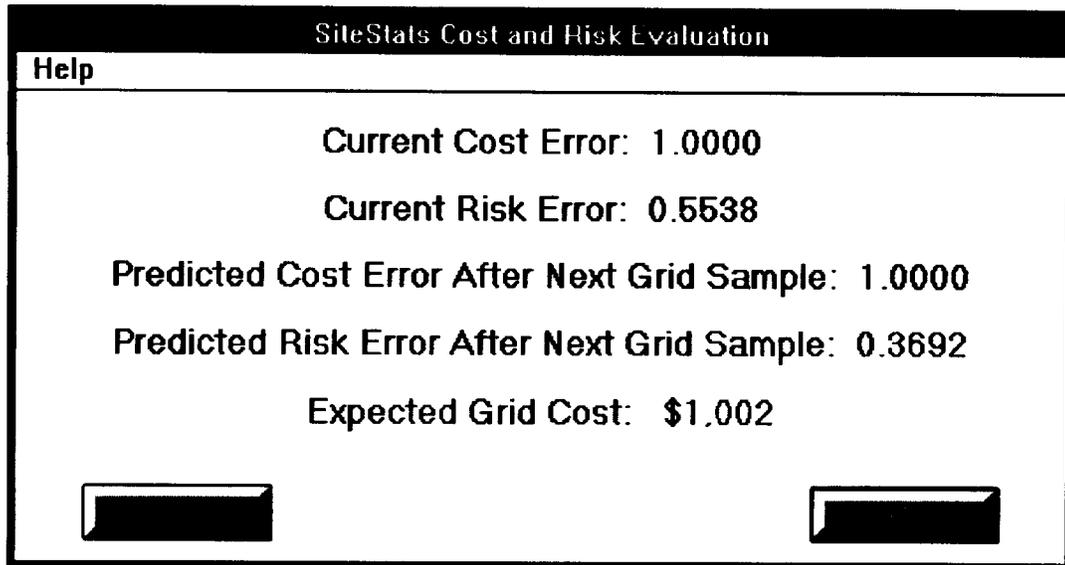


Figure 7.5-1. Cost and Risk Errors

## 7.6 Explanation of the Grid Sampling Screen

- \* Click the anomaly type (refer to GridStats Sampling Display, Figure 7.6-1).
- \* Click **Record This Sample** to identify the anomaly.
- \* Click **Halt Sampling - Save Data** to conclude grid sampling based upon current information. (You will not be able to continue sampling this grid later.)
- \* Click **No Anomalies - New Location** when no anomalies are present in the current subgrid square.
- \* Click **Quit - Discard Data** to halt sampling without concluding. (This grid may be sampled at a later time, but all data relating to previous sampling of this grid is discarded.)

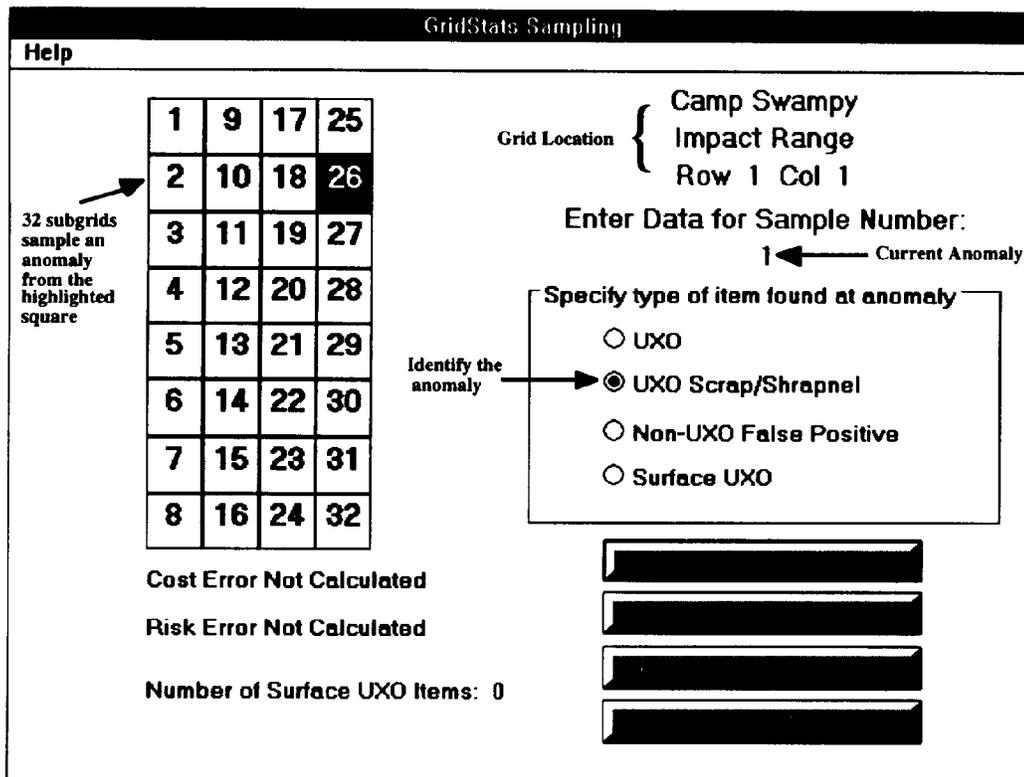


Figure 7.6-1. GridStats Sampling Display

## 7.7 Surface UXO

SiteStats assumes that all ordnance found on the surface during an EE/CA investigation will be identified and removed. The GridStats sampling routine provides for an accounting of surface UXO, see Figure 7.7-1. Surface ordnance data is not used within this software to draw any statistical characterization of sub-surface UXO content.

GridStats Sampling

Help

1	9	17	25
2	10	18	26
3	11	19	27
4	12	20	28
5	13	21	29
6	14	22	30
7	15	23	31
8	16	24	32

Camp Swampy  
Impact Range  
Row 1 Col 1

Enter Data for Sample Number:  
1

Specify type of item found at anomaly

UXO

UXO Scrap/Shrapnel

Non-UXO False Positive

**Surface UXO** ← Click here for Surface UXO Item then Click Record

Cost Error Not Calculated

Risk Error Not Calculated

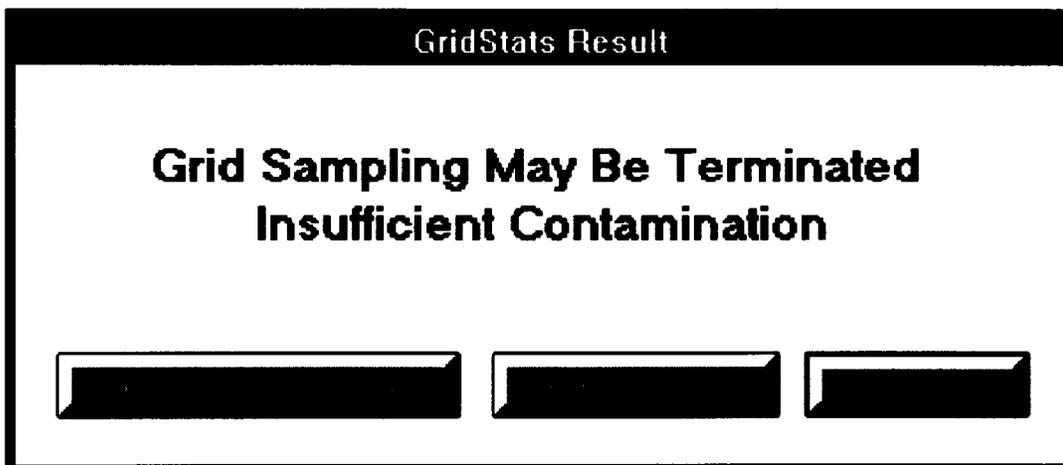
Number of Surface UXO Items: 1

→ The number of surface UXO located in this grid is displayed here

**Figure 7.7-1. Surface UXO Count**

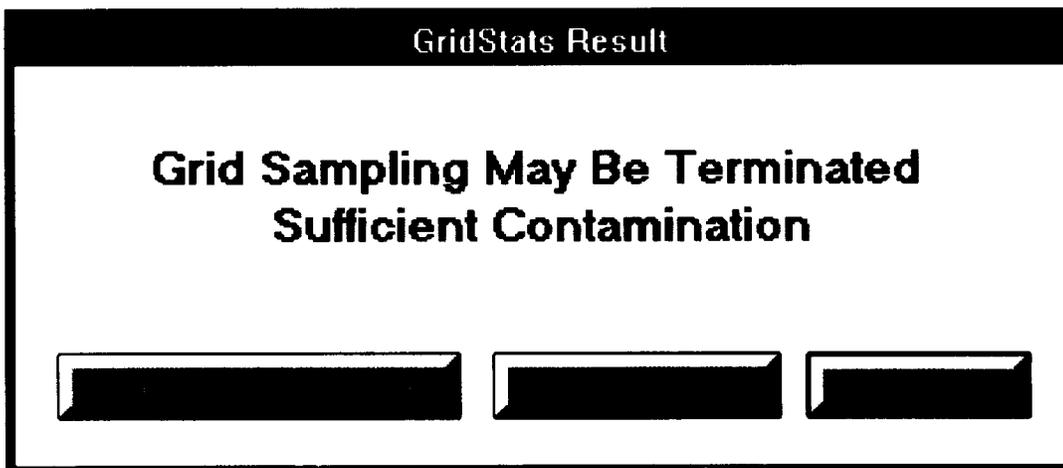
**7.8 Grid Characterization**

Continue sampling anomalies within a grid until one of the three following statistical conclusions can be determined, as shown in Figures 7.8-1 through 7.8-3.



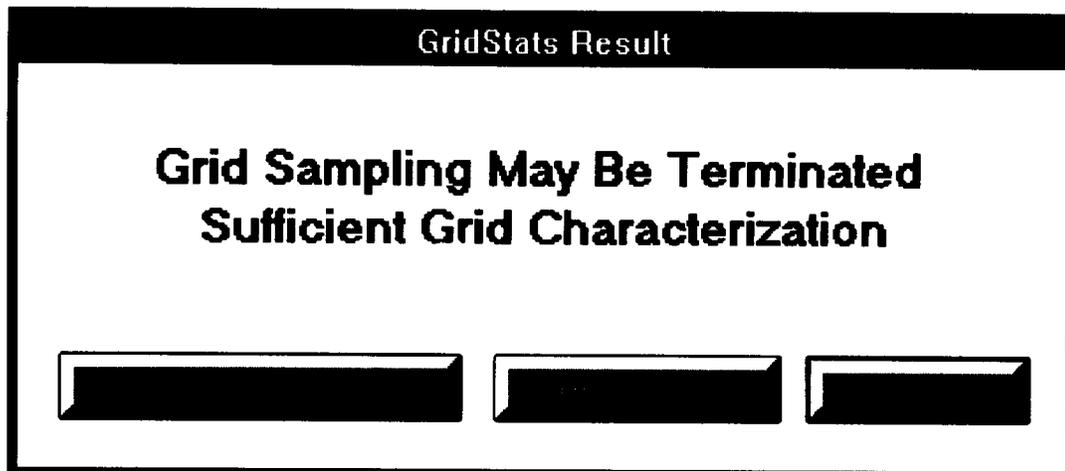
**Figure 7.8-1. Less Contaminated Grid**

The message in Figure 7.8-1 will be displayed when the grid may not require remediation.



**Figure 7.8-2. More Contaminated Grid**

The message in Figure 7.8-2 will be displayed when the grid may require remediation.



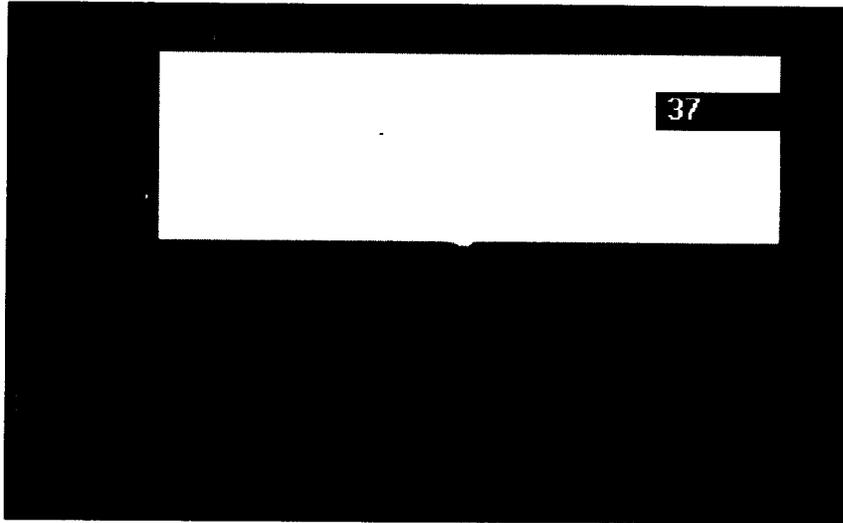
**Figure 7.8-3. Grid Sufficiently Characterized**

The message in Figure 7.8-3 will be displayed when the grid is otherwise characterized.

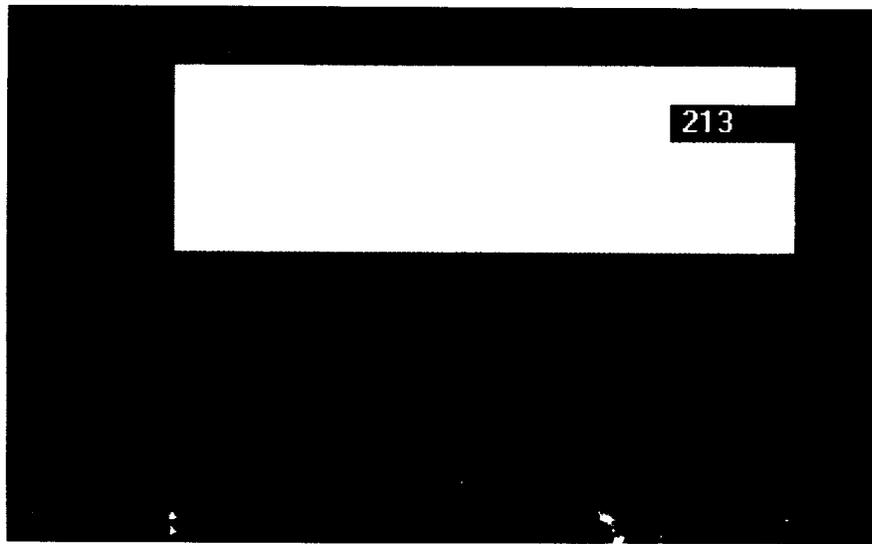
Notice that additional grid sampling can be performed after a conclusion has been drawn. Click **Continue Sampling Grid** to investigate additional anomalies.

## **7.9 Marking Grid Results on the Sector Maps**

When individual grid sampling has been concluded, the grid will be highlighted on the sector maps. The sampled grid will be highlighted in red with the expected UXO printed in white. On the False Positives map, the grid will be highlighted in blue with the expected non-UXO printed in white. The False Positive map can be displayed by choosing **Map of False Positives** from the **View** menu. In the example in Figure 7.9-1, the expected UXO items in the marked grid is 37. In the example in Figure 7.9-2, the expected non-UXO items in the marked grid is 213.



**Figure 7.9-1. UXO Count in Grid**



**Figure 7.9-2. Non-UXO Count in Grid**

## 8.0 GRID SAMPLING OF LOCALIZED SECTORS (SITE CHARACTERIZATION)

### 8.1 Marking the Localized Centroid

For localized sectors, a centroid has been provided. (See the discussion in Section 4.6.) To highlight the centroid on the sector map choose **Mark Localized Centroid** from the **Tools** menu. The centroid will be highlighted as shown in Figure 8.1-1.

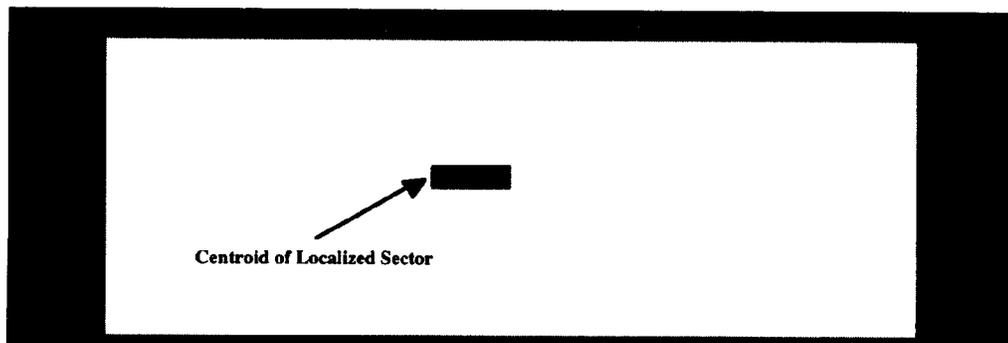


Figure 8.1-1. Localized Sector Centroid

### 8.2 Explanation of the Localized Grid Sampling Screen

After investigating the chosen/identified grid, record the results of the investigation on the Localized Sector Inspection Results screen, see Figure 8.2-1.

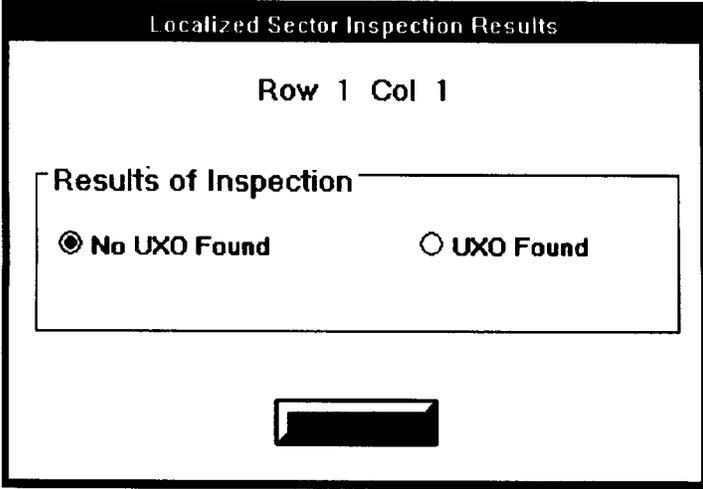


Figure 8.2-1. Localized Grid Sampling Screen

### 8.3 Marking Sampled Grids on the Sector Map

When individual grid sampling has been concluded, the grid will be highlighted on the sector map as shown in Figure 8.3-1. If UXO was found in the sampled grid, it will be highlighted in red with the word "UXO" printed in white. If no ordnance was found in the sampled grid, it will be highlighted in blue with the word "CLEAR" printed in white.

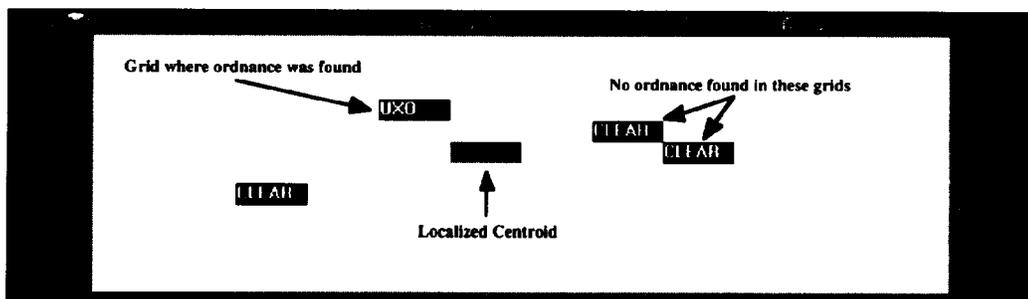


Figure 8.3-1. Localized Sector

## 9.0 CHARACTERIZING A SECTOR

Sampling of individual grids within a sector should continue until some conclusion concerning ordnance contamination characterization can be reached.

### 9.1 Dispersed Sector Conclusions

The two conclusions, as shown in Figure 9.1-1 and 9.1-2 can be drawn after sufficient sampling within a dispersed sector.

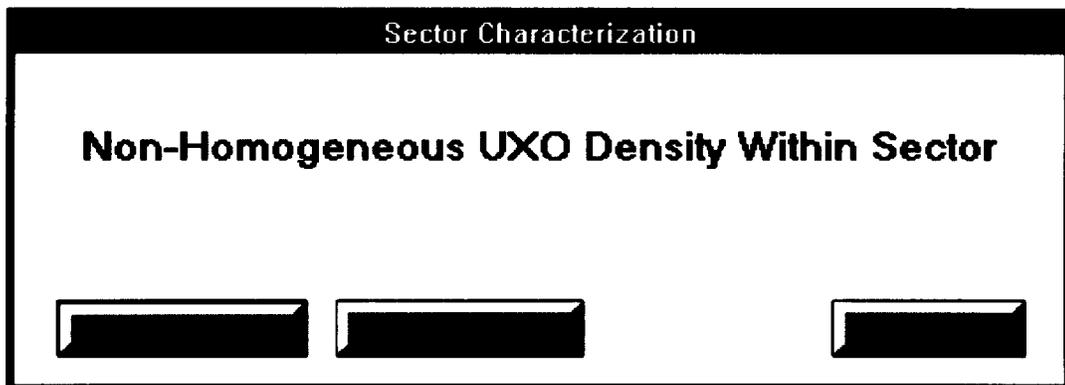


Figure 9.1-1. Non-Homogeneous Sector

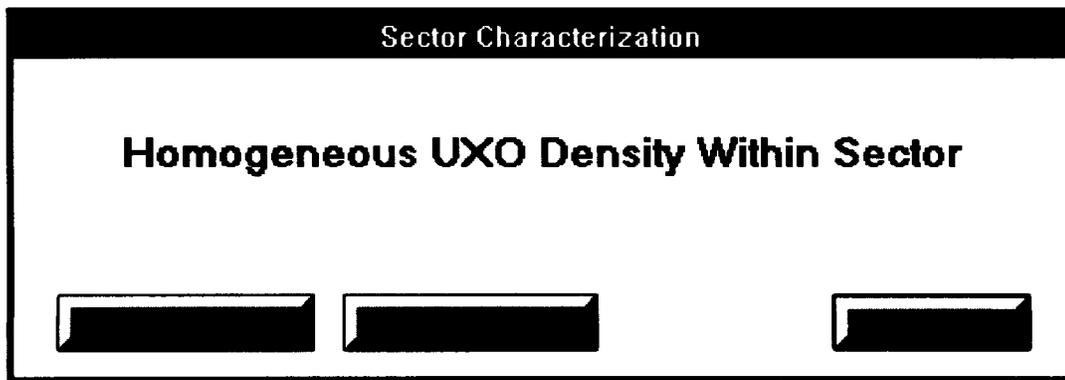


Figure 9.1-2. Homogeneous Sector

The conclusion shown in Figure 9.1-1 indicates that the initial sector defined by the user is not valid in terms of UXO density, i.e., the area is truly more than a single sector with respect to ordnance contamination density, and should be further subdivided.

The conclusion shown in Figure 9.1-2 indicates the initial sector defined by the user is valid in terms at UXO density.

## 9.2 Localized Sector Conclusions

The two conclusions, as shown in Figure 9.2-1 and 9.2-2 can be drawn after sufficient sampling within a localized sector.

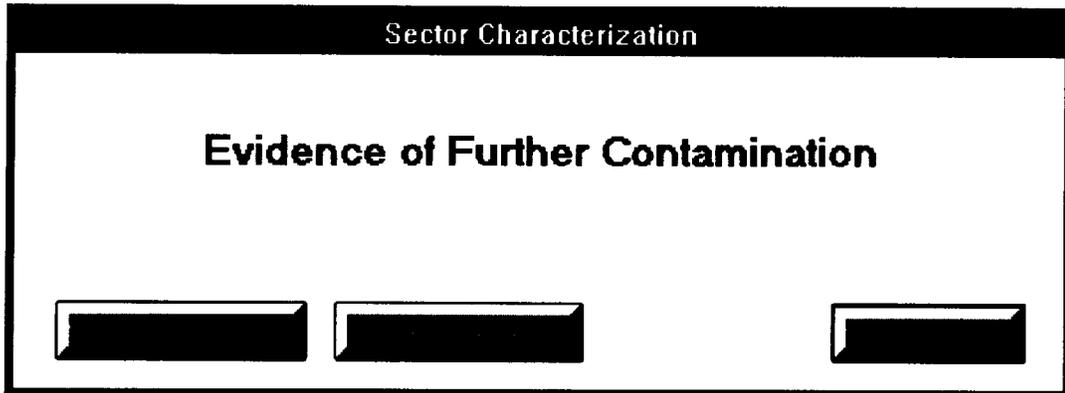


Figure 9.2-1. Localized Sector Further Contaminated

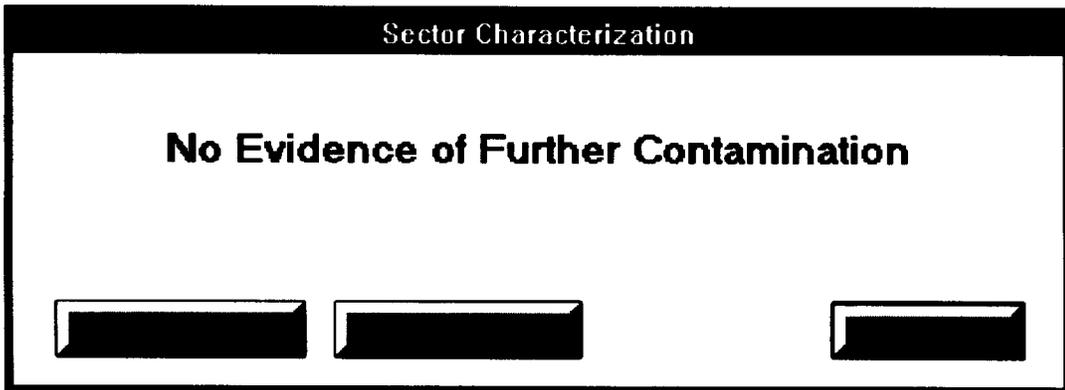
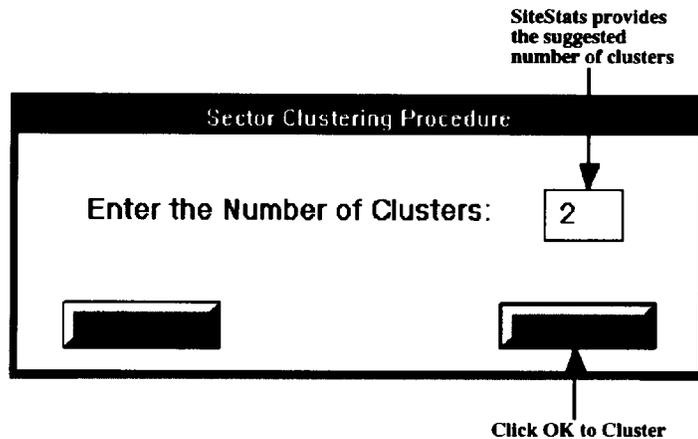


Figure 9.2-2. Localized Sector Not Contaminated

The conclusion shown in Figure 9.2-1 states that the results of the sampling indicate that the localized sector contains OEW contamination outside the identified centroid. The conclusion shown in Figure 9.2-2 states that the results of the sampling indicate that the localized sector does not contain OEW contamination.

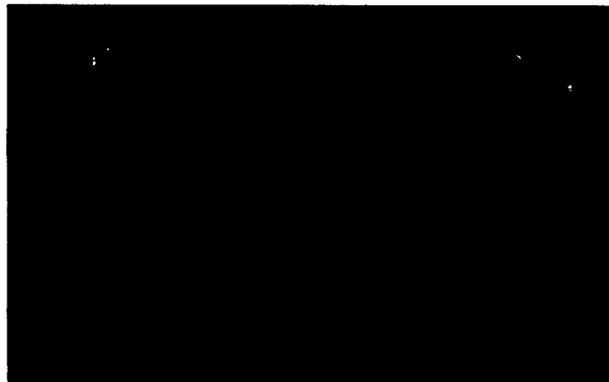
### 9.3 Clustering Dispersed Sectors

SiteStats may conclude that the initial sector is actually more than one sector because of differences in UXO contamination density levels. The user will be prompted to cluster the sector. The suggested number of clusters will be provided in the edit field as shown in Figure 9.3-1, however, the user may override the SiteStats recommendation. The maximum number of clusters is six.



**Figure 9.3-1. Sector Clustering**

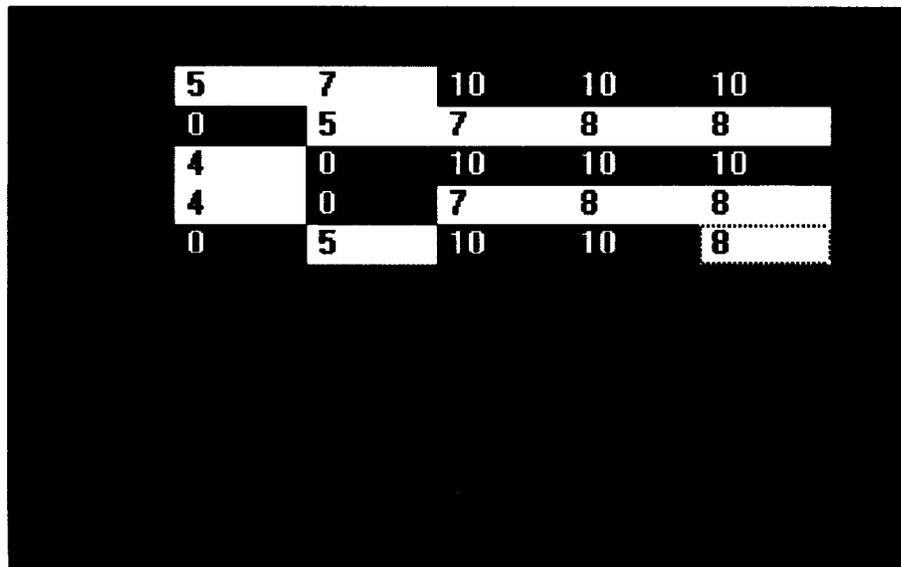
Once the data has been clustered, the sector map will appear like the one in Figure 9.3-2. This example shows two clusters (or sectors) within the initial sector boundaries.



**Figure 9.3-2. Clustered Sector Map**

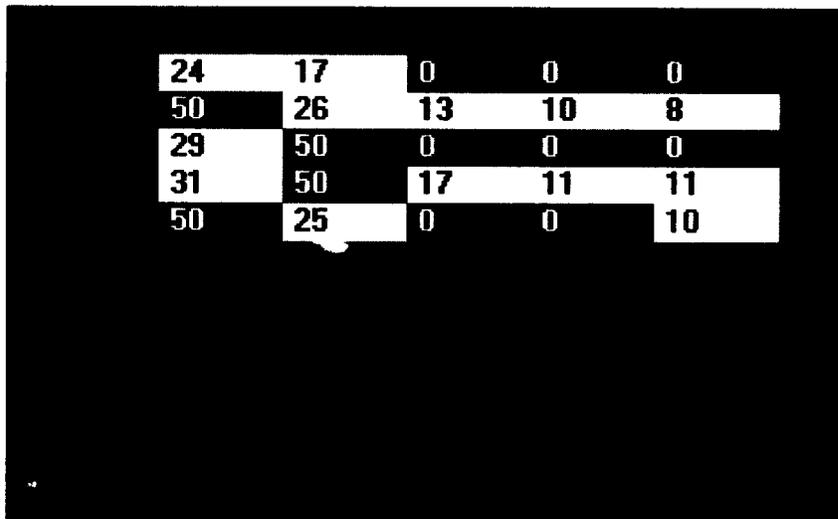
During the clustering procedure both UXO and non-UXO values are interpolated into those grids which were not sampled. To display the interpolated values go to the **View** menu.

To display the non-UXO interpolated values choose **Map of False Positives** from the **View** menu. A sector representation similar to the one in Figure 9.3-3 will appear. Notice that the highlighted grids are those that were sampled. All other grids contain interpolated values.



**Figure 9.3-3. False Positive Map (With Interpolated Values)**

To display the UXO interpolated values choose **Map of Interpolated UXO** from the **View** menu. A sector representation similar to the one in Figure 9.3-4 will appear. Notice that the highlighted grids are those that were sampled. All other grids contain interpolated UXO values.



**Figure 9.3-4. UXO Map (With Interpolated Values)**

## 10.0 VIEWING SITE CHARACTERIZATION DATA

### 10.1 Sector Data

Two methods are available to display sector data shown in Figure 10.1-1.

- \* Choose **Sector Data** from the **Results** menu at any time during code execution. Current values will be displayed.
- \* Click the **Display Results** button on the sector conclusion dialog box.

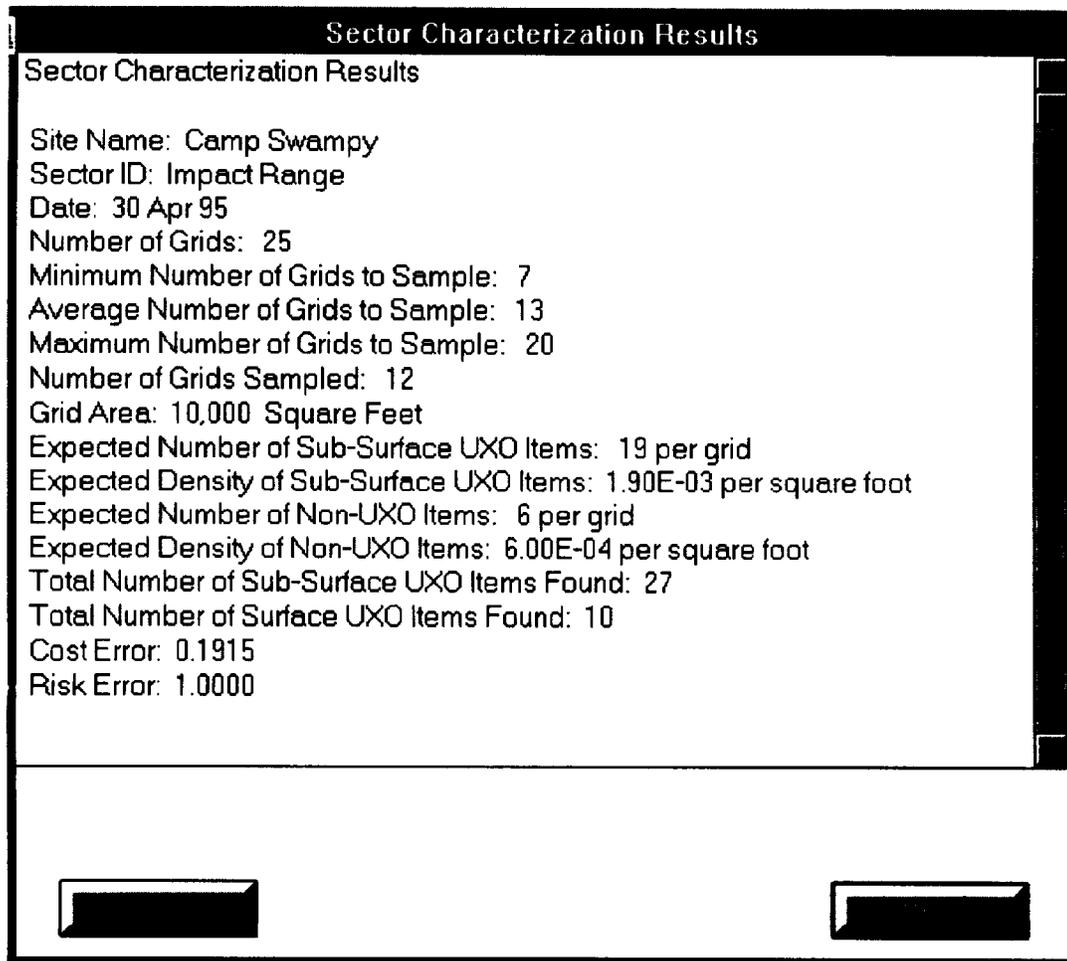


Figure 10.1-1. Sector Characterization

## 10.2 Grid Data

Two methods are available to display grid data presented in Figure 10.2-2.

- \* Choose **Grid Data** from the **Results** menu at any time during code execution.
- \* Enter the grid number in the dialog box shown in Figure 10.2-1 and Click **OK**.

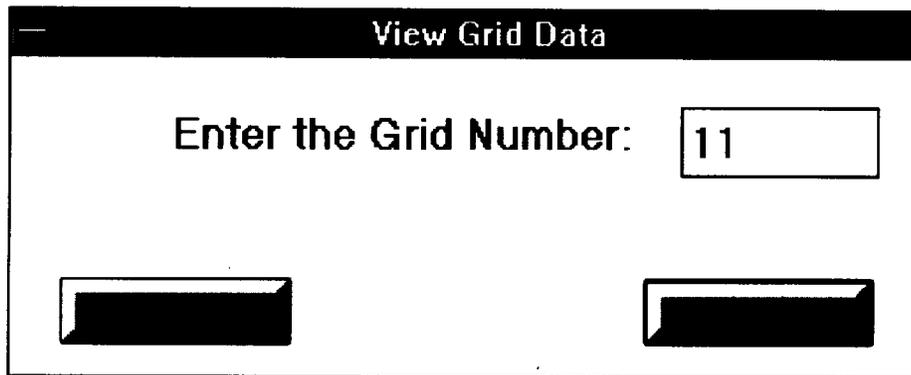


Figure 10.2-1. Viewing Grid Data

- \* Click the **Display Results** button on the sector conclusion dialog box.

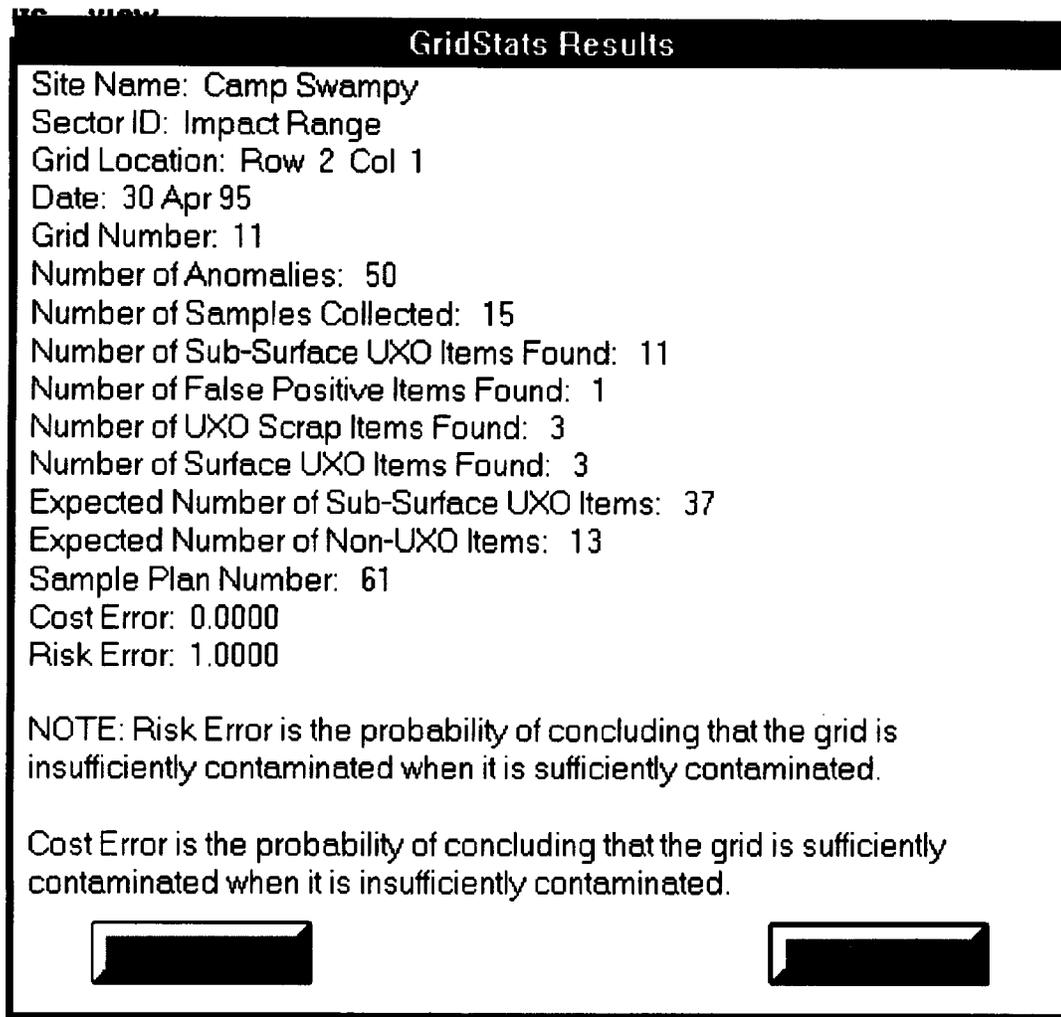
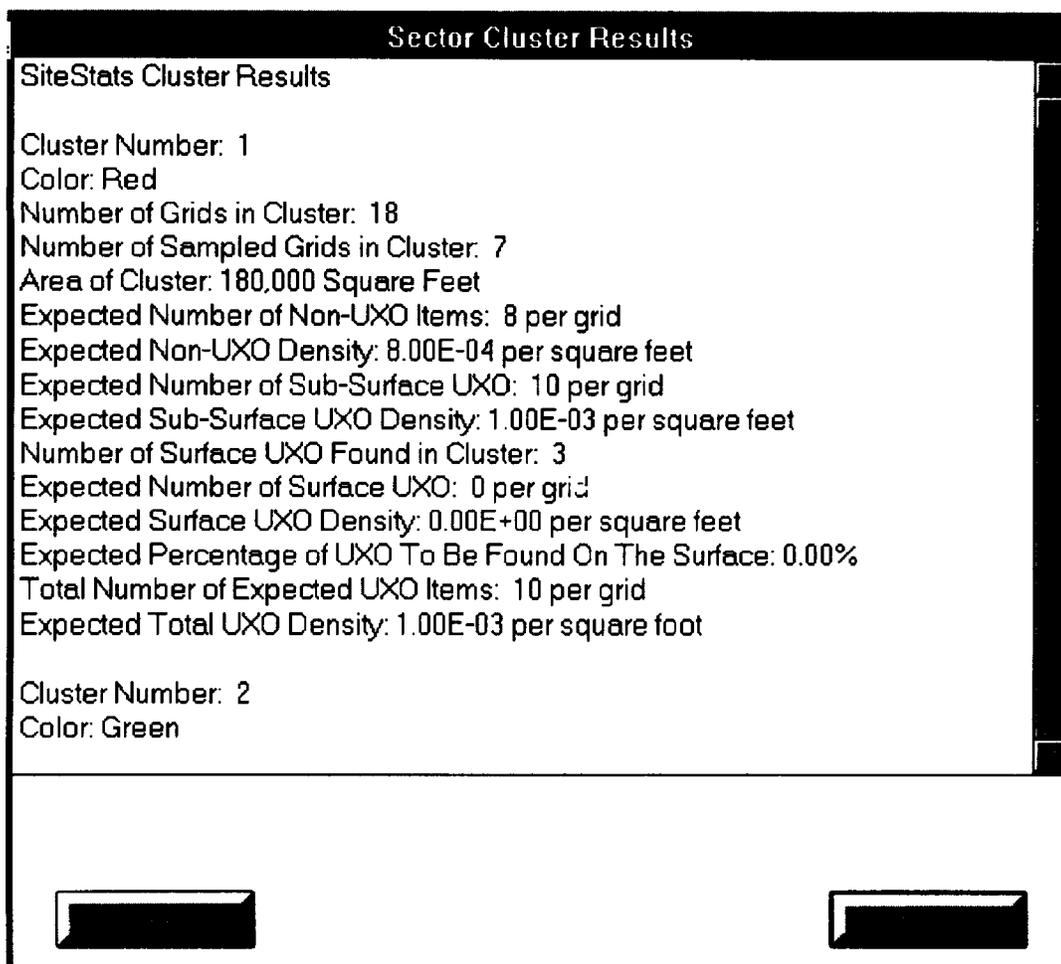


Figure 10.2-2. GridStats Results

### 10.3 Cluster Data

Cluster data as shown in Figure 10.3-1 will be displayed only after an initial sector has been clustered into two or more distinct sectors. To view the data choose **Cluster Data** from the **Results** menu.



**Figure 10.3-1. Sector Cluster Results**

## 11.0 REMEDIATION PLANNING TOOL

### 11.1 About the Code

The Remediation Planning Tool (RPT) is written in conjunction with and integrated into the SiteStats code, though it may be run separately from the **File Manager**. Its purpose is to allow the user to generate “what-if” scenarios for site remediation based on dollars available, probability of exposure reduction goals, and work levels. Users can quickly quantify and graphically examine remediation options, and optimize planning based on the results. The tool is extremely flexible with its inputs, and is designed for ease of use and clarity of results.

### 11.2 Launching the Code

RPT is launched by selecting **Remediation Planning Tool** under the **File** menu and **New Evaluation** sub-menu. The SiteStats Site Characterization code closes (for purposes of RAM conservation), and RPT is launched. The user may, alternatively, launch RPT as a stand-alone code by selecting **RPT.exe** from the **File Manager**. The executable is located in the **SiteStats** directory.

The code consists of a series of input screens for parameters, followed by algorithm execution and display of output, which is in both text and chart format. The user then may save or print the results. Finally, the user may exit or start a new run.

The initial screen has two buttons. (See Figure 11.2-1.)

- \* To launch RPT, click **Begin** or press **Return** or **Enter**.
- \* To exit RPT, click **Exit**.

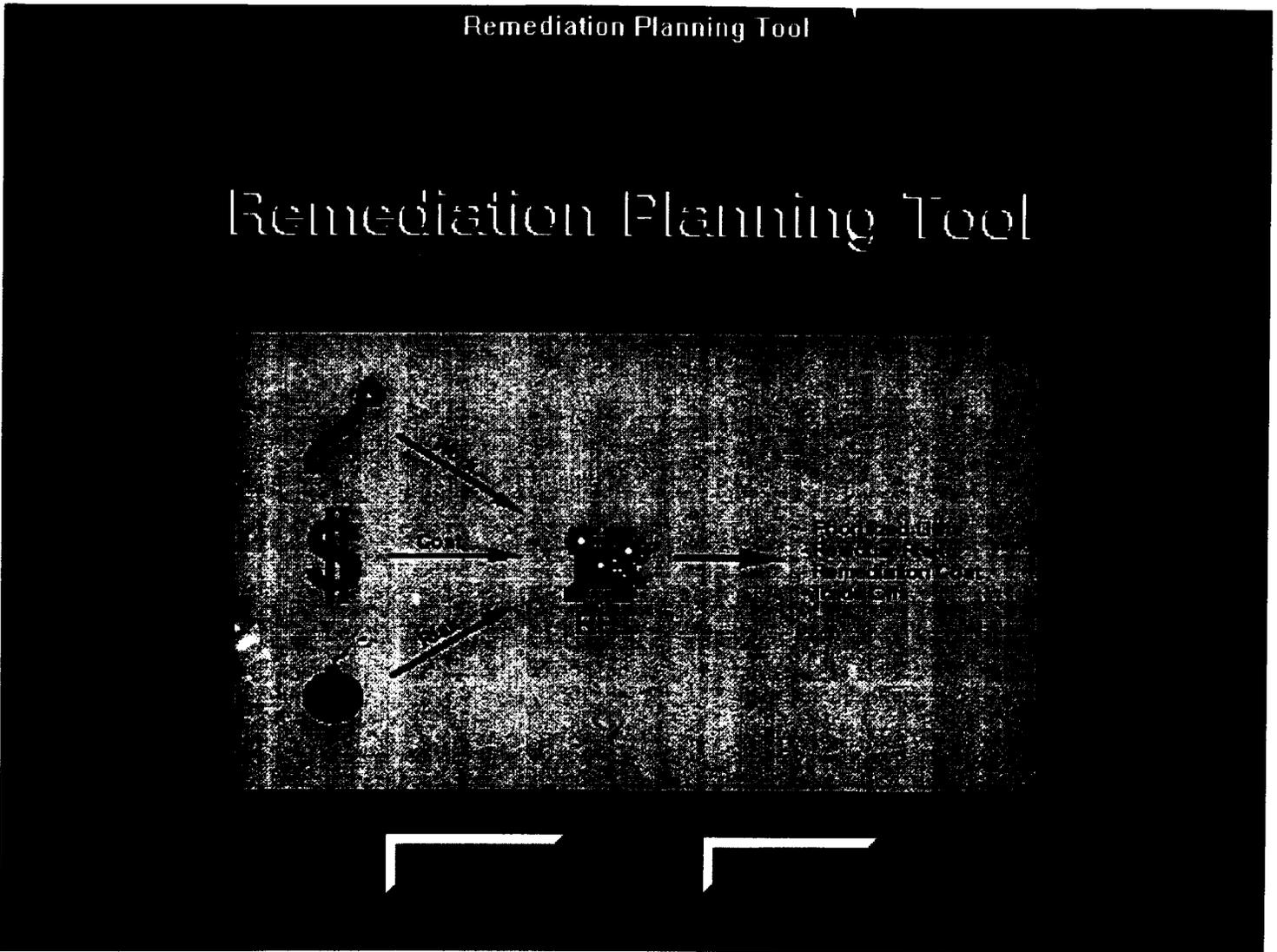


Figure 11.2-1. Remediation Planning Tool Opening Screen

### 11.3 Fixed Parameter Dialog Box

When the user has chosen to begin a run, a dialog box appears containing options for the type of fixed run the user wants to make (see Figure 11.3-1).

Select the fixed parameter

Parameter

Probability of Exposure (0-1)

Site Cost (\$)

Clear Depth (Feet)

Fixed Value: 1000000

Figure 11.3-1. Fixed Parameters

The user can fix cost, risk (expressed in terms of the probability of exposure associated with a single individual's one-time visit to the site), or clear depth. RPT will calculate the value of the two parameters not fixed for that run. The parameters and their associated properties are shown in Table 11.3-1.

Table 11.3-1. Fixed Parameters Options

Parameter	Units	Range of Values
Probability of Exposure	probability	(0-1)
Cost	dollars	(>0)
Clear Depth	feet	(0-10)

For RPT to find the other two parameters, the user must input the value at which to fix the selected parameter. This value is entered into the text box with the **Fixed Value:** label. Upon completion of the run set, the fixed value will be interpolated based on the neighboring values determined by varying clearance depth from 0-10 feet in one-half foot increments. When the user has input the fixed value and parameter selection, the run can be continued by selecting **OK**, or stopped by selecting **Cancel**. The user may also select a button or other control on the form by repeatedly pressing the tab key until the desired control becomes highlighted. If the user puts an unreasonable input into the **Fixed Value:** box, the RPT will inform the user and return to the box so that the number can be reentered.

#### 11.4 Site Data Inputs

The next input screen shown will be for site specific information. Although there are several data inputs on this screen, only eight of them are activated for this code version. These parameters along with their bounds and units are listed in Table 11.4-1.

**Table 11.4-1. Site Inputs**

Site Parameter	Units	Range
Site Name	----	----
Site Area	Acres	>0
County Area	Sq. Mi.	>0
City Area	Sq. Mi.	>0
State	----	----
Number of Sectors	#	0-1000
Guards Required	#	≥0
Number of New Construction Permits	#	≥0

The user is asked for the site name, site area (in acres), number of guards required for remediation, number of sectors in the site, city and county area (in square miles), state, and number of new construction permits. The Site Input Screen is shown in Figure 11.4-1. The unused (grayed out) inputs involve other site data not currently needed for RPT. The user again has two buttons at the bottom of the window, **Cancel** to exit the code and **OK** to continue the analysis run.



**Sector Type**

**Sector Types**

**Dispersed Sector**

**Localized Excavation**

**Localized Surface**

**Localized Building**

**Dispersed Water**

**Localized Water**

**OK**

**Figure 11.5-1. Sector Type**

The user has four active options (water logic is not currently included in RPT) which are: Dispersed, Localized Excavation, Localized Surface, and Localized Building. Each sector type has an associated set of algorithms used to characterize risk and cost.

\* Select the sector type and click **OK**.

This box will appear one time per each sector as quantified on the site inputs screen. The next input boxes displayed depend on the selection made by the user at this point. Each of the four possible paths is discussed in the following sections.

### **11.5.1 Dispersed Sector Inputs**

If the user has selected **Dispersed Sector** (indicating the sector is contaminated across a large area with randomly dispersed OEW), the **Sector Data** input box will be displayed next, as seen in Figure 11.5.1-1. As with the **Site Data** input box, there will be several grayed inputs, some unused by dispersed sectors, others unused in this version of RPT. For a dispersed sector, twenty-three sector inputs are necessary. These values, along



**Table 11.5.1-1. Dispersed Sector Inputs**

<b>Parameter</b>	<b>Units</b>	<b>Range</b>
Sector Area (SA)	Sq. Mi.	$0 < SA \leq \text{Site Area}$
Slope	degrees	select from categories
Soil Type	----	select from categories
Vegetation Density	----	select from categories
Area Farmed	Sq. Ft.	$\geq 0$
Area Ranched	Sq. Ft.	$\geq 0$
Archeological Area	Sq. Ft.	$\geq 0$
Area for Metal Detecting	Sq. Ft.	$\geq 0$
Extraordinary Environmental Costs	\$	$\geq 0$
Burning Allowed	Yes/No	----
Slippery	Yes/No	----
Portion of OEW on Surface	%	0-100
OEW Density	#/Sq. Ft.	$> 0$
UXO Weight	lbs	$> 0$
Percent UXO	%	0-100
Percent LMS	%	0-100
Percent WP	%	0-100
Percent CBR	%	0-100
Total Density	#/Sq. Ft.	$> 0$
Number of CWM Tents	#	$\geq 0$
Snakes	Yes/No	----
Bees	Yes/No	----
Poisonous Foliage	Yes/No	----

Following the dispersed sector input screen, an activity window will open. This window contains a list of activities that may occur in the current sector of interest. This window is shown in Figure 11.5.1-2.

- \* Click on check box to the left of all activities occurring in sector
- \* Click **OK** to proceed or **Cancel** to quit.

This window will also appear one time per dispersed sector in the site. If the user selects **Construction** as one of the activities, an input box will appear later in the run. This box (Figure 11.5.1-3) will prompt the user to input the construction intrusion depth in feet.

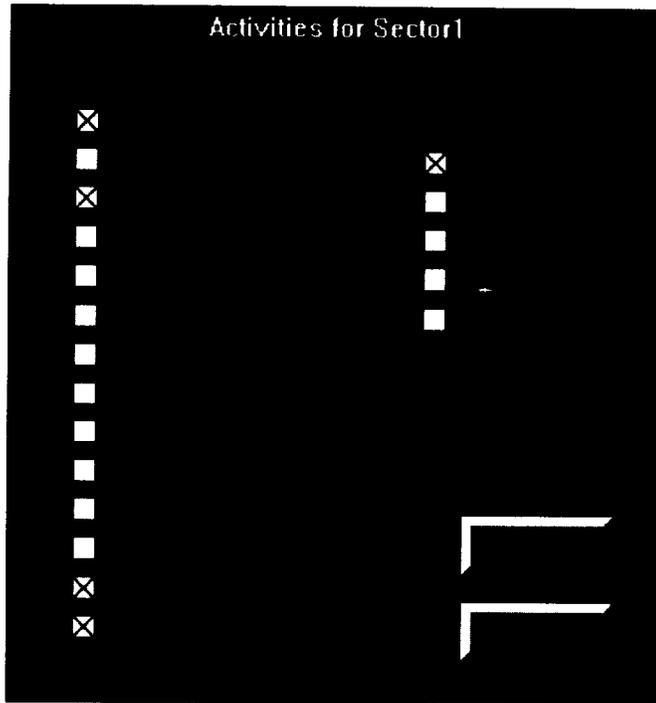


Figure 11.5.1-2. Activities Specification

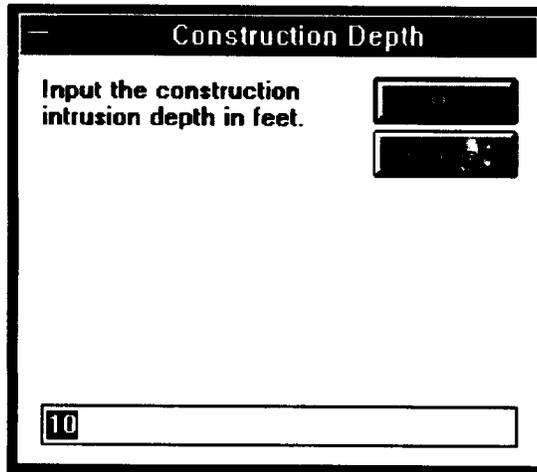


Figure 11.5.1-3. Construction Depth Box

After selecting the activities for the current dispersed sector, a cost data screen will be activated, as shown in Figure 11.5.1-4. This screen asks the user for information about rates, labor mixes, and remediation techniques

- \* Select optional labor rates and numbers, check boxes and input associated rates for checked boxes.
- \* Click **OK** to continue or **Cancel** to terminate.

The rates and mixes on the right side of the window are not optional, thus no check box is associated with them. If the form of excavation selected is **Mechanical Only**, then a small dialog box, shown in Figure 11.5.1-5, appears and asks the user to define how the excavated volume is to be removed.

- \* Click **Sift Off Site, Haul away, or Sift On Site**.
- \* Click **OK**.

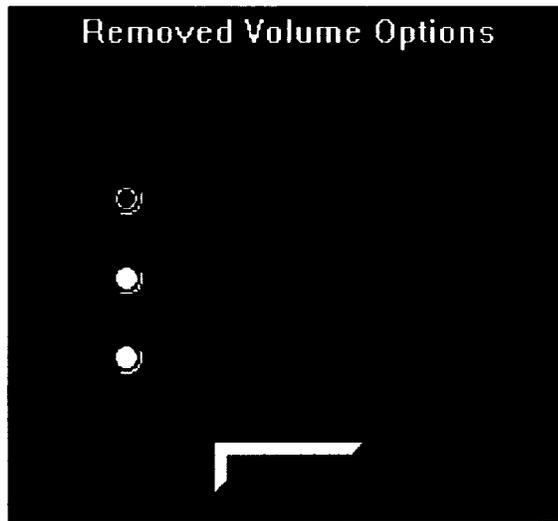
For discussion of the display of the results, turn to Section 11.6.

The screenshot shows a window titled "Sector Cost Data" with a list of activities. Each activity has a checkbox on the left, a rate value in a text box in the middle, and a labor mix value in a text box on the right. The activities are listed as follows:

Activity	Rate	Labor Mix
<input checked="" type="checkbox"/>	2700	15
<input checked="" type="checkbox"/>	600	13.23
<input checked="" type="checkbox"/>	250	77.43
<input checked="" type="checkbox"/>	100	54.35
<input type="checkbox"/>		24.20
<input type="checkbox"/>		50.72
<input type="checkbox"/>		10
<input checked="" type="checkbox"/>	72.79	50
<input checked="" type="checkbox"/>	77.06	.87
<input checked="" type="checkbox"/>	96.27	
<input checked="" type="checkbox"/>	23.21	
<input checked="" type="checkbox"/>	50.00	
<input checked="" type="checkbox"/>	96.27	25
<input checked="" type="checkbox"/>	29.79	25
<input checked="" type="checkbox"/>	17.76	50
<input type="checkbox"/>		

At the bottom right of the window, there is a section labeled "Hand Dig" with a text box containing the value "25". Below this, there are two checkboxes, each with a text box containing the value "25".

Figure 11.5.1-4. Sector Cost Data



**Figure 11.5.1-5. Removed Volume Options Box**

### **11.5.2 Localized Excavation Inputs**

If the user has selected **Localized Excavation** indicating the sector contains only a localized area of buried OEW, an input box will appear asking for the maximum ordnance depth in feet. This box is shown in Figure 11.5.2-1. The **Sector Data** input box will be displayed next, as shown in Figure 11.5.2-2. This window is similar to the window used with dispersed sector inputs, but with some tailoring for the localized sector characteristics. As with the **Site Data** input box, there will be several grayed inputs, some unused by localized excavation, others unused in this version of RPT. For localized excavation, twenty sector inputs are necessary. These values, along with their ranges and units, are listed in Table 11.5.2-1. This box will appear one time per localized excavation (each time the user selects **Localized Excavation** in the **Sector Type** dialog box). The user can exit the code by selecting **Cancel**, or continue by clicking **OK**.



**Table 11.5.2-1. Localized Excavation Sector Inputs**

<b>Parameter</b>	<b>Units</b>	<b>Range</b>
Sector Area (SA)	Sq. Ft.	$0 < SA \leq \text{Site Area}$
Slope	degrees	Select from categories
Vegetation Density	----	Select from categories
Area Farmed	Sq. Ft.	$\geq 0$
Archeological Area	Sq. Ft.	$\geq 0$
Area for Metal Detecting	Sq. Ft.	$\geq 0$
Extraordinary Environmental Costs	\$	$\geq 0$
Burning Allowed	Yes/No	----
Slippery	Yes/No	----
Armed UXO	Yes/No	----
Unarmed UXO	Yes/No	----
Explosives and Materials	Yes/No	----
Propellants and Pyrotechnics	Yes/No	----
Non-Controlled Chemical	Yes/No	----
White Phosphorus	Yes/No	----
Localized CBR	Yes/No	----
Number of CWM Tents	#	$\geq 0$
Snakes	Yes/No	----
Bees	Yes/No	----
Poisonous Foliage	Yes/No	----

Following the Localized Excavation Sector Input screen, an activity window will open. This window contains a list of activities that may occur in the current sector of interest. This window is shown in Figure 11.5.1-2.

- \* Click on check box to left of all activities occurring in sector
- \* Click **OK** to proceed or **Cancel** to quit.

This window will also appear one time per Localized Excavation Sector in the site. If the user selects **Construction** as one of the activities, an input box will appear later in the run. This box (Figure 11.5.1-3) will prompt the user to input the construction intrusion depth in feet.

After selecting the activities for the current localized sector, a cost data screen will be activated, as shown in Figure 11.5.1-4. This screen asks the user for information about rates, labor mixes, and remediation techniques.

- \* Select optional labor rates and numbers, check boxes, and input associated rates for checked boxes.
- \* Click **OK** to continue or **Cancel** to terminate.

The rates and mixes on the right side of the window are not optional, thus no check box is associated with them. For Localized sectors, the form of excavation selected is set to **Mechanical Only**. A small dialog box, shown in Figure 11.5.1-5, appears and asks the user to define how the excavated volume is to be removed.

- \* Click **Sift Off Site, Haul Away, or Sift On Site**.
- \* Click **OK**.

For discussion of the display of the results, turn to Section 11.6.

### 11.5.3 Localized Surface Inputs

If the user has selected **Localized Surface**, indicating the sector contains only a localized area of surface OEW, the **Sector Data** input box will be displayed next, as shown in Figure 11.5.3-1. This window is similar to the window used with dispersed sector inputs, but with some tailoring for the localized sector characteristics. As with the **Site Data** input box, there will be several grayed inputs, some unused by localized surface, others unused in this version of RPT. For localized surface, eighteen sector inputs are necessary. These values, along with their ranges and units, are listed in Table 11.5.3-1. This box will appear one time per Localized Surface sector (each time the user selects **Localized Surface** in the **Sector Type** dialog box). The user can exit the code by selecting **Cancel**, or continue by clicking **OK**.

Following the Localized Surface Sector input screen, an activity window will open, Figure 11.5.1-2. This window contains a list of activities that may occur in the current sector of interest.

- \* Click on check box to the left of all activities occurring in sector.
- \* Click **OK** to proceed or **Cancel** to quit.

This window will also appear one time per Localized Surface Sector in the site. If the user selects **Construction** as one of the activities, an input box will appear later in the run. This box, Figure 11.5.1-3, will prompt the user to input the construction intrusion depth in feet.

After selecting the activities for the current sector, a cost data screen will be activated, as shown in Figure 11.5.1-4. This screen asks the user for information about rates, labor mixes, and remediation techniques.

- \* Select optional labor rates and numbers check boxes and input associated rates for checked boxes.
- \* Click **OK** to continue or **Cancel** to terminate.

The rates and mixes on the right side of the window are not optional, thus no check box is associated with them. For Localized sectors, the form of excavation selected is set to **Mechanical Only**. A small dialog box, shown in Figure 11.5.1-5, appears and asks the user to define how the excavated volume is to be removed.

- \* Click **Sift Off Site, Haul Away, and Sift On Site**.
- \* Click **OK**.

For discussion of the display of the results, turn to Section 11.6.

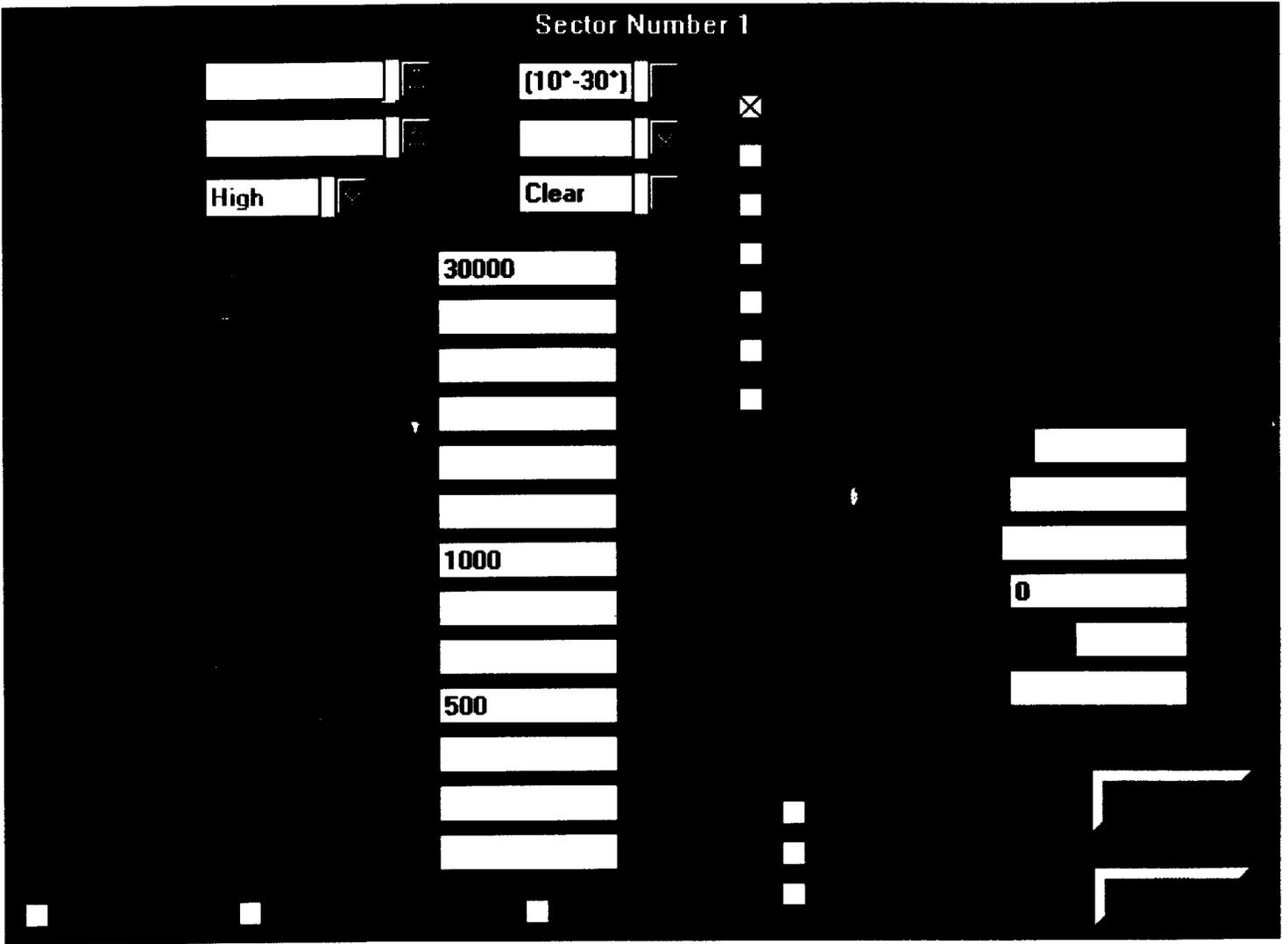


Figure 11.5.3-1. Localized Surface Input Box

**Table 11.5.3-1. Localized Surface Sector Inputs**

<b>Parameter</b>	<b>Units</b>	<b>Range</b>
Sector Area (SA)	Sq. Ft.	$0 < SA \leq \text{Site Area}$
Slope	degrees	select from categories
Vegetation Density	----	select from categories
Extraordinary Environmental Costs	\$	$\geq 0$
Line of Sight to contamination	Ft.	$\geq 0$
Burning Allowed	Yes/No	----
Slippery	Yes/No	----
Armed UXO	Yes/No	----
Unarmed UXO	Yes/No	----
Explosives and Materials	Yes/No	----
Propellants and Pyrotechnics	Yes/No	----
Non-Controlled Chemical	Yes/No	----
White Phosphorus	Yes/No	----
Localized CBR	Yes/No	----
Number of CWM Tents	#	$\geq 0$
Snakes	Yes/No	----
Bees	Yes/No	----
Poisonous Foliage	Yes/No	----

#### **11.5.4 Localized Building Inputs**

If the user has selected **Localized Building** indicating the contamination is to be removed from a physical structure, the **Sector Data** input box will be displayed next, as seen in Figure 11.5.4-1. This window is similar to the window used with dispersed sector inputs, but with some tailoring for the localized sector characteristics. As with the **Site Data** input box, there will be several grayed inputs, some unused by localized building, others unused in this version of RPT. For localized building, eighteen sector inputs are necessary. These values, along with their ranges and units, are listed in Table 11.5.4-1. This box will appear one time per Localized Building sector (each time the user selects **Localized Building** in the **Sector Type** dialog box). The user can exit the code by selecting the **Cancel** button, or continue by clicking on the **OK** button.

Following the Localized Building Sector input screen, a cost data screen will be activated, as shown in Figure 11.5.1-5. This screen asks the user for information about rates, labor mixes, and remediation techniques.

- \* Select optional labor rates and numbers check boxes and input associated rates for checked boxes.
- \* Click **OK** to continue or **Cancel** to terminate.

The rates and mixes on the right side of the window are not optional, thus no check box is associated with them. For Localized sectors, the form of excavation selected is set to **Mechanical Only**. A small dialog box, shown in Figure 11.5.1-5, appears and asks the user to define how the excavated volume is to be removed.

- \* Selects from **Sift Off Site**, **Haul Away**, and **Sift On Site**.
- \* Click **OK**.

For discussion of the display of the results, turn to Section 11.6.

Sector Number 1

(10'-30\*)

High

Clear

30000

1000

10000

0

Figure 11.5.4-1. Localized Building Inputs

**Table 11.5.4-1. Localized Building Sector Inputs**

<b>Parameter</b>	<b>Units</b>	<b>Range</b>
Sector Area (SA)	Sq. Ft.	$0 < SA \leq \text{Site Area}$
Slope	degrees	Select from categories
Vegetation	----	Select from categories
Extraordinary Environmental Costs	\$	$\geq 0$
Number of Buildings	#	$\geq 0$
Burning Allowed	Yes/No	----
Slippery	Yes/No	----
Armed UXO	Yes/No	----
Unarmed UXO	Yes/No	----
Explosives and Materials	Yes/No	----
Propellants and Pyrotechnics	Yes/No	----
Non-Controlled Chemical	Yes/No	----
White Phosphorus	Yes/No	----
Localized CBR	Yes/No	----
Number of CWM Tents	#	$\geq 0$
Snakes	Yes/No	----
Bees	Yes/No	----
Poisonous Foliage	Yes/No	----

## 11.6 RPT Results

If the user has selected a fixed parameter that lies outside the bounds (clear depth from zero to ten ft.), a message will appear letting the user know whether the fixed parameter lies below or above the bounds. Otherwise, the solutions will appear in a window with the fixed value nested appropriately within the data. This output window will list clear depth from zero to ten feet in six inch increments, probability of exposure (values from zero to one), and cost in dollars, as shown in Figure 11.6-1. View these results graphically by selecting either, **Plot Risk** or **Plot Cost** (see Figure 11.6-2, 11.6-3, respectively). These graphs give the user insight to critical points in the data. The user can return to the outputs by clicking on **OK** at the bottom left of the plot window. The user can also print the results using **Print Outputs**. Finally, the user can save the results by

selecting **Save Data**. When the user is finished with the data, **Done** returns the user to the opening screen, where a new run may be started, or the code exited.

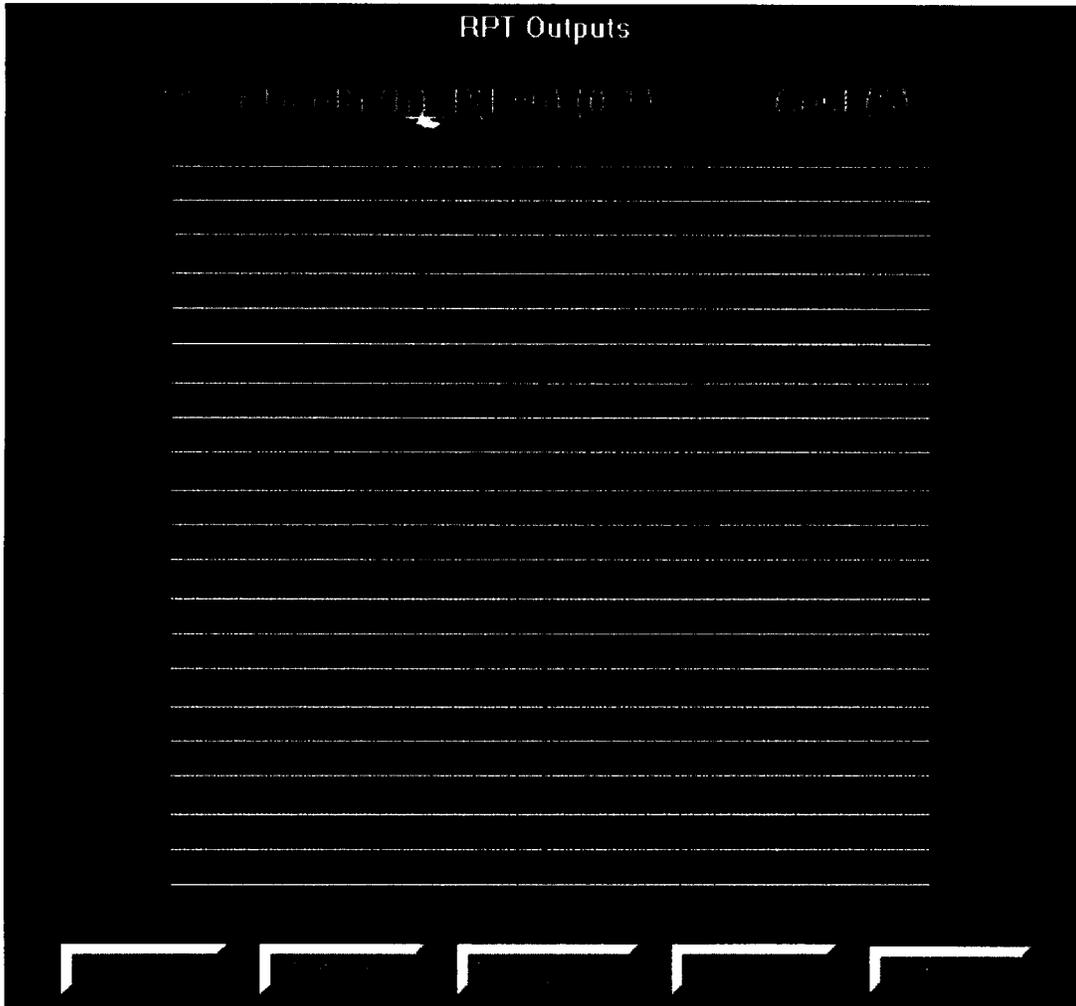


Figure 11.6-1. Output Screen

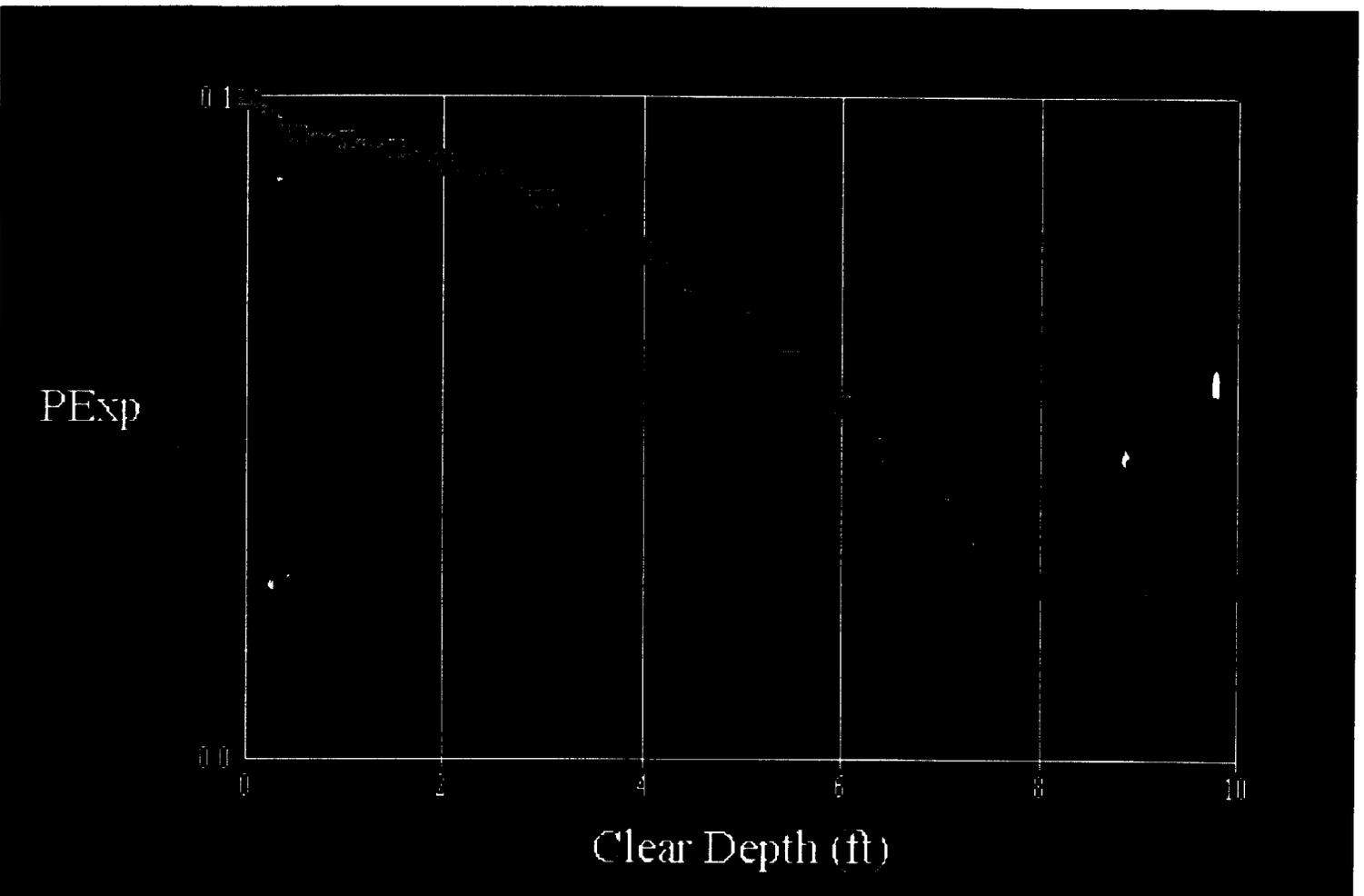


Figure 11.6-2. Clear Depth vs. Pexp (Probability of Exposure)

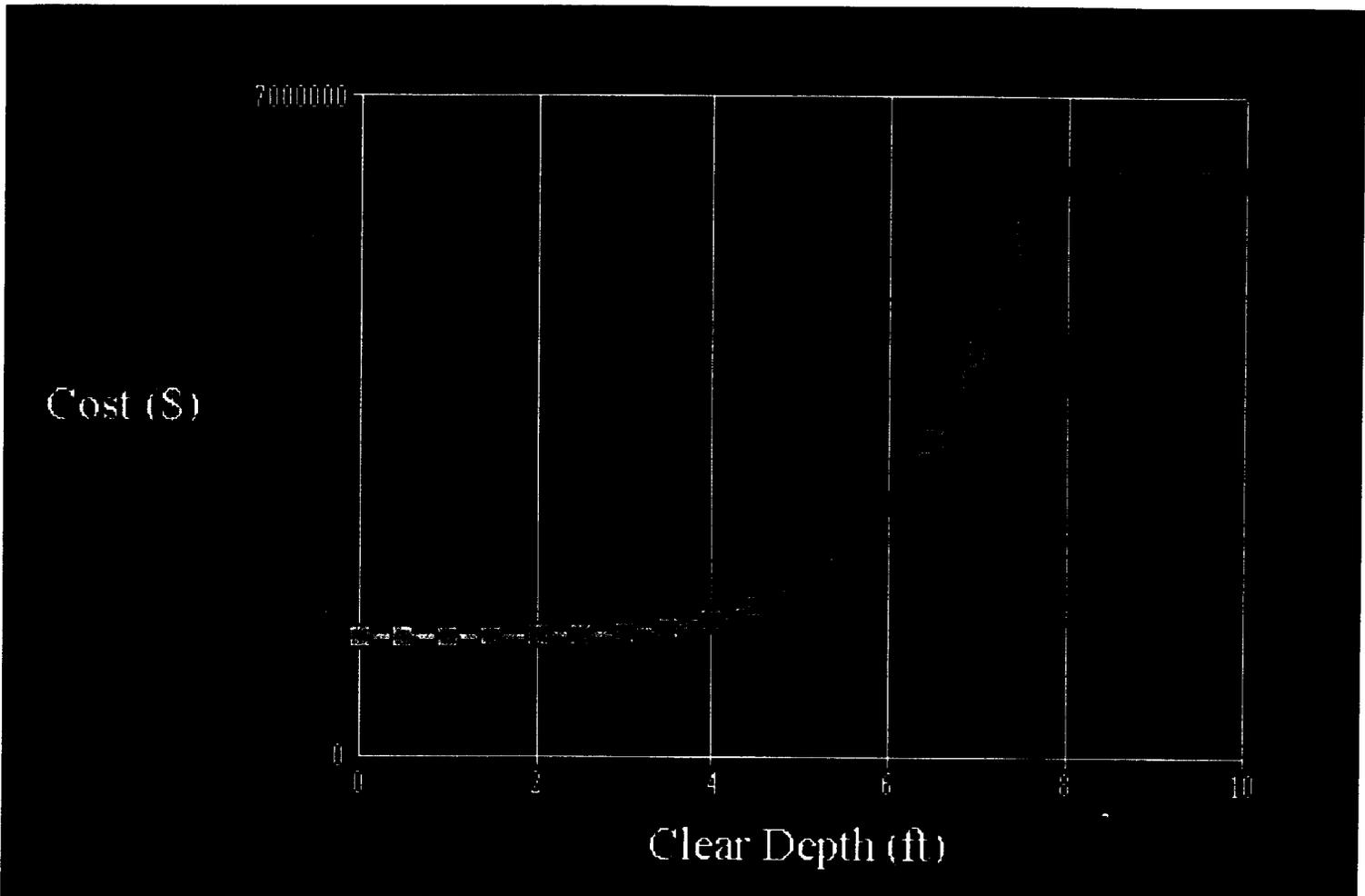


Figure 11.6-3. Clear Depth vs. Cost