

Navigating the Seismic Survey

This chapter covers how to select and view 2d and 3d seismic data from a **Base Map** and from a **Vertical Seismic Display**. It also explains how to adjust the seismic view using several display options and change the seismic gain and color.

Display 3D In-Lines and Cross Lines

1. In **Base Map**, click on the 3D survey to make it active. Position the cursor (arrow) on In-line 110 (In-lines are north-south in this survey). Line and crossline numbers are plotted along the edges of the survey.
2. Right click and select **Display In-line 110**. The seismic line will now appear as shown in (Figure 2.1).
3. Click on the Select (arrow) icon in the upper left corner of the Vertical Seismic display to open the Select Vertical Display dialog box shown in (Figure 2.2).
4. Toggle ON Crossline under 3D Surveys and enter Crossline **45**. Click on **OK**.

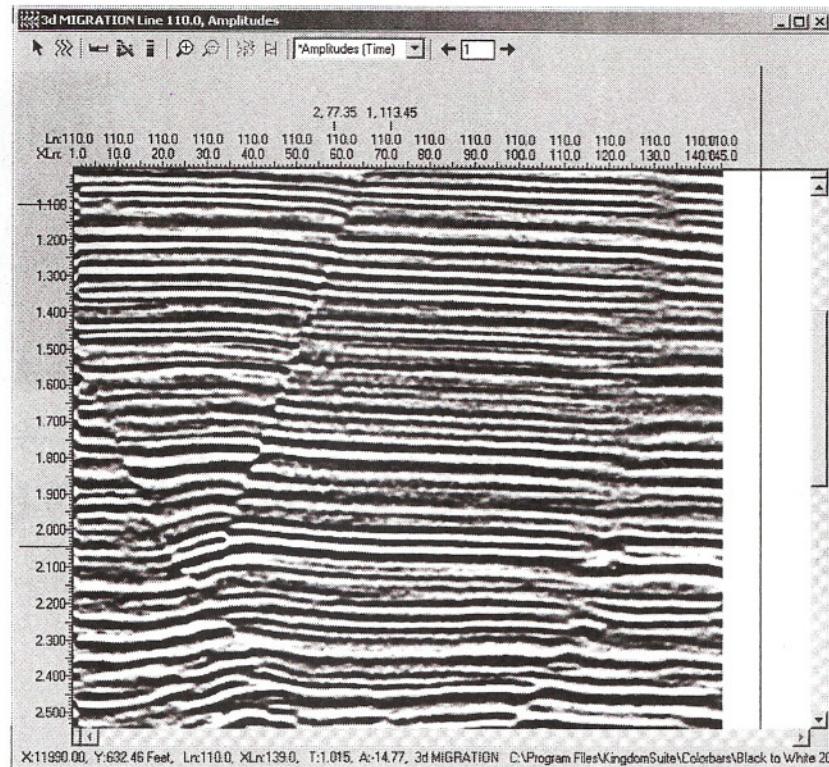


Figure 2.1 - 3D Line 110

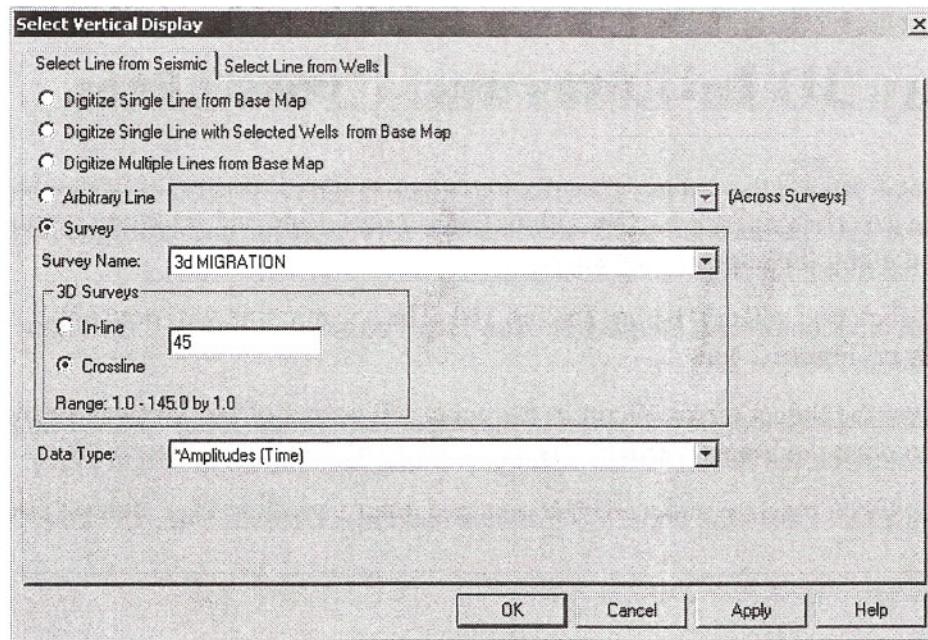


Figure 2.2 - Select Vertical Display dialog box

Move 3D Lines on Base Map

On the **Base Map**, click and drag the Map Line Overlay (bold red line) at **Crossline 45** and move **Crossline 45** to **Crossline 50**. Release the mouse button to display **Crossline 50** in the same vertical seismic window.

Verify that the seismic display is **Crossline 50** by reading the title bar at the top of the vertical seismic window.

Tip: You can change the thickness of the **Map Line Overlays** in **Project > User Preferences > Line Thickness**.

Display Line from Vertical Seismic Display

1. Move the selection cursor (arrow) into the **Vertical Seismic Display (VSD)** and right-click the mouse on the displayed **In-line** or **Crossline**.
2. From the pop-up window, select **Display In-Line (or Crossline) <line number of line intersecting VSD at cursor location on the In-line or Crossline displayed>**.
3. Observe the **Base Map** display.
4. Position the two vertical seismic displays adjacent to one another in the workspace.
5. In the rightmost seismic window, click and drag the vertical Line Overlay to another position. Observe the left vertical seismic display. Observe the **Base Map**.
6. Close the vertical seismic views by clicking the large X located in the upper right corner.
7. Right-click on the **Base Map** and display a new In-Line.
8. In the **Vertical Seismic Display (VSD)** window that opens, click the **Make this window the designated Vertical Display** icon  .
9. In **Base Map** select either an inline or cross line. Notice that the vertical seismic window is updated with the new line. The designated vertical widow option prevents the workspace from having too many vertical seismic windows open.

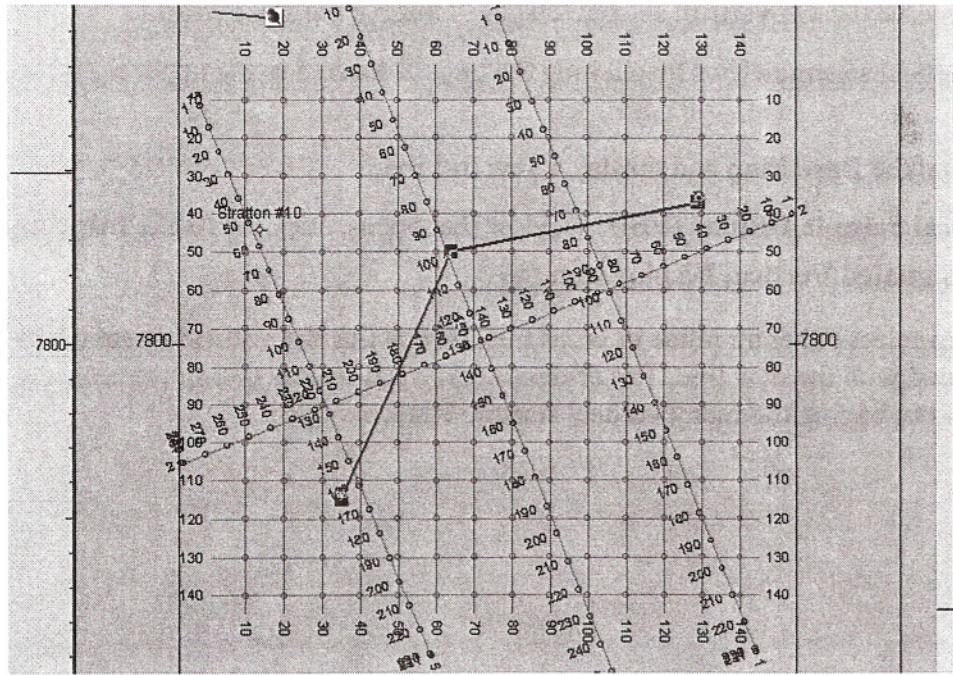
Display 2D Line

1. In the **Base Map**, right click and in the pop up window check to see if the **Activate 2D Double Click** option is enabled with check mark. This is the default setting. If no check mark is left of the option then highlight the **Activate 2D Double Click** to enable and place a check next to the option.
2. To view a 2D line make sure that the 2D surveys are activated in the **Project Tree**.
3. In the **Base Map**, point the cursor at a 2d line and double click to open the line.

Tip: Click F4, F5 and F6 to adjust the apparent gain of the 2D data. Make adjustments to the amount of gain in **Project > User Preferences > General** tab. Change the Seismic Display Scale Factor from 1.6 to 1.1. Click **OK**.

Display Arbitrary Line

1. Place the cursor on the **Base Map** on the 3D survey.
2. Right click and select **Digitize Arbitrary Line > Single Across Survey...**
3. The cursor will change shape to a cross with an **L** for line. Click with the left mouse button to pick the turning points for the arbitrary line. Double click to end.
4. The arbitrary line automatically displays in a vertical seismic window.



Move Arbitrary Line

1. In the **Base Map** using MB1 click and drag one of the nodes along the arbitrary line and move it to a new location. Observe the vertical seismic view.
2. Now, click and drag a leg on the arbitrary line (red line between nodes) to a new position on the **Base Map**. Release the left mouse button and observe the vertical seismic view.
3. You can also move the active arbitrary line by using the arrow keys.

Save Arbitrary Line

1. First, make the vertical arbitrary seismic view active. Second, click on **Line > Arbitrary Line > Save As** in the main menu.
2. Third, type in a name for the line. Name it **ARB 1** and click on **OK**.

Select Saved Arbitrary Line

1. From the main menu, select **Project > New Vertical Display**.
2. Toggle ON **Arbitrary Line**.
3. Click the down arrow and from the drop down window select **ARB 1**.
4. Click **OK**.

Single Line with Selected Wells Arbitrary Line

1. In the **Project Tree** under the **Wells** data folder activate the well **Subsets** folder for **All Wells** by clicking in the selection box to place an X in the box next to All Wells.
2. In the **Base Map** with a 3D survey displayed right click and select **Digitize Arbitrary Line > Single Line with Selected wells**.
3. A yellow wizard box will appear. Digitize the arbitrary line on the **Base Map**. Double click at the end of the line to proceed to the next step.
4. In the yellow wizard, Step 2 is now colored red. Point the cursor at a well adjacent to the arbitrary line. The bottom hole well symbol on the **Base Map** will be highlighted. Click once with the left mouse button. The well will be projected onto the arbitrary line
5. After a few wells have been selected, click **OK** in the yellow wizard to finish.

6. The well projection node can be moved along the arbitrary line path by clicking and dragging.

Multiple Across a Single 3D Survey

1. In the Base Map with a 3D survey displayed right click and select **Digitize Arbitrary Line>Multiple Across a Single 3D Survey**. This will open the Parallel Line parameters dialog box Figure 2.4.

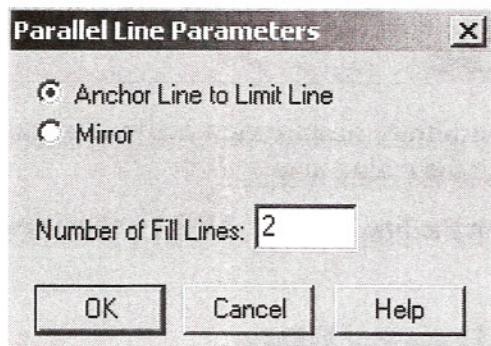


Figure 2.4 Parallel Line Parameters dialog box

2. Toggle on either Anchor Line to Limit Line or Mirror.
3. Enter 2 for the Number of Fill Lines and click OK.
4. Digitize an arbitrary line across the 3D survey. Double click to finish and then move the cursor up or down of the arbitrary line. Again double click to select the multiple panel display. Examples of the Anchor Line and Mirror arbitrary lines are shown in Figure 2.5.

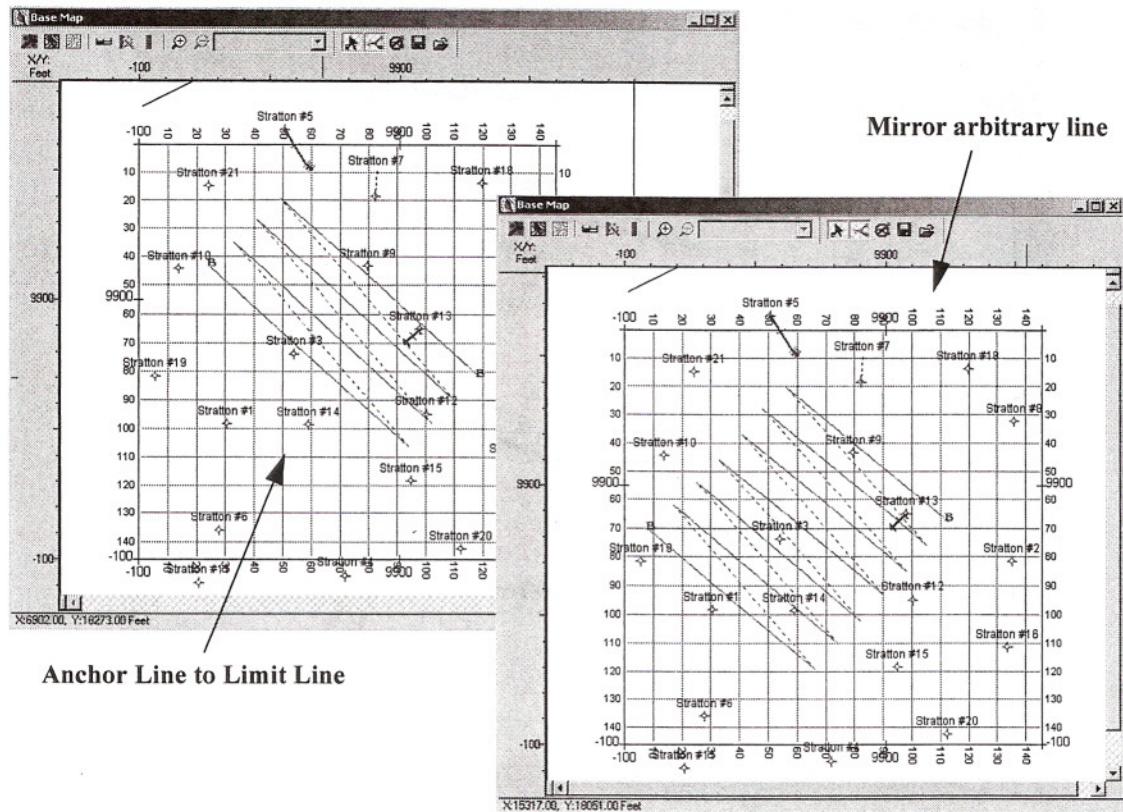


Figure 2.5 Anchor line and Mirror arbitrary line examples

Single Across 2D Surveys Only Arbitrary Line

1. From the **Project Tree**, uncheck the 3d MIGRATION survey so that only the 2d surveys are displayed on the **Base Map**.
2. In the **Base Map**, right click and select **Digitize Arbitrary Line > Single Across 2D Surveys Only**. The cursor will display a cross with a 2D.
3. On **2D survey 5**, click the left mouse button on shot point **70**.
4. On **2D survey 2**, click the left mouse button on shotpoint **180**.
5. On **2D survey 3**, double click on shotpoint **190**. The 2D arbitrary line should look like Figure 2.6.

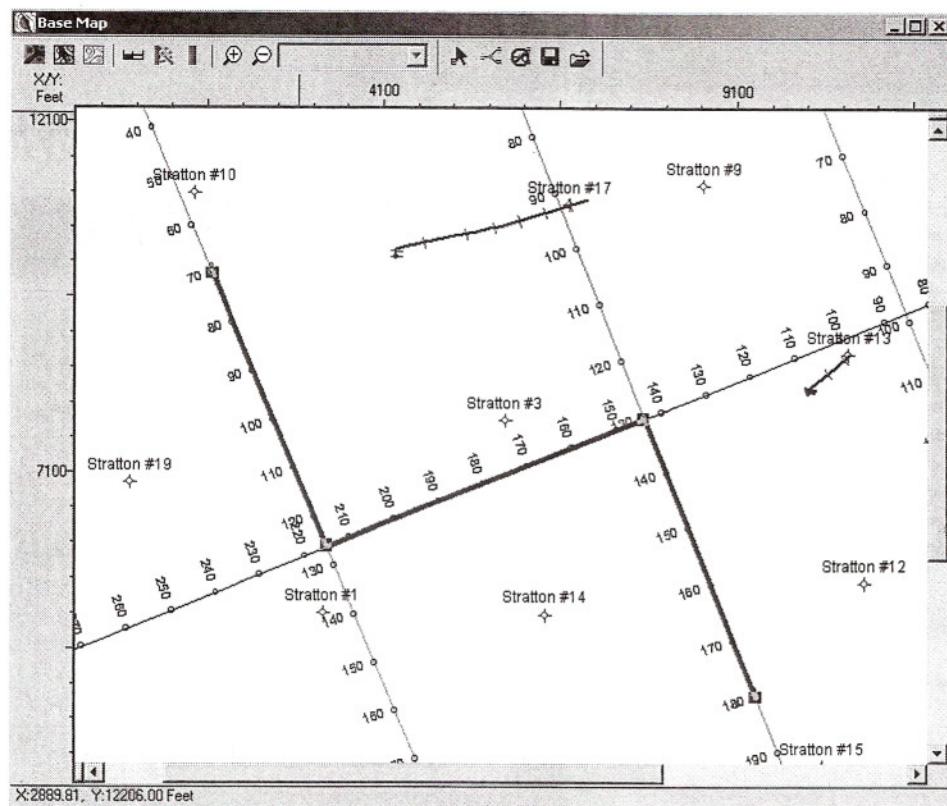


Figure 2.6 — Example of Single Across 2D Surveys Only

Balance Amplitudes

The 2D data has mixed storage units. Some lines are stored as 8bit, 16bit and 32 bit data. Balance Amplitudes will apply a scaler to the lines and scale to a reference survey. This will make it easier to view the data in multi-panel seismic views.

1. From the **KINGDOM Suite** main window menu bar, choose **Surveys > Balance Amplitudes** to open the **Balance Amplitudes** dialog box.
2. In the **Balance Amplitudes** dialog box, click on the down arrows adjacent to the **Reference Survey** and **Data Type to Balance** text fields and select the **3d MIGRATION** survey and **Amplitudes (Time)** data type respectively.
3. Click to place a check in the **Use Median RMS Value** check box.
4. Select 2D surveys **2, 3 and 5** in the **Select Surveys to Balance** list area.
5. Click **OK**.

Display Time Slice

1. From the **Project Tree**, display the **3d MIGRATION** survey on the **Base Map**.
2. Place the cursor in a **Vertical Seismic Display (VSD)** window and right click at the time point where you wish to display a time slice.
3. In the pop-up menu, click to select **Display Time Slice <time point on VSD where you right clicked>**.

A time slice window opens displaying the desired time slice. The **VSD** window now displays a red horizontal line bisecting the seismic display at the slice time location.

4. Left click and hold down the mouse button on the horizontal red line.
5. Drag the horizontal red line up or down to another position on the **VSD** window.

Pan Seismic Lines and Slices

1. Navigate through the vertical seismic and time slices by using the up, down, left or right arrows on the keyboard.
2. Set the pan increment by entering a line increment in the window at the top of a vertical Seismic view. Click the Left/Right arrows to pan the seismic line.
3. For a time slice, click the **Set Scales** icon  or selecting **View > Settings**. Click on the **Seismic** tab and enter a value (in seconds) in the window next to **Slice Skip Increment**.

Area of Interest

Use a polygon to limit the extents of seismic data displayed in a seismic window when selecting an inline, crossline, arbitrary line and 2D line(s) from the basemap. Area of interest is useful in restricting what seismic traces are available for viewing in large 2D and 3D surveys.

1. In **Base Map** select **Tools > Polygons > Polygon Management**.

Note: Use this manager to Create polygons, rename and edit (Properties tab) and delete existing polygons.

2. Under the **Create** tab click the **Planimeter** button.
3. In the pop up window click the **Digitize** button. Move your cursor over the **Base Map**. Note that the Planimeter dialog box remains open.
4. Place your cursor in the **Base Map** and digitize a polygon. Double click to finish.

5. Point your cursor on one of the polygon legs (line between nodes) and double click to open the **Polygon Object** window. In this dialog box enter a name for the polygon. Name it **AOI**. Also, adjust its appearance. Click **OK**.
6. In the Planimeter dialog box, click **Close**.
7. Right click anywhere in the basemap, in the pop up window un-check **Enable Planimeter Polygon Editing**.
8. Select **Survey > Survey Management > Area** tab, shown in Figure 2.7.

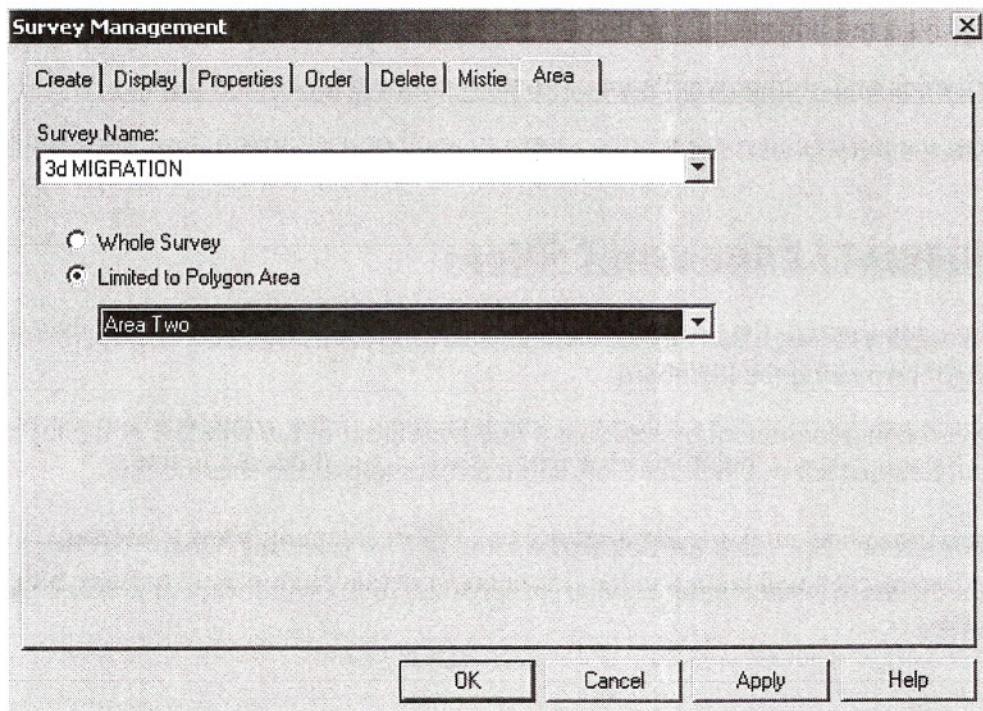


Figure 2.7 - Survey Management dialog box with Area tab active

- Choose a Survey, using the down arrow next to Survey Name. Toggle on **Limited to Polygon Area** and in the second window click the down arrow to select your saved polygon. Click **APPLY**.
9. Answer **Yes** to the pop up window disclosing closure of all vertical displays.
 10. You will repeat selecting a survey and a polygon for each 2D line and 3D survey inside the polygon area. Click **Apply** between each survey. When finished click **OK**.
 11. Open a seismic line inside the polygon area and view the restricted trace range limited by the inclusive polygon.

Note: If you are assigning multiple surveys then select the survey, polygon and click **Apply**. The program will remember the assignment for each survey.

12. Reset by going back to the **Survey Management** dialog box and on the **Area** tab, toggling **ON Whole Survey**.
13. Turn OFF the polygon in the **Project Tree**.

Seismic Amplitude Scale

1. In an active seismic window, click on **View > Seismic Amplitude Scale** from The **KINGDOM Suite** menu. This menu allows you to control the amplitude on seismic windows. You can also change the amplitudes using only your keyboard.

Table 1: Hot Key Equivalents for Amplitude Scale

Hot Key	Function
F-4	Reset - resets the amplitude to the default (imported) values. You may review the original values in the Data Type Management - List tab .
F-5	Increase - boosts the amplitudes by the seismic display scale factor. The factor can be changed from Project>User Preferences > General tab
F-6	Decrease - reduces the amplitudes by the seismic display scale factor. The factor can be changed from Project >User Preferences > General tab.

2. Click on the **Show Color Bar** icon  in the Seismic window. Practice using the F4, F5 and F6 keys and observe how the Color Bar numeric scale changes.

Set Horizontal and Vertical Scales

1. Change the horizontal and/or vertical scale by selecting the **Set Scales** icon or by selecting **Views > Settings** from the main menu Figure 2.8.

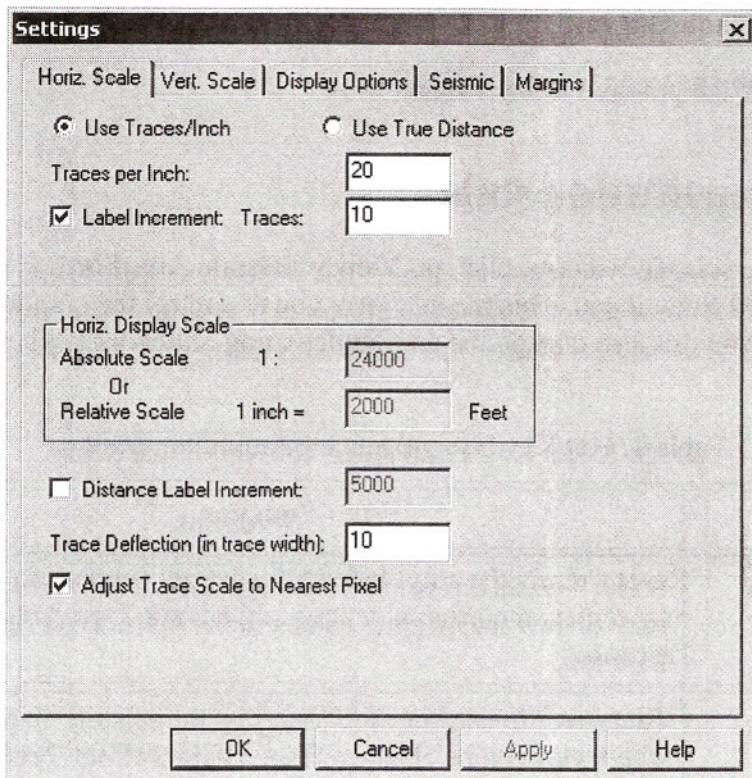


Figure 2.8 — Settings dialog box with Horiz. Scale tab active

2. To change display scales, click on the Horiz. Scale or the Vert. Scale tabs. Try 20 traces per inch and 4 inches per second to provide a reasonable aspect ratio of the line.
3. You can orient yourself to geographical directions by moving the cursor on the seismic window and watch the cursor movement on the map. If the reverse orientation of the seismic line is preferred, type the **R** (Reverse) key on the keyboard.

Note: If you reverse the direction of a crossline using the R key, any other crossline window that you pull up from this window will be reversed as well (until you hit R again). The In-line windows will not be reversed.

Descriptions of additional **Hot Keys** are available in Online Help and in Appendix A.

Seismic Display Options

Set general display options, type of plot for seismic display and enable cursor tracking. If an EarthPAK license is active set true vertical depth for deviated wells in a cross-section.

1. The default seismic display is Hi Res Color Raster. Change the seismic display to **Wiggle Variable Area**.

2. Select **Both Fill** for the wiggle trace fill and click on **Wiggle Options...** to open the **User Preferences Wiggle Options** dialog box. Set the **Peak Fill** color to **Maroon** and the **Trough Fill** color to **CadetBlue**. Click on **OK** to close and **OK** on the **Settings** dialog box to display the modified seismic line.
3. Select **Color Mapped Wiggle** and select **Both Fill**. The display will be similar to the one shown below. **Color Mapped Wiggle** displays traces as in the wiggle variable area mode, only the color of the trace is controlled by the color bar.

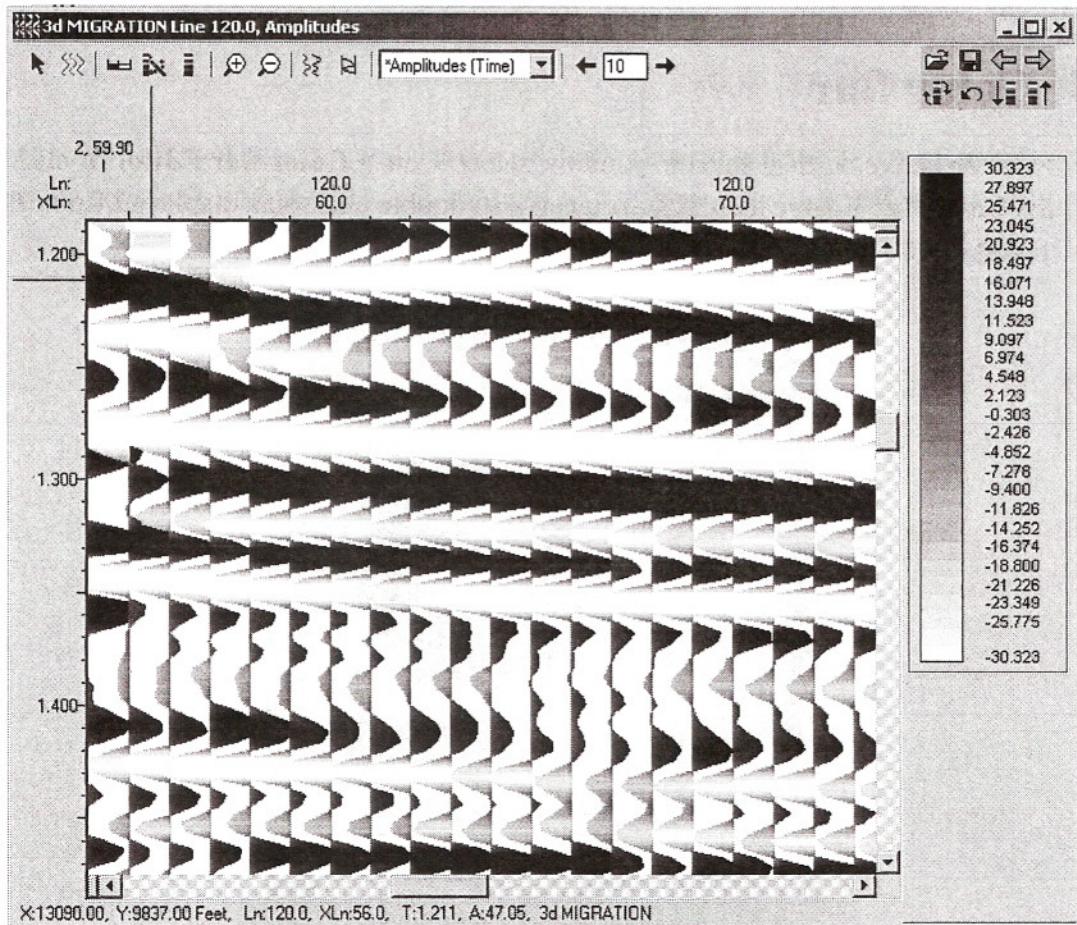


Figure 2.9 — Color Mapped Wiggle Trace

4. Select the type of seismic display you want to use for your interpretation and return to the Vertical Seismic Window.

Color Bar Selection

1. The **KINGDOM** software default location for the Colorbar folder is in **C:\Program Files\KingdomSuite\Colorbars**. Using Microsoft Explorer, copy the Colorbar folder from this default location and paste the copied folder into the Golden Project folder.

2. From the active vertical seismic window, display the color bar by clicking the **Show Color Bar** icon .
3. Select a different color bar by clicking the **Select** icon .
4. Navigate to the Golden project folder and open the Colorbar folder. Select a different color bar from the list. A preview bar is located at the bottom of the window.
5. Click on **OK** to close the **Color Editor** once you are satisfied with a color bar.

Edit Color Bar

1. From an active vertical seismic window, select **View > Color Bar Editor** or click on the **Color Bar Editor** icon . You can also double click on a displayed Color Bar. The Color Editor is shown in Figure 2.10

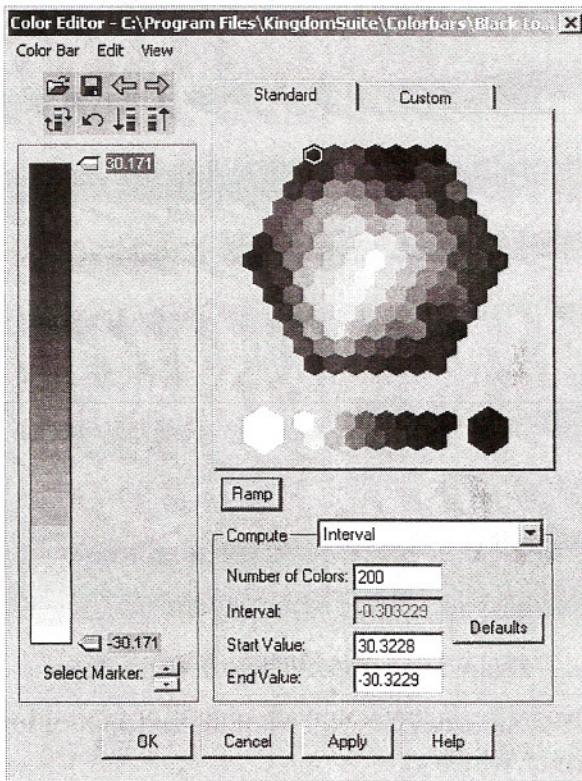


Figure 2.10 — Color Editor dialog box

2. In the **Color Editor**, select **Color Bar > New**.
3. Drop and drag colors from the color palette to the appropriate location along the color bar.

4. If only a portion of the color bar is to be edited, hold the **control** key down and click on the marker arrow adjacent to the color bar until both marker arrows are depressed.
5. Click on **Ramp**. Any color cells that fall between the marker arrows will be colored between the two depressed marker arrows.
6. To interpolate the entire color bar, drop and drag colors to the appropriate locations on the color bar and click on the Ramp button.
7. Save the new color bar by selecting **Color Bar > Save As**. Navigate to the **Colorbar** folder in the Golden project folder. Enter a new color bar name in the File name window.

Seismic Toolbars

The seismic **Toolbars** contain shortcut icons that allow quick access to common tasks from the vertical seismic window. There are tool bars for fault and horizon interpretation, culture layer editing and for displaying location rulers and colors. You can turn tool bars ON and OFF in the active seismic window by clicking on **View > Toolbars....**

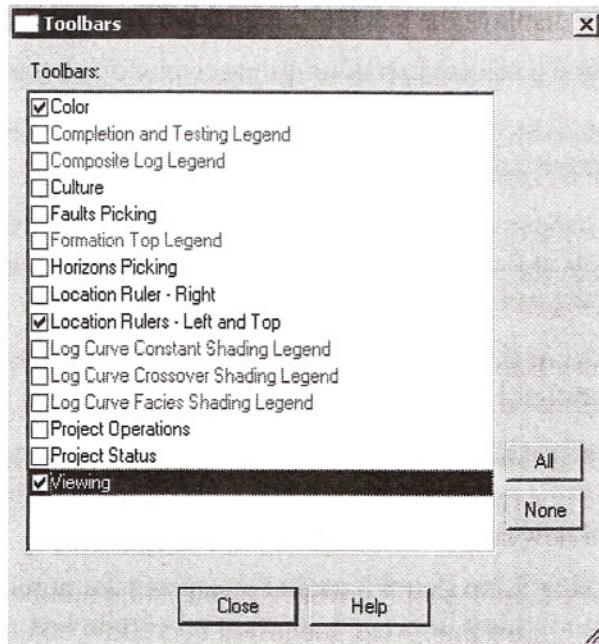


Figure 2.11 — Toolbars dialog box

Seismic Viewing Toolbar

The Viewing icons shown in Figure 2.12 are described in the following numbered list:

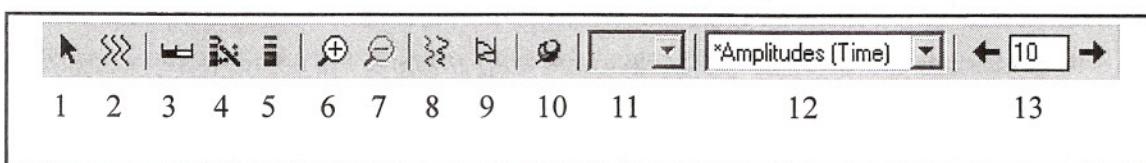


Figure 2.12 Seismic Viewing Toolbar

1. **Select** - select a line, crossline or arbitrary line.
2. **Wiggle Overlay** - select a seismic data type, overlay trace increment and an wiggle overlay type:.
3. **Set Scales** - adjust the horizontal and vertical scale, edit the trace increments, trace label increments, display options and margins.
4. **Color Bar Editor** - retrieve new color bar, edit existing color bar and create new color bars.
5. **Show Color Bar** - displays the selected color bar on the active window.
6. **Zoom In** - expand a selected section of the seismic display in the active window.
7. **Zoom Out** - return to the display scale previous to the last Zoom In command. Zoom Out is active once a Zoom In has been performed.
8. **Log Settings** - choose digital, raster or composite logs to be displayed beside the well borehole position in the seismic vertical view. Choose the color, thickness, position and shading of the well logs.
9. **Digitize Log Curve Baselines** - requires an EarthPAK license. Use to pick log curve min and max baselines on a cross section.
10. **Designated Vertical Display** - enables displaying multiple selections of 2D, 2D Arbitrary, 3D, or 3D Arbitrary seismic lines in the same vertical seismic window without opening a new seismic window.
11. **Current Arbitrary Line Panel Number** - displays the number of the active panel in a multi-segment arbitrary line. Also, identified by yellow box around the panel in the vertical seismic display.
12. **Current Display Data Type** - displays the selected seismic data type for the active window or window panel.
13. **Left/right arrows** - display the next line according to the number shown in the white box between the arrows (1 will advance the display to Line 109 or 111, depending on which arrow is chosen, 10 will advance to Lines 120 or 100).

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Viewing Toolbar—Vertical Seismic Display

The figure below shows the Viewing toolbar for a Vertical Seismic Display (VSD). The data type selected determines which icons are active.

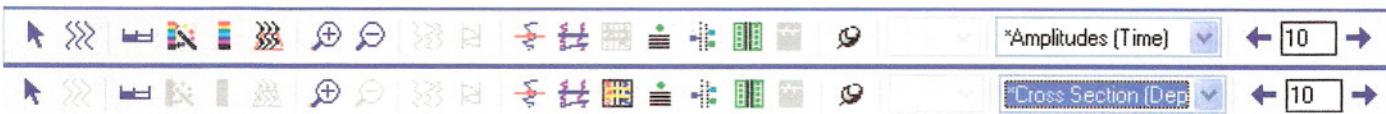


Figure 7 VSD Viewing Toolbar

The table shows the icons and explains their function.

Table 4 Vertical Seismic Display Toolbar

Icon	Icon Name	Explanation of Function
	Select Vertical Display	Opens the Select Vertical Display dialog box, in which you can specify parameter values for displaying vertical seismic sections.
	Wiggle Overlay	Opens the Wiggle Overlay dialog box, in which you can specify values for wiggle trace overlay parameters.
	Set Scales	Opens the Settings dialog box, in which you can specify different values for the Horizontal and Vertical scales.
	Color Bar Editor	Opens the Color Editor dialog box in which you can change the color bar palette.
	Show Color Bar	Displays the currently selected color bar.
	Bandpass Filter	Opens the Bandpass Filter dialog box, in which you can dynamically filter the traces in a vertical seismic display.
	Zoom In	Enlarges an area of the window for more detailed information.
	Zoom Out	Returns enlarged area to normal view.
	Log Settings	Defines which log curves to display and their priority, colors, scale, and line style. Display digital, raster, and composite logs.
	Digitize Log Curve Baseline	Assigns low-end and high-end values, or baselines, for log curves
	Correlation Parameters	Choose between a crosshair or drag a copy of log curves to correlate between wells

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T**Table 4 Vertical Seismic Display Toolbar**

Icon	Icon Name	Explanation of Function
	Flatten or Unflatten	Flattens vertical windows, cross-sections, and horizontal slices dynamically relative to a horizon or a formation top
	Digitize Intervals	Interactively select and compute net thickness intervals on well logs
	Post Borehole Data	Select information about boreholes posted on vertical seismic sections and how the information is displayed or positioned relative to the boreholes
	Show Test Data	Post information from tests such as Initial Potential and Monthly Production along the borehole in the vertical windows
	Show Test Interval	Post selected casing, core, drilling, and test information along the borehole in the vertical window
	Digitize Composite Log Intervals	Digitize intervals for a composite log.
	Make this window the designated Vertical Display	Toggle ON to display any selected seismic line in the current vertical seismic display window (VSD) and not open another VSD.
	Arbitrary Line Panel Number	Displays the number of the active line panel of an arbitrary line.
	Current Data Type	Displays the current seismic data type of the seismic displayed in the vertical seismic display window or, for arbitrary lines, the data type of the seismic displayed in the active panel.
	Line Increment	Specify a line skip increment value, and then click on the left or right arrow to roll the seismic display forward or backward by the increment amount.

Toolbars dialog box

1. From the active seismic view, select **View > Toolbars**.
2. Click in the box adjacent to **Location Rulers - Left and Top** to remove the check mark in the box.
3. Observe the active seismic window.
4. Click in the **Location Rulers - Left and Top** to add the check and keep this toolbar open.

Tip: If a well symbol is displayed in the top margin, and if you point your cursor at the well symbol and click the right mouse button, a pop up window will open displaying well options.

5. Click on **Close** to dismiss the **Toolbars** dialog box.