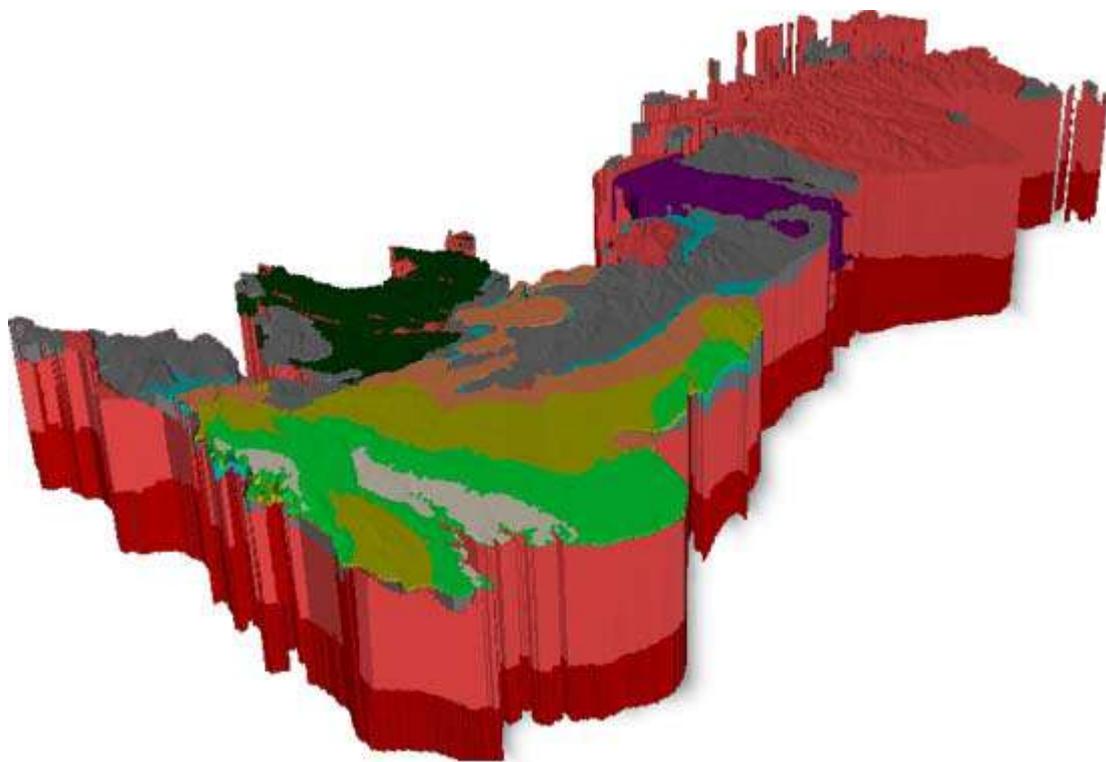


# LithoFrame Viewer

v2.0

## User's Guide



**British  
Geological Survey**

NATURAL ENVIRONMENT RESEARCH COUNCIL



**INSIGHT**

# *LithoFrame Viewer*

## *V2.0*

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## 1 – Introduction

### What is the LithoFrame Viewer?

Welcome to the User's Guide for the LithoFrame Viewer v2.0. The LithoFrame Viewer is a software tool which enables you to view and query complex 3D geological models constructed by The British Geological Survey (BGS). It was developed jointly by BGS and INSIGHT Geologische Softwaresysteme GmbH using the GSI3D 3D modelling platform – [www.gsi3d.org.uk/](http://www.gsi3d.org.uk/).

The software enables you to view 3D geological models in terms of a GIS-style interface, presenting spatial and three-dimensional data in terms of maps, logs, cross-sections (profiles) and also 3D. The LithoFrame Viewer presents pre-built 3D geological models as provided by the BGS. These data files are delivered in a proprietary, encrypted format, and can be opened in the Viewer just as one would open a document in a word processing application. The LithoFrame Viewer does not enable you to incorporate, view or model your own geological data, nor to edit and modify existing data.

The LithoFrame Viewer is designed to be used easily by both experts and by casual users; it is not specialist software. It provides a simple interface to investigate and query 3D geological models in meaningful ways.

### Typographical Conventions

The following typographical conventions are used within this document:

- Menu and button choices appear in italic typeface and the greater-than symbol (>) represents the path to follow through any sub-menus. For example, if you are instructed to choose the Load model command from the File menu, it will appear as *File > Load model*.

## 2 Getting Started

### System Requirements

The minimum system requirements for the LithoFrame Viewer are in some respects dependent upon the geological models which are to be loaded and viewed. Suggested general minimum requirements for installation are as follows:

- A PC running Windows 2000 or Windows XP.
- A high-end graphics card (NVIDIA is preferred).
- 512MB RAM.
- 200MB free disk space.
- A colour display or monitor with a resolution of at least 800 X 600 pixels.

Large data files will operate faster on systems that exceed 512MB RAM and may require significant amounts of disk space. Your data provider will be able to advise you if a model data file has particular requirements in this respect.

### Installing LithoFrame Viewer

The LithoFrame Viewer is provided as a download from our website and uses a wizard-style installer to install the necessary components from a setup file (setup.exe). The software can be downloaded from here:

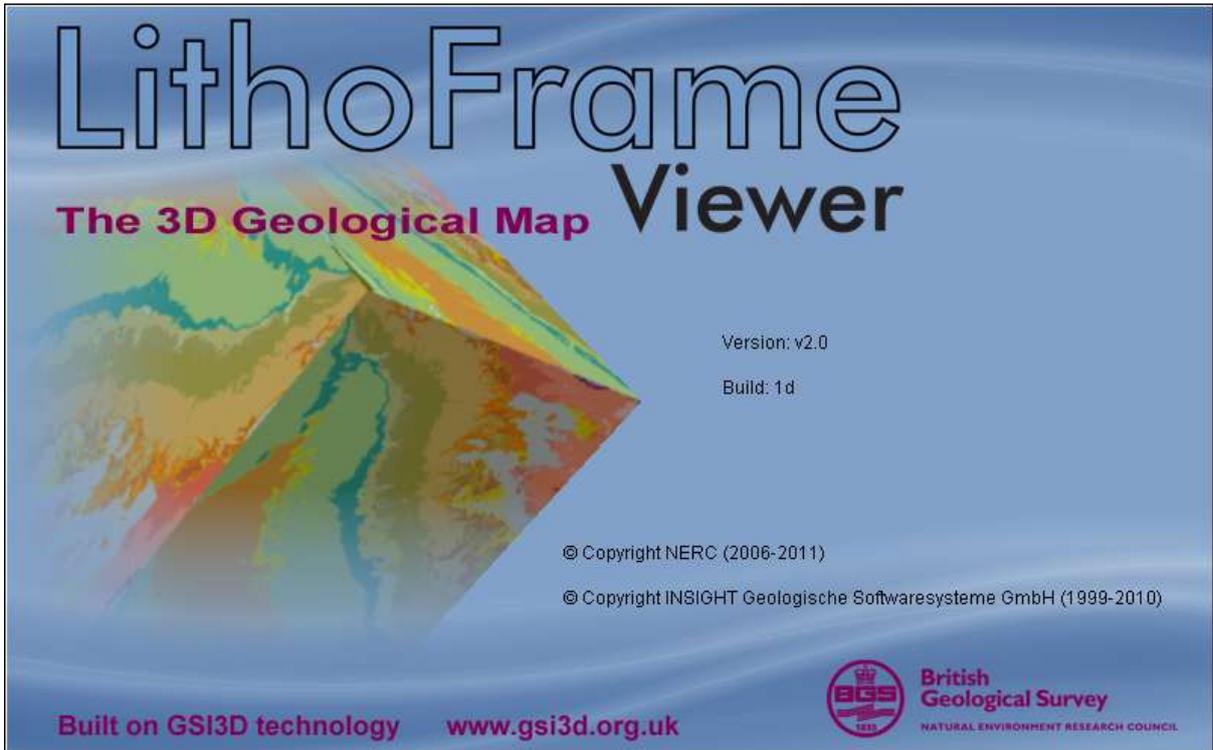
[www.bgs.ac.uk/services/3dgeology/lithoframe.html](http://www.bgs.ac.uk/services/3dgeology/lithoframe.html)

1. Double click on the provided setup.exe file.
2. When the installation wizard appears, follow the prompts displayed to install the software. Make sure to accept the license conditions and specify an installation location as you prefer.

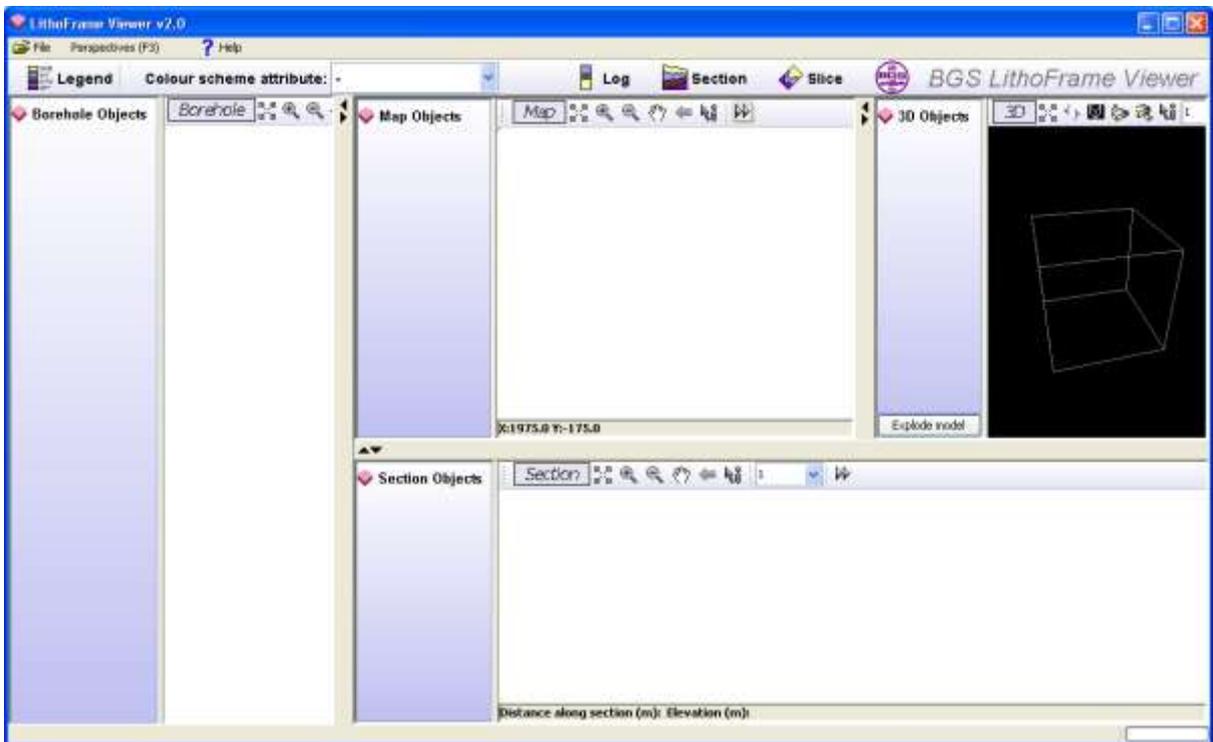
### Starting LithoFrame Viewer

The installation process will have generated a desktop shortcut and/or a Start menu item for the LithoFrame Viewer. Either double click the LithoFrame Viewer icon from the desktop or select the menu item via *Start > Programs > LithoFrame Viewer*.

When you start the LithoFrame Viewer, after a few moments you should see the start up screen of the Viewer appear.



After a few more seconds the start up screen will disappear and the main LithoFrame Viewer interface will appear. It should look similar to the picture below, although the arrangement of the individual panels may appear slightly different depending upon your screen resolution, and also depending upon your version of Windows and your system settings.



## Loading a Model

The LithoFrame Viewer starts up without any data loaded into it. In order to view data you will need to open a model file, which has a format of *.gsipre*. To do this, choose *File > Load model* (or press Ctrl+O on the keyboard) and browse for the model data file. Usually the model file will have been delivered to you by a representative of The BGS, or you will have downloaded it from the LithoFrame data download pages of the BGS website.

The LithoFrame Viewer does ship with a very small example model file (see the sample data folder under your installation). This model is purely fictional and is not based on any real geology, but you could use it to learn how to use the Viewer.

Usually when you receive or download a model from the BGS website you will get a *.gsipre* file plus a variable number of supporting files which must be kept in the same folder as the *.gsipre* file. For more details please refer to Appendix A: Model Files.

If you have opened model files in previous Viewer sessions these will be stored in a short project history listing which can be accessed via *File > Open...* which will expand a list of previously opened model files. Simply select the one you want to load in. This list presents the date and size of the file to aid identification. If the file has been moved or renamed since you last viewed it then it will appear in red in the history listing indicating that the file is not accessible. Nothing you do in the Viewer interface can affect, modify or corrupt the data files. If you think that one of your files has become corrupted or no longer loads try a fresh download from the BGS website, or contact your data provider within BGS directly.

The LithoFrame Viewer can only load any one model file at a time. To view a different model you will need to start up a new instance of the Viewer via the desktop shortcut or the Start menu. You can open as many instances of the LithoFrame Viewer as you wish, although multiple copies with large model files are likely to cause performance problems for your PC. It is therefore recommended that, for optimum performance, all other instances of the Viewer are closed down before loading a new model.

## Exiting LithoFrame Viewer

The LithoFrame Viewer should be closed down via *File > Exit*. Alternatively, if you are experiencing problems with the user interface that prevent you from doing this, you can use the Windows 'X' in the top right of the screen, or failing that use the Windows 'X' in the top right of the black console window.

## Uninstalling LithoFrame Viewer

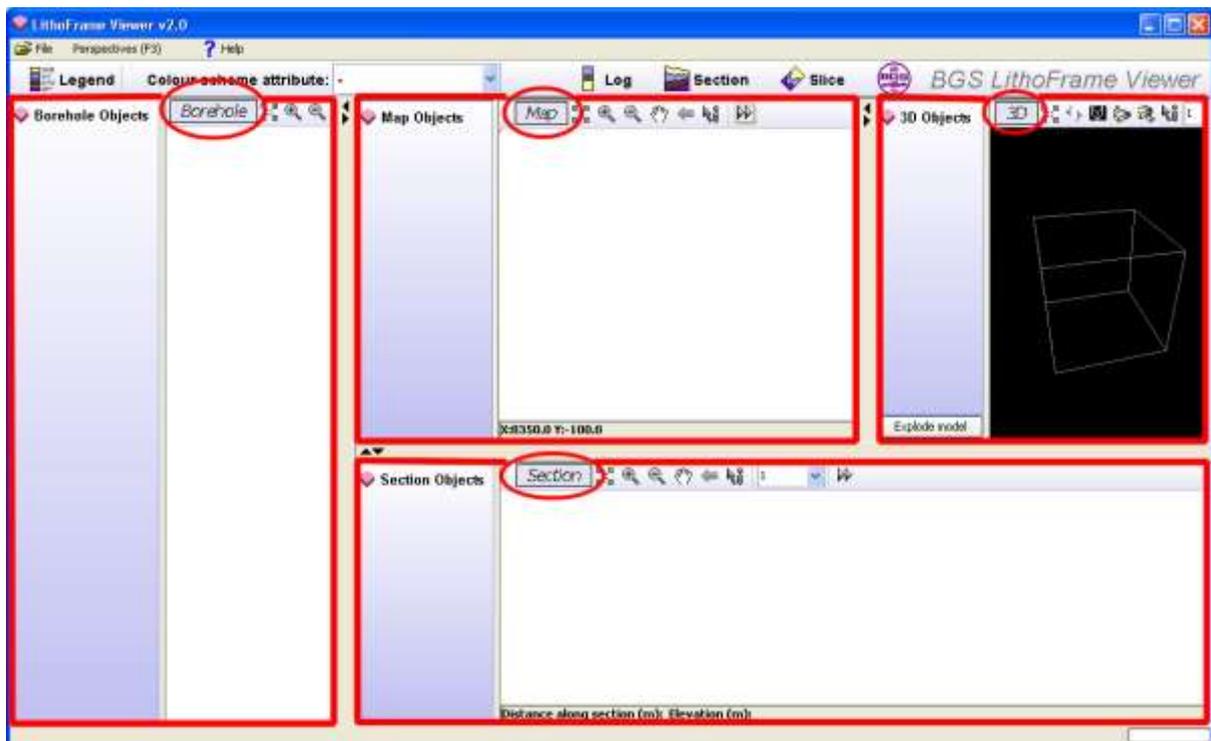
To uninstall the LithoFrame Viewer use the Windows Control Panel as follows:

1. From your desktop, choose *Start > Settings > Control Panel*
2. Double click on *Add or Remove Programs* and wait for the list of installed software to load.
3. Scroll down the list to LithoFrame Viewer and click on its entry to highlight it.
4. Click the *Remove* button to start the uninstall wizard.
5. Follow the uninstall wizard instructions to remove the software from your computer.

## 3 – Using the LithoFrame Viewer

### The Main Interface

The main interface of the LithoFrame Viewer is comprised of four components called ‘windows’. These are **Map** window, **Section** window, **Borehole** log window and **3D** window. The exact arrangement of these will depend on your settings and how you have chosen to arrange the interface. The different windows are labelled in their toolbars for easy identification. Choose *Perspectives > Standard* to arrange the Viewer interface as below and identify the different windows highlighted in red in the figure below. With most models, when you load the GSIPRE data file you will see objects appear in both the map and 3D windows. The section and borehole windows are normally used to display the results of model queries once the model is loaded and so are usually blank after first loading the model.



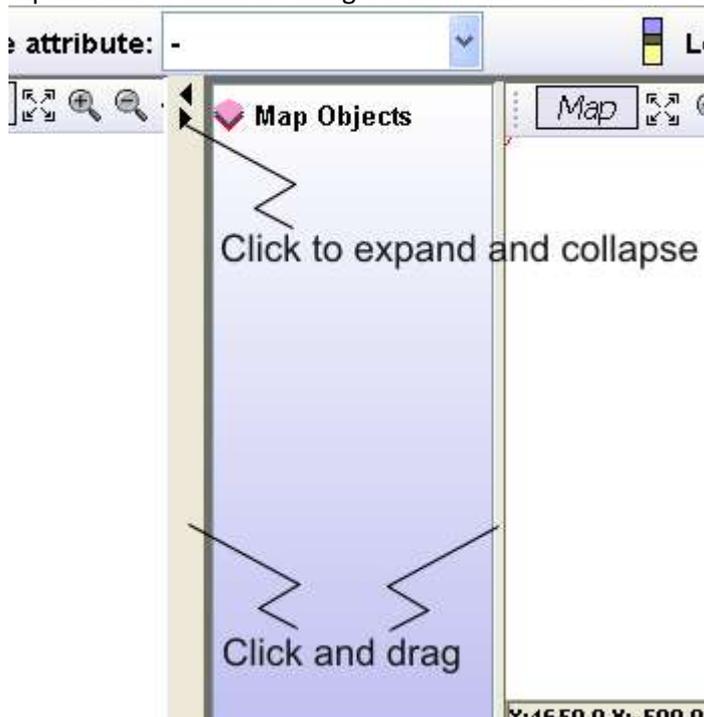
Across the top of the main interface is the main query toolbar. This enables you to view a legend, switch between different legend attributes (colour schemes) that may be available, and also use the three main query tools, *Log*, *Section* and *Slice*. These functions are described fully in the later section on querying models.

### Arranging the Windows

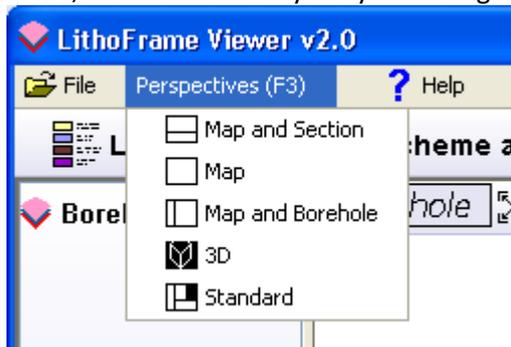
There are two ways of arranging the aforementioned windows in the Viewer.

1. You can arrange the windows exactly as you want them using the divider bars between the windows. You can either hold down the left mouse button and drag the bars up or down or left or right (depending upon the aspect of the window in question), or you can collapse and

expand whole windows using the small direction arrows on the divider bars.



2. You can choose from a series of preset window layout 'perspectives' which are designed to suit particular modes of visualization. To do this choose from the list under the *Perspectives* menu, or use the 'F3' key to cycle through the various layout options.



## Managing Objects

Each window has a panel to its left with a graded blue background which is called the Object Tree. These contain folders of different model objects and, once a model is loaded into the Viewer, they can be expanded and collapsed by using the +/- icons or by double clicking on their labels to explore and display the various model and query objects. Objects are broken down into the following categories, but are not always visible in all windows.

### Surfaces

Holds gridded or triangulated surfaces. These do not form part of the geological model, but are often used to provide valuable reference surfaces such as terrain models (DTMs) or water tables.

### Geological units

These form the core of the 3D geological model. There will be one for each modelled geological or rock unit within the project area. In the object tree they are displayed along with their legend colours for quick identification.

### Cross-sections

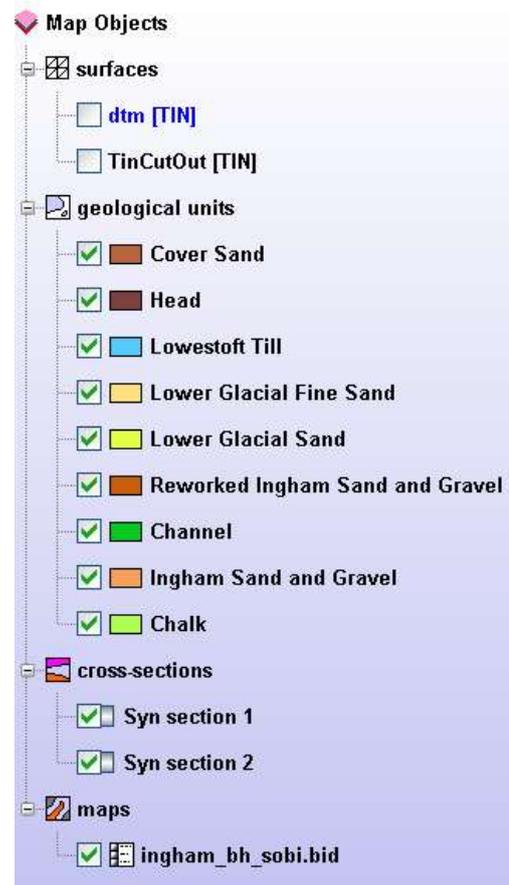
In most models this list will be built as you use the 'section' querying tool, but there may also be objects in here when the model loads. These are vertical sections through the geological model.

### Maps

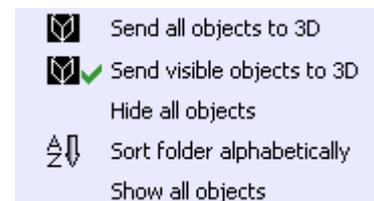
Maps can represent a range of different data including image overlays (raster maps) such as topography, and maps of borehole locations. The contents of this folder will depend upon the type of model being viewed. This folder is also used to store results of the 'slice' query tool.

### Logs/Synthetic logs

This folder only appears in the Borehole window. It holds the results of the 'Log' query tool and is built up as new queries are carried out.

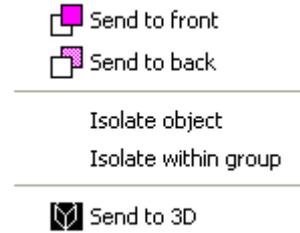


Most folders have a context-sensitive popup menu which can be accessed via right-clicking on the folder name and which affect all objects held under that folder. The following options are usually available allowing you to view all objects in 3D and, in the map and 3D window, to hide and show all objects. Further options may appear depending on the type of object and the specific operations available.



Against each object in the tree is a checkbox which can be used to show and hide the object in the relevant window. Additionally there is a context-sensitive popup menu for each object which can be accessed by right-clicking on the object name. One or more of the following options will be available.

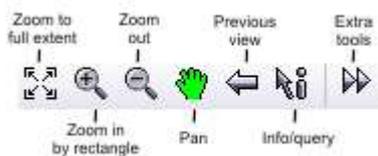
- *Send to 3D* – sends the object into the 3D window for viewing. Note that this option may be greyed-out if the object is already visible in 3D.
- *Send to front* – in the map window this option moves the selected object to the front so that it is drawn on top of all others.
- *Send to back* – in the map window this option moves the selected object to the back so that it is drawn beneath all others.
- *Isolate object* – in the map window this option hides all other objects, regardless of type.
- *Isolate within group* – in the map window this hides all other objects that are of the same type.



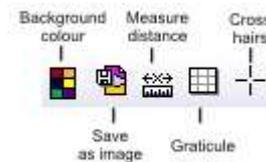
## Navigation Toolbars

Each of the four windows has its own toolbar which provides buttons that allow you to manipulate the view within that window. The options available vary slightly between each window and are detailed below. You can hover the mouse cursor over each button to see a short description of its function. Some buttons display as green icons when active.

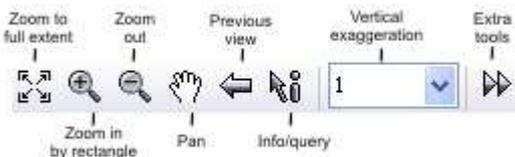
### Map Window



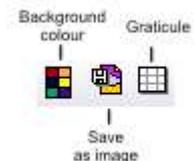
Clicking "Extra tools" gives >



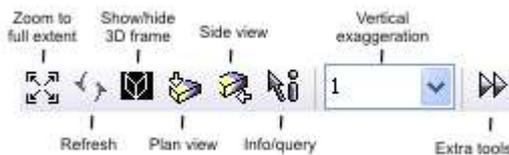
### Section Window



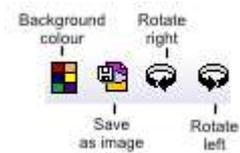
Clicking "Extra tools" gives >



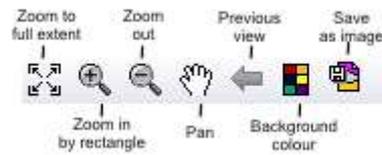
### 3D Window



Clicking "Extra tools" gives >



## Borehole Window



## Navigating Within the Map, Section and Borehole Windows

All windows except the 3D window have the following navigation tools:

	Zoom to full extent will zoom the image window out so that all objects contained within it can be viewed at once.
	To zoom by rectangle, pick this tool and then click and drag a rectangle to specify which part of the image window you are interested in.
	Use this button repeatedly to zoom out step-by-step.
	To drag the image across the window, choose the pan tool and then click and drag to re-position it within the image window.
	Click this button to step back through previous views.

If you have a mouse wheel you can also scroll in and out to zoom by a fixed amount step-by-step.

## Navigating Within the 3D Window

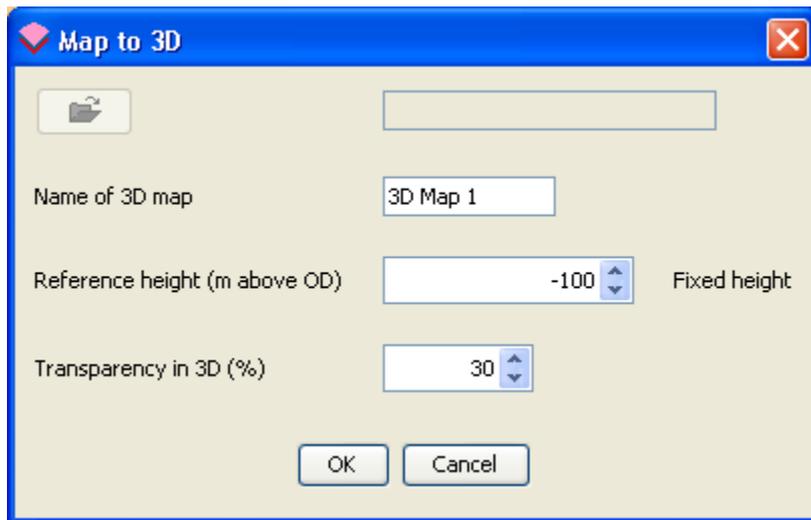
The 3D window behaves a little differently. On most computer/mouse setups the following apply.

- To rotate the 3D scene, hold down the left mouse button and drag in any direction.
- To zoom up and down, hold down the right mouse button and drag backwards or forwards.
- To pan the scene, hold down both left AND right mouse buttons and drag in any direction.
- If you have a mouse wheel you can also scroll in and out to zoom by a fixed amount step-by-step.

## Sending the Map to the 3D Window

You can send the entire map window to the 3D window as an image for reference via *Right-click > Send map to 3D* anywhere in the map image window. This will display a dialog box with the following options:

- *Name* – give the map a name
- *Reference height* – this is the height in metres (relative to OD) that will be used to place the map in the 3D window. Note that the map will be presented as a flat plane image in the 3D window at a fixed elevation.
- *Transparency* – specify a transparency for the image in 3D in % (0 – 100).

The image shows a software dialog box titled "Map to 3D". It has a blue title bar with a red close button in the top right corner. The main area is light beige and contains several input fields and controls. At the top left, there is a folder icon and an empty text box. Below that, the label "Name of 3D map" is followed by a text box containing "3D Map 1". The next row has the label "Reference height (m above OD)", a spin box with "-100", and the text "Fixed height". The final row has the label "Transparency in 3D (%)", a spin box with "30", and two buttons labeled "OK" and "Cancel" at the bottom center.

**Map to 3D**



Name of 3D map

Reference height (m above OD)  Fixed height

Transparency in 3D (%)

## 4 - Querying Geological Models

The LithoFrame Viewer has a set of tools which allow you to query the geological model and see the results in the various windows. The query tools use the 3D block model and allow you to generate so-called **synthetic** objects based on that model. There are three query modes which are:

- **Synthetic log** – allows you to click in the map window to generate a synthetic vertical log through the 3D model at that point and view the results as a vertical log plot and also in the 3D window.
- **Synthetic cross section** – allows you to draw a line in the map and have that generate a synthetic cross section through the 3D model along that path. The results can be viewed as a section plot and also in the 3D window.
- **Synthetic horizontal slice** – sometimes referred to as an “uncovered map”, this allows you to slice the model horizontally at a specified elevation and view in both map and 3D windows. This is a similar function to the synthetic cross section, except the section is created horizontally instead of vertically.

All of the query tools are found together on the main toolbar.



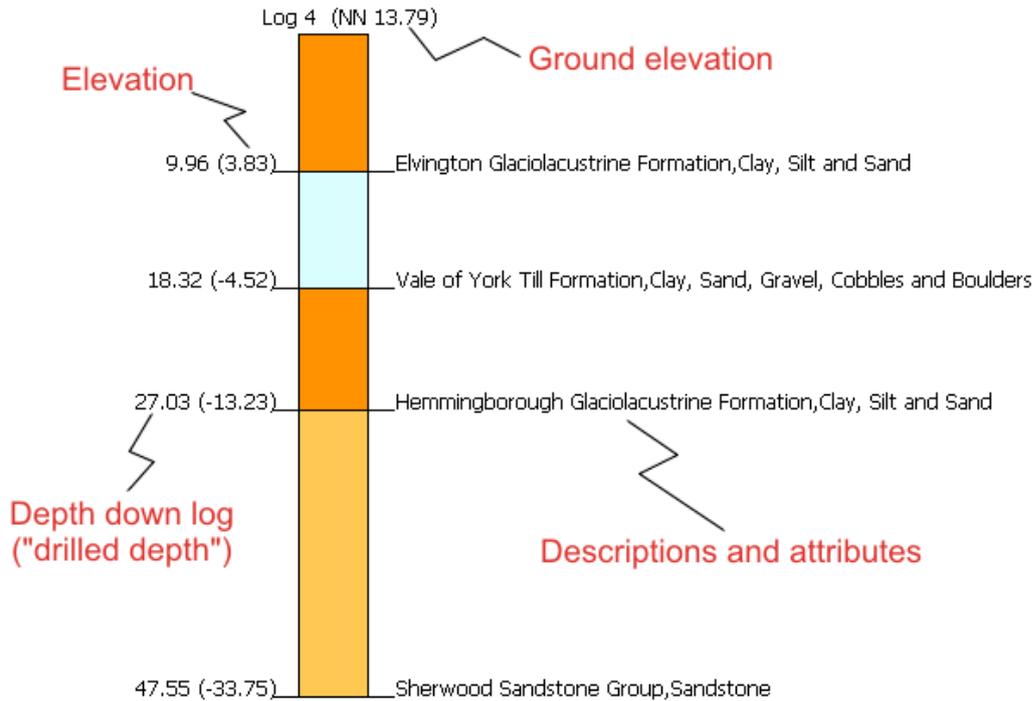
### Creating synthetic logs

The synthetic log query tool allows you to click a point in the map window and have a synthetic, or virtual, vertical log be created through the entire 3D model at that position. It is important to note that the results of this query tool do not necessarily represent an accurate and realistic log of the geology below that point on the ground, they represent a modelled prediction only, and the accuracy will vary according to the type of model being queried. For further detail you should refer to your model provider at the British Geological Survey.

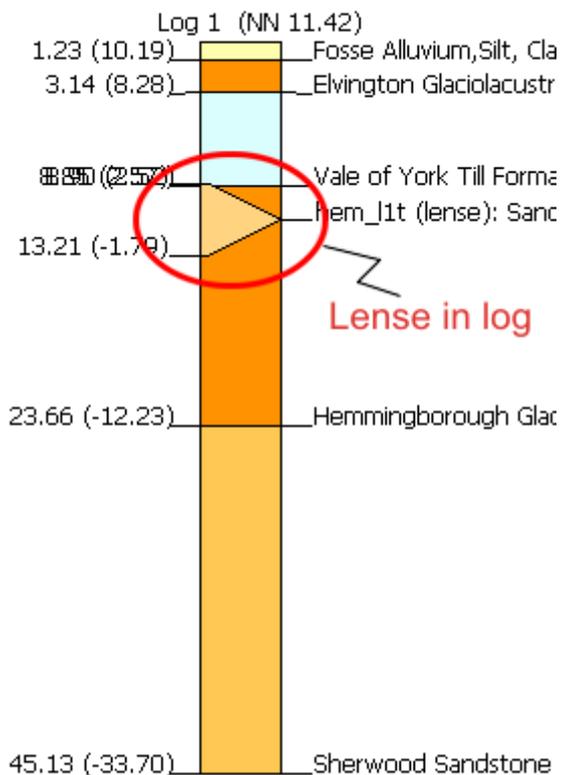
To create a synthetic log, click on the Log button in the main toolbar. This will switch the LithoFrame Viewer into borehole log query mode. In this situation the log button will be displayed with a raised border visible and aspects of the button's icon will turn red.



Firstly, arrange the Viewer windows so that you can see both the map and the borehole windows simultaneously (you can do this via *Perspectives > Map and borehole*) and then select the log query mode. Now click once in the map with the left mouse button at the position where you wish to generate the synthetic log. The log will appear in the borehole window. Sometimes this may take a moment especially if the model is large. When the log appears in the borehole window you may need to use the various zoom and pan tools to scale and centre the image as required.



If your log query penetrates a lense within the model it will be displayed on top of the log as a wedge-shape, together with elevation labels for the top and base of the lense at that position.

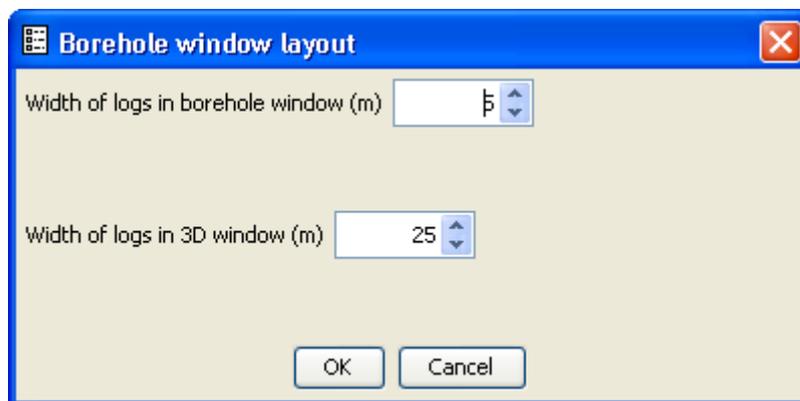


To generate further synthetic logs simply click again in the map at the desired locations. Subsequent logs will be displayed in the borehole window using the new zoom settings. A list of your generated

logs will be kept in the object tree of the borehole window under a folder called “synthetic logs” and will be named automatically using an incremental system, so that you can refer back to them. The logs you create will also be added to a map object called “Synthetic Logs” in the maps folder of the map window and will be displayed as a map of log positions (green circles with a cross inside) in the map image. Only one log can be viewed at a time in the borehole window and you will need to use the object tree checkboxes to work through the results of your log queries.

You can view the results of synthetic log queries in 3D. To do this, right-click with the mouse on the *drill-logs* folder in the borehole window object tree and choose *Send all objects to 3D*. You may need to expand the *Borehole Objects* folder to see this; simply double click on it to expand the folder. Logs in 3D are displayed as columns by default with a diameter of 5 metres in log view, and 25m in 3D.

The width or thickness of the logs in the borehole window and in the 3D window can be set via Right-click > Layout by clicking anywhere in the borehole window image panel. As dialog is displayed that allows you to specify the width in metres for each view:



## Creating synthetic cross sections

The synthetic section query tool allows you to connect a series of clicked-on points in the map window and have a synthetic, or virtual, vertical cross section be created through the entire 3D model along that path. It is important to note that the results of this query tool do not necessarily represent an accurate and realistic log of the geology along that line of section, they represent a modelled prediction only, and the accuracy will vary according to the type of model being queried. For further detail you should refer to your model provider at the British Geological Survey.

To create a synthetic section, click on the Section button in the main toolbar. This will switch the LithoFrame Viewer into cross section query mode. In this situation the section button label will change to *Finish section*, it will be displayed with a raised border visible and aspects of the button's icon will turn red.



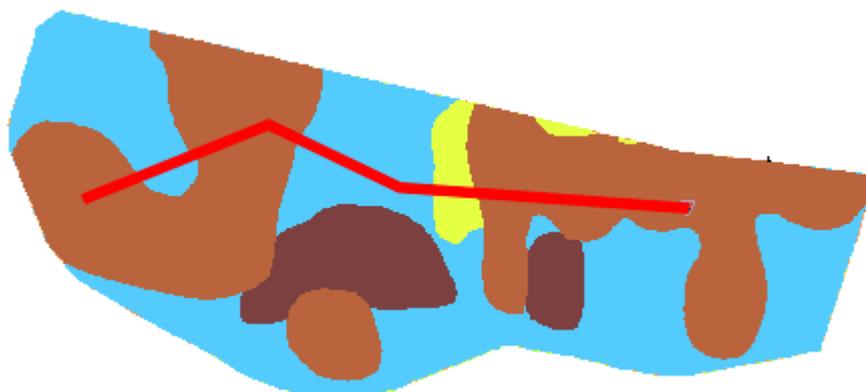
When you click the button to switch on the section query mode, a message dialog will appear with basic instructions on how to proceed.

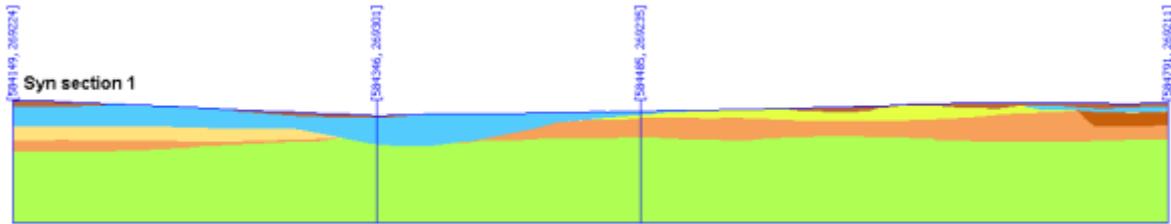


Arrange the user interface so that both the map and the section windows are visible simultaneously (you can do this via *Perspectives > Map and section*) and then click the *Section* button to enter section query mode. Note that the label on the button changes to *Finish section*. Because the section drawing allows you to specify an arbitrary line of section, using multiple clicks in the map window, the section building mode remains active until you click *Finish section*.

To build the section click in the map where you want the section to start. At this stage nothing will happen because a section must consist of a line on the map and hence it will only start to be built when you specify a second point in the map. Successive clicks in the map append further segments to the line of section and so you can make the line as complex as you wish.

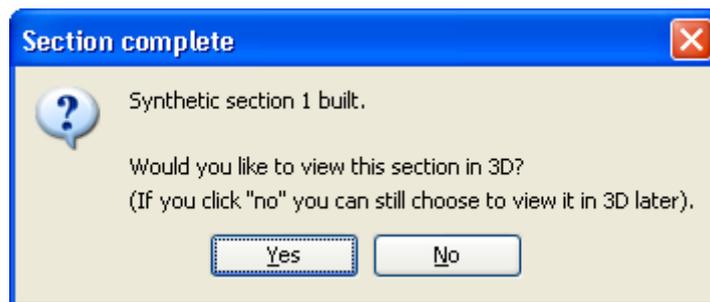
As you click in the map you will see a red line appear that reflects your digitized path and your synthetic section will built up in the section window. As you click to extend the section please be patient and wait for the new red line segment to appear in the map before proceeding to the next point. The section query tool performance will depend upon the size and complexity of the 3D model and may need a few moments to construct each leg of the section as you click in the map.





Depending upon the zoom settings you may need to re-scale the section window for the best view. Use the full extent button in the section window toolbar and then use the pan and zoom tools to arrange the section graphic as you wish.

When you are happy with the section either double-click in the map, or click on the *Finish section* button in the main toolbar. This will switch off the section query mode and prompt you to send the new section object to the 3D window straight away. If you intend building a series of sections it is advisable to click “No” at this stage and send all section objects to 3D once they are constructed as this will improve the performance of the 3D graphics. You can send the sections to 3D from both the map window and the section window object trees. You can right click on an individual section name in the tree and choose *Send to 3D*, or you can send all sections to 3D at once by right clicking on the cross-sections folder and choosing *Send all objects to 3D*.



There is no way to edit or modify an existing section once you have clicked to finish it. If you find a section is in the wrong place or needs to be extended you will need to reconstruct it by undertaking a new section query.

## Creating synthetic horizontal slices

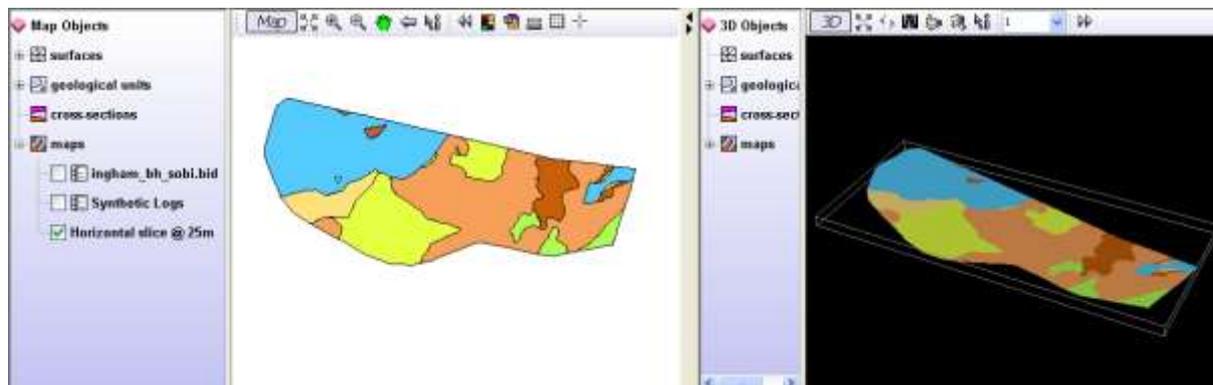
Horizontal slices, sometimes called “uncovered maps”, are effectively horizontal cross sections through the model. The synthetic slicing query tool allows you to cut through the 3D model at a user-specified elevation value (in metres relative to OD) and see a generated ‘map’ of the 3D model across that plane. It is important to note that the results of this query tool do not necessarily represent an accurate and realistic map of the geology across that plane of elevation, they represent a modelled prediction only, and the accuracy will vary according to the type of model being queried. For further detail you should refer to your model provider at the British Geological Survey.

To build a horizontal slice, click on the Slice button **BUTTON Slice**, in the main toolbar. Note that the slice tool behaves differently to the log and section query tools in that it does not enter a query ‘mode’. Multiple slicing queries are achieved by repeated clicking of the slice button. When the button is clicked you will be prompted to specify a numeric value for the elevation (in metres) at which you wish to generate the model slice. Reasonable values for this field will vary from model to model. To get some idea of the elevation range of the model you can refer to any synthetic cross section

objects. Hovering the mouse across the section in the section window will give a read out of elevation as “Z” in the section window status bar, and will hence give you a point of reference. If in doubt, start with a value of 0 (zero) to create a synthetic slice at sea level (OD) and click OK.



The query tool will usually take a several seconds to generate the slice object, depending upon the size and complexity of the 3D model. When the slice is generated it will appear in the map window and will be accessible in the map window object tree under the maps folder as an object labelled *Horizontal slice @ 0m*. Below is an example of a synthetic horizontal slice displaying in isolation in both the map and 3D windows.



To see the results of the slice in isolation, right click on the object label in the map window object tree and choose *Isolate object*. This will switch all other objects off in the map. Results of slice operations can also be viewed in 3D by right clicking on the object label in the tree and choosing *Send to 3D*.

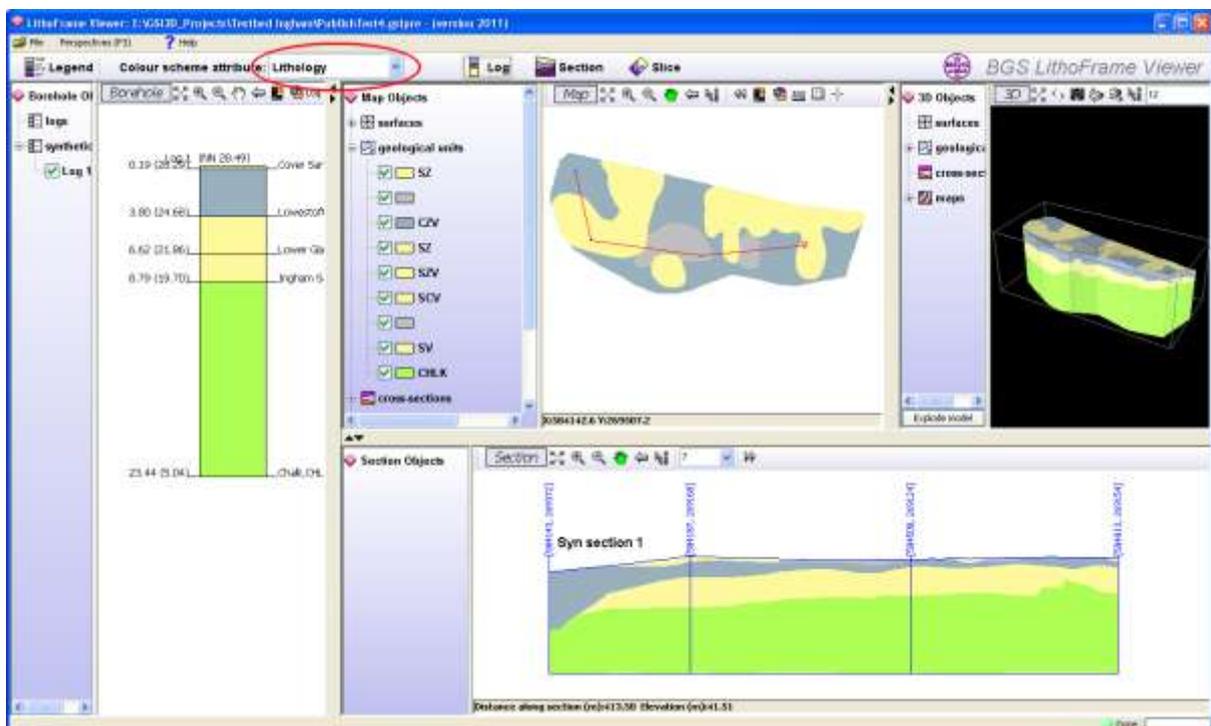
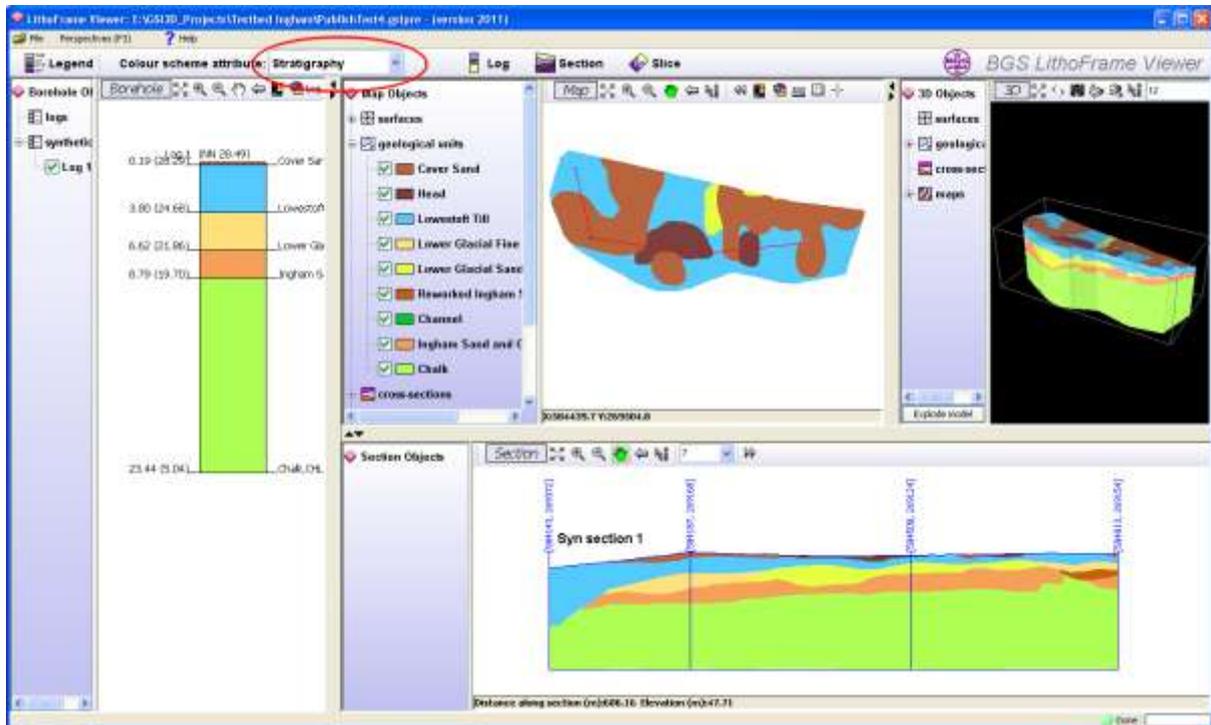
## Using the Legend

### Changing the colour scheme attribution

3D models will be delivered with at least one legend colour scheme attribute that specifies how different objects in the model are coloured-up. Each geological unit represented in the model will have a legend colour ascribed to it based on a ‘legend attribute’. This means that where the model has more than one legend attribute it is possible to re-colour the model in the Viewer according to different rock properties. For example, the rock units may have one colour for rock type (i.e. based on the BGS colouring scheme, as with a normal geological map), another colour for rock age, and yet another colour for rock permeability values. The set of available attributes and corresponding legend colours will depend upon the 3D model itself and cannot be altered or specified within the Viewer. Check with your model provider at The BGS to see what legend attribution colour schemes should be available for a particular model.

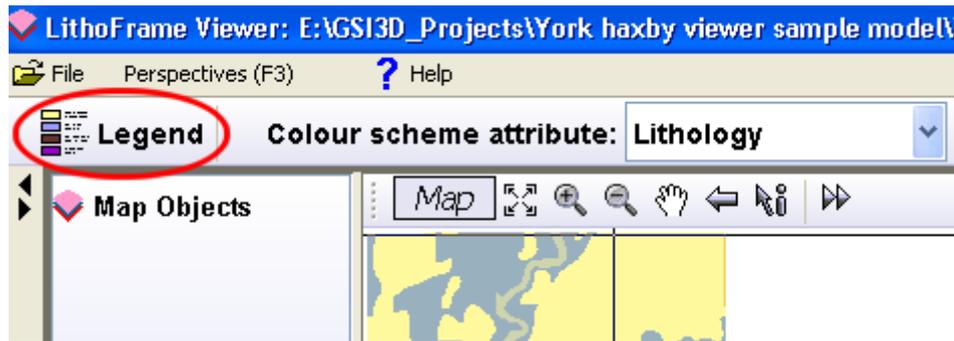
The legend attribution is controlled from the main toolbar using the attribution selection menu. The number of options in this list will depend on the model. To change the colour scheme for the model,

simply select a different attribute from this list. You should see the colours of the model change in all Viewer windows. The following two figures depict the same model under two different attribution legend colour schemes.

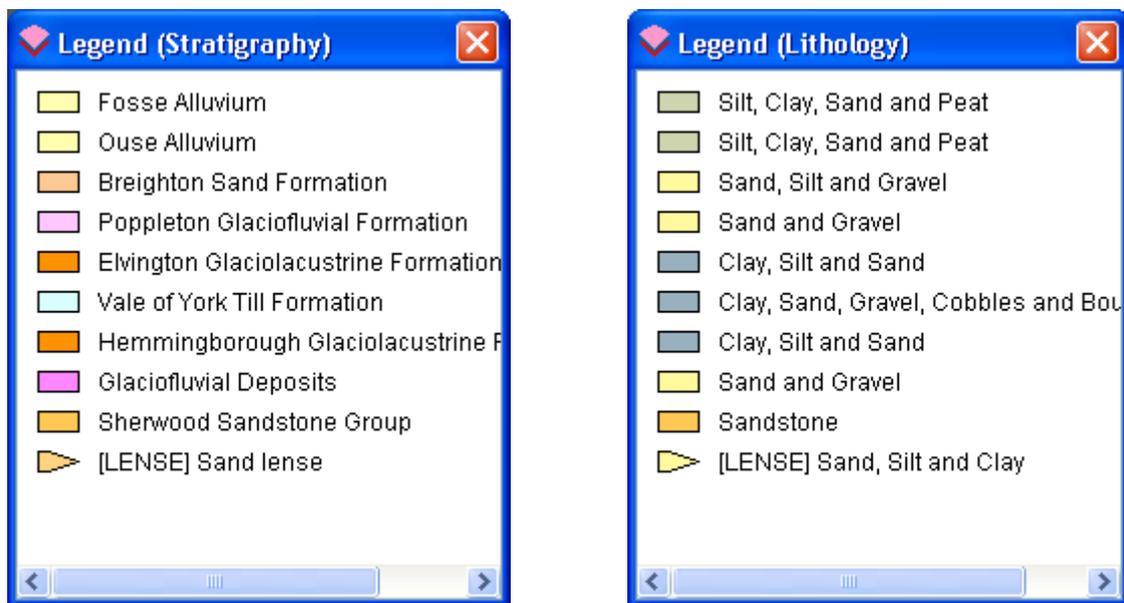


### Viewing the Legend

You can display a small floating legend window for the currently selected colour scheme using the legend button.



This will open a small floating dialog containing the legend. You can open up multiple legend dialogs to compare different colour schemes easily.



Note that the legend is always presented with one entry per geological unit. The listing is also presented in stratigraphical order. Any lenses within the model will be listed at the bottom of the legend with a special wedge-shaped icon.

Because the legend is presented in this way, if you switch to a colour scheme where two or more of the geological units have the same attribution (e.g. "Sand and Gravel"), this will appear multiple times in the legend.

## Appendix A: Model Files

3D models are delivered as a set of files, usually packaged in a ZIP archive file which should first be unpacked on your computer to a convenient folder. The main model file has an extension of GSIPRE (e.g. LondonModel.gsipre) and this is the file that is loaded into the LithoFrame Viewer via *File > Load model*. The main model file contains the 3D model data itself.

Each project will also have a set of supporting files. These will be at least a GVS file and a GLEG file which together specify the stratigraphic order and the legend colour to use for the model data, but there may be others such as images, maps and spatial registration files. These files are not encrypted but remain copyright of NERC or our licensors and as such should never be modified, redistributed or generated by the end user or applied to other projects that were not delivered with the supporting files. Such activity is likely to constitute a breach of your LithoFrame Viewer license agreement.

It is important that when copying a model file, all of the supporting files that were delivered alongside it are kept in the same folder as the GSIPRE file, otherwise the model will either fail to load or will behave incorrectly.

## Appendix B: Troubleshooting

### *The LithoFrame Viewer fails to start*

There are several reasons why this might happen. The best solution is to follow the earlier instructions to uninstall the LithoFrame Viewer and then run the installer again. If the installation still fails or the Viewer fails to start then either update your graphics card drivers to the latest version or try the installation on a higher specification computer as the problem may be hardware related.

### *I am experiencing problems with viewing data in 3D*

3D software relies heavily upon the graphics hardware of the user's computer. Whilst we have made reasonable efforts to ensure the performance of the 3D window we cannot guarantee that the 3D graphics will behave exactly as described on all configurations of hardware and operating system. If you are having difficulties with objects not appearing or colouring incorrectly in the 3D window you can use the refresh button on the 3D window toolbar to force all objects to be re-drawn.

### *The user interface is responding very slowly*

There are two usual reasons for this. If the 3D model file is very large, or the computer is of a low specification then you may experience performance issues. These two factors can combine to give performance issues. If the model is especially large (greater than 25MB GSIPRE file) try loading the model on a computer with a higher specification. Also check to make sure that you do not have multiple other applications running alongside the LithoFrame Viewer. Close these down if possible to improve general performance. If the LithoFrame Viewer has been running for some time (i.e. more than an hour) it may also be beneficial to close it down and re-open it.

### *Synthetic logs appear only as black lines*

Sometimes the default width of the log stick isn't sufficient for the depth of the log and the result is a log which appears simply as a black line.

To resolve this, simply increase the width of the stick. To do this, Right-click anywhere in the borehole window image panel and choose Layout.



Increase the width value in the top field and click OK.

