

User Manual

Software version: 1.1

Table of Contents

1	Intro	roduction	4					
	1.1	About HiveMap						
	1.2	What Is Mapping?	4					
	1.3	Software Installation	5					
	1.4	Microsoft Store	5					
	1.5	Direct Download	7					
2	Qui	uick Start Guide	7					
	2.1	License Registration	7					
	2.2	System Set Up	8					
	2.3	User Interface	10					
	2.4	Adjusting panel layout	12					
	2.5	Importing First Project	16					
	2.6	Controls	21					
	2.6.	6.1 Hotkeys and shortcuts	21					
	2.7	Mapping Structures	22					
	2.8	Joint Mapping	31					
	2.9	Joint Set Analysis	34					
	2.10	Exporting Data	41					
	2.10	10.1 Folder Structure	41					
	2.10	10.2 Joint Mapping Data	41					
	2.10	10.3 Tracing Data	42					
3	Use	er Guide	44					
	3.1	Projects	44					
	3.2	Project Explorer and Data	47					
	3.2.	2.1 Training Data Files	49					
	3.2.	2.2 Mesh Files	50					
	3.2.	2.3 Drill Holes	56					
	3.2.	2.4 Raster Files	65					
	3.3	3D View and View menu	68					
	3.3.	3.1 Mesh Colour	70					
	3.3.	3.2 Mesh View Aspect	75					

	3.3.	.3 Mesh and Data Clipping76					
	3.3.	4	80				
	3.3.	5	Disc Visibility	81			
	3.3.	6	Drillhole Visibility	83			
	3.4	Мар	ping	85			
	3.4.	1	Tracing	85			
	3.4.	2	Orientation Measurement Tool	100			
	3.	.4.2.1	Auto Facet Mapping	112			
	3.4.	3	Stereonet	114			
	3.4.	4	Joint Sets	116			
	3.	.4.4.1	Clustering	116			
	3.	.4.4.2	2 Joint Set Spacing	122			
	3.	.4.4.3	Joint Set Persistence	124			
	3.4.	5	Cell Mapping	124			
	3.4.	6	Ruler Tool	133			
	3.5	Kine	matic Analysis	135			
	3.6	Sam	ipling	140			
	3.7	Tool	s	146			
	3.8	Netv	vorking and Collaborative Mapping	154			
	3.9	Sett	ings	156			
	3.10	H	elp	158			
4	Sup	port.		159			
	4.1	Rep	orting Issues	159			
	4.2	Req	uesting Product Feature Enhancements	159			
	4.3	3 Other Inquiries					
	4.4	Syst	em Requirements	159			
	4.5	Res	ources	159			
	4.6	Soft	ware Updates	160			

1 Introduction

1.1 About HiveMap

HiveMap is a cutting-edge mapping solution that empowers geoscience professionals to capture high-quality data in the field or office and relay this info into important geological and geotechnical modelling and analysis.

HiveMap was developed by <u>SRK Consulting</u> to support improved mapping and data interpretation of remotely collected rock exposure data. This was motivated by a desire to increase data availability to support improved geological interpretations and products for their clients. SRK remains intimately involved in the direction of HiveMap, with a team of experienced industry professionals supporting its development and engagement with users.

- Precise Mapping
 - HiveMap delivers high-resolution, precise geological mapping that ensures reliable data for better decision-making.
- Easily Integrates
 - Integrate HiveMap with existing datasets and downstream modelling packages for a streamlined workflow.
- Collaborate in Real-Time
 - Foster real-time, safe, cross-functional collaboration among geologists and engineers, regardless of location.
- Quick to Generate
 - Capture high-confidence geological observations that are quickly and immediately usable for analysis, interpretation, and discussion.

1.2 What Is Mapping?

Mapping is the process of looking at the rocks and recording what we see. Depending on our technical discipline, what we record, and the level of detail achieved can vary significantly. It is also important to understand that mapping involves recording the location of geological features, their orientations, and their attributes. These fundamental observations must be recorded properly and consistently to support downstream analysis and modeling work.

To learn more about HiveMap, check out our blog posts: <u>https://hivemap3d.com/blog/</u>

1.3 Software Installation

There are two ways to download HiveMap:

- 1. Using the Microsoft Store app
- 2. Direct download provided by the HiveMap Team (to be used if there are company IT restrictions on use of Microsoft Store).

1.4 Microsoft Store

To download HiveMap, install the program from the Microsoft store & follow the install instructions: <u>https://apps.microsoft.com/detail/9mvg8cv6n1q4</u>

Microsoft store download link.



Click Download, and if prompted, click Open Microsoft Store to get to the download page.



Table of Contents

Page 5 of 160

Click on Get from the Microsoft store pop up.



HiveMap will begin to download. A desktop notification will pop up once installation is completed.



Table of Contents

Page 6 of 160

1.5 Direct Download

If there are any issues with the system installation through Microsoft Store, please submit an <u>IT</u> <u>Support Request Form</u>. Help Desk will follow up and provide a zipped folder for direct download of the software.

2 Quick Start Guide

In this section an overview of HiveMap features are outlined in a tutorial format. See <u>User Guide</u> for more information (Section 3.0).

2.1 License Registration

Once HiveMap has been installed, open the software to register the program license. Take the following steps:

Step 2.1-1:Click Help in the navigation bar at the top of the screen. Choose the 'License' button.

Step 2.1-2:On the License popup window, click on the Request Registration button which will open the license registration form.

Help Desk will process your licensing request once the form is received.

Users will receive an email from Help Desk once the license is confirmed set up and active.

To activate the user license, restart HiveMap.

Step 2.1-1: Click Help in the navigation bar at the top of the screen. Choose the 'License' button.



Step 2.1-2:On the License popup window, click on the Request Registration button which will open the license registration form.

License		×
Registration	n ID ************************************	****
	Сору	
	Check License Server Connection	1
	Request Registratio	n

2.2 System Set Up

Before you can begin creating projects in HiveMap, the system settings need to be configured with a Username and a file path location for the HiveMap main folder, where all project files will be saved and accessed from.

Step 2.2-1: To set up HiveMap, go to Settings (top right corner, gear symbol) and update the system settings.

Step 2.2-2: The username and the main file location should then be updated.

Step 2.2-3: To update the main folder location, click on Select Main Folder.

Step 2.2-4: Once the username and main folder path location are updated, click Apply & Save Settings.

Step 2.2-1: To set up HiveMap, go to Settings (top right corner, gear symbol) and update the system settings.



Step 2.2-2: The username and the main file location should then be updated.

Settings	×
User name: (required)	HiveMap main folder path:
HiveMap Tester	C:\Users\HP ENVY\OneDrive\HiveMap Data Files

Step 2.2-3: To update the main folder location, click on Select Main Folder.



Step 2.2-4: Once the username and main folder path location are updated, click Apply & Save Settings.



2.3 User Interface

The HiveMap main window has 3 main areas: ribbon menu (red), view menu (blue), and workspace (green).

The ribbon menu is located on the top of the HiveMap window. It contains tabs which groups tools and options. Mapping (section 3.4), Kinematic (section 3.5), Sampling (section 3.6), Tools (section 3.7), Networking (section 3.8) and Help (section 3.9) tabs can be accessed from here. Ribbon menu can be hidden with Hide/Unhide ribbon button.

View menu is located left side of the window. View menu is used to adjust the camera of the 3D View and display settings of the objects in the 3D View (section 3.3). Workspace has dockable panels that can be dragged interactively around the screen to make them float over any location, and dock back to panels. Below shows the default layout of the workspace.



There are 4 different default layouts, which include Default, Geotech, Geology, and Tablet. Users can switch between these layouts or create their own layout and save it. To save a custom layout, enter a name and click the Save button. To delete a custom layout, select the *X* beside the specific layout and it will be deleted.

	_	o ×
Ę.	↑ 🔅	Layout 🔻
	Default	
	Geotech	
	Geology	
	Tablet	
	Save Layout:	
	Enter Layout	Name
	Sa	ve

Table of Contents

HiveMap User Manual (v2 20250424)

Page 11 of 160

2.4 Adjusting panel layout

All panel sizes can be adjusted in the workspace.

Move your cursor to the edge of the panel you want to resize. When the cursor changes to a double-sided arrow, press, and hold the left mouse button. Drag the mouse to adjust the panel to your desired size.

A panel can be moved out from its docked position and become a floating panel or can be docked to a new position.

Step 1: Move your cursor to the title of the panel you want to move.

Step 2: Press and hold the left mouse button.

Step 3: Drag the mouse to move the panel. A shade of a panel will be displayed.

Step 4: Release the mouse button and the panel will appear where the panel shade was displayed.

While dragging the panel, if the cursor gets close to a panel border in the workspace, the panel shade will appear docked to that border.

HiveMap				- 0	× HiveMap							-	o x
File	Mapping Kinematic	Sampling Tools I	Vetworking Help	A Layor	ıt ▼ File	Mapping	Kinematic	Sampling	Tools	Networking	Help	Ô	Layout 🔻
Merge Trace	Export Traces Add Discs to as .dxf Files Traces	Export Trace Export Discs as .obj File	Mesh Transformation G	eoreference Export Dip/DD of Meshes	Proje Tri Merge Trace Files	Export Traces as .dxf Files	Add Discs to I Traces	Export Trace Discs	Export Discs as .obj File	Flight Mode T	Mesh ransformation Ge	oreference Expo	ort Dip/DD Proje Meshes Ti
A 53	Explorer	Projects 3D View HiveMap	Training_Initial	Properties	Ø 53	Explorer		Projects	3D View Hive	Map_Training_I	nitial	Stereonet	
	Mesh Files	XA MAR	Unit a Card		A A	Mesh Files	5	and like	A	. Xidish	all the	Filter by Cell	~
	Tile_10.ob) Tile_11.obi	A A A A A				Tile_11.obj		H. A.S.	二個 1	ana a la			N
	Tile_17.obj	A CARLER AND		1		Tile_17.obj		Star Bar	The line	The state	W		
	Tile_18.obj Tile_22.obj	the and think	Dp 35			Tile_22.obj		and and	SOTE	nto Villa	Do 37		
00	Tile_23.obj	A A 163 198	Azmuth 266		R. 4	Tile_23.00j Tile_4.0bj		and the	and all and	The second second	Azimuth 266	W	· E
	Tile_5.obj	Juncon h	1 43			Tile_5.obj		An	Contraction .	to for	13		
6 .	Tile_6.obj Tile_7.obj	A State of the second	S R	6	1 - 1	Tile_6.00j		Pro Port	N AND	1 ANT	Pul		
	Tile_8.obj Tile_9.obj	CAR FT	CARP T	Stereonet		Tile_8.ob) Tile_9.obj		Charles a	A.F.	Constant State	APP P	Properties	
Trace	Traces V	All and a start	ALL ALLAND	Filter by Cell	Trace	Traces √		All are	1				
0	1 Fault, Emre		a second and a second	N N	Width	1 Fau	It, Emre						
Alwaye	Sampling √	Joint Sets			Always	Sampling	V	Joint Sets					
Visible		Assign Joints to Joint Sets		■ ^w	E Visible	Celle		Assign Jo	oints to Joint Se	ets			
Disc	Cells V	Number of Joint Sets 4		5	3 Disc	Cells v		Number of J	oint Sets 4				
Thickness	Discs OrientationData √	Fuzziness		s >>	3 Thickness	Discs Orientation	Data √	Fuzziness					
		Auto V Manual		Console				Auto	V Manu	al		Console	
Opacity	Drillholes	Include trace discs		5,335.74	Opacity	Drillholes		Include tr	ace discs			5,335.74	
Constant Size	Raster Files	Filter by Cell		Tile_6Tile_6	Constant	Raster File	55	Filter by Cell		~		Tile_6Tile_	6

If it is not close to any panel border, the shade will appear as a floating panel.

If the mouse cursor gets over a title bar of another panel, it will be attached as a tab to the panel.

To move the floating panel, move your mouse cursor to the title bar, but not to the title. Press and hold the left mouse button. Drag the mouse to move the panel.

Table of Contents

Page 15 of 160

2.5 Importing First Project

Users can access the HiveMap training data files on the website from the resources page: hivemap3d.com/resources.

The HiveMap Training Data.zip file folder contains 3 zipped sub-folders as follows:

- HiveMap_JointSetAnalysis
- HiveMap_Training_Initial
- HiveMap_Training_Interpreted

Download the training data files zip folder, then extract all the files. There will be 3 zipped subfolders within.

Step 2.5-1: Extract the files for each zipped sub folder.

Step 2.5-2: Copy these folders to the HiveMap main folder.

Step 2.5-3: Go to Projects tab.

Step 2.5-4: If the training data set is not visible on the Projects list, click the Refresh button.

Step 2.5-5: On the project list click "HiveMap_Training_Initial" project. All the data of this project will be listed in the Explorer panel. This project has 12 mesh files which are listed under the Mesh Files branch.

Step 2.5-6: Right click the "Mesh Files" branch which will select all the mesh files and display right click menu. Click the Load button.

Step 2.5-7: The loading status for each file will appear beside each file name.

Step 2.5-8: Once all the meshes have been loaded, the 3D View panel will automatically zoom in on the loaded mesh files.

Step 2.5-1: Extract the files for each zipped sub folder.

>	Thi	s PC	> Downloads > HiveMapTrainingData
	^		Name
Smith		Г	HiveMap_JointSetAnalysis
nts		-	HiveMap_Training_Initial
			HiveMap_Training_Interpreted

Step 2.5-2: Copy these folders to the HiveMap main folder.

Table of Contents

HiveMap User Manual (v2 20250424)

Page 17 of 160

HiveMap			- 0 ×
File	Mapping Kinematic	Sampling Tools Networking Help	🕼 Layout 🔻
Draw A	C Drape trace onto surface User view Z axis Tracing	Image: Product of the second seco	Assign Undo Ruler
Ø 53	Explorer	Projects 3D View HiveMap_KinematicAnalysis	Properties
ф ф	Mesh Files	Recent Projects	
	Traces √ Sampling √	HiveMap_KinematicAnalysis s	
	⊂ Cells √	Projecte New Project	
∅•∎	Discs	A>Z Date /	Stereonet
# + =	Drillholes	HiveMap_JointSetAnalysis	Filter by Cell ~
Trace	Raster Files	HiveMap_JointSpacingAnalysis	
Width		HiveMap_KinematicAnalysis	N
Always Visible		HiveMap_Training_Initial	
Disc		HiveMap_Training_Interpreted	
Thickness		Joint Sets	
Opacity		Find Joint Sets	S
Constant		Number of Joint Sets 0 JS13	Console
Constant Size		✓ Auto Manual JS#5• ✓	
Drillhole		Include trace discs	
Display		Filter by Cell	

Step 2.5-4: If the training data set is not visible on the Projects list, click the Refresh button.

Projects	
A>Z Date	C
HiveMap_JointSetAnalysis	
HiveMap_JointSpacingAnalysis	
HiveMap_KinematicAnalysis	F
HiveMap_Training_Initial	
HiveMap_Training_Interpreted	

Step 2.5-5: On the project list click "HiveMap_Training_Initial" project. All the data of this project will be listed in the Explorer panel. This project has 12 mesh files which are listed under the Mesh Files branch.

Explorer							
V Mesh Files							
Tile_10.obj							
Tile_11.obj							
Tile_17.obj							
Tile_18.obj							
Tile_22.obj							
Tile_23.obj							
Tile_4.obj							
Tile_5.obj							
Tile_6.obj							
Tile_7.obj							
Tile_8.obj							
Tile_9.obj							
Traces √							
Sampling √							
V Cells √							
Discs							
V Drillholes							
Raster Files							

Step 2.5-6: Right click the "Mesh Files" branch which will select all the mesh files and display right click menu. Click the Load button.

Explorer	Projects 3
V Mesh File	
Tile_10.obj	Import
Tile_11.obj	1
Tile_17.obj	Load
Tile_18.obj	Refresh
Tile_22.obj	110110011
Tile_23.obj	Select All
Tile_4.obj	
Tile_5.obj	
Tile_6.obj	
Tile_7.obj	
Tile_8.obj	
Tile_9.obj	

Table of Contents

Page 19 of 160

Step 2.5-7: The lo	ading status for	each file will appear	beside each file name.
--------------------	------------------	-----------------------	------------------------

Б	kplorer
	Mesh Files
	Tile_10.obj [Loading]
	Tile_11.obj [Loading]
	Tile_17.obj [Loading]
	Tile_18.obj [Loading]
	Tile_22.obj [Loading]
	Tile_23.obj [Loading]
	Tile_4.obj [Loading]
	Tile_5.obj [Loading]
	Tile_6.obj [Loading]
	Tile_7.obj [Loading]
	Tile_8.obj [Loading]
	Tile_9.obj [Loading]

Step 2.5-8: Once all the meshes have been loaded, the 3D View panel will automatically zoom in on the loaded mesh files.

2.6 Controls

To interact with the meshes:

- Use right mouse button to rotate the mesh.
- Use the scroll wheel on the mouse to zoom in and out.
- Use the middle mouse button (usually scroll wheel) to pan the mesh.

2.6.1 Hotkeys and shortcuts

A list of hotkeys and shortcuts for the software are included in the Table below.

	Enter or Right Click + Left Click	Stops the tracing and starts tracing with the same structure.				
Tracing	Shift + Enter					
	or	Stops tracing				
	Shift + Right Click + Left Click					
	Backspace	Undo last node				
	Esc	Close trace editing menu without saving				
Tracing menu	Shift + Delete	Delete the trace and close the menu				
Orientation	Enter or Right Click + Left Click	Create disc (If there is at least 3 sampling points)				
measurement	Backspace	Undo last sampling point				
	Delete	Delete selected disc				
	1	Texture				
	2	Inverse colour				
	3	Vertices colour				
	4	Shade				
Mesh colours	5	Wireframe				
	6	Orientation				
	7	Slope				
	8	Aspect				
	9	Elevation				
Change view	Numpad 0	Switch between perspective and				
		orthographic projection				
	Numpad 5	Look down				
	Numpad 2	Look south				
	Numpad 6	Look west				
	Numpad 8	Look north				
	Numpad 4	Look east				

2.7 Mapping Structures

Step 2.7-1: By using your mouse find a geological structure such as fault to trace on the mesh.

Step 2.7-2: Go to the Mapping tab on the ribbon and click on the Draw button on the Tracing group.

Step 2.7-3: A drop-down menu is displayed with the list of structures. Select one of these structures.

Step 2.7-4: Use your left mouse button to start tracing the structure on the mesh. You can use single clicks or hold down the left mouse button.

Step 2.7-5: After finishing tracing click on the Stop button to end the process.

Step 2.7-6: The new trace file is displayed on the Explorer panel under the Traces branch.

Step 2.7-7: To edit the trace file, left click the trace on the mesh. Alternatively, right click the trace on the Explorer panel and then the Edit Trace on the Right Click menu.

Step 2.7-8: The Trace Menu is displayed, and the nodes of the trace polyline/polygon becomes visible.

Step 2.7-9: Click the Add Point button and then click the trace line.

Step 2.7-10: A new node will be added where the line is clicked.

Step 2.7-11: Click one of the white nodes. The node will become red, and on the menu the Delete Point button will become visible. Click this button to delete the selected red node.

Step 2.7-12: Click the mesh and the red node will move to the clicked position on the mesh.

Step 2.7-13: Click the first or last node of the trace, which is coloured purple. The node will become red, and on the menu the Delete Point button and Continue Tracing button will become visible. Click Continue Tracing. This will close Trace Menu and hide the nodes and tracing will continue from the selected node.

Step 2.7-14: On the Trace Menu click the Calculate DD/Dip of Trace. A disc with the orientation of the structure will be created.

Step 2.7-15: To save the changes click X on the top right of the Trace Menu. A menu will be displayed.

Step 2.7-1: By using your mouse find a geological structure such as fault to trace on the mesh.

Step 2.7-2: Go to the Mapping tab on the ribbon and click on the Draw button on the Tracing group.

File	Mapping	Kinematic	Sampling	Tools	Networking	Help					<u>نې</u>	Layout 🔻
Draw	Drape trai onto surfa	se ce ew Settings	Filter Under	Measure	Undo Undo Uelete #Points	A•▲ 🔛 A	Auto FM Filter by Diameter Clear Min 0 Save Max 300	Д Draw	Undo	Assign	Dindo	turner Ruler
	T	acing			Ori	entation Measurement			Cell N	lapping		

Table of Contents

Page 23 of 160

Step 2.7-3: A drop-down menu is displayed with the list of structures. Select one of these structures.

Contact	P
Fault	
Fracture	
Vein	
Dyke	
Lamination	
Lineament	
Polygon	
Polyline	

Step 2.7-4: Use your left mouse button to start tracing the structure on the mesh. You can use single clicks or hold down the left mouse button.

Table of Contents

HiveMap User Manual (v2 20250424)

Page 24 of 160

Step 2.7-5: After finishing tracing click on the Stop button to end the process.

Step 2.7-6: The new trace file is displayed on the Explorer panel under the Traces branch.

Explorer
V Mesh Files
Tile_10.obj
Tile_11.obj
Tile_17.obj
Tile_18.obj
Tile_22.obj
Tile_23.obj
Tile_4.obj
Tile_5.00j
Tile_7.00j
Tile 8 obi
Tile 9.obj
Traces √
1 Fault, Emre
✓ Sampling √
Cells √
Discs
Drillholes
Raster Files

Step 2.7-7: To edit the trace file, left click the trace on the mesh. Alternatively, right click the trace on the Explorer panel and then the Edit Trace on the Right Click menu.

Step 2.7-8: The Trace Menu is displayed, and the nodes of the trace polyline/polygon becomes visible.

Trace Menu	×			
Fault 1 Emre				
Calculate DD/Dip of Trace				
Structure Type				
Enter text				
Dip Direction				
Enter text				
Dip				
Enter text				
Infill				
Enter text				
Roughness				
Enter text				
Add Point	Copy Attributes From Other Trace			
Add Discs				
Duplicate Trace	Delete Point			
	Delete Trace			

Step 2.7-9: Click the Add Point button and then click the trace line.

Step 2.7-10: A new node will be added where the line is clicked.

Table of Contents

HiveMap User Manual (v2 20250424)

Page 27 of 160

Step 2.7-11: Click one of the white nodes. The node will become red, and on the menu the Delete Point button will become visible. Click this button to delete the selected red node.

Step 2.7-12: Click the mesh and the red node will move to the clicked position on the mesh.

Table of Contents

Page 28 of 160

Step 2.7-13: Click the first or last node of the trace, which is coloured purple. The node will become red, and on the menu the Delete Point button and Continue Tracing button will become visible. Click Continue Tracing. This will close Trace Menu and hide the nodes and tracing will continue from the selected node.

Step 2.7-14: On the Trace Menu click the Calculate DD/Dip of Trace. A disc with the orientation of the structure will be created.

Table of Contents

Page 29 of 160

Step 2.7-15: To save the changes click X on the top right of the Trace Menu. A menu will be displayed.

Table of Contents

HiveMap User Manual (v2 20250424)

Page 30 of 160

2.8 Joint Mapping

Step 2.8-1 Go to the Mapping tab on the ribbon and click the Measure button on the Orientation Measurement group.

Step 2.8-2: Find a joint surface and start placing sampling points on it with your left mouse button. After placing a number of points, a disc will be created. A best fitting plane is calculated to find the orientation of the disc. Disc location and size is determined by the 2 furthest apart points.

Step 2.8-3: Number of points can be adjusted by using the Points slider. Increasing the number of sampling points will give more accurate orientation measurement. **Step 2.8-4:** Continue mapping other joints.

- While placing sampling points you can press the Backspace key or click the Undo button to undo the last sampling point.
- If you have flat facets to map, you can adjust the point slider to minimum and create discs quickly by just placing 3 points for each of them.
- Alternatively, you can keep the Points slider at maximum and press the enter key to create discs by using variable number of points for each joint. If you have facets and traces with rough, wavey surfaces you need to increase the number of sampling points to get the correct average orientation of the joint.

Step 2.8-5: After finishing mapping click the Stop button.

Disc data will be saved to OrientationData.csv file. If there is an unsaved data a * sign is displayed next to the file name in the explorer bar. Clicking the Save or Stop button saves data to the file and removes the * sign.

Step 2.8-1 Go to the Mapping tab on the ribbon and click the Measure button on the Orientation Measurement group.

Step 2.8-2: Find a joint surface and start placing sampling points on it with your left mouse button. After placing a number of points, a disc will be created. A best fitting plane is calculated to find the orientation of the disc. Disc location and size is determined by the 2 furthest apart points.

Step 2.8-3: Number of points can be adjusted by using the Points slider. Increasing the number of sampling points will give more accurate orientation measurement.

Step 2.8-4: Continue mapping other joints.

- While placing sampling points you can press the Backspace key or click the Undo button to undo the last sampling point.
- If you have flat facets to map, you can adjust the point slider to minimum and create discs quickly by just placing 3 points for each of them.
- Alternatively, you can keep the Points slider at maximum and press the enter key to create discs by using variable number of points for each joint. If you have facets and traces with rough, wavey surfaces you need to increase the number of sampling points to get the correct average orientation of the joint.

Step 2.8-5: After finishing mapping click the Stop button.

Disc data will be saved to OrientationData.csv file. If there is an unsaved data a * sign is displayed next to the file name in the explorer bar. Clicking the Save or Stop button saves data to the file and removes the * sign.

2.9 Joint Set Analysis

Step 2.9-1: Joint set analyses can be undertaken using the Joint Sets tab in the user interface. **Step 2.9-2:** Adjust the Fuzziness slider to 0.70 and click the Find Joint Sets button. This separates joints which are away from the joint set centers and categorizes them as random joints.

Step 2.9-3: Increase the number of joint sets to 4 and run the algorithm again. This splits Joint Set 2 and some of the joints from this set become members of Joint Set 4.

Step 2.9-4: By following this process, adjusting the number of joint sets and fuzziness parameter, users can determine the joint sets with the help of this algorithm.

Step 2.9-5: To manually determine the joint sets, check the Manual box. Click the JS#1 button. This will open Joint Set 1 menu. Click the Select the Joint Set button on the Stereonet. Change the Dip Direction Deviation and Dip Deviation values on the form. Use your left mouse to change the location of the Joint Set 1 window on the Stereonet.

Step 2.9-6: Click X on the top right corner of the menu and click Save changes and close button. Click X on the top right corner of the menu and click Save changes and close button. **Step 2.9-7:** Click the Assign Joints to Joint Sets button. All the joints inside Joint Set 1 window will be assigned to Joint Set 1.: Click the Assign Joints to Joint Sets button. All the joint Sets button. All the joints inside Joint Set 1 window will be assigned to Joint Set 1.: Click the Assign Joints to Joint Set 1.

Step 2.9-1:

Joint set analyses can be undertaken using the Joint Sets tab in the user interface.

- The pole of each joint is displayed on the stereonet. From the rock face and the stereonet we can interpret that there are 3 or 4 joint sets.
- In the Joint Sets panel enter 3 to the Number of Joint Sets box. Then click the Find Joint Sets button.
- The algorithm separates joints into 3 sets and colourizes each joint pole on the stereonet and the disc on the 3D View in their joint set colour. Also, the triangles on the mesh are colourized if they have the same orientation as the joint sets.

Step 2.9-2: Adjust the Fuzziness slider to 0.70 and click the Find Joint Sets button. This separates joints which are away from the joint set centers and categorizes them as random joints.

Table of Contents

Page 36 of 160


Step 2.9-3: Increase the number of joint sets to 4 and run the algorithm again. This splits Joint Set 2 and some of the joints from this set become members of Joint Set 4.

Table of Contents

Page 37 of 160

Step 2.9-4: By following this process, adjusting the number of joint sets and fuzziness parameter, users can determine the joint sets with the help of this algorithm.



Step 2.9-5: To manually determine the joint sets, check the Manual box. Click the JS#1 button. This will open Joint Set 1 menu. Click the Select the Joint Set on Stereonet. Change the Dip Direction Deviation and Dip Deviation values on the form. Use your left mouse to change the location of the Joint Set 1 window on the Stereonet.

Joint Sets	
Assign Joi	nts to Joint Sets
Number of Joi	int Sets 4
Fuzziness 🗍)
Auto	🗸 Manual
Include tra	ice discs
Filter by Cell	~
Colourize N	Auto

Table of Contents

Page 38 of 160



Table of Contents

Page 39 of 160

Step 2.9-6: Click X on the top right corner of the menu and click Save changes and close button.

Joint Set Menu			×
Joint Set 1			
Select Jo	int Set	on Stereone	et
Calcul	ate Joi	nt Spacing	
Max. spacing:	100	Disc size:	2
Lognormal			~
✓ Display me	asurem	nents as line	s
Calculat	e Joint	Persistence	
Lognormal			~
Dip Direction			
294.70			-11
14 50			- 11
Dip Direction [Deviatio	n	
40.0			
Dip Deviation			
20.0			
Spacing Mean			
Enter text			

Step 2.9-7: Click the Assign Joints to Joint Sets button. All the joints inside Joint Set 1 window will be assigned to Joint Set 1.

Joint Sets	
Assign Joints to .	Joint Sets
Number of Joint Sets	s 4
Fuzziness]
Auto	Manual
Include trace disc	cs
Filter by Cell	~
Colourize Meshes	🗸 Auto

Table of Contents

Page 40 of 160

Step 2.9-8: Repeat this process for the other joint sets.



2.10 Exporting Data

2.10.1 Folder Structure

2.10.2 Joint Mapping Data

Run Windows File Explorer and go to the main HiveMap folder. Open the project folder "HiveMap_Training_Initial". Then go to OrientationData folder which has OrientationData.csv file.

This file contains all the data which is captured with the Orientation measurement tool.

Table of Contents

HiveMap User Manual (v2 20250424)

Page 41 of 160

OrientationData X +	
← → ↑ ♂ 🌀 OneDrive → … HiveMapMainFolder → HiveMap_Training_Initial → OrientationData Sear	ch OrientationData Q
④ New ∽ 🐰 🕼 🖆 🖄 Sort ∽ 🎫 View ∽ 🚥	Details
🗩 💷 Desktop 🖉 😰 OrientationData.csv	
Documents	
EasyMap MR-VR	
EasyMineXRLicense	
늘 HiveMap	
Dicrosoft Copilot Chat Files	
Discrosoft Teams Chat Files	
🚞 MS VM	
Notebooks	
Pictures	
necordings	
Share	
item 1 item selected 3.14 KB Available on this device	≡

4	AutoSave 🤇		୭ ୯			Orier	itationData.c	sv 🗸	, С	mre Onsel	🔅 E	i – I	×
Fi	le Hor	me Inse	ert Pag	le Layout	Formula	s Data	Review	v View	Autom	ate Hel	p Acro	obat 🖵 🕑	ŝ •
N	3	+ : 5	x 🗸	f_x									¥
	А	в	с	D	E	F	G	н	1	J	к	L	
1	Orientatio	on Data											$\neg \Box$
2	Dip	DipDirecti	JointSet	x	y	z	Diameter	Cell	Project	Mesh	Author	DateTime	
3	39.5	292.2	1	2089.54	165.44	5319.22	45.44		HiveMap_	Tile_7Ti	Emre	2024-10-31 5:41	
4	66.9	240.4	1	2090.66	167.41	5320.44	45.39		HiveMap_	Tile_7Ti	Emre	2024-10-31 8:45	
5	76.1	231.8	1	2079.43	209.3	5312.67	6.18		HiveMap_	Tile_7Ti	Emre	2024-10-31 8:54	
6	68.5	148.7	1	2080.52	206.86	5313.88	4.6		HiveMap_	Tile_7Ti	Emre	2024-10-31 8:54	
7	79.3	167.9	1	2080.51	203.25	5312.04	1.65		HiveMap_	Tile_7Ti	Emre	2024-10-31 8:54	
8	47	257.8	1	2079.48	205.14	5310.33	8.6		HiveMap_	Tile_7Ti	Emre	2024-10-31 8:55	
9	71.6	234.4	1	2084.44	205.59	5320.56	14.48		HiveMap_	Tile_7Ti	Emre	2024-10-31 8:55	
10	76.9	121.8	1	2086.33	187.03	5321.23	20.65		HiveMap_	Tile_7Ti	Emre	2024-10-31 8:55	
11	62.2	330.1	1	2081.47	178.97	5313.83	5.13		HiveMap_	Tile_7Ti	Emre	2024-10-31 8:55	
12	72.4	123.4	1	2102.49	154.31	5334.46	7.39		HiveMap_	Tile_7Ti	Emre	2024-10-31 8:56	_
13	69.4	237.3	1	2094.5	149.74	5326.71	15.15		HiveMap_	Tile_7Ti	Emre	2024-10-31 8:56	
14	42.6	289.1	1	2092.75	150.03	5324.27	21.56		HiveMap	Tile 7Ti	Emre	2024-10-31 8:56	
	<	Orient	ationData	+					4				►
Rei	ady 🕅 Ad	cessibility: U	Inavailable						=		<u> </u>	+ 1	00%

2.10.3 Tracing Data

Step 2.10-1: Go to the Tools menu. Click Export Traces as .dxf Files button. Click Export button. This will export polyline/polygon of the traces to .dxf files. **Step 2.10-2:** Click the Export Trace Discs button.

Step 2.10-1: Go to the Tools menu. Click Export Traces as .dxf Files button. Click Export button. This will export polyline/polygon of the traces to .dxf files.



These .dxf files can be found in the ExportedTraceData folder of the project folder.

ExportedTraceData	× +				- 0	×
$\leftarrow \rightarrow \downarrow \texttt{C}$	G OneDrive → ·	··· HiveMap_Training	_Interpreted >	ExportedTraceData	Search ExportedTraceData	Q
🕀 New ~ 🔏 🖸	î () ()	Î ÎÎ Sort ∨	≡ View ~		Pre	view
Name	Status	Date modified	Туре	Size		1
Trace_1_Fault_Geo1.dxf	g	2025-04-24 1:58 PM	DXF File	2 KB		
Trace_2_Contact_Geo1.dxf	g	2025-04-24 1:58 PM	DXF File	2 KB		
Trace_3_Contact_Geo1.dxf	g	2025-04-24 1:58 PM	DXF File	2 KB		
Trace_6_Fracture_Geo1.dxf	g	2025-04-24 1:58 PM	DXF File	1 KB		
Trace_8_Fault_Geo1.dxf	g	2025-04-24 1:58 PM	DXF File	1 KB		
Trace_9_Fault_Geo1.dxf	g	2025-04-24 1:58 PM	DXF File	3 KB		
Trace_10_Fault_Geo1.dxf	g	2025-04-24 1:58 PM	DXF File	2 KB		
Trace_11_Polyline_Geo2.dxf	g	2025-04-24 1:58 PM	DXF File	1 KB		
Trace_13_Polyline_Geo2.dxf	g	2025-04-24 1:58 PM	DXF File	1 KB		
Trace_14_Polyline_Geo2.dxf	g	2025-04-24 1:58 PM	DXF File	2 KB		
113 items]	

Table of Contents

Page 43 of 160

Step 2.10-2: Click the Export Trace Discs button.



This will create the TraceOrientationData.csv in the ExportedTraceData folder of the project.

Traces	× +	- 0 ×
$\leftarrow \rightarrow \uparrow$ C	△ OneDrive > ···· HiveMapMainFolder > HiveMap_Training_Initial > Traces Search Traces	٩
⊕ New ~ 🔏 🕡	(i) (i) (N. Sort ~ ≣≣ View ~ ···	Preview
 ☆ Home ➢ Gallery ✓ ♠ Emre - SRK Consulting > ⊡ Desktop > ⊡ Decuments > ➡ EasyMap MR-VR > ➡ EasyMineXRLicense 	FillTrace 1 Fault Emre sv TraceOrientationData.csv	
2 items		≣□

This file has all the discs from the traces.

A	utoSave (l 1 1 1 1 1 1 1 1 1 1 1				Tra	ceOrientatio	onData.csv 丶	~	e کر	mre Onsel	ء 🧐	d –		×
Fi	e Ho	ome Insert	Page L	ayout	Formulas	Data	Review	View	Automate	Help	Acrobat	C C C	mments	🖻 Share	e ~
E8		• : ×	$\checkmark f_x$												¥
	Α	В	С	D	E	F	G	н		1		J	К	L	
1	Trace Ori	entation Data													
2	Dip	DipDirection	JointSet	x	у	z	Diameter	Polarity	Name			ID	TraceType	2	
3	24	4 317.4	1	2085.29	140.84	5315.24	103.85	1	TraceDisc T	race_1_Fa	ult_Emre	1	Fault		
4															
5															
6															
7															_
8															
9															
10															⊥⊡
	() }	TraceOrie	ntationDat	ta (Ð										►
Rea	idy 🎊	Accessibility: Unav	ailable							=		巴	-		00%

3 User Guide

3.1 Projects

Step 3.1-1: Projects are managed in the Projects panel. If the projects panel is not visible click the File button on the ribbon or click title of the Projects panel.: Projects are managed in the

Table of Contents

HiveMap User Manual (v2 20250424)

Page 44 of 160

Projects panel. If the projects panel is not visible click the File button on the ribbon or click title of the Projects panel.

Step 3.1-2: The last 4 projects that are opened in HiveMap are listed on the top of the panel as buttons. Left clicking these buttons will load that project. The last 4 projects that are opened in HiveMap are listed on the top of the panel as buttons. Left clicking these buttons will load that project.

project. All projects are listed in the Projects list. In this list are the subfolders which are in the HiveMap main folder (Section 2.2). Left clicking these buttons will load that project.

list. By using A>Z or Date buttons the list can be sorted in alphabetical order or according to project's last edit date. If there are new subfolders in the main folder, click the circular arrow button to update the list.

Project. Create a new project by entering the New Project name and selecting Create Project. This will prompt the display view to the 3D View.

Step 3.1-1: Projects are managed in the Projects panel. If the projects panel is not visible click the File button on the ribbon or click title of the Projects panel.



Step 3.1-2: The last 4 projects that are opened in HiveMap are listed on the top of the panel as buttons. Left clicking these buttons will load that project.

Table of Contents

Page 45 of 160

Recent Projects			
HiveMap_Training_Initial	HiveMap_JointSetAnalysis	HiveMap_Training_Interpret	
Projects	New Project		
A>Z Date	1		
HiveMap_JointSetAnalysis			
HiveMap_JointSpacingAnalysis	Create	Project	
HiveMap_KinematicAnalysis			
HiveMap_Training_Initial			
HiveMap Training Interpreted			

Step 3.1-3: All projects are listed in the Projects list. In this list are the subfolders which are in the HiveMap main folder (Section 2.2). Left clicking these buttons will load that project.

Pr	ojects				
	Recent Projects				
	HiveMap_Training_Initial s	p_KinematicAnalysi	HiveMap_JointSetAnalysis	HiveMap_Training_Interpret ed	
	Projects		New Project		
	A>Z Date	C	1		
	HiveMap_JointSetAnalysis				
	HiveMap_JointSpacingAnalysis		Create	e Project	
	HiveMap_KinematicAnalysis				
	HiveMap_Training_Initial				
	HiveMap_Training_Interpreted				

Step 3.1-4: By using A>Z or Date buttons the list can be sorted in alphabetical order or according to project's last edit date. If there are new subfolders in the main folder, click the circular arrow button to update the list.

Table of Contents

HiveMap User Manual (v2 20250424)

Page 46 of 160



Step 3.1-5: Create a new project by entering the New Project name and selecting Create Project.

This will prompt the display view to the 3D View.



3.2 Project Explorer and Data

Error! Reference source not found. The explorer panel displays all the imported and created data for the projects, with each data type organized under its own branch. These branches include Mesh files (link to section), Traces (link to Mapping section), Sampling (link to Sampling section), Cells (link), Discs (link), Drillholes (link), and Raster files (link).

Step 3.2-1: Select All selects all the items in the Explorer. Select All selects all the items in the Explorer.

Step 3.2-2: Left or right clicking a branch selects the items that belongs to that branch. By using the Ctrl and Shift Keys with left click, multiple items can be selected.

Step 3.2-1:The explorer panel displays all the imported and created data for the projects, with each data type organized under its own branch. These branches include: <u>Mesh files</u>, <u>Traces</u>, <u>Sampling</u>, <u>Cells</u>, <u>Discs</u>, <u>Drillholes</u>, and <u>Raster files</u>.

Table of Contents

HiveMap User Manual (v2 20250424)

Page 47 of 160

Explorer	
V Mesh Files	
V Traces √	
▼ Sampling √	
V Cells √	
Discs	
▼ Drillholes	
Raster Files	

Right clicking the Explorer panel will display the right click menu. This menu will change depending on what kind of item is clicked.

In an empty area, the right click menu will display Refresh and Select All. Refresh recreates the project explorer list.

If there is a change in the project folder such as removed or added files, that change will be seen in the Explorer after Refresh.

Step J.Z-I. Select All selects all the iterits in the Lypore
--

Explorer		Projects	3D \
V Mesh Files			_
▼ Traces √	Refresh		
✓ Sampling √	Select A	I	
V Cells √			
Discs			
V Drillholes			
Raster Files			

Step 3.2-2: Left or right clicking a branch selects the items that belongs to that branch.

Table of Contents

HiveMap User Manual (v2 20250424)

By using the Ctrl and Shift Keys with left click, multiple items can be selected.



3.2.1 Training Data Files

Users can access HiveMap training data files on the website Resources page: <u>hivemap3d.com/resources</u>

The HiveMap Training Data.zip file folder contains 3 zipped sub-folders as follows:

- HiveMap_JointSetAnalysis
- HiveMap_Training_Initial
- HiveMap_Training_Interpreted

Error! Reference source not found.

Error! Reference source not found. Extract the files for each zipped sub folder.

These files will be used during HiveMap system training when a project is created, and to demo other system functions that are being reviewed during HiveMap training.



3.2.2 Mesh Files

HiveMap works with textured mesh files which are in .obj file format. The file formats are as follows:

- .obj files are created with 2 more files which are .mtl and .jpg files
- .obj files have the geometry information such as triangles, vertices and vertex normals
- .mtl files are text files referenced by the .obj file, which have the list of texture files
- .jpg files are texture files. There can be more than 1 file. Textures are limited to 16384 x 16384 pixels.

Step 3.2-6: After creating a new project, to import mesh files, from within the Explorer panel right click over the Mesh Files branch and select Import.

Step 3.2-7: The File Explorer window will pop up. Find and select the mesh files (.obj) and side files (.mtl, .jpg). To multiselect more than one file use the Ctrl or Shift keys.

Loaded meshes will appear in blue in the Explorer panel. When you right-click on a mesh file, the context menu will show options to Zoom, Hide, and Unhide.

Step 8: Zoom will zoom to the selected mesh.

Step 3.2-9: Hide and Unhide will hide or unhide the selected meshes. Hidden meshes will be displayed in a grayed-out appearance.

Step 3.2-: Left click on a mesh to view its properties in the Properties panel. From there, you can hide or unhide the mesh, adjust its brightness and opacity, and change its color. Please note that these changes will be reset after reloading the meshes.

To change the mesh colour, go to the View menu and select either "Texture" or "Shade" from the attribute map list.

Step 3.2-31: Left click the mesh.

On the properties tab click Change Mesh Colour button. A menu with colour options will pop up. Click the colour that you want.

Step 3.2-6: After creating a new project, to import mesh files, from within the Explorer panel right click over the Mesh Files branch and select Import.



Step 3.2-7: The File Explorer window will pop up. Find and select the mesh files (.obj) and side files (.mtl, .jpg). To multiselect more than one file use the Ctrl or Shift keys. The imported files will be listed in Explorer. Right click the mesh files and select Load to display the meshes in 3D View.

)pen			>
\leftrightarrow \rightarrow \checkmark \uparrow $\stackrel{\bullet}{=}$ $<$ HiveMap $>$ HiveMap_Train	ning_Initial > ~	C Search HiveMap_	م Training_I
Organize 👻 New folder		≣	
> 🔛 Documents	Name	Status	Date modifie
> 늘 EasyMap MR-VR	Tile_8_0.jpg	Ø	2024-09-03 1
> 🚞 EasyMineXRLicense	Tile_9.mtl	Ø	2024-09-03 1
> 🛅 HiveMap	C Tile_9.obj	Ø	2024-09-03 1
> 🛅 Microsoft Copilot Chat Files	Tile_9_0.jpg	Ø	2024-09-03 1
> 🛅 Microsoft Teams Chat Files	📋 Tile_10.mtl	0	2024-09-03 1
> 🚞 MS VM	C Tile_10.obj	\odot	2024-09-03 1
> 🔁 Notebooks	Tile_10_0.jpg	Ø	2024-09-03 1
> Pictures			
File name: "Tile_9.mtl" "Tile_9.obj" "T	file_9_0.jpg"	 All files (*.obj;*.m 	ntl;*.jpg)
		Open	Cancel

Table of Contents

Page 52 of 160

Loaded meshes will appear in blue in the Explorer panel. When you right-click on a mesh file, the context menu will show options to Zoom, Hide, and Unhide.

Explorer			Projects	
Mesh File Tile_10.obj	IS		SRK Co	
Tile_17.ol Tile_18.ob Tile_22.ob Tile_23.ob Tile_4.obj Tile_5.obj Tile_6.obj Tile_7.obj Tile_8.obj	Load Unload Load Tra Selected Zoom Hide	aces of t I Meshe	he s	
Traces √	Refresh Select A	11		
Cells √				
Discs				
Raster Files				

Step 3.2-8: Zoom will zoom to the selected mesh.



Step 3.2-9: Hide and Unhide will hide or unhide the selected meshes. Hidden meshes will be displayed in a grayed-out appearance.



Step 3.2-10: Left click on a mesh to view its properties in the Properties panel. From there, you can hide or unhide the mesh, adjust its brightness and opacity, and change its color. Please note that these changes will be reset after reloading the meshes.

To change the mesh colour, go to the View menu and select either "Texture" or "Shade" from the attribute map list.

Propertie	s
Tile_7	Tile_7
Hide	Change Mesh Colour
Brightne	SS
Opacity	
	0

Step 3.2-31: Left click the mesh.

On the properties tab click Change Mesh Colour button. A menu with colour options will pop up. Click the colour that you want.



3.2.3 Drill Holes

Step 3.2-42: To import drill holes data, go to Explorer panel and right click Drillholes branch and select Import. To import drill holes data, go to Explorer panel and right click on the Drillholes branch and select Import.

Step 3.2-53: The following Add Drill Holes pop-up menu will appear. Click the folder icon next to Collar File.

Step 3.2-64: Select the collar file, which is in .csv file format.

Step 3.2-65: The first 5 rows of the file are listed. Select the correct matching columns for the Hole ID, X, Y, Z and depth parameters of the collar data.

Step : Repeat the same process for the survey file. Select the correct matching columns for the Hole ID, Depth, Dip and Azimuth parameters of survey data.

You can have more than one interval file. Click the plus and minus icons to adjust the number of interval files.

Step 3.2-97: Click the folder icon next to Interval Files to select the interval file. Select the correct matching columns for the Hole ID, From and To parameters of the interval data. Select "Value" for the columns that you want to import. If "Ignore" is selected for a column that column will not be imported.

Step 3.2-108: Once the collar, survey and interval files are added, click the Add DH to Project button.

Step 3.2-119: Drillholes will appear in the Explorer panel under the Drillholes branch. Right click the Drillholes and select the Drill Hole Colourmaps.

Step 3.2-20: If the data type is a category, each unique value will be identified and randomly assigned a colour.

Step 3.2-121: To manually create the drillhole colour map, click the Add Colour map item, which will add a new row. Clicking the minus icon in the row will remove the row. If the data type is numeric, type numbers into the Property box. If the data type is category, type the values into the Property box. Then click the Colour box and select the colour.

Step 3.2-132: After creating the colourmap, automatically or manually click the Save Colourmap button.

Step 3.2-143: To load the drillholes select the drillholes in Explorer, right click and select Load.

Step 3.2-42: To import drill holes data, go to Explorer panel and right click Drillholes branch and select Import.

Table of Contents

HiveMap User Manual (v2 20250424)

Page 56 of 160



Step 3.2-53: The following Add Drill Holes pop-up menu will appear. Click the folder icon next to Collar File.

Table of Contents

HiveMap User Manual (v2 20250424)

Page 57 of 160



Step 3.2-64: Select the collar file, which is in .csv file format.

Open				>
$\leftrightarrow \rightarrow \checkmark \uparrow$	🗅 > Do > Dr	illh	Search Drillholes	م
Organize 👻 New fol	der			
		loday		
E Desktop	*	collar.csv		
🛓 Downloads	*	LithoAssay.csv		
Documents	*	survey.csv		
Pictures	*			
-		· · · · · · · · · · · · · · · · · · ·	All files (* ep.)	
rite	collar.csv		Air mes (.csv)	Creat
			Open	Cancel

Step 3.2-75: The first 5 rows of the file are listed. Select the correct matching columns for the Hole ID, X, Y, Z and depth parameters of the collar data.

Table of Contents

HiveMap User Manual (v2 20250424)

Page 58 of 160

Drillhole Files			×
Collar File			
C:\Users\eonsel\Dow	nloads\Drillholes\collar.c	sv	
Hole ID 🗸	x v	Y ~	/ Z
✓ Hole ID X Y Z Max Depth Ignore	x 1638 1829 2151	y 291 45 1	z 5630 5536 5508
BR-1076	1991	142	5537
			Save & Close

Step 3.2-86: Repeat the same process for the survey file. Select the correct matching columns for the Hole ID, Depth, Dip and Azimuth parameters of survey data. Check the "Negative dip values represent downward direction" checkbox if this applies to your data.

You can have more than one interval file. Click the plus and minus icons to adjust the number of interval files.

Add Drillholes	×
Collar File collar.csv	-
Survey File survey.csv	-
Negative dip values represent downward direction	
LithoAssay.csv	+
Add DH to Project	

Step 3.2-97: Click the folder icon next to Interval Files to select the interval file. Select the correct matching columns for the Hole ID, From and to parameters of the interval data. Select "Value" for the columns that you want to import. If "Ignore" is selected for a column that column will not be imported.

Table of Contents

Page 60 of 160

C	rillhole Files								×
I	nterval 1 File								
	C:\Users\eonsel\Dow	nloads\Drillholes\Litho	oAss	say.csv					
ſ	Hole ID 🗸	From	~	то 🗸	Value 🗸	·	Value	~	Value
	holeid	from		to	AU		Hole ID		Lith
	BER-00059	0		5	0.00979		From To		
	BER-00059	5		10	0.00866		✓ Value		
	BER-00059	10		15	0.01	4	Ignore 0.01132		
	BER-00059	15		20	0.01105	(0.01185		
ſ									
į								S	ave & Close

Step 3.2-108: Once the collar, survey and interval files are added, click the Add DH to Project button.

Add Drillholes	×
Collar File	
collar.csv	-
Survey File	
survey.csv	
Negative dip values represent downward direction	
Interval Files	
LithoAssay.csv	+
Add DH to Project	

Step 3.2-119: Drillholes will appear in the Explorer panel under the Drillholes branch. Right click the Drillholes and select the Drill Hole Colourmaps.

Explorer					
V Mesh F	Mesh Files				
▼ Traces	✓				
▼ Samplir	ng √				
✓ Cells √					
Discs					
Drillhol BER-00	Import				
BR-106	Load				
BR-107-	Load				
BR-107	Drill Hole Colourmaps				
BR-248					
BR-258-	Refresh				
BR-265:	Select All				
BR-979	Select All				
BR-980					
BR-982					
BCG-110	092				
BCG-110)93				
BCG-110	994				
BCG-110	J95				
BCG-11096					
BCG-110	12				
BCG-111	12				
BCG-III	13				
BCR-00	542				
BCR-00	009				

Select the interval property and select the type of data as Numeric or Category. Click Auto Generate. If the data type is numeric, the minimum and maximum values will be found, and the data will be split into 10 equally sized groups; coloured from blue to red.

Step 3.2-20: If the data type is a category, each unique value will be identified and randomly assigned a colour.



Step 3.2-121: To manually create the drillhole colour map, click the Add Colourmap item, which will add a new row. Clicking the minus icon in the row will remove the row. If the data type is numeric, type numbers into the Property box. If the data type is category, type the values into the Property box. Then click the Colour box and select the colour.

Colourmaps	×
LithoAssay AU	Name: LithoAssay.Lith Type: Category ~
LithoAssay AUSL	Add Colourmap Item Auto Generate Property Colour
LithoAssay Lith	Porphyritic_Phonolite
LithoAssay Correlation_Interp	Mafic_Phonolite
LithoAssay Lithology_Interp	Aphanitic_Phonolite_Undiffe
	No_Data
	Stope —
	Backfill
	Save Colourmap

Step 3.2-132: After creating the colourmap, automatically or manually click the Save Colourmap button.

Colourmaps			×
LithoAssay AU	Name:	LithoAssay.AUSL	
LithoAssay AUSL	+ Add	Colourmap Item	Auto Generate
LithoAssay Lith	Property		
LithoAssay Correlation_Interp			
LithoAssay Lithology_Interp			
		Save Colour	rmap

Step 3.2-143: To load the drillholes select the drillholes in Explorer, right click and select Load.

Б	plorer
•	Mesh Files
	Traces √
	Sampling √
	Cells √
	Discs
	Drillhol BER-00 Import
	BR-106 BR-107
	BR-107 Drill Hole Colourmaps
	BR-258 Refresh
	BR-979 Select All
	BR-982
	BCG-11092 BCG-11093
	BCG-11094
	BCG-11095 BCG-11096
	BCG-11097
	BCG-11112
	BCG-11113
	BCR-00542
	BCR-00569

Table of Contents

Page 64 of 160

3.2.4 Raster Files

Step 3.2-154: GeoTiff files can be imported to HiveMap. They are limited to 16384 x 16384 pixels. To import raster files, in the Explorer panel right click the Raster Files branch and select Import.

Step 3.2-165: Right click the imported raster files and click load to display them on 3D View. **Step 3.2-176:** The raster file will appear as a georeferenced image in the 3D View. It will be at 0 altitude.

Step 3.2-187: Raster files can be draped to meshes. Right click the raster file and select Drape to Mesh.

Step 3.2-198: On the Explorer panel everything becomes grayed except the mesh files. Click the mesh that you want to drape the raster file to.

Step 3.2-9: The name of the mesh file will be displayed next to Raster Files. If the mesh is not loaded. Load the mesh and raster file. Raster files will be displayed on the mesh.

Step 3.2-154: GeoTiff files can be imported to HiveMap. They are limited to 16384 x 16384 pixels.To import raster files, in the Explorer panel right click the Raster Files branch and select Import.



Step 3.2-16: Right click the imported raster files and click load to display them on 3D View.

Explore			
Mesl 2410	h Files 05DOB_Pit(1x1)_TrianglesFlipped.obj		
> Trac	es √		
Sam	pling √		
Cells	s √		
Orien	s ntationData √		
V Drilli	Drillholes		
Raster Files			
Pit.t	Load		
	Zoom		
	Hide		
	Unhide		
	Drape to Mesh		
	Don't Drape to Mesh		
	Refresh		
	Select All		

Step 3.2-17: The raster file will appear as a georeferenced image in the 3D View. It will be at 0 altitude.

Explorer
Mesh Files 241005DOB_Pit(1x1)_TrianglesFlipped.obj
> Traces √
Sampling √
⊂ Cells √
Discs OrientationData √
Drillholes
Raster Files Pit.tif

Table of Contents

Page 66 of 160

Step 3.2-18: Raster files can be draped to meshes. Right click the raster file and select Drape to Mesh.

Explorer	
Mesh 24100	Files 5506_Pit(1x1)_TrianglesFlipped.obj
Trace	es √
Samp	oling √
Cells	4
Orient	tationData √
V Drillh	oles
Raste	er Files
Pala	Load
	Zoom
	Hide
	Unhide
	Drape to Mesh
	Don't Drape to Mesh
	Refresh
	Select All

Step 3.2-198: On the Explorer panel everything becomes grayed except the mesh files. Click the mesh that you want to drape the raster file to.

 Mesh Files 241005DOB_Pit(1x1)_TrianglesFlipped.obj Traces √ Sampling √ Cells √ Discs OrientationData √ Drillholes Raster Files Prt.til 	Explorer
 ► Traces √ ▼ Sampling √ ▼ Cells √ > Discs OrientationData √ > Drillholes > Raster Files Fritter 	Mesh Files 241005DOB_Pit(1x1)_TrianglesFlipped.obj
 Sampling √ Cells √ Discs OrientationData √ Drillholes Raster Files Pittel 	> Traces √
 Cells √ Discs OrientationData √ Drillholes Raster Files Prt.tri 	▼ Sampling √
Discs OrientationData √ Drillholes Raster Files Pittiti	▼ Cells √
 Drillholes Raster Files Pr. M 	V Discs OrientationData √
Raster Files Pittol	▼ Drillholes
	Raster Files

Table of Contents

Page 67 of 160

Step 3.2-29: The name of the mesh file will be displayed next to Raster Files. If the mesh is not loaded. Load the mesh and raster file. Raster files will be displayed on the mesh.



3.3 3D View and View menu

Loaded data are displayed in the 3D View panel.

The Compass is located on the top right corner. It displays the camera orientation of the 3D View.



Using 3D View and View Menu Tools.

An information bar is in the bottom part of the 3D View. When a mouse hovers over an object it displays the related info.

View settings of the 3D View can be changed with the mouse and View menu.

To rotate objects, right click on the mesh and a green spot will appear. This is the rotation axis which is the pivoting center of the image. Press the Ctrl key to rotate the camera, not the objects.

Use the scroll wheel on the mouse to zoom in and out. Zoom direction can be adjusted in the settings.

Use the middle mouse button (usually the scroll wheel) to pan the objects.

View menu is located left side of the HiveMap window. View menu is used to adjust the camera of the 3D View and display settings of the objects in the 3D View.



Perspective button switches between perspective and orthographic view. In the orthographic view a scale bar is displayed in the bottom right corner.



Fit to screen button moves the objects to the center and fits hem to the view.



Direction buttons fit the objects to view and rotates the camera to the selected direction.



3.3.1 Mesh Colour

Mesh colour can be changed to show different attributes. These include:

Texture: If the mesh has a texture, it will display the texture. Usually, photogrammetry models are textured mesh files.



Table of Contents

Page 70 of 160

Texture (Inverse Colour): If the mesh has a texture, it will display the texture with inverse colour. This method sometimes can make some structures and features easier to notice.

3D View HiveMap_Training_Initial Projects



Vertice Colour: If the mesh has colour on its vertices, it will display these colour. When the point clouds converted to meshes each point becomes a vertex and the point colour is transferred to the vertex.

Shade: If there is no texture or vertice colour, this the default view. The surface will be white and shaded according to its vertex normals.

Table of Contents

HiveMap User Manual (v2 20250424)

Page 71 of 160



Wireframe: This will show only the triangle edges. This can used to display the mesh geometry resolution and quality.



Orientation: This will colourize the surfaces according to the vertex normals. This can be useful to find the joint facets.


Slope: This will colourize the surfaces according to the Dip of vertex normal. A Slope legend is also displayed.



Aspect: This will colourize the surfaces according to the Dip Direction of vertex normal. An Aspect legend is also displayed.

Table of Contents

HiveMap User Manual (v2 20250424)

Page 73 of 160



Elevation: This will colourize the surfaces according to the elevation of the vertices. An elevation legend is also displayed.



Table of Contents

HiveMap User Manual (v2 20250424)

Page 74 of 160

3.3.2 Mesh View Aspect

Meshes have front and back sides. On default both sides of the meshes are displayed. You can choose to view only one side. This can be important when displaying underground development or tunnels.



Here is a back side culled mesh of a stope, with the inside of the stope visible.



Here is a front side culled mesh of a stope, with the outside of the stope visible.



3.3.3 Mesh and Data Clipping

The "Clip Mesh and Data" button displays a bounding box around the meshes and hide it if clicked again. When you click on this bounding box, the Properties panel will show buttons for clipping.



The "Resize," "Rotate," and "Reposition" buttons provide controls to adjust the bounding box.



Table of Contents

Page 77 of 160



Bounding box also can be adjusted by using the two boxes which are located on the bottom south-west and top north-west corners. Clicking these boxes will display controls for adjustment.

Table of Contents

HiveMap User Manual (v2 20250424)

Page 78 of 160



Clicking Clip button will hide the mesh and data which is not inside the bounding box. Unclip button unhides the mesh and data. Reset button resets the bounding box.

Table of Contents

HiveMap User Manual (v2 20250424)

Page 79 of 160

3.3.4 Trace Visibility

There are 2 Trace settings in the View Menu.

Width slider adjusts the Trace width.



If the "Always Visible" checkbox is checked, the meshes will not obscure the traces. If unchecked, parts of the trace that are behind the mesh will become invisible.



Table of Contents

Page 80 of 160



3.3.5 Disc Visibility

There are 4 Disc settings in the View Menu.

The Thickness slider adjusts the thickness of the discs.



Table of Contents

Page 81 of 160



The Opacity slider adjusts the transparency of the discs.



If the Constant Size check box is checked all the discs are displayed with the same diameter relative to the screen. This diameter can be adjusted with the Constant Size slider.

Table of Contents

HiveMap User Manual (v2 20250424)

Page 82 of 160



3.3.6 Drillhole Visibility

There are 3 Drillhole settings in the View Menu.

Display Drillholes checkbox hides or unhides the Drillholes.

The Width slider adjusts the drillhole diameter.





The "Toggle Drillhole Attributes" button allows you to switch between different attributes and interval files. The first text below this button displays the currently used interval file, while the second text shows the attribute name.



3.4 Mapping

The Mapping menu has 4 tools for mapping: Tracing, Measurement Orientation Tool, Stereonet, and Joint Sets.



3.4.1 Tracing

The tracing tool group enables users to trace the geological structures.



Draw button opens the list of structures.

File	Mapping	ping Kinem		Sampli	ing
Draw	Drape onto s	trace urface er view	そ う Settings	Filter	ل Undo
Contact	/. /	pir	ng		
Fault			Projects	3D V	iew HiveM:
Freeture					
Fracture					
Vein					
Dyke					
Lamination					
Lineament					
Polygon					
Polyline					

Selecting a structure starts the tracing process. During this process other tools remain disabled.



Clicking on Stop, stops the process and will allow for other tools to be used.

Use your left mouse start tracing the structure on the mesh. You can do single clicks or hold down the left mouse button.



The "Drape Trace onto Surface" option drapes the trace onto the surface. If the "User View" checkbox is checked, the draping direction can be adjusted with the mouse. If the "Z Axis" checkbox is selected, the trace will be draped vertically.

With the draping feature, you can capture a mesh shape with just two mouse clicks.





Clicking the 'Undo button' or backspace key will delete the last node. Clicking on the 'Redo button' brings back the removed nodes.

The 'Undo last click button' will delete all the nodes which have been created with a single click. The 'Redo last click 'brings back all of the removed nodes that had been created with single clicks.



While tracing, you can split traces to follow structures that are not continuous.



After finishing tracing click on the 'Stop button' to end the process.



Instead of clicking on the Stop button, you can press the 'Enter Key' or click with the right and left mouse buttons simultaneously. This will end and restart tracing for the same structure.

The new trace file is displayed on the Explorer panel under the Traces branch. Trace files are saved to the Traces folder inside the Project folder.

Explorer
Mesh Files
Tile_10.obj
Tile_11.obj
Tile_17.obj
Tile_18.obj
Tile_22.obj
Tile_23.obj
Tile_4.obj
Tile_5.obj
Tile_6.obj
Tile_7.obj
Tile_8.obj
Tile_9.obj
Traces √ 1 Fault, Emre
Sampling √

Table of Contents

HiveMap User Manual (v2 20250424)

Page 88 of 160

The Trace Settings menu has 4 options:

- 1. Don't show menu when disc/cones clicked: When the trace discs and cones are clicked the trace menu is displayed. If this option is unchecked, only clicking the trace itself will open the trace menu.
- 2. Show menu after creating trace: If this option is checked, after finishing tracing, the trace menu will be displayed automatically.
- 3. Create disc after tracing: This will automatically create the trace disc/cone after the tracing is finished.
- Trace simplification tolerance: The simplification process leverages the <u>Ramer-Douglas-</u> <u>Peucker algorithm</u> to decrease the number of points, guided by the Tolerance parameter.



The "Trace Filter" button opens the trace filtering menu, allowing users to filter the loaded traces based on structure, trace author, and mesh.

Filter Traces	×
	Select all 🗸
Structure List	✓ Select all
✓ Contact	
<mark>√</mark> Fault	
Fracture	
✓ Vein	
Vyke	
Lamination	
Lineament	
V Polygon	

The "Undo" button reverses the most recent trace deletion. Deleted traces are stored in the Recycle Bin within the project folder.

File	N	lapping I	Kinematic	Sampli	ing
2	57	Drape trace onto surface	455	• 7	±
Draw	1-7.9	Z axis	Settings	Filter	Undo
		Traci	ng		

To edit the trace file, left click the trace in the 3D View menu. Alternatively, right click the trace on the Explorer panel and then the Edit Trace on the right click menu.

Table of Contents

Page 90 of 160

Explorer	Projects
Mesh Files Tile_10.obj Tile_11.obj Tile_17.obj Tile_22.obj Tile_22.obj Tile_23.obj Tile_4.obj Tile_5.obj Tile_6.obj Tile_7.obj Tile_8.obj Tile_9.obj Traces √	
Sampling √ Cells √ Discs	Load Zoom Hide Unhide
Drillholes	Edit Trace
Raster Files	Delete Traces Export Traces as DXF files Refresh Select All
	✓ Auto

The Trace Menu is displayed, and the nodes of the trace polyline/polygon becomes visible.



Table of Contents

Page 91 of 160

Click Add Point button and then click the trace line.

Trace Menu	×
Fault 1 Emre	
Calculate DI	D/Dip of Trace
Structure Type	
Enter text	
Dip Direction	
Enter text	
Dip	
Enter text	
Infill	
Enter text	
Roughness	
Enter text	
Add Point	Copy Attributes From Other Trace
Add Discs	
Duplicate Trace	Delete Point
	Delete Trace

A new node will be added where the line is clicked.



Table of Contents

HiveMap User Manual (v2 20250424)

Page **92** of **160**

Click one of the white nodes. The node will become red, and on the Trace Menu, the Delete Point button will become visible. Click this button to delete the selected red node.



Click the mesh and the red node will move to the clicked position on the mesh.



Click the first or last node, which will be in purple. The node will turn red, and the "Delete Point" and "Continue Tracing" buttons will appear in the Trace Menu. Click "Continue Tracing" to close the Trace Menu and hide the nodes, allowing tracing to resume from the selected node.

Table of Contents

HiveMap User Manual (v2 20250424)

Page 93 of 160



An orientation can be calculated for each trace line by selecting the trace and pressing the *Calculate DD/Dip of Trace.*



Table of Contents

HiveMap User Manual (v2 20250424)

Page 94 of 160

If it is a linear structure, you can fit a cone. This may be done by selecting the *Lineation* trace option.



If it is a folded structure, you can add discs along the trace to capture an orientation change.



Duplicate trace button duplicates the trace as a different structure. For example, if a fault is a contact, after tracing the fault it can be duplicated as contact.

Table of Contents

HiveMap User Manual (v2 20250424)

Page 95 of 160

ojects	3D View HiveMap_Tra	ining_Initial
race Menu		×
Fault 1 Emre		200
Calcula	ate DD/Dip of Trace	The state
Structure Type	е	
Enter text		in a
Dip Direction		
270.0	1.774	Field
50.9	Contact	
Infill	Fault	
Enter text	Fracture	
Roughness	Vein	
Enler text	Dyke	
Add Point	Lamination	
Add Discs	Lineament	
Duplicate Tra	ace	
	Polygon	
10 A A A A A A A A A A A A A A A A A A A	Polyline	

"Copy Attributes from Other Trace" will copy the form data from another trace. After clicking this button, select the source trace that corresponds to the same type of structure.



In the Explorer panel, the right-click menu includes options to Zoom, Hide, Unhide, Edit, and Delete traces.

Ex	plorer						
	Tile_6.obj						
	Tile_7.c	obj					
	Tile_8.0	obj					
	Tile_9.0	obj					
	Traces	\checkmark					
	1	Fault, Geo1					
	2	Contact, Geo					
	3	Contact, Geo	Load				
	6	Fracture, Geo	Zoom				
	8	Fault, Geo1	200111				
	9	Fault, Geo1	Hide				
	10	Fault, Geo1					
	11	Polyline, Geo	Unhide				
	13	Polyline, Geo					
	14	Polyline, Geo	Edit Trace				
	17	Polyline, Geo	Delete Traces				
	18	Fault, Geo2	Delete fraces				
	20	Fracture, Gec	Refresh				
	21	Fracture, Geo					
	23	Fracture, Geo	Select All				
	24	Fracture, Geo2	2				

In the Explorer panel, right click menu for the Traces branch includes the Import button, which will display .csv import menu.



Click the folder button to select the .csv file.

Import .csv	file							×
File								
C:\Users\e	C:\Users\eonsel\Downloads\PolygonBreccia.csv							
Import as	Contact							~
×	~	Y	\sim	z	~	Ignore Column	ı v	Ignore Colu
#Leapfrog 31 polyline file (D bezier (v1.2).							
#Point X		Point Y		Point Z		Normal X		Normal Y
30345.93729	91	69619.9370743		9428.85504204		None		None
31483		68902		9704		None		None
31565		68485		9707.25009252		None		None
21010.00543	20	67055 2220604		10105 2062001		None		None
Skip lines	1 Sepe	erator , Poly.	sepe	erator End			In	nport

Select the structure type that the polyline is going to represent and adjust the ""skip lines", "seperator" and "polyline seperator" parameters to correctly parse the .csv file.

Import .csv file				>
File				
C:\Users\eonsel\E	ownloads\PolygonBree	ccia.csv		-
Import as Contac	t			~
х	✓ Y	✓ Z	✓ Ignore Column	✓ Ignore Colu
#Leapfrog 3D bezier polyline file (v1.2).	^	1	^	
#Point X	Point Y	Point Z	Normal X	Normal Y
30345.937291	69619.9370743	9428.85504204	None	None
31483	68902	9704	None	None
31565	68485	9707.25009252	None	None
21910 005429	67055 2228604	10105-2062001	None	Mana
Skip lines 1	Seperator , Poly	seperator End		Import

Table of Contents

HiveMap User Manual (v2 20250424)

Page 98 of 160

Select the matching columns for x, y and z. Click import to create the trace file.

Import .csv	file							>
File								
C:\Users	\eonsel\Down	lloads∖PolygonBr	eccia.cs	5V				
Import as	Contact							~
х	~	Υ	~	Z	~	Ignore Column	· ~	Ignore Col
#Leaptrog a polyline file	3D bezier (v1.2).							
#Point X		Point Y		Point Z		Normal X		Normal Y
30345.9372	91	69619.9370743		9428.85504204		None		None
31483		68902		9704		None		None
31565		68485		9707.25009252		None		None
21010.005/	100	670EE 2329604		10105 2062001		Nana		Mane
Skip lines	1 Sepe	erator , Po	ly. sepe	rator End			In	nport

Table of Contents

Page **99** of **160**

3.4.2 Orientation Measurement Tool

The orientation measurement tool enables users to measure orientation of the geological structures.

To begin the process, navigate to the Mapping tab on the ribbon and click the "Measure" button in the Orientation Measurement group.



The number of sampling points can be adjusted using the Points slider. Increasing the number of sampling points will provide a more accurate orientation measurement. The minimum value is 3, and the maximum value is 12.



Sampling points can be placed on the structure traces and facets:

 Identify a joint trace and begin placing sampling points on it using your left mouse button. A disc will form once you've placed the number of points specified by the point slider. The orientation of the disc is determined by calculating the best fitting plane. The disc's location and size are based on the two points that are furthest apart.



Table of Contents

HiveMap User Manual (v2 20250424)

Page 100 of 160

2. Locate a facet of a joint on the mesh. Use your left mouse button to place sampling points on the facet surface. A disc will form once you've placed the number of points specified by the point slider.



While placing sampling points you can press the backspace key or click the Undo button to undo the last sampling point.



If you have flat facets to map, you can adjust the point slider to minimum and create discs quickly by just placing 3 points for each of them.

Alternatively, you can keep the Points slider at maximum and press the enter key to create discs by using variable number of points for each joint. If you have facets and traces with rough, wavey surfaces you need to increase the number of sampling points to get the correct average orientation of the structure.

After you've finished mapping, click the Stop button.



Your disc data will be saved to OrientationData.csv file in the Project/OrientationData folder. If there is any unsaved data, a * sign is displayed next to the file name. Click the Save or Stop button to save data to the file and remove the * sign.



Explorer
Mesh Files
Tile_10.obj
Tile_11.obj
Tile_17.obj
Tile_18.obj
Tile_22.obj
Tile_23.obj
Tile_4.obj
Tile_5.obj
Tile_6.0bj
Tile_7.00j
Tile_8.00j
Hie_9.00j
Traces √
Sampling √
V Cells √
Discs
OrientationData √*
□ Drillholes
Raster Files

If you want to save into a different file, right click the Discs branch in the Explorer panel and click add new file button.

Table of Contents

HiveMap User Manual (v2 20250424)

Page 102 of 160



Type the name of the file and click the Create File button.

New Orientation Data File	Х		
	.csv		
Create File			

Right click the file and click the Active File. Next to the filename a $\sqrt{}$ symbol will be displayed to mark the file as active file. The new discs that are created will be saved into this active file.



To import orientation data from a .csv file, right click the Discs branch and click the Import button.



Click the folder button to select the .csv file.

Import .csv file							×
File							
C:\Users\eonsel\Downloads\OrientationData.csv							
Dip	✓ Dip	Direction	~	JointSet	~	х	
Orientation Data							
Dip	DipD	irection		JointSet		х	
47.0	27.0			5		615222.68	
44.0	16.1			5		615215.74	
46.9	28.4			5		615210.90	
45.7	21.7			5		615219.82	
12.0	20.2			E		£1E200.00	
Skip lines 1	Seperator	,				Import	

Adjust the "skip lines	and "seperator"	" parameters to correctly parse the .csv file.
------------------------	-----------------	--

Import .csv file							×
File							
C:\Users\eonsel\Downloads\OrientationData.csv							-
Dip	~	Dip Direction	~	JointSet	~	х	
Orientation Data							
Dip	I	DipDirection		JointSet		х	
47.0	:	27.0		5		615222.68	
44.0	1	16.1		5		615215.74	
46.9	:	28.4		5		615210.90	
45.7	:	21.7		5		615219.82	
42.0		20.2		F		£15000.00	
Skip lines 1	Seper	ator ,				Import	

Select the matching columns for dip, dip direction, joint set, x, y, z, diameter, etc. Click import to create the new orientation data file.

Import .csv file					×
File					
C:\Users\eonsel\Downloads\OrientationData.csv					
Dip	✓ Dip Direction	✓ JointSet	~	×	
Orientation Data					
Dip	DipDirection	JointSet		х	
47.0	27.0	5		615222.68	
44.0	16.1	5		615215.74	
46.9	28.4	5		615210.90	
45.7	21.7	5		615219.82	
42.0	20.2	F		£1E200.00	
Skip lines 1	Seperator ,			Import	

Left click a disc to access the disc properties. Diameter can be modified by editing the diameter textbox or slider.



Orientation can be modified with two methods:

1. Edit the Dip Direction and Dip text boxes or use the mouse scroll after clicking these text boxes.

Ð

button. For each axis, 3 circles on the disc will be displayed. Click 2. Click the rotate one of these circles and rotate the disc by dragging the mouse. Click the reset button

÷ to reset the rotation change.


To change the location of the disc, click the move button . For each axis and each axis combination, 3 arrows and 3 planes will be displayed on the disc, respectively. Click one of

these arrows or planes and move the disc by dragging the mouse. Click the reset button to reset the location change.



A disc can be deleted in one of three ways. Select the disc and:

- 1. Press the Delete key.
- 2. Click the Delete button on the ribbon menu.
- 3. Click the Delete button on the Properties panel.



Click the Delete button on the Properties panel.



To remove all of the discs, click the Clear button on the ribbon menu.



Table of Contents

Page 110 of 160

The Colourize function is used to highlight the mesh triangles with a specific orientation.



Click the "Colourize" button, and a menu with three sliders will appear in the 3D View menu. Use these sliders to set the Dip, Dip Direction, and Variance. The slider values are displayed in the 3D view information bar.

Click the colour button to change the highlighting color.

If you click a disc, the sliders will automatically adjust to match the disc's orientation.





Table of Contents

HiveMap User Manual (v2 20250424)

Page 111 of 160

Check "Filter by Diameter" to filter the discs based on their diameters.



3.4.2.1 Auto Facet Mapping

The Auto Facet Mapping algorithm searches for facets and creates discs for each facet that it detects. This algorithm works with cell polygons (refer to Section 3.4.5).

Click the Auto FM button. A menu will be displayed with these options:

- Cell list: Select the cells where the facets will be searched.
- Angle variance: Each vertex of the mesh has a normal. Vertices from the same facet will be oriented to the same direction with some variability due to facet surface roughness and waviness. Using the variance parameter algorithm, it decides to add or remove vertices to the facets.
- Minimum number of vertices: If a facet has less vertices than this parameter, it will not be included.
- Maximum Amplitude: A vertex will be part of the facet if the distance from the facet plane less than this value.
- Simplify: It is the ratio of vertices that will be used in the algorithm. When the parameter is 1 all the vertices will be used. This will cause the algorithm to run longer.
- Show Facets: After running the algorithm discs will be generated on the facets. if Show Facets is checked, vertices will be coloured. If they are from the same facets, they will have the same colors. Each facet will have a random colour.





Table of Contents

Page 113 of 160

3.4.3 Stereonet

Poles of discs, cones, joint sets, and kinematic analysis elements such as friction cone, daylight area, etc. are displayed on the Stereonet. The Save and Stereonet Menu button is in the bottom right corner. Save button saves the stereonet to Stereonet.jpg file in the project folder.



Show Poles option displays disc poles as dots and cones as triangles.

Stereonet Menu		×
Show Contours	✓ Show Poles	
Grid: 🗸 Polar	Equatorial	No Grid
Projection: Equal Area	✓ Equal Angle	

Table of Contents

HiveMap User Manual (v2 20250424)

Page 114 of 160

Show Contours displays the density of disc and cones.



The grid can be removed or selected as polar or equatorial. The projection is set to equal angle, as equal area is not yet supported.



Table of Contents

HiveMap User Manual (v2 20250424)

Page 115 of 160

Data on the Stereonet can be filtered <u>using cells</u> (Section 3.4.5). If no cell is selected, all the data will be shown.



3.4.4 Joint Sets

3.4.4.1 Clustering

In the Joint Sets panel, joint sets can be determined using a Fuzzy K-Mean algorithm, either automatically or manually.

To find the joint sets automatically, check the Auto box.

Table of Contents

HiveMap User Manual (v2 20250424)

Page 116 of 160

Joint Sets		
Find Joint Sets	JS#1	
Number of Joint Sets 3	JS#2	
	JS#3	
Fuzziness	Rnd	
V Auto		
Include trace discs		
Filter by Call		
Colourize Meshes Auto		

Auto method algorithm requires 2 parameters:

- 1. Number of joints: This should be estimated by using the stereonet and interpreting the rock face.
- 2. Fuzziness: If fuzziness is 0, the algorithm will assign every joint to a joint set. If there are random joints which are not close to any joint set center, they should not be assigned to a joint set. This can be adjusted with increasing the fuzziness parameter. The higher the fuzziness is, the less dispersed the joint sets will become.

Joint Sets		
Find Joint Sets	JS#1	
Number of Joint Sets 3	JS#2	└────○ ✓
	JS#3	
Fuzziness	Rnd	
✓ Auto Manual	JS#5	OV
Include trace discs	JS#6	
Filter by Cell		
Colourize Meshes Auto	JS#9	

After running the algorithm, joints are separated into sets and each joint pole on the stereonet, and the disc on the 3D view, are colourized into their joint set colour.

If the Colourize Meshes button is clicked or Auto box next to it is checked, the triangles, which have the same orientation as the joint sets, are colourized too.

Table of Contents

HiveMap User Manual (v2 20250424)

Page 117 of 160

Joint sets are listed in the Joint Sets list.

Each joint set has a slider, a check box, and a button in the joint set colour.

- The slider changes the opacity of the joint set discs.
- The checkbox hides and unhides the discs of the joint set.
- The button opens the joint set menu.



To determine the joint sets manually, check the Manual box. This will disable the Fuzziness slider and the button text will change to "Assign Joints to Joint Sets".

Table of Contents

HiveMap User Manual (v2 20250424)

Page 118 of 160

Joint Sets	
Find Joint	Sets
Number of Joint Se	ts 3
Fuzziness	
Auto	Manual
Include trace dis	scs
Filter by Cell	~
Colourize Meshe	s 🗸 Auto
JS#1	
JS#2	
JS#3	_
Rnd	

Joint Sets		
Assign Joints to Joint Sets	JS#1	
Number of Joint Sets 3	JS#2	
	JS#3	
Fuzziness	Rnd	O 🗸
Auto 🗸 Manual	JS#5	O 🗸
Include trace discs	JS#6	
Filter by Cell		
Colourize Meshes Auto	JS#9	O 🗸
		— L.

Enter the number of joint sets.

Click the Assign Joints to Joint Sets button.

On the joint set list, click the JS#1 button to open Joint Set 1 menu.

Table of Contents

HiveMap User Manual (v2 20250424)

Page 119 of 160

ioint Sets	
Find Joint	Sets
Number of Joint Se	ts 3
Fuzziness	
✓ Auto	Manual
Include trace dis	SCS
Filter by Cell	~
Colourize Meshe	s 🗸 Auto
JS#1	
JS#2	0
JS#3	0 🗸
Rnd	0

Click to select the Joint Set on the Stereonet. Adjust the Dip Direction Deviation and Dip Deviation values in the form. Then, click on the Stereonet and drag the mouse to reposition the Joint Set 1 window on the Stereonet.

Projects 3	BD View HiveMap_Training_Initial		
	Joint Set Menu		
Joint Sets	Calculate Joint Persistence	Stereonet	
Assign Joint	Lognormal ~	Filter by Cell	~
Number of Join Fuzziness Auto Include trac Filter by Cell Colourize Me JS#1 JS#3 JS#4 JS#4 JS#5 JS#6 JS#6 JS#6 JS#7 JS#8 JS#9	Dip Direction 280.89 Dip 36.88 Dip Direction Deviation 20 Dip Deviation 20 Spacing Mean Fater first	w	N N See S

Table of Contents

Page 120 of 160

Click "X" on the top right corner of the menu and click the Save changes and close button.

Joint Set Menu	×
Joint Set 1	-
Select Joint Set on Stereone	t
Calculate Joint Spacing	
Max. spacing: 100 Disc size:	2
Lognormal	~
 Display measurements as lines 	s
Calculate Joint Persistence	
Lognormal	~
Dip Direction	
294.78	
Dip	
44.59	18
Dip Direction Deviation	
40.0	
Dip Deviation	
20.0	
Spacing Mean	
Enter text	

Click Assign Joints to Joint Sets button. All the joints inside Joint Set 1 window will be assigned to the Joint Set 1.

Joint Sets	
Assign Joints to Joi	int Sets
Number of Joint Sets	4
Fuzziness	
Auto	Manual
Include trace discs	
Filter by Cell	~
Colourize Meshes	🗸 Auto

Repeat this process for the other joint sets.



3.4.4.2 Joint Set Spacing

To calculate joint set spacing for a joint set open the joint set menu of that joint set.

The Joint Spacing algorithm measures the distance between each disc pair, and if they intersect when they are projected in the joint set orientation.

• Display measurements as lines: This will display green or red lines in the disc center. If there is a measurement, line will be green. Users can validate the algorithm by checking the measurements.



- Max. spacing: If the distance between two discs is larger than the maximum spacing value, it will be ignored.
- Disc size: This is the disc diameter scale during the calculation. If the disc size parameter is 1, the disc diameters stay same during the calculation. 2 will double the disc diameters. If the discs are mapped smaller than they should be, the disc diameters can be increased to ensure that there is measurement between these discs.
- Distribution: Lognormal or Negative Exponential can be selected. This will be displayed on the histogram.



Click the Calculate Joint Spacing button to run the algorithm.

A histogram will be created with the selected distribution.

Mean, standard deviation, min, max values will be calculated. Raw data are saved in the JointSets folder in the Project folder as .csv file.



3.4.4.3 Joint Set Persistence

Click Calculate Joint Persistence to calculate disc size statistics of the joint set.

 Direct Hirtsdage

 Joint Deck Hortsdage

 Joint Deck Son Stersoner

 Detextate Joint Spocing

 Max: spocing

 Direct Persistence

 Joint Persistence

 Joint Persistence

 History

 Persistence

 Persistence

 Joint Persistence

 Persistence

 Persistence

A histogram will be created with the selected distribution.

3.4.5 Cell Mapping

With the Cell Mapping tool users can draw polygons which can be used to:

- 1. Do geotechnical cell mapping.
- 2. Separate the geological domains.
- 3. Split rock faces according to slope direction for kinematic analysis.

To create a cell polygon, select Draw.



Use your left mouse and do single clicks to draw polygon.

Table of Contents

HiveMap User Manual (v2 20250424)

Page 124 of 160

Clicking Undo button or backspace key will delete the last node. Redo button brings back the removed nodes.





Click the Stop button to finish drawing.



The new cell file is displayed on the Explorer panel under the Cells branch. Cell files are saved to the Cells folder inside project folder.

Table of Contents

HiveMap User Manual (v2 20250424)

Page 125 of 160



Assign button assigns joints to the cells.



Discs from the same cells are colored identically, while discs that are not in any cell are displayed in gray.



Cells are also listed on the <u>stereonet</u>, joint set menu and <u>kinematic analysis</u> menu. Discs can be filtered by selecting a cell in the Filter by Cell drop down menu.

Table of Contents

Page 127 of 160



The "Undo" button restores the most recently deleted cell. Deleted cells are stored in the Recycle Bin folder within the project folder.

	∽ Undo		<u>í</u>
Draw	Redo	Assign	Undo
	Cell N	Aapping	

To edit a polygon, left click the cell in the 3D View menu. Alternatively, right click the cell on the Explorer panel and then the Edit Trace on the Right Click menu.

Explorer	
Mesh Files Tile_10.obj Tile_11.obj Tile_17.obj Tile_22.obj Tile_22.obj Tile_23.obj Tile_5.obj Tile_6.obj Tile_7.obj Tile_8.obj Tile_9.obj	
 Traces √ Sampling √ Cells √ 116 Cell Mapping Polygor 	Load Zoom Hide
Discs Drillholes	Unhide Edit Trace Delete Traces
Raster Files	Export Traces as DXF files Refresh Select All



When the Cell Mapping Menu is displayed, and the nodes of the polygon becomes visible.

Click the Add Point button and then click the polygon.

Cell Mapping Menu	l
Cell Mapping Polygon 116 Emre	l
Name	l
Enter text	l
Comments	l
Enter text	l
	l
	l
	l
	l
	l
	l
Add Point	I
	I
Delete Trace	

Table of Contents

Page 130 of 160

A new node will be added where the polygon is clicked.



Click one of the white nodes. The node will become red, and, on the menu, the Delete Point button will become visible. Click this button to delete the selected red node.



After selecting node, click the mesh and the red node will move to the clicked position on the mesh.



Click the first or last node, which will be purple. The node will turn red, and the "Delete Point" and "Continue Tracing" buttons will appear in the menu. Click "Continue Tracing" to close the trace menu and hide the nodes, allowing tracing to resume from the selected node.



Table of Contents

HiveMap User Manual (v2 20250424)

Page 132 of 160

3.4.6 Ruler Tool

The Ruler tool can be used to measure length, vertical length, horizontal length, trend, and plunge between two points on the mesh.

File	Mapping	Kinematic	Samplin	ng	Tools	Networking	Help							
1 Draw	Drape trace onto surface User view Z axis	Settings	Filter	undo €	Start	Undo Delete #Points Orie	Colourize	Auto FM	Filter by Diameter Min 2 Max 300	Д Draw	Undo Cell M	Assign	ل Undo	Ruler

When this tool is activated, a line will be displayed on the screen. The endpoint that is clicked becomes active.



When the user clicks a point on the mesh the active endpoint will be placed to that point. Measurements will be displayed in the Console panel.



Table of Contents

Page 134 of 160

3.5 Kinematic Analysis

After completing mapping - planar sliding, wedge sliding, flexural toppling, and direct toppling kinematic analysis can be conducted.

File	Mapping	Kinemati	c Sa	mpling	Tools	Netw	orking/	Help			
Filter by Cell		Φ	(1)	5	5 and	Slope Dip	45	Friction Angle	30	Daylight Enve	elope
æ	¢	Planar	Wedge	Flexural	Direct	Slope DD	0	Polar Fricti	on Cone	Lateral Limit	20
Find Interse	ections (Sliding	Sliding	Toppling	Toppling	Slope		Planar Fric	tion Cone		

Analysis can be done for all the mapping data or data can be filtered using the Filter by Cell tool.

File	Mapping	Kinemati	c Sa	ampling	Tools	Netw	vorking	Help			
Filter by Cell		Φ	(1)	ST.	5	Slope Dip	45	Friction Angle	30	Daylight Enve	elope
	*	Planar	Wedge	\\\ Flexural	TIL	Slope DD	0	Polar Fricti	on Cone	Lateral Limit	20
Find Interse	ctions ()	Sliding	Sliding	Toppling	Toppling	Slope		Planar Fric	tion Cone		

Wedge sliding and direct toppling might happen when there are wedge shaped blocks. Wedge shaped blocks are created by the intersection of joints. To find the intersections between joints click Find Intersection button.

File	Mapping	Kinemati	c Sa	mpling	Tools	Netw	orking	Help		
Filter by Cell	~	Φ		5 T	5-3	Slope Dip	45	Friction Angle 30	Daylight Enve	elope
		Planar	Wedge	Flexural	Direct	Slope DD	0	Polar Friction Cone	Lateral Limit	20
	sections	Sliding	Sliding	Toppling	Toppling	Slope		Planar Friction Cone		



Cones will be created along the disc intersections.

Remove intersections button deletes the intersection cones.

File	Mapping	Kinemati	c Sa	mpling	Tools	Netw	orking	Help			
Filter by Cell		Φ	(1)	5	5	Slope Dip	45	Friction Angle	30	Daylight Enve	elope
	a do	Planar	Wedge	Flexural	Direct	Slope DD	0	Polar Friction	on Cone	Lateral Limit	20
Find Inters	ections 📿	Sliding	Sliding	Toppling	Toppling	Slope		Planar Fric	tion Cone		

Slope plane, friction cones, daylight envelope and lateral limits can be displayed on the stereonet.

Slope Dip	60	Friction Angle	30	✓ Daylight Enve	elope
Slope DD	90	Polar Fricti	on Cone	✓ Lateral Limit	20
Slope		✓ Planar Fric	tion Cone		

Planar sliding: For a joint to cause a planar failure, it must be within the daylight envelope, have a dip angle greater than the friction angle (outside the friction cone), and be within the lateral limit. This area on the stereonet is displayed in red. Discs within this area are colored red, while the remaining discs are colored green.





Wedge sliding: Once the disc intersections are calculated, this analysis can be run. If a joint intersection is going to cause a wedge slide, it should be inside the planar friction cone and it should be outside of the slope plane. This area on stereonet displayed with red colour. Cones which are inside this area are coloured in red.

There is a secondary area where the wedge blocks slide on one of their sides. This area is outside of the slope plane, outside of the planar friction cone and inside of the planar friction plane. This area on stereonet displayed with yellow colour. Cones which are inside this area are coloured yellow.

The rest of the cones are coloured green.

Table of Contents

Page 137 of 160



Flexural toppling: If a joint is going to cause a flexural toppling, it should be outside of slip limit (slope dip-friction angle) plane and it should be in the lateral limit. This area on stereonet displayed with red colour. Discs which are inside this area are coloured red and rest of the discs are coloured green.

Direct toppling: Once the disc intersections are calculated, this analysis can be run. If a joint intersection is going to cause a direct toppling, it should be inside the slope dip cone, it should be inside the lateral limits and dip into the slope. This area on stereonet displayed with red colour. Cones which are inside this area are coloured red.

There is a secondary area where the wedge blocks topple at an oblique angle. This area is inside of the friction cone, outside of the lateral limits and dipping into the slope. This area on stereonet displayed with yellow colour. Cones which are inside this area are coloured yellow.

The rest of the cones are coloured green.

Table of Contents

HiveMap User Manual (v2 20250424)

Page 138 of 160



After running analysis Export Results button is displayed. Click this button to export results into KinematicAnalysis folder. An image of the stereonet and a .csv file will be saved.

File	Mapping	Kin	nematic	Samplin	ig To	ools	Networking	GPS	Help		
Filter by Cell		~	Φ			S al	Slope Dip	60	Friction Angle 30	✓ Daylight Envelope	8
Find Inte	ersections	Receipt	Planar Sliding	Wedge Sliding	Flexural Toppling	Direct Toppling	Slope DD	90	Polar Friction Cone Planar Friction Cone	✓ Lateral Limit 20	Export Results

3.6 Sampling

The Sampling tool may be used to support chip sample mapping.

Click Draw button.



Click the start and end points of chip sampling intervals on the mesh.



Use Undo and Redo buttons to undo and redo last node while drawing.



Click Stop after finishing. File Mapping Kinematic Sampling Tools Networking GPS Help 5 ŵ, . + Undo \sim Stop Undo Convert Redo

In the explorer panel under the Sampling branch, the sampling files are listed.

To edit the sampling data right click and select Edit Trace or left click the sampling polyline in the 3D View.

The Sampling Menu will be displayed, and the nodes of the trace polyline/polygon becomes visible.

Explorer	
 Mesh Files UndergroundMapping.ol 	Dj
▼ Traces √	
Sampling √ 69 Sampling, Emre	
	oad
V Cells √	Zoom
✓ Discs OrientationData √	Hide
	Unhide
V Drillholes	Edit Trace
Raster Files	Delete Traces
	Export Traces as DXF files
	Refresh
	Select All



Each segment of polyline represents a sample. Clicking a sample scrolls the form to that sample.

Sample ID fields on the form can be automatically filled. Type the Prefix and the sample number of the first sample. Click Fill Sample ID's.



Click one of the white nodes. Node will become red and, on the menu, Delete Point button will become visible. Click this button to delete the selected red node.



Click the mesh and the red node will move to the clicked position on the mesh.



Table of Contents

HiveMap User Manual (v2 20250424)

Page 143 of 160

Click the first or last node which is purple in colour. The node will become red, and, on the menu, Delete Point button and Continue Tracing button will become visible. Click continue tracing. This will close the Sampling Menu and hide the nodes and tracing will continue from the selected node.



In the explorer panel, the right click menu includes options to zoom to a trace and hide/unhide traces. Besides editing a trace, multiple traces can be also deleted.

Sampl	ing √		No. Mar			
118	Sampling	Enaro	1000			
119	Sampling	Load				
121	Sampling	7.000				
122	Sampling	20011				
124	Samplin	Hide				
Cells	/	Unhide				
Discs		Edit Trace				
Orienta	itionData	Delete Traces				
Drillho	les	Refresh				
Raster	r Files	Select All				
			-			
Undo button undeletes the latest sampling. Deleted sampling files are stored in the Recycle Bin folder within the project folder.

File	Мар	pping ł	Kinematic	Sampling	Tools	Networking	GPS	Help
	∽ Undo	ť.						
Draw	∼ Redo	Undo	Convert					

Convert button converts sampling trace to a drillhole and saves into SamplingDH folder as .csv files.

File	Мар	ping	Kinematic	Sampling	Tools	Networking	GPS	Help
	▶∽ Undo	đ .//	***					
Draw	∕~ Redo	Undo	Convert					

3.7 Tools

The Tools menu includes various functionalities.

File	Mapping	Kinematic S	Sampling	Tools N	etworking	GPS H	lelp			
Ę.	245X	dxf C	су va.	$\widetilde{\diamondsuit}$		★		₽/₽	.obj OO	$\overset{\sim}{}$
Template Editor	Export Traces as .csv Files	Export Traces as .dxf Files	Export Trace Discs	Add Discs to Traces	e Export Discs as .obj File	Flight Mode	Mesh Transformation	Georeference	Export Dip/DD of Meshes	Projection of Traces

Template Editor: Trace structures and their attributes, cell mapping attributes, and sample attributes are customized in Template Editor.

Template Editor	×
+ Add	Name: Contact
Contact	Colour:
	+ Add Text Box + Add Drop Down
Fault	Text Box
	Name: ID
Fracture	Text Box
	Name: Dip*n
Lamination	Text Box
	Name: Dip Direction*n
Lineament	Text Box
	Name: Lithology 1
Polygon	Text Box
Save Template File	Delete

Structures are listed in the left panel. Click up and down buttons, which are placed next to each structure button, to change the order of the structures. Click Add button to add new structure.

Template Editor	×
+ Add	Name: Contact
Contact	Colour:
V	+ Add Text Box + Add Drop Down
Fault	Text Box
	Name: ID
Fracture	Text Box
	Name: Dip*n
Lamination	Text Box
	Name: Dip Direction*n
Lineament	Text Box
	Name: Lithology 1
Polygon	Text Box
Save Template File	Delete

Click a structure to display the structure form on the right-side panel. On top of the panel, name and colour of the structure item can be changed. Click Add Text Box button to add a new text box to form and click Add Drop Down to add a new drop down list to the form. Delete button, which is located on the bottom of the panel, removes the structure.

Template Editor	×
+ Add	Name: Contact
Contact	Colour: + Add Text Box + Add Drop Down
Fault	Text Box ▲▼ Name: ID
Fracture	Text Box ▲▼ Name: Dip*n
Lamination	Text Box ▲▼ Name: Dip Direction*n
Lineament	Text Box ▲▼ Name: Lithology 1
Polygon	Text Box
Save Template File	Delete

Click the up and down buttons to change order of the items on the form. Click – button to delete an item. Click Add Item button to add a drop-down item to drop down list. Click up and down buttons to change order of the list items and click the – button to delete them. Click the square box to change the colour of list item.

Template Editor	×
+ Add	Name: Contact
Contact	Colour:
	+ Add Text Box + Add Drop Down
	Name: Contact Type
-aut	Text Box
	Name: Comments
Fracture ▼	Drop Down Menu
	Name: Footwall
	+ Add Item
	A1
Lineament	A2
	B1 ▲▼-
Polygon	B2 ▲▼-
Save Template File	Delete

Export Traces as .csv Files: For each structure type a .csv file is generated. Polyline/polygon and attributes of the related traces are saved in these .csv files, which are located in ExportedTraceData folder of the project.

Export Traces as .dxf Files: Polylines/polygons of each trace file are saved as a seperate .dxf file in the ExportedTraceData folder of the project.

Add Discs to Traces: This will add a disc to traces which does not have a disc.

Export Trace Discs: All trace discs are saved into TraceOrientationData.csv in ExportedTraceData folder in the project folder.

Export Discs as .obj File: Discs are saved as a mesh file in .obj file format. This file can be found in the project folder.

Flight Mode: When the flight mode is activated, the camera in the 3D View can be moved with keyboard. Control keys are listed in the drop-down menu. This may be useful for capturing videos for use in presentations.



Mesh Transformation: Mesh Transformation menu lists the .obj mesh files of the project.

- Flip y-z, x-y axis: Some software export meshes with different axis for vertical or horizontal axis. These files can be fixed with this tool.
- Flip triangles: This changes which side of the mesh is front, and which is side is back.
- Translate Mesh: Moves the meshes by adding values in the x,y,z boxes.
- Import new mesh files: Imports the processed mesh files.
- Delete proceeds mesh files: Processed mesh files are moved to the Recycle Bin folders.

Mesh Trans	formation	:				
Mes	sh Files List:					
	Tile_4					
	Tile_5					
	Tile_6					
	Tile_7					
	Tile 8					
Flip	y-z Axis					
Flip	x-y Axis					
Flip	Triangles					
Mes	h Translation:					
×	0					
У	0					
z	0					
	Translate Mesh					
✓ Import new mesh files						
	Delete processed mesh files					

Georeference: This tool georeferences mesh files, such as those from iPhone/iPad scans, which use local coordinates and have an incorrect northing direction. However, their scale and vertical orientation are accurate.

For georeferencing 2 survey points, or 1 survey point and the north direction is specified:

Click the Place Survey Point #1 button.

Geo	preference	×
	Place Survey Poir	nt #1
	Place Survey Poir	nt #2
Su	rvey Point #1	
x	0	
у	0	

Click the survey point on the mesh, this will create a red sphere on that point.

Click Survey Point [Stop] button.

Geo	preference	×			
	Survey Point [Stop]				
	Survey Point #2				
Su	rvey Point #1				
х	454122.1				
у	121455.2				

Enter the Survey Point #1 coordinates.

e	nuov Boint #1
Su	ivey Point #1
X	454122.1
y	121455.2
z	15.2
Ge	oreference by using:
~	SP1 & SP2
-	

If you have 2 survey points, select the SP1&SP2 checkbox.

у	0
z	0
Ge	oreference by using: SP1 & SP2
	SP1 & North Correction
Su	rvey Point #2
х	0

Repeat the same process for the survey point 2.

If you have 1 survey point and you know the north direction, select the SP1&North correction checkbox, and enter the north correction which is the difference between the azimuth of the mesh and north.

Georeference by using: SP1 & SP2					
✓ SP1 & North Correction					
Survey Point #2					
х	0				
у	0				
z	0				
North Correction: 0					

Table of Contents

Page 151 of 160

Click the Georeference button.

If the mesh is mapped before it is georeferenced, the traces and discs will be not georeferenced either. If the Update trace files of the mesh and Update discs of selected mesh are selected, these files will also be georeferenced along the mesh.



Export Dip/DD of Meshes: It collects the following data from the meshes:

- Triangle centers: Orientation of the mesh triangles and position of the triangle center.
- Vertices: Orientation of the mesh vertices and position of the vertices.
- Inside triangles: Orientation of the mesh triangles and the 3 positions between triangle center and triangle corners.
- Average of each mesh: It finds the best fitting plane for the vertices of the mesh. This planes orientation and center.

Results are exported to the Exported_DD_Dip.csv file in the project folder.



Projection of Traces: This tool changes the coordinates system of the georeferenced traces to another coordinate system.

Projection of Traces					
From EPSG:					
To EPSG:					
Change Projection of Traces					

Table of Contents

HiveMap User Manual (v2 20250424)

Page 153 of 160

3.8 Networking and Collaborative Mapping

In HiveMap users can collaborate remotely. They can do virtual site visits where they can map virtual outcrops together. They can also do audits where they can review and edit the mapping.

During online meetings, screens are not shared. Mouse location and real-time mapping data are shared.

Each user should have the same mesh files, drill hole data and raster files before the meeting. All the participants should enter the same Room Name and Room Password to meet in the same room.

Display Name should be unique to each user.

Click the Join button to start/join the online meeting. Participants are listed in the right side of the menu, under Networking.

File	Mapping	Kinematic	Sam	oling	Tools	Networking	Help
Display name	Test User F	Profile		\sim		Jacqui	
Room name	SRK		-1-		£Ç}		
Room password	SRK		Leave	Sync	Settings		
		Online Meeting					

During the meeting in 3D View, each participant's mouse cursor is displayed with their display name.



Table of Contents

Page 154 of 160

All tracing data that is created during the meeting is shared between the participants in realtime. The Sync button syncs the traces which are created before the meeting.

Click the Leave button or close the HiveMap to leave the meeting.

3.9 Tablet Mode

By clicking the Switch button on the top left corner, you can switch between tablet mode and desktop mode. Tablet mode changes scale of the user interface to make menu items larger so the users can easily use their fingers instead of a mouse to interact with them. The scale for tablet mode can be adjusted in the Settings Menu. The layout is switched to the Tablet mode.



The View menu is hidden and can be displayed by clicking the View Menu button on the lower left corner.



Single finger behaves like left mouse button. In the Explorer panel holding your finger longer on the screen will open the right click menu. In the 3D View panel, 2 fingers are used for zooming in/out and panning. 3 fingers are used for rotation.

3.10 Settings

To open the settings menu, go to the Help menu and click the Settings button or click the settings button on the top right corner of HiveMap windows.

File	M	lapping	Kinema	itic	Sampling	Tools	Networking	Help	<u> </u>	<i>ت</i>	Layout
? Manual	ک Debug	کې Settings	About	License	Feature Request	Support Request				·	

Settings	×					
User name: (required)	HiveMap main folder path: (required)					
User						
User name is determined by the user. It can be your first name or						
employee ID.	Select Main Folder					
Inverse mouse scroll	Camera clipping plane near:					
C Sharper text and butters	1					
Sharper text and buttons	Camera clipping plane far:					
Cap frame rate at 30 fps	90000					
Menu scale for tablet mode(%):						
200	Select background colour					
Menu scale (%):						
100	Apply & Save Settings					

Username: The username is included in the trace file names and in the author section of the files. If a trace file is edited, the username of the editor is saved in the file. In orientation data files, the authors username is also saved for each disc.

Main folder: All HiveMap project folders will be created in this folder. To update the main folder location, click on Select Main Folder. The Select Folder browse window will pop up. Select a folder location where all HiveMap files can be saved.

Inverse mouse scroll: Mouse scroll direction for zooming in 3D View changes.

Sharper text and buttons: On default it should be checked. If there is performance issue with your computer, this can be unchecked to improve it.

Cap frame rate at 30fps: On default it should be unchecked. If there is performance issue with your computer, this can be checked to improve it.

Menu scale (%): Default value is 100%. Increasing this value will increase the user interface elements and decreasing it will make them smaller.

Menu scale for tablet mode(%): User interface scale during the tablet mode.

Camera clipping plane near: Default value is 1. Camera cannot see anything closer than this distance. Decreasing this value below 1 is not suggested as it might decrease the accuracy of the mouse.

Camera clipping plane far: Camera cannot see anything further than this distance.

Select background colour: 3D View background is adjusted here.

3.11 Help

Within the Help section, users can access the user manual, the settings, about details, license ID, the feature request, and the IT support ticket forms.



The Manual button opens the link of the .pdf manual file.

The Debug can be accessed by users when troubleshooting issues with Help Desk support.

The Settings button opens the settings menu.

The About button opens the HiveMap about menu. HiveMap version number is displayed here.

License button opens License menu (link).

The Feature Request and Support Request buttons open the forms to contact HiveMap support.

4 Support

4.1 Reporting Issues

If users encounter any technical issues with HiveMap, please submit an <u>IT Support Request</u> <u>Form.</u> Help Desk support will follow up with clients for each ticket submission.

4.2 Requesting Product Feature Enhancements

If users would like to request a product feature enhancement, please complete the <u>Product</u> <u>Feature Request Form</u>. Help Desk support will log each product feature request submission, and these will be reviewed periodically as product development progresses.

4.3 Other Inquiries

For any sales and or general inquiries (not tech / help desk related), please email <u>Inquiries@hivemap3d.com</u>.

4.4 System Requirements

To run HiveMap software, the minimum system requirements for Desktop are as follows:

- Operating System: Windows 10 / Windows 11
- Memory: 8 GB (Minimum), 16 GB (Recommended)

4.5 Resources

Users can access HiveMap related resources on the website Resources page: <u>hivemap3d.com/resources</u>

Resources available include:

- HiveMap User Manual
- HiveMap Training Data.zip files (contains 3 zipped sub-folders)
 - HiveMap_JointSetAnalysis
 - HiveMap_Training_Initial
 - HiveMap_Training_Interpreted
- Privacy policy
- End User Licensing Agreement (EULA)

4.6 Software Updates

When there is a new update for HiveMap, users can use Microsoft Store to update HiveMap. If "App Updates" are on in the settings menu of Microsoft Store, updates will be done automatically. If it is "Off" users can go to the "Downloads" tab and update HiveMap.

Table of Contents

HiveMap User Manual (v2 20250424)

Page 160 of 160