

Leapfrog Geothermal 2021.2

new release

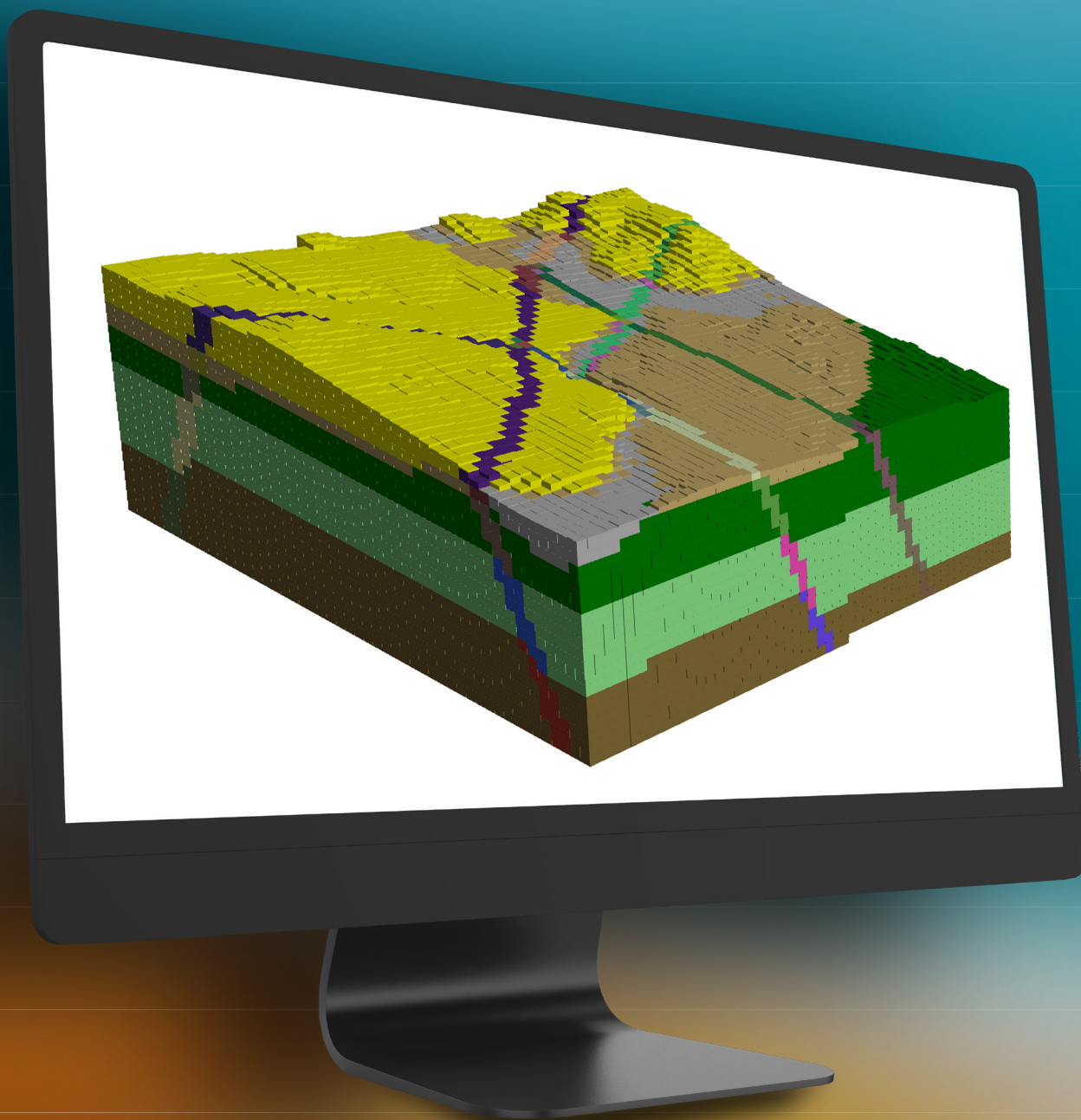


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Leapfrog Geothermal Release Notes

1.1. Single Projects Tab – Phase 2



The second phase of this initiative makes connecting to Central smooth and effortless, particularly if you are working with multiple Central servers. The Central server list and associated features, “go to portal” and “publish”, are now located in a single location which, with a refreshed user interface, makes the Central integration from Leapfrog more intuitive, easier, and quicker to use. Other items that have been changed in this release are:

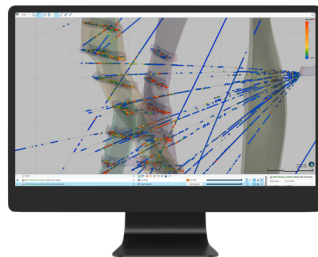
- Selecting a central project will connect to the server it comes from (auto-connect)
- Central Server selection menu relocated alongside user profile at top right corner
- Projects’ view – now includes the option of grid view
- Updated styling of the server list

1.2. Restricted Objects

You may notice some changes in the availability of objects created in a different Leapfrog product to the one you are working in now. These changes are part of longer-term work related to the delivery of Leapfrog functionality.

If you have any questions, please contact your regional representative.

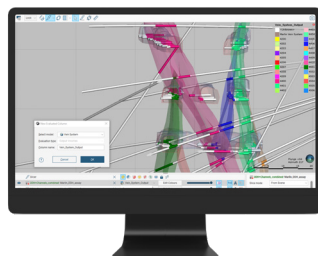
1.3. Drilling improvements



1.3.1. MERGED DRILLHOLE SETS

In the previous release (2021.1) a major new change was introduced to Leapfrog with the addition of multiple drillhole sets. This opened significant new workflow opportunities for using data of different types in geological models. However, there were still a few modelling situations where data from the additional drilling data sets could not be included, for example, the vein segments required to build a vein must all come from a single table as must the inputs to domained estimation.

In this release, we are pleased to bring you powerful new functionality to overcome these limitations, by allowing you to combine drillhole sets. This simple process is accessed via the New Combined Drillholes option. Any drillhole sets can be combined, with the user specifying which tables to combine, which value or category fields to map together and the priority order to use when combining.



1.3.2. EVALUATED COLUMNS ON INTERVAL TABLES

Evaluate GM categories directly onto interval tables as a new column then use this as a category in set level statistical analysis. A valuable alternative to the use of back-flagging, as it avoids the issue of small intervals that can be created in back-flagging.

This feature provides a valuable alternative to the use of back-flagged tables for analysis of statistics by category at the drillhole set level.

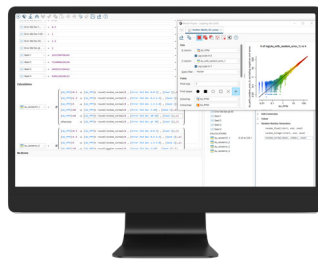
Currently, to break down an assay table by GM category requires the user to create a back-flag evaluation table and merge this with the assay table. Because GM surfaces are interpolated, there are normally small differences between the exact location of a GM boundary in the back-flagged table and the assay interval boundaries.

This can result in the creation of small intervals that break the original assay intervals and the splitting of originally discrete assay intervals between different categories. While the impact on length weighted statistics is usually minimal, it affects the 'count' and length and is the cause of frequent enquiries. By evaluating directly onto the mid-points of intervals, the issue of boundary splitting is eliminated.

1.3.3. ACQUIRE LINK AND SMART REFRESH PERFORMANCE

The acQuire Link and Smart Refresh have been improved to allow for faster and more seamless reloading of data.

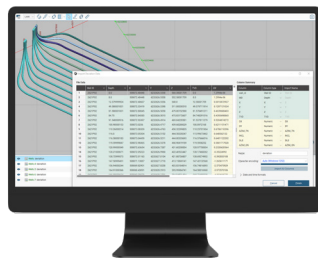
- It is now possible to add multiple assay tables during the set-up of an acQuire drillhole selection, in the same way that multiple geology tables could be loaded.
- acQuire Smart Refresh has been changed to enable you to bypass all the table importer dialogues if no changes are present in the mapping of column names and data types.
- A validation has been introduced that detects whether the individual interval values returned by acQuire Smart Refresh contain any new data. If no new data is present, the table is not loaded to Leapfrog which means that no reprocessing related to that table needs to occur.



1.3.4. ADD TRIG AND RANDOM NUMBER GENERATOR TO CALCULATIONS

Standard Trig functions have been added to the calculation engine. These enable orientation data to be used in calculations – for example, planar structural data observations from drillholes or mapping, or the local evaluation of a variable orientation.

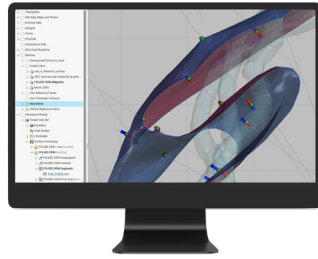
For Leapfrog users who want to incorporate trigonometric functions into calculations and incorporate pseudo-random numbers modelling and estimation workflows to simulate variability, validate results and produce synthetic data, without needing to export data to and from MS Excel, which breaks Leapfrog's dynamic workflows.



1.3.5. IMPORT WELL DEVIATION FILES

Leapfrog can now import drilling trajectory data in Petrel deviation file format. The trajectory for each well or drillhole is defined in its own deviation file with x,y,z and measured depth columns (space separated) and a header specifying the well name and the top x,y,z location. There is no requirement to have a dip and azimuth measurement to import and render this drilling data. This increases the level of flexibility of the well importer and allows more pathways for data to be imported into Leapfrog from sources where downhole dip and azimuth are not collected.

1.4. Vein Modelling improvements

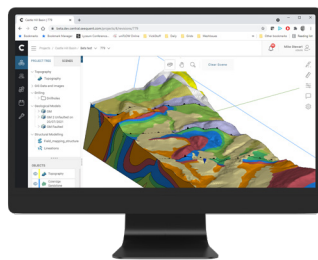


The Leapfrog vein modelling tool provided a ground-breaking but somewhat inflexible workflow for rapid and repeatable modelling of thin, laterally continuous, gently curved structural geometries such as veins and faults.

A whole suite of changes has now been made, that build on the original design to bring an unprecedented new level of flexibility to this already powerful tool. This work has been ongoing over a couple of development cycles.

- Vein Organisation in the Project Tree - Mid-points have been made more discoverable by moving them out from under the Reference Surface tab and placing them at the same level as Vein Segments and Mid-points.
- Mesh From Vein Segment Mid-points - This enables you to create a reference plane with as much complexity as desired, using the advanced editing options available in the meshes folder:
 - Interpolant model type, drift options, sill, nugget and range
 - Trend directions and anisotropy
 - Direct editing with polylines or structural disks
 - Addition of existing points, values, structural data, polylines or GIS vector data
- Sharing Boundary Polylines Across Veins - Until now, vein boundary polylines had to be created separately for each vein. They could be exported but could not be imported. Much more flexibility has now been added to vein boundaries, by making vein boundary polylines shareable through the polylines folder.
- Improved pinch-out behaviour - Previously, if a drillhole did not contain valid logging it was ignored for pinch-out creation, meaning vein models passed straight through drillhole traces. An additional control is provided to the user to choose whether the vein should pinch out on an empty trace (a hole where no lithology has been logged) or continue through it.
- Export/Import of Bulk Vein Edits - it is common that manual editing of vein components is required to produce the vein model you want. Until now, vein edits were only accessible from within the vein model, which made it difficult to recreate a vein from scratch, or even keep a record of edits that had been made. It is now possible to export all user-made vein edits to file, using the Export Vein Edits option on the vein object. This dumps all user made vein edits for segments, midpoints and pinch-outs to a text file.

1.5. Central Improvements



1.5.1. PUBLISH OCTREE AND REGULAR SUB-BLOCK MODELS

Now that we have completed optimisation of the storage underlying our new block model formats, we also publish these models to Central. Both regular and octree block models, along with their evaluations, can now be published for collaboration purposes and web visualisation.

Note: Regular and octree block models will only be visible in Central Portal web visualisation and will not appear in the Central Browser desktop product as this is being phased out.

1.5.2. PUBLISH IMPORTED GM'S

Prior to this release GM's that were imported from Central into Leapfrog as static GM's could not be published back to Central. This partly limits Leapfrog <-> Central workflows - in particular the use of imported GM's to aggregate a final model from separate models that have been split and dispersed into separate 'working areas.'

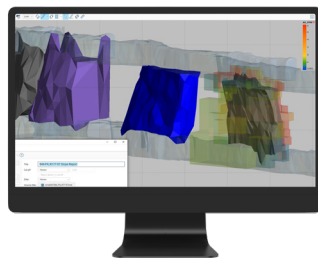
You can now publish imported GM's to Central, removing this limitation and making it possible to view aggregated GM's in Webviz and available for linked workflows that require the full aggregated GM.

1.5.3. PUBLISH SECTION LINE WORK

A key input to Geostudio slope stability models is 2D sectional representations of geology. Cross-sections of three-dimensional Leapfrog geological models can now be published to Central, opening the way for workflow connections into Geostudio slope stability analysis (in development).

1.5.4. PUBLISH ADDITIONAL META DATA

Volume attributed objects in Leapfrog (combined models, numeric models, indicator interpolants, distance functions, geological models and refined models and their static variants) now include those attributes when published in Central. This allows those volume attributes to be viewed in Central web visualisation and imported back into Leapfrog.

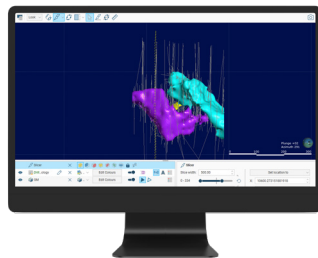


1.6. Proportion weighted resource reports

A new feature has been implemented in Edge resource reports that calculates the proportion of blocks falling inside a reporting volume and uses this proportion to weight the reported tonnage and grade. This ensures that the block model volume reported from within a constraining volume will exactly match the volume of the geometry.

Two temporary columns are written to the block model, storing a category filter and the proportion falling inside the chosen volume. The 3D scene can be filtered by the category filter, displaying only the blocks that meet the filter conditions - providing a quick visual validation.

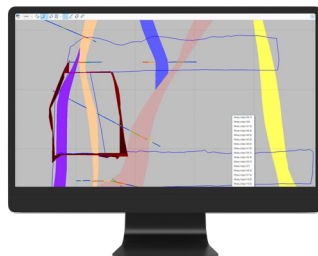
1.7. Slicer Sets



1.7.1. ASYMMETRIC THICK SLICE

Many modelling environments require an asymmetric slice through the objects in the 3D scene. For example, in an open-pit mining environment, the modeller will often want to see a certain distance above a bench or flitch height but a different distance below it.

Until now, the thick slice mode of the slicer has been symmetrical. Now, the user can slice asymmetrically, using a different distance back and front of the slice plane.

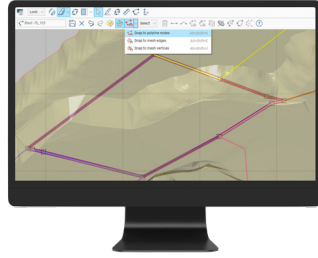


1.7.2. SLICER SETS

The original Leapfrog slicer revolutionised the navigation of 3D data sets, providing a quick and intuitive way of controlling the visualisation volume using a fluid slicing and sliding motion. Such freedom is invaluable, but in many modelling situations, such as landfills, site remediation or open-pit mining, activity is focussed on pre-defined sets of visualisation planes, which the user needs to be able to return to rapidly.

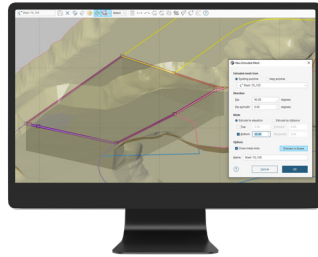
In this release, we are pleased to bring you a new feature - the 'slicer set' - that combine dynamic slicing with pre-defined sets of planes, enabling you quickly, precisely and repeatably locate yourself in space.

1.8. Polyline Improvements



1.8.1. GENERAL TOOL CHANGES

A new feature has been added to the polyline editor that allows you to 'snap' polyline nodes to existing polyline nodes, points, mesh edges or mesh vertices, providing an accurate and predictable way of placing a node. This polyline creation behaviour allows you to be more 'explicit' about polyline creation, which is particularly useful when needing to create polylines that interact with engineered structures, such as foundation designs or underground mine openings, or that need to dovetail against existing polylines, such as for creating dig-block outlines.

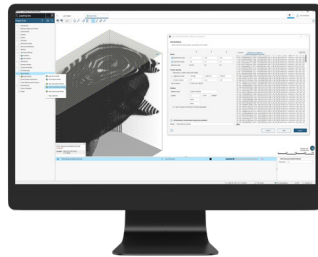


1.8.2. EXTRUDE MESH FROM CLOSED POLYLINE

Users have consistently asked for the ability to make simple geometric volumes by triangulation from polylines, without the necessity to create and isosurface an interpolant. Examples include, creating simple foundation geometries, developing 'cookie cutters' for clipping solids and the ability to create a dig-block volume from a polyline digitised on a bench surface.

In this release, we are pleased to introduce an easy to use, intuitive new tool allowing users to create mesh volumes by extrusion of polylines.

1.9. Octree Model



1.9.1. ADD TRIG AND RANDOM NUMBER GENERATOR TO CALCULATIONS

For Leapfrog users who want to incorporate trigonometric functions into calculations and incorporate pseudo-random numbers modelling and estimation workflows to simulate variability, validate results and produce synthetic data, without needing to export data to and from MS Excel (which breaks Leapfrog's dynamic workflows).

1.9.2. MIGRATE REGULAR BLOCK MODELS TO N-TREE

In order to harness the performance, functionality and compression that the new octree format allows, regular block models have been converted in the Leapfrog backend to use the octree grid storage structure. The user will see no change to their workflows or data besides benefits from better performance and visualisation, as well as the ability to rotate regular models created in Leapfrog on all three axes which use of the octree structure makes possible.

1.9.3. STORAGE AND PERFORMANCE IMPROVEMENTS

We have further optimised the new octree block model format to make creating, visualising and processing octree block models faster as well as reducing Leapfrog project size and improving publishing speeds due to better block model compression.

1.9.4. ENHANCEMENT OF CSV SUB-BLOCK IMPORTER.

A whole raft of improvements has been made to the .csv importer for octree block models making interoperability with Leapfrog easier than ever. The new .csv block model improvements allow regularly sub-divided block models from virtually any external package to be imported, with market-leading ease of use tools such as in-scene visualisation of block centroids, auto-calculated metadata to help guide users, as well as informative messages. Moreover, even if the block model being imported doesn't perfectly fit a regularly divided octree style structure, it will still import correctly provided the dimensions of the blocks being imported fit within any combination of the minimum defined sub-block size.

- Up to 5x faster importer of large .csv files!
- New auto-parsing and filling in of fields for block models exported from Leapfrog.
- New auto-calculated metadata tab to help guide users on valid settings to enter if they are missing the block model header information.
- New options to define block model dimensions using number of blocks or extents.
- New powerful custom rotation settings allowing import of regularly divided block models from virtually any package as well as arbitrary block models if they closely approximate an octree style grid.
- Support for import of block models with offset rotation origins. Supports model vs. Project centroid space block models.
- New icons to help visually guide users on the meaning of new settings.
- Improved warning messages guiding users on which centroids will be imported / will not be imported / don't match grid definition but can still be imported.

1.10. Maintenance improvements

1.10.1. CHANGE ARCHIVER

Current Central (3.0.2, 3.1.1, 4.0) archiver uses Zpaq. The problem is that as files are compressed for storage in Central the process requires the system to have up to 2x the storage capacity of the original files. A more efficient alternative, namely ZSTD, will provide lossless compression. This HTTP compression can be built into web servers and web clients to improve transfer speed and bandwidth utilisation. Existing project data files in Central will not be unpacked during migration, therefore will continue to be Zpaq packed.

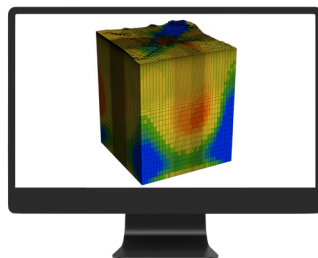
1.10.2. LEAPFROG STORAGE PERFORMANCE IMPROVEMENTS

Significant gains have been made in improving the storage performance of Leapfrog projects.

The biggest improvement comes from changes to the storage format of image files along with the compression of result arrays, while further optimisations have also been made in the storage of octree models.

Reduction in project size will vary a lot from project to project, depending on the types of data stored. Projects containing large or numerous images, or with large octree block models will benefit most - with testing showing 60-90% reductions in size on disk. Not only does this free up valuable disk space but backing up and publishing projects to Central is much faster.

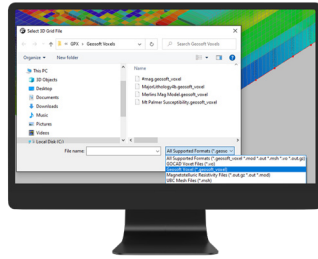
1.11. Geophysical Data handling



1.11.1. RATIONALISE 3D GEOPHYSICAL GRID STORAGE

The previous release of Leapfrog has supported geophysical grids in GoCAD, UBC and MT format. However, each was a separate implementation with different visualisation features and performance. Support for these geophysical formats has now been rationalised with consistent importation, evaluation, and visualisation.

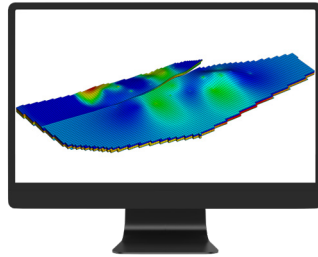
All imported grids are now stored in an optimised internal storage with visualisation improvements in performance, transparency, filtering, subsetting and index slicing. The new grid storage paves the way for publishing of grids to Central for web visualisation. This was a step required to better support Oasis montaj Voxels, and for when we complete the publishing Geophysical Grids to Central.



1.11.2. IMPORT 3D GEOSOFT VOXELS FROM DATAROOM

To allow seamless consumption of Oasis Montaj voxels in Leapfrog, which would allow for the support of geophysical data inputs into geological modelling workflows, Leapfrog now can support the importation of Geosoft voxel grids (.geosoft_voxel file format).

1.12. Flow Modelling Improvements

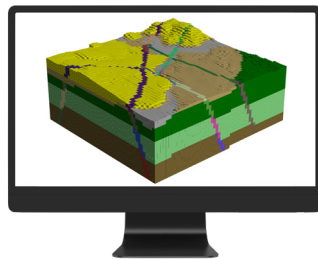


1.12.1. RESERVOIR SIMULATION MODELS

Oil and gas reservoir simulators used in the geothermal industry include ECLIPSE (Schlumberger) and STARS (CMG/Computer Modelling Group). ECLIPSE dominates the oil & gas market with around 80% or more of the installed user base.

Leapfrog Geothermal now supports the creation of a Reservoir Simulation Model with a corner point grid geometry being constructed from a parent geological model. The grid geometry supports alignment

to faults and surfaces. Numeric models of porosity, permeability, etc., created from well/drillhole data, can be evaluated on to the simulation model grid. The model grid definition and associated numeric model evaluations can be visualised in the scene and then exported in either ECLIPSE or CMG format.



1.12.2. TOUGH

In this release a suite of improvements has been made to Leapfrog's TOUGH flow modelling workflow:

- A new import dialogue has been provided for TOUGH models combining the specification of input data files into a single step.
- Support for the TOUGH3 file format has been improved, allowing for import of TOUGH3 time-step data, as well as export of models in CSV format.
- Handling of fault geometries in models has been improved so that a new rock type is created for each fault/lithology combination. This allows separate rock type properties to be set for each lithological unit in contact with the fault surface.
- The origin, orientation, grid extent, grid block size and resolution of a Leapfrog structured flow model grid can now be modified, and the associated TOUGH model updated, bringing the behaviour of structured grids into parity with unstructured.
- Structured TOUGH grids (.dat files) created outside of Leapfrog can now be imported, and the matching grid geometry recreated inside Leapfrog. Some limitations on the grid geometries that can be handled apply.

1.12.3. FEFLOW

FEFLOW grid creation has been streamlined with a new wizard that combines the 2D and 3D steps into one. In addition, all grid editing, evaluation and material properties tools have been relocated to a single dialogue on the parent.

Initial contaminant conditions in a FEFLOW model can now be set from numeric models or estimations, using simple workflows for evaluating contaminant concentrations per lithology onto grid centroids or nodes. Prior to this release, estimators couldn't be used as parameter inputs for initial conditions.

1.12.4. MODFLOW

When modelling several contaminants in a project, users want to apply the contaminants to MODFLOW and FEFLOW grids as initial conditions so that the contaminant concentration and location can be simulated through time. Prior to this release, estimators couldn't be used as parameter inputs for initial conditions.

Numeric models and estimators can now be used to create initial contaminant conditions with the following:

- Addition of material field to the Modflow and Feflow material parameter dialogues for Contaminants
- Per lithology - select a contaminant or numeric model or a constant value input.
- Export evaluations as initial conditions. Evaluate numeric models and estimators onto centroids and nodes.

1.13. Default behaviour changes

1.13.1. MULTIPLE DEVIATION DRILL PLANNER

A minor modification has been made to the multiple deviation drill hole planner. Previously, the collar position was not displayed until the first segment was created. Now the collar location is shown as soon as it is created. This immediately gives the user the direction the hole is going after each planned section leaving no guesswork or tedious side calculations.

Leapfrog Geothermal Point Release 2021.2.3

The following issues have been resolved:

Issue Key	Issue Addressed
LF-43557	Fixes an issue with Interval Selections built from Grouped Columns. Customers with projects in Leapfrog 2021.2.2 should upgrade to this release.
LF-43537	Resolves an issue where projects with broken blocks cannot be published after upgrade. Previously publishing was blind to presence of broken blocks.
LF-43681	Resolves an error when upgrading a Central mesh from 2021.2.2 to 2021.2.3.
LF-43666	Resolves a traceback when upgrading Geo-2.0 projects.
LF-43618	resolves an issue with retention of source information for meshes reloaded from Dataroom.
LF-43599	Resolves an issue with flat section mesh projections not publishing correctly.
LF-43598	Resolves an issue with interval tables exported from multi-deviation planning tool.
LF-43587	Resolves an issue with duplication of face dip values on upgrade of meshes from Central.
LF-43568	Resolves an specific issue with missing filters that causing project upgrade to fail.
LF-43543	Resolves an issue with the display of values in the interface of the multi-deviation drilling tool.
LF-43569	Resolves an issue when publishing projects that contain errors to Central.
LF-43458	Resolves an issue with upgrading of old points tables.
LF-43414	Resolves a traceback occurring on merged drilling tables.
LF-43247	Resolves a path error in serialisation.
LF-43245	Resolves an issue occuring when Central licence requests are made with an invalid token.
LF-43239	Fixes an issue with Central projects tab.
LF-42971	Resolves a specific issue with evaluated columns (new functionality).
LF-42957	Resolves a traceback from duplicate lithologies in an interpretation table.

Leapfrog Geothermal Point Release 2021.2.5

The following issues have been resolved:

Issue Key	Issue Addressed
LF-43248	Fixed an upgrade issue on projects that originated in V4.5 or older
LF-43695	Fixed an issue where project images were corrupted on upgrade
LF-43720	Resolved an issue when setting GIS elevations on surfaces
LF-43819	Resolved a display issue on object user not entitled for but fully processed
LF-43901	Fixed a UI issue where Nothing and Easting columns were swapped on the directional Well Planner
LF-43903	Fixed an upgrade step on meshes used in merged locations
LF-43912	Fixed an import issue on Block Models when importing via .TXT
LF-43921	Resolved a Traceback on meshes
LF-43926	Changed a default behaviour of the upper limit of 100 on the Estimation Parameter Table
LF-43947	Changed a default behaviour when selecting a bandwidth higher than 90
LF-43950	Fixed slow performance when importing a new column into a Drillhole dataset
LF-43965	Fixed an issue on publish objects that have already been published
LF-43977	Fixed an issue on stereonet where mean and line of best fit do not display
LF-44154	Resolved an upgrade step with merged tables
LF-44219	Resolved an issue where downhole variograms would cause Leapfrog to crash
LF-44256	Resolved a Traceback when copying a master layout with planned drillholes
LF-44265	Fixed a default behaviour where univariate stats table didn't display weighted value as expected
LF-44303	Resolved behaviour whereby interval selections on combined drillholes would not save
LF-44304	Resolved behaviour whereby an additional column could disappear when editing intervals selections
LF-44305	Fixed adverse behaviour where Sub-block and Octree models defined blocks outside of lithology
LF-44334	Fixed a publishing error to Central
LF-44351	Resolved an issue whereby ioGAS was not able to be selected on checkout
LF-44361	Fixed an upgrade issue where the additional data on a vein reference surface gets removed