Case Study:

COMPARING RESOURCE ESTIMATION IN LEAPFROG EDGE TO DATAMINE

In early 2018 Polymetal carried out a comparison of new resource estimation solution Leapfrog EDGE with their existing solution, Datamine. The comparison proved that Leapfrog EDGE achieved the same results as the established solution.

Polymetal International plc is a leading precious metals mining group with a high quality portfolio of gold, silver and copper mines in Russia, Kazakhstan and Armenia. Polymetal has used Leapfrog Geo for geological modelling since 2015.

The Yolochka deposit is a small, yet complex deposit in northeast Russia’s Magadan region. It provided a perfect opportunity to compare Leapfrog EDGE to Polymetal’s existing resource estimation solution Datamine.

The comparison between Leapfrog EDGE and Datamine had two parts.

Firstly, the reliability of Leapfrog EDGE was tested. To do this, ore wireframes and data were simply exported from Datamine into Leapfrog EDGE, all other parameters were kept the same, and model kriging was repeated. The resulting Leapfrog EDGE resource estimate differed from the existing Datamine estimate by only 0.2% in tonnes, 0.3% in grade and 0.5% in metal. These results confirm the validity and reliability of Leapfrog EDGE. (As detailed in the table on the last page).

Secondly, Polymetal used Leapfrog EDGE to carry out the entire resource estimation process, including building all new domains. This case study documents Polymetal’s experiences during this second test which resulted in the Leapfrog EDGE resource estimate being 15% higher in tonnes, 13% lower in grade and containing the same metal as Datamine.

Although higher than the first test, this difference is considered insignificant for ore models built independently using different software solutions with different wireframe models and interpolation parameters. (Refer to the table on the last page for more information).

“The results obtained illustrate the validity and reliability of carrying out a mineral resource estimation using Leapfrog EDGE. It should also be emphasized that verification using Leapfrog EDGE took the minimum of time and effort.”

Natalia Utkina, Senior Geologist, Exploration Department - Mineral Resources Management, Polymetal International plc.
Starting with geostatistics, I used the tools available in Leapfrog to analyse samples within selected geological domains such as basic statistical calculation and graph creation. This included histograms on the basis of ordinary and composited samples, scatter and Q-Q plots and Box-Whisker diagrams. Any geological structures or wireframe volumes can be used as domains. Results can be exported in the form of tables or figures which I found very convenient for generating reports.

In Leapfrog EDGE geostatistical analysis and search ellipsoid selection are designed in a special way. The basic parameters of variograms are standard but the user interface looks very different.

Linear, spherical and spheroidal variogram models are all available in Leapfrog EDGE. I usually find the interpolation parameter selection to be a tedious process, but Leapfrog EDGE has dynamic visualisation. I can change the parameters and see the results straightaway in 3D.

The ellipsoid orientation and variograms updating tool is also very convenient, and it's possible to create nested variogram models.
Grade interpolation can be completed using nearest neighbour, inverse proportional distance, simple and ordinary kriging, and RBF. My experience in using the statistical tools in Leapfrog EDGE has been very positive.

**RESOURCE ESTIMATION ONTO BLOCK MODEL**

Defining the block model is a simple and intuitive workflow. When setting up the estimation process I was happy to discover it’s linked to the underlying estimation domain.

Validation of estimators is straightforward. In Leapfrog EDGE you can quickly set up and run parallel estimates for comparison. We used inverse distance and ordinary kriging methods. When your modelling requires many stages, you need to choose the best interpolation method at each stage. In this regard Leapfrog EDGE provided a valuable advantage by giving the option to quickly scroll through different options and understand which one will help to achieve the desired result.

Next, estimates are validated against the sample data using in built swath plots. Grade comparisons are clearly presented together with the initial sample grades. An in built grade distribution histogram is also available.

**COMPARISON OF RESOURCE ESTIMATES USING ALTERNATIVE METHODS**

Finally, the resulting resource estimate is compared to the original Datamine estimate. The EDGE estimate is 15% higher in tonnes, 13% lower in grade and contains the same metal as Datamine. (Refer to the table on the last page). This difference is considered insignificant for ore models built independently using different software solutions with different wireframe models and interpolation parameters.

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*Model of ore zones and faults*

*Yolochka deposit model created in Leapfrog EDGE*

*Variogram parameters selection in Leapfrog EDGE*

*Reviewing the model - spatial distribution diagrams*
“Leapfrog EDGE stands out from other similar products with its excellent visualisation at all stages of deposit modelling. The crucial point is that this visualisation helped me to carry out many operations more meaningfully.”

Natalia Utkina, Senior Geologist, Exploration Department - Mineral Resources Management, Polymetal International plc.

**CONCLUSION**

To conclude, I can say that I found Leapfrog EDGE to be really convenient, easy for a resource practitioner to learn and a reliable estimation tool. Leapfrog EDGE will undoubtedly solve various problems facing geologists at different stages of geological exploration.

Its distinctive features are enhanced geological interpretation capabilities and the connection with the Leapfrog structural model. Leapfrog EDGE stands out from other similar products with its excellent visualisation at all stages of deposit modelling. The crucial point is that this visualisation helped me to carry out many operations more meaningfully.

I congratulate the geological community on the arrival of a wonderful tool that combines traditional resource estimation methods with new opportunities for creative research, which is the kind of activity mineral deposit modelling is.
**LEAPFROG EDGE RESOURCE ESTIMATE RESULTS COMPARED TO DATAMINE**

Identical wireframe models and interpolation parameters for both Datamine and Leapfrog EDGE estimates

<table>
<thead>
<tr>
<th>ESTIMATION METHOD</th>
<th>ZONE</th>
<th>TONNAGE % DIFFERENCE</th>
<th>AU GRADE(G/T) % DIFFERENCE</th>
<th>AU METAL (KG) % DIFFERENCE</th>
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</thead>
<tbody>
<tr>
<td>Ordinary kriging</td>
<td>Centre</td>
<td>0.0%</td>
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<td>-0.2%</td>
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<td>0.1%</td>
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<tr>
<td></td>
<td>Total</td>
<td>0.2%</td>
<td>0.3%</td>
<td>0.5%</td>
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</tbody>
</table>

Different wireframe models and interpolation parameters for Datamine and Leapfrog EDGE estimates *

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</tr>
</thead>
<tbody>
<tr>
<td>Ordinary kriging</td>
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<td></td>
<td>Total</td>
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<td>-13%</td>
<td>-0.3%</td>
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* Datamine wireframes were based on standard delineation methods and interpolation parameters defined by Datamine geostatistical tools. Leapfrog wireframes were built using Leapfrog’s Vein tool.

**CONTACT LEAPFROG FOR A TRIAL OR DEMO**

www.leapfrog3d.com