

A dark blue horizontal band at the top of the page features a light blue world map. The map shows the continents of North America, South America, Africa, Europe, and Australia.

DEFINE | PLAN | OPERATE



Subterranean Fauna Habitat
Assessment and Modelling Review
February 2021



SUBTERRANEAN FAUNA HABITAT ASSESSMENT AND MODELLING REVIEW FEBRUARY 2021

PROJECT COMPLETION DATE: February, 2021

RIO TINTO IRON ORE

Document Control Information

	Subterranean Fauna Habitat Assessment and Modelling Review February 2021	REVISION	
		No.	DATE
	Peer Review of Subterranean Fauna Habitat Modelling Process	00	15/02/2021

Revision Tracking

Revision	Prepared By	Reviewed By	Issued For	Approved By	Date
00	Patrick Smillie		RC	Patrick Smillie	15/02/2021

Issued For: Review and Comment (RC), Information Only (IO), Implementation (IM), Final Version (FV).

Quality Control

PRINCIPAL AUTHOR	PATRICK SMILLIE	SIGNATURE	
		DATE	15/02/2021
<p>IMPORTANT INFORMATION:</p> <p>THIS DOCUMENT HAS BEEN PREPARED FOR THE EXCLUSIVE USE OF THE CUSTOMER ON THE BASIS OF INSTRUCTIONS, INFORMATION AND DATA SUPPLIED BY THEM AND REGARDS THIS AS COMPLETE AND ACCURATE. THIS DOCUMENT AND ITS CONTENTS ARE CONFIDENTIAL AND MAY NOT BE DISCLOSED, COPIED, QUOTED OR PUBLISHED UNLESS MINING PLUS PTY LTD (MP) HAS GIVEN ITS PRIOR WRITTEN CONSENT. MINING PLUS ACCEPTS NO LIABILITY FOR ANY LOSS OR DAMAGE ARISING AS A RESULT OF ANY PERSON OTHER THAN THE NAMED CUSTOMER ACTING IN RELIANCE ON ANY INFORMATION, OPINION OR ADVICE CONTAINED IN THIS DOCUMENT. THIS DOCUMENT MAY NOT BE RELIED UPON BY ANY PERSON OTHER THAN THE CLIENT, ITS OFFICERS AND EMPLOYEES. MINING PLUS ACCEPTS NO LIABILITY FOR ANY MATTERS ARISING IF ANY RECOMMENDATIONS CONTAINED IN THIS DOCUMENT ARE NOT CARRIED OUT, OR ARE PARTIALLY CARRIED OUT, WITHOUT FURTHER ADVICE BEING OBTAINED FROM MINING PLUS UNLESS EXPLICITLY STATED OTHERWISE, THIS DOCUMENT, OR PARTS THEREOF, IS FOR THE CUSTOMER'S INTERNAL PURPOSES ONLY AND IS NOT INTENDED FOR EXTERNAL COMMUNICATION. NO PERSON (INCLUDING THE CUSTOMER) IS ENTITLED TO USE OR RELY ON THIS DOCUMENT AND ITS CONTENTS AT ANY TIME IF ANY FEES (OR REIMBURSEMENT OF EXPENSES) DUE TO MINING PLUS BY ITS CLIENT ARE OUTSTANDING. IN THOSE CIRCUMSTANCES, MINING PLUS MAY REQUIRE THE RETURN OF ALL COPIES OF THIS DOCUMENT.</p>			

1 SUMMARY

Rio Tinto Iron Ore has requested that Mining Plus conduct a peer review of the memorandum: Subterranean Fauna Assessment and Modelling (Biologic Environment Survey, 2020).

In collaboration with Biologic Environmental Survey Pty Ltd (Biologic), Rio Tinto Iron Ore (RTIO) has developed an approach to modelling potential subterranean fauna habitat within Project Hubs.

Three-dimensional modelling of subterranean fauna habitats has the potential to significantly inform the Environmental Impact Assessment of subterranean fauna in relation to proposed mining developments, by providing a more realistic basis for assessment of the size and extent of subterranean fauna habitats relative to potential impact areas.

This approach was most recently put forward for assessment under the Greater Paraburdoo Iron Ore Hub Proposal (Assessment No. 2189, EPBC 2018/8341). The Environmental Protection Authority (EPA) advised Rio Tinto (the Proponent) that “the use of a habitat prospectivity model for subterranean fauna habitats should be considered experimental as it has not been tested against all the habitat categories or regional data” (EPA 2020). At a meeting between EPA, DPAW, Rio Tinto, and Biologic (23 April 2020), it was jointly decided, “if the subterranean fauna habitat modelling method proposed is intended to be used for future assessments, it should be peer reviewed, and a report provided to the EPA detailing the methods and data used” (EPA 2020).

Therefore, the EPA requires an independent peer review of the subterranean habitat modelling approach so as to provide a greater level of certainty regarding the environmental impact conclusions derived from current and future assessments.

Mining Plus’ expertise is limited to geology and geology modelling procedures, and cannot speak to the appropriateness or suitability of the fauna habitat extents, or the impact assessment. Mining Plus has reviewed the geological modelling procedures, and found them to be robust. Models are informed by all relevant and available data, and no unreasonable assumptions have been made in the modelling process. The specific procedures used to model habitat may produce a slight volumetric overestimation on a regional scale, but this not considered to be material, and can be remedied when models are refined to a local or project scale.

2 REVIEW

Mining Plus has reviewed the Subterranean Fauna Assessment and Modelling (Biologic Environment Survey, 2020) memo, the Seequent Habitat Modelling Workflow Process, and a resulting regional scale Leapfrog project. The modelling process is robust, and is considered to produce volumes and surfaces that are representative of the underlying data and fit for purpose.

Three-dimensional modelling of geology using drillhole logging is accepted practise in the mineral industry. Drillhole spacing of mineral resources is designed to ensure that there will be geological continuity between drillholes. RTIO drillhole spacing in the reviewed project is sufficient to assume continuity between drillholes. Lithological data is recorded at 1m intervals downhole during drilling, and coded with rock type and physical rock characteristics. Discontinuities such as faults are noted and included in the modelling process. Rio Tinto Iron Ore’s lithological logging procedures are based on millions of metres of drilling, and decades of experience in the region. Data is generally of very high quality, and is reliable and suitable for modelling.

The Leapfrog vein function is generally used for modelling flat tabular bodies such as veins, dykes, sills, or mineralised lodes. It works by extracting the midpoints of all intervals flagged with the desired categorisation and building a best-fit plane called the reference surface. The reference surface is used to assign upper (hanging wall) and lower (footwall) contacts to the intervals. Leapfrog then extracts points from the hanging and footwall contacts and builds surfaces snapping to them, with the volume between them being the ‘vein’.

When two or more intervals in the same drillhole are given the same categorisation, the Leapfrog vein tool will build the wireframe to encompass all intervals between, regardless of their categorisation. This has likely caused a slight volumetric overestimation of habitat volume on a regional scale (Figure 1). In the models reviewed this is not considered to be material, and could be remedied by more detailed modelling on a local or project scale. A Leapfrog ‘vein system’ could be constructed, using more detailed flagging of drillhole intervals, and bifurcation of the veins around intervening drillhole intervals.

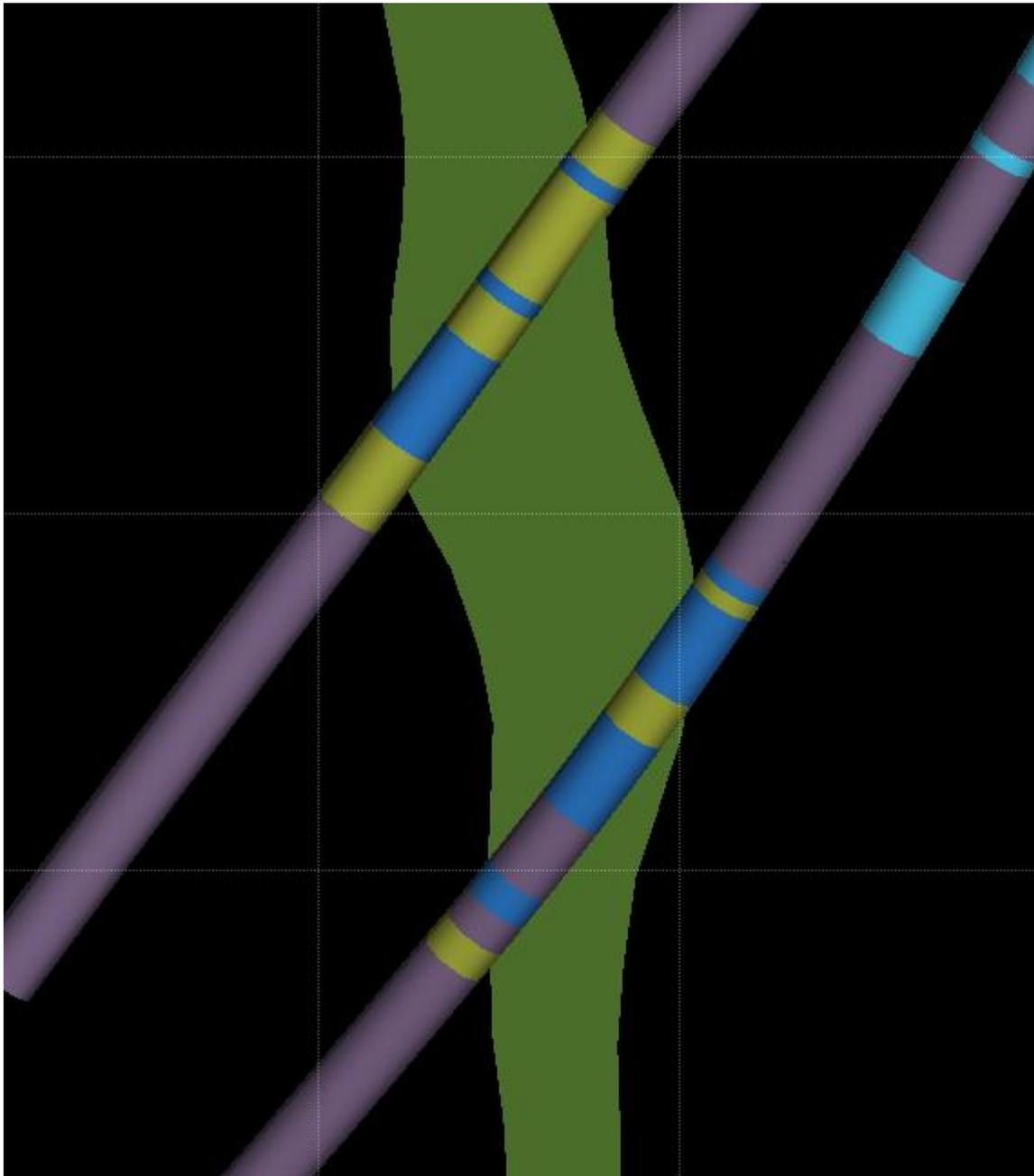


Figure 1 - Example of vein volumetric overestimation. Blue intervals are flagged vein lithology in drillholes, green solid is resulting vein. Leapfrog builds the vein through the upper and lowermost contacts of flagged vein lithology, regardless of other intervals. Note this is a generic example, not from the reviewed project.

Other data processing options used within Leapfrog are as would be recommended. Data snapping to ‘drilling only’ ensures that vein surfaces pass precisely through drillhole contacts. The ‘pinch outs’ function ensures the vein does not pass through drillhole that do not contain the flagged category.

Disabling the boundary filter ensures that all data in the drillhole database is considered when building the vein wireframes, not just data within a particular model boundary or fault block.

The resolution block size of 50m is considered appropriate for regional scale modelling, but should be set to a finer resolution (lower number) for any project or local scale modelling. While the model appears broadly accurate on a regional scale, there will be local or project-scale variability in the geology that cannot be accounted for on a regional level. Sub-models of areas of particular concern should be created to better account for small-scale variability.

Models have been well-controlled with other conservative estimation methods and parameters ensuring that no geologically unreasonable extrapolation has occurred in the models.

Mining Plus' expertise is limited to geology and geological modelling procedures, and cannot speak to the accuracy of the habitat suitability categorisation of the logged lithological data beyond the physical rock characteristics (porosity, permeability, presence of voids/fractures). The categorisation used is consistent with these characteristics as understood by Mining Plus. Given that the "Uncertain" category has been used where any uncertainty exists, the categorisation is most likely conservative.

The 300m radial boundary around the drillholes, and the exclusion of excessively thin areas of modelled habitat ensures no unreasonable extrapolation beyond the limits of data has occurred.

Exclusion of coarse scale surface mapping ensures that only the finer scale and more accurate drilling data is used in model construction. If finer scale geological mapping exists or can be sourced over project areas it is recommended that this be incorporated to increase precision at surface.

3 CONCLUSION

Overall Mining Plus considers the subterranean fauna habitat modelling procedures developed to be robust and representative of the underlying data. No major changes to the modelling procedures would be recommended. Minor changes and local sub-modelling may increase the precision on a project or local scale.