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GEOLOGICAL MAPPING OF THE TAMPIA GOLD DEPOSIT – OVERVIEW AND LIST OF COMPONENTS

P DUURING AND S MORIN-KA





Department of **Energy, Mines,
Industry Regulation and Safety**

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PERTH 2024



**Geological Survey of
Western Australia**

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About this publication

The study presented in this metadata report is the result of a collaborative MRIWA research project, M10433, 'Detection of Distal Footprints of Minerals Systems in the southwest of Western Australia: Linking basement and Cover,' between the Geological Survey of Western Australia (GSWA) and CSIRO, Minerals Research Institute of Western Australia (MRIWA), Anglo American Ltd and Ramelius Resources Ltd.

The principal objective of this research is to build a contextual framework to help more efficient mineral exploration protocols in the southwest region of Western Australia. This research aims to better understand how the basement and cover variability of the area are linked, and how these links can be used to vector mineral systems at depth and in the cover.

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Acknowledgement of Country

We respectfully acknowledge Aboriginal peoples as the Traditional Custodians of this land on which we deliver our services to the communities throughout Western Australia. We acknowledge their enduring connection to the lands, waterways and communities and pay our respects to Elders past and present.

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Cover image

One of the largest and most distinctive metagranitic units in the Gascoyne Province, the Davy Well Granite emerges from the water of the Yinnetharra Pool along the Gascoyne River. Photo by Angela Riganti

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Geological mapping of the Tampia gold deposit – overview and list of components

P Duuring and S Morin-Ka

Introduction

The Tampia gold deposit is situated about 245 km east of Perth and is hosted by high-grade metamorphic rocks of the Youanmi Terrane. The geological controls on the genesis, distribution, and timing of gold mineralization, and the influence of granitic rocks, are currently poorly understood. To address these knowledge gaps, comprehensive geological mapping at a 1:500 scale was conducted by the Geological Survey of Western Australia (GSWA) in May 2022, with further work carried out in March 2023 as mining activities approached completion.

The resulting geological maps are presented as a series of ArcGIS layers, categorized into observations and interpretations. Direct observations were made from pit walls, while interpretations were derived by extrapolating observed rock contacts and structures throughout the pit floor and ramps. Drone surveys conducted by GSWA and Ramelius Resources played a crucial role in providing imagery that facilitated the observation of geological relationships in less accessible areas of the pit, including pit walls located several benches above the pit floor. Grade-control drilling data was utilized to further constrain the distribution of rock types and gold mineralization throughout the pit. Gold, arsenic, and sulfur values are reported as draped surfaces over the pit shell or as representative horizontal plans, such as the 320 mRL (approximately 25 m below the current land surface). Figures 1–9 illustrate the various types of geological data incorporated into the ArcGIS map layers. Appendix 1 provides a metadata statement for all generated GIS layers while Appendix 2 present data dictionaries for these digital files.

Acknowledgments

Ramelius Resources are thanked for their generous field support and access to Tampia deposit datasets. Construction of the GIS map layers benefitted from advice provided by Tania Ibrahimi (CSIRO). We are especially thankful to MRIWA, Anglo American, Ramelius Resources, and CSIRO for their support of this work through the MRIWA 10433 Project.

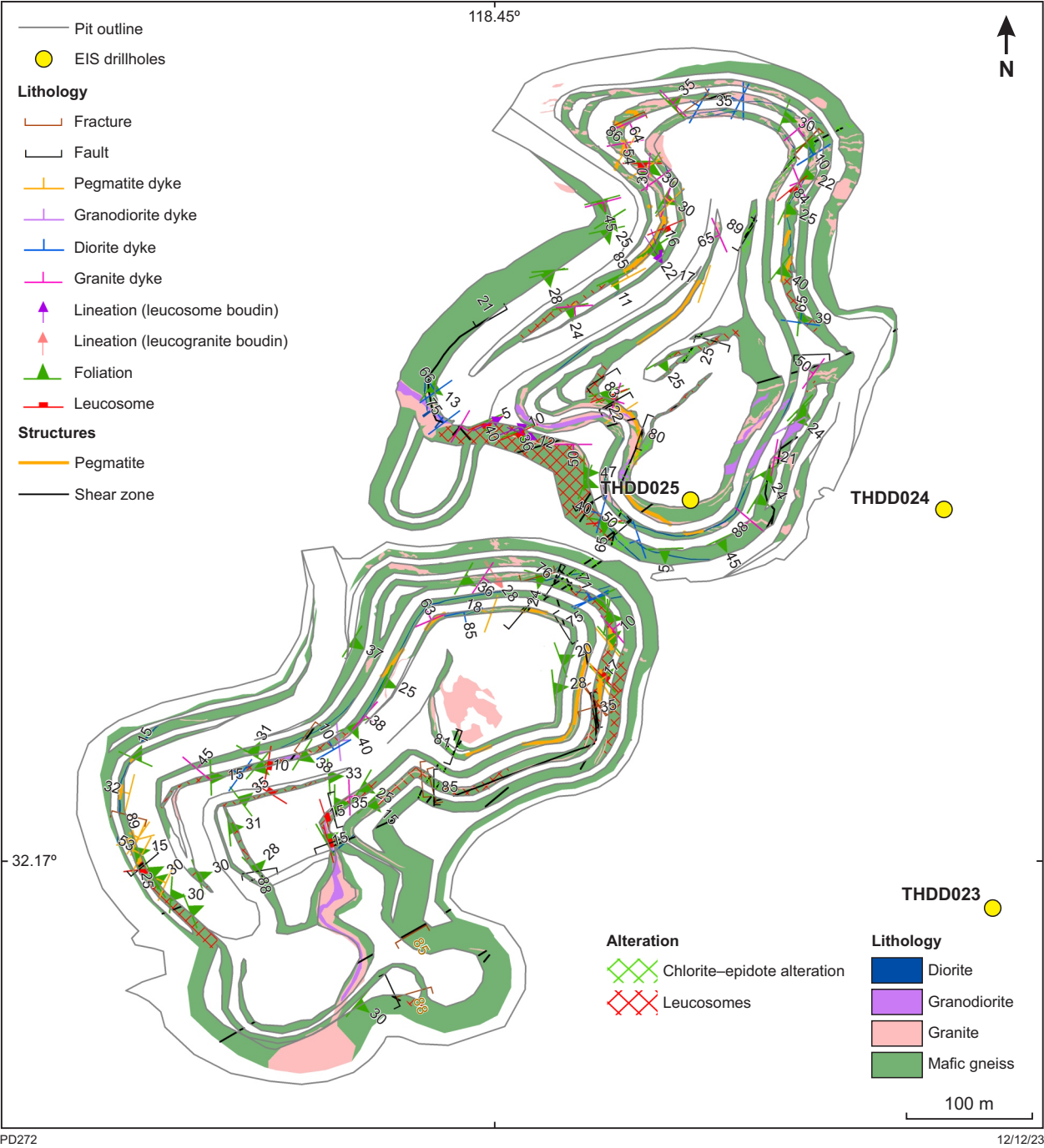


Figure 1. A fact map for the Tampia deposit, showing the observed distribution of rock types, structures, and alteration zones

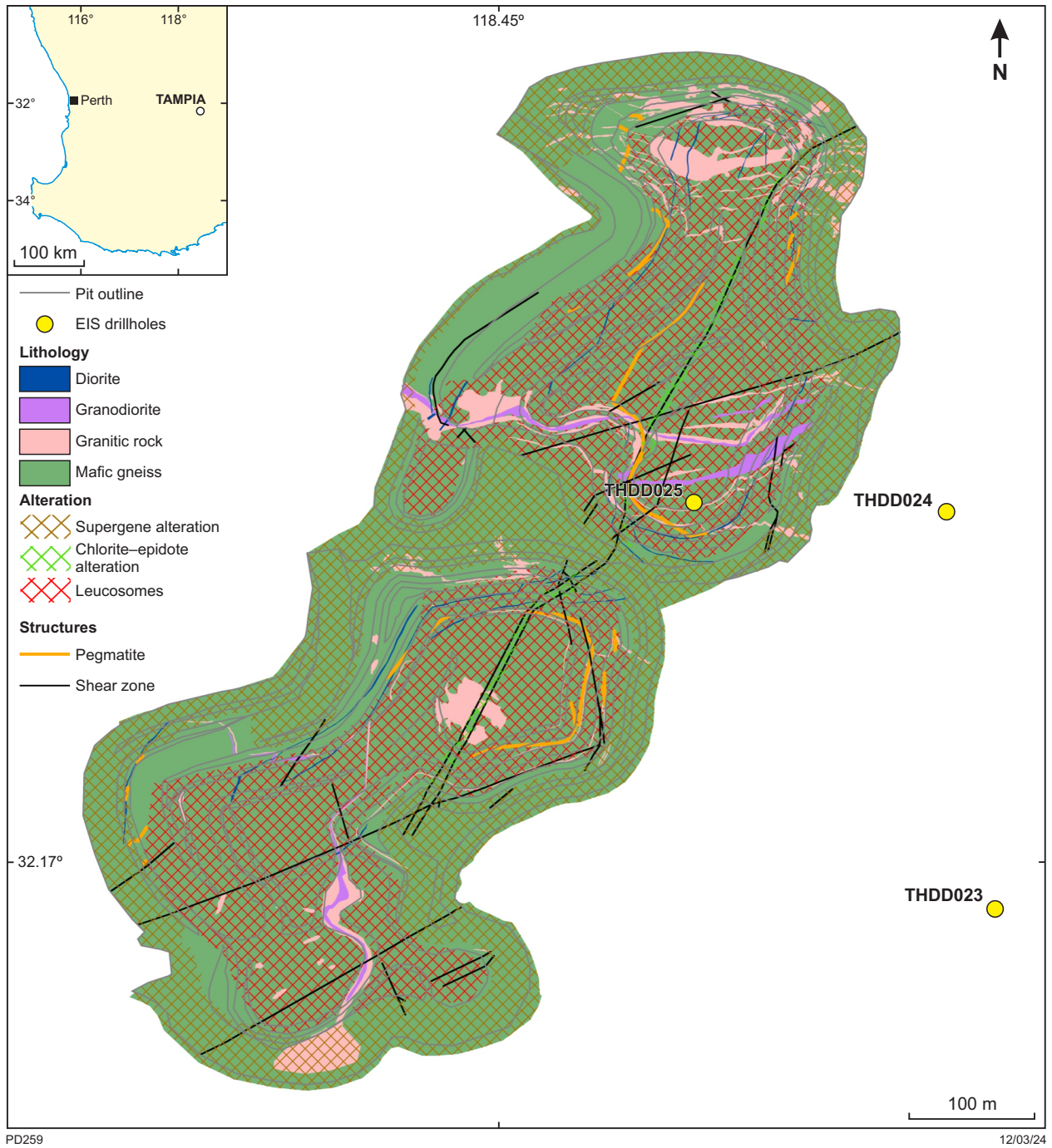


Figure 2. An interpreted solid geology map for the Tampia deposit, incorporating drillhole lithological information

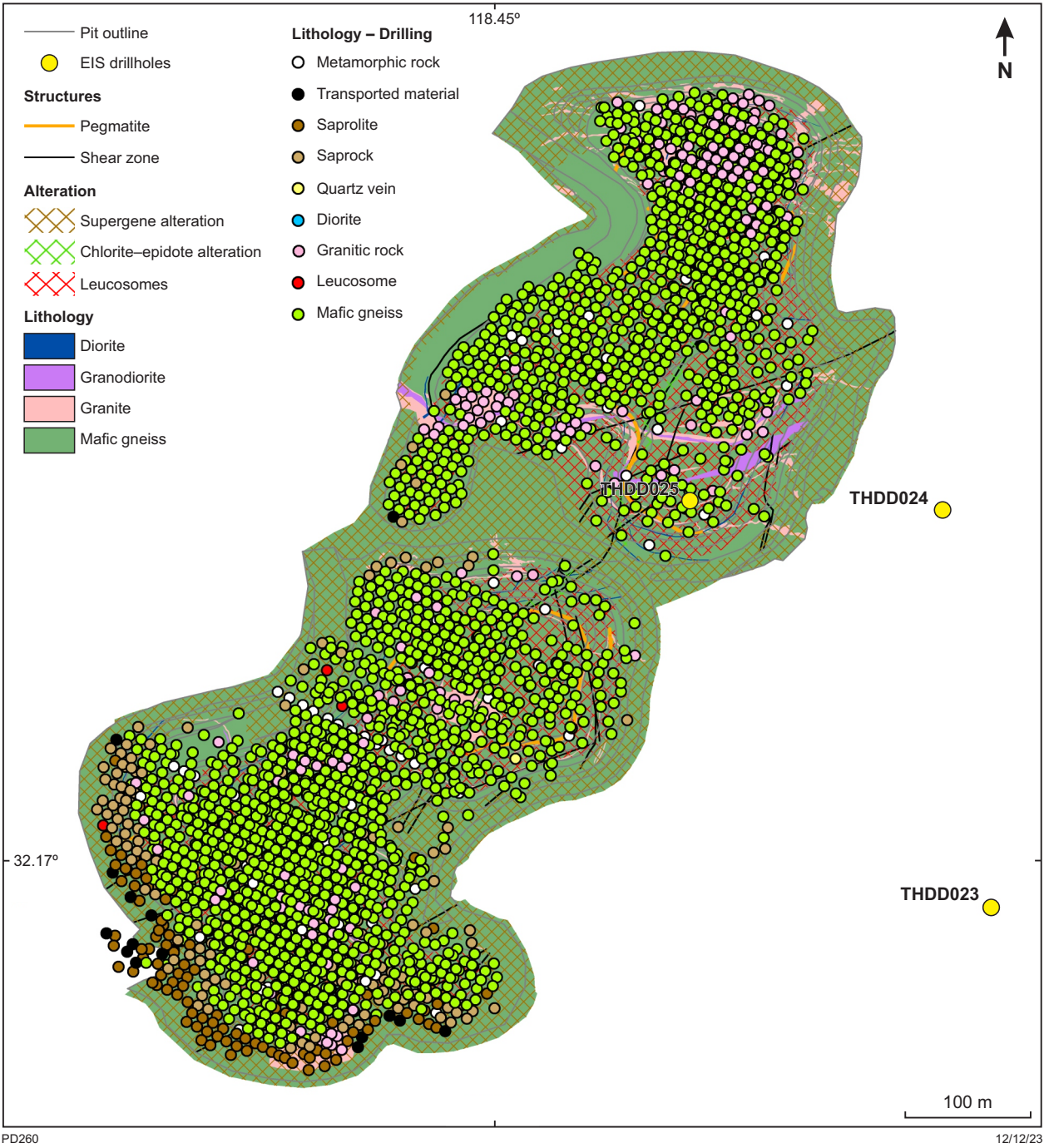


Figure 3. Point data extract from the grade-control drillhole database draped over the Tampia pit surface and solid geology map, illustrating the distribution of rock types

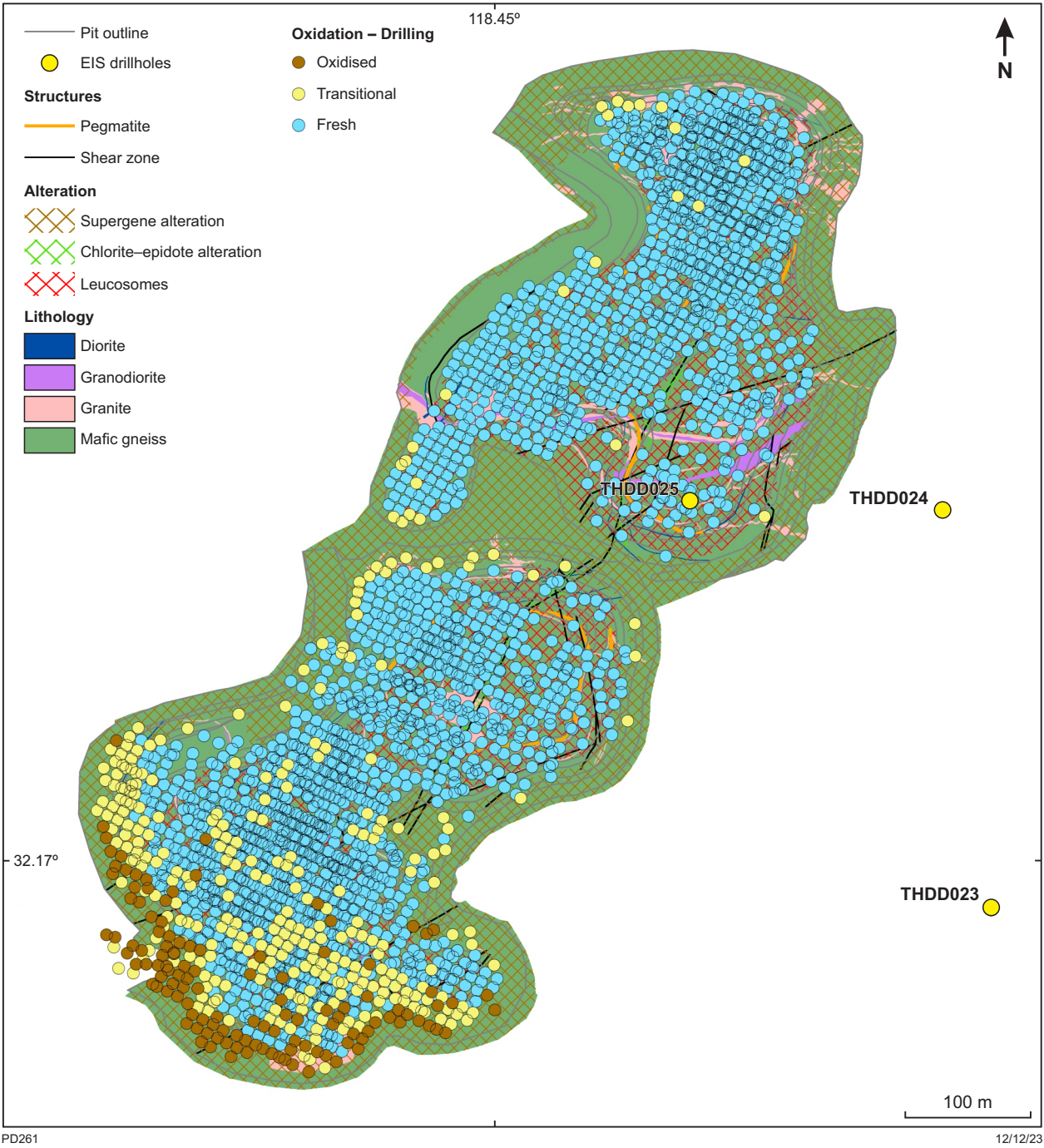


Figure 4. Point data from the grade-control drillhole database draped over the Tampia pit surface and solid geology map, illustrating the distribution of oxidation intensity



Figure 5. Point data from the grade-control database draped over the pit surface and solid geology, illustrating the distribution of sulfide species



Figure 6. Point data from the grade-control database draped over the pit surface and solid geology, illustrating the distribution of sulfide mineral abundance



Figure 7. Gold values determined for drillholes intersecting the pit surface, displayed in 1 m sample intervals

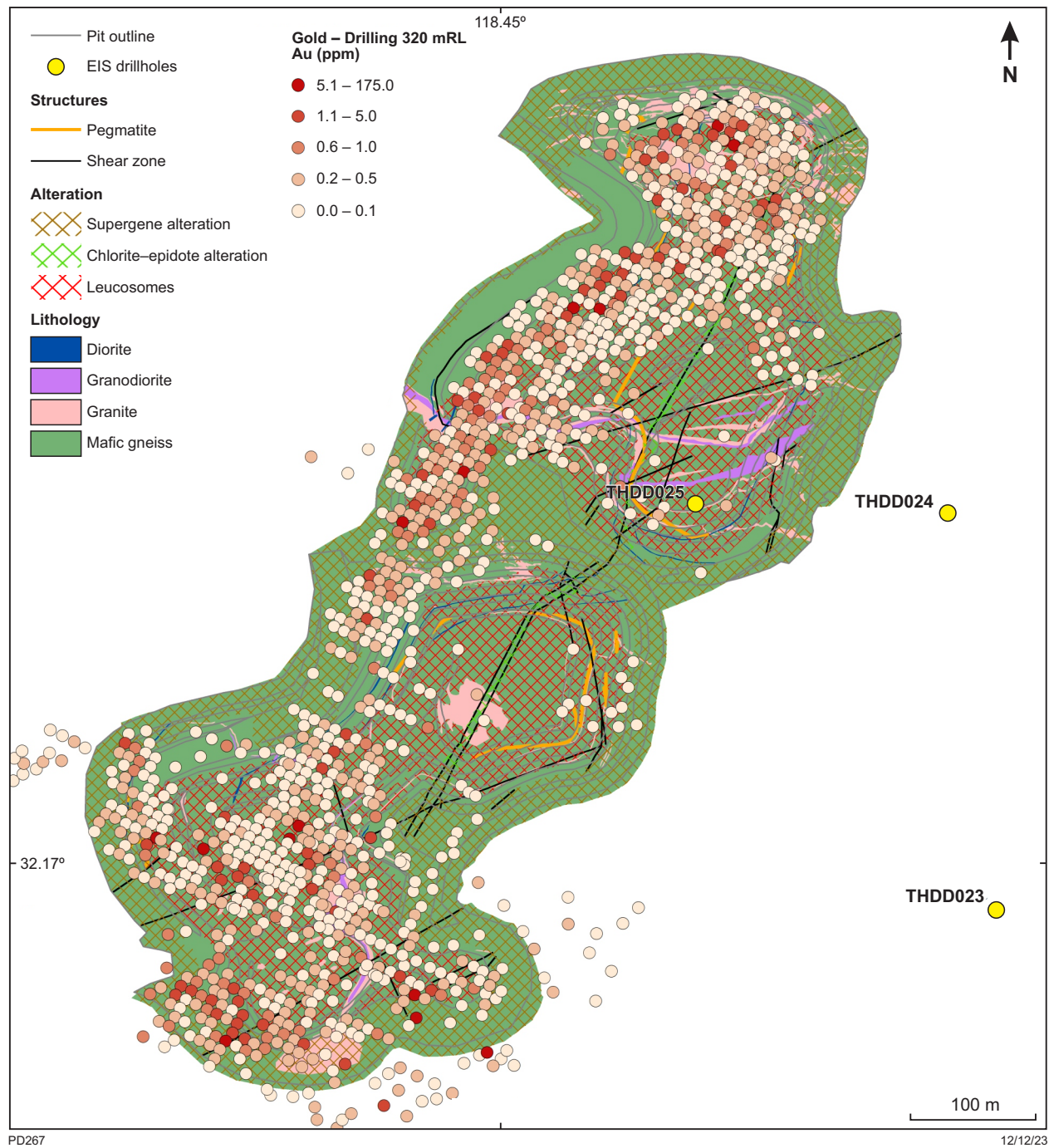


Figure 8. Gold values determined for drillholes intersecting the 320 mRL horizontal surface, displayed in 1 m sample intervals

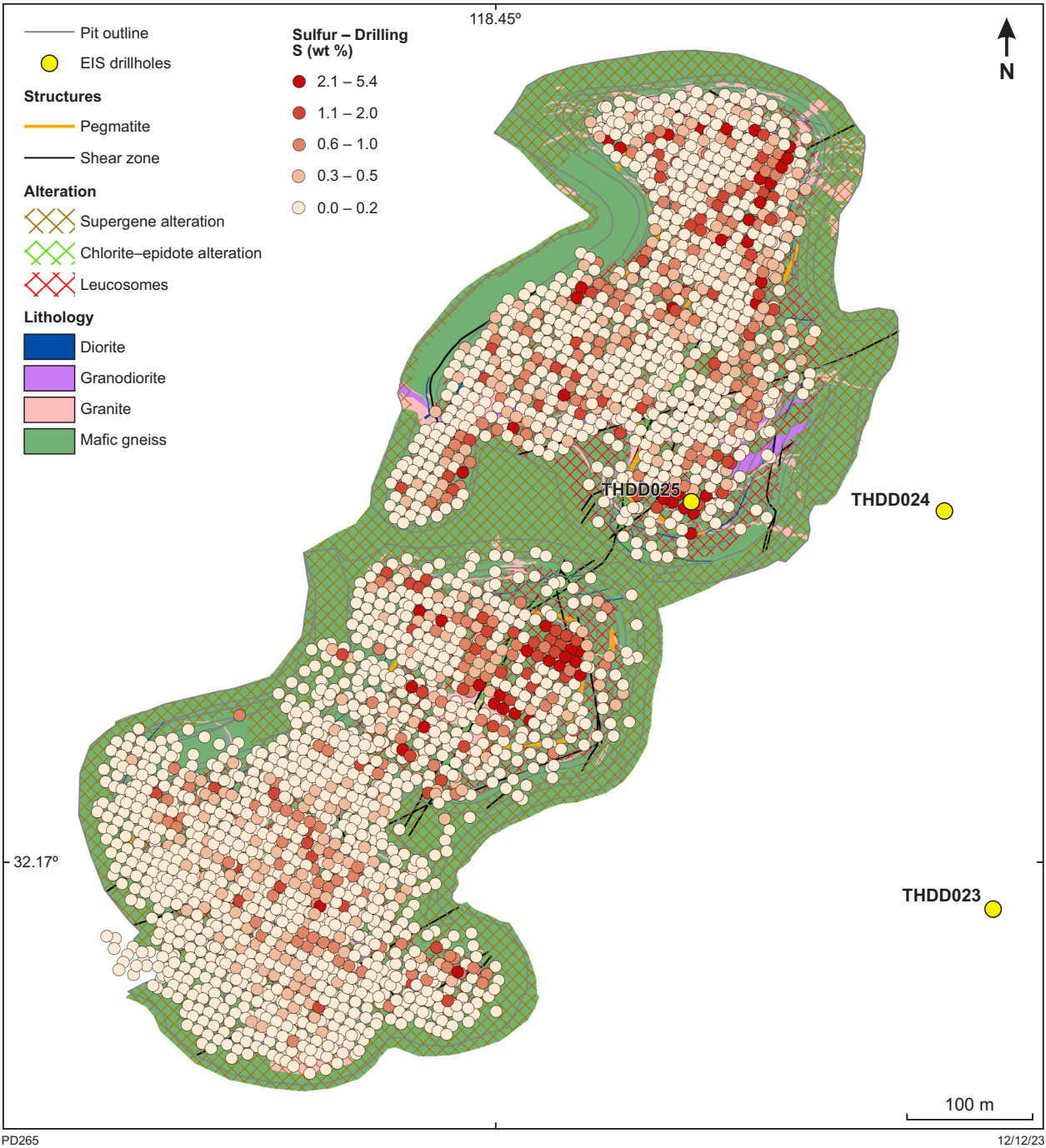


Figure 9. Sulfur values determined for drillholes intersecting the pit surface, displayed in 1 m sample intervals



Figure 10. Sulfur values determined for drillholes intersecting the 320 mRL horizontal surface, displayed in 1 m sample intervals

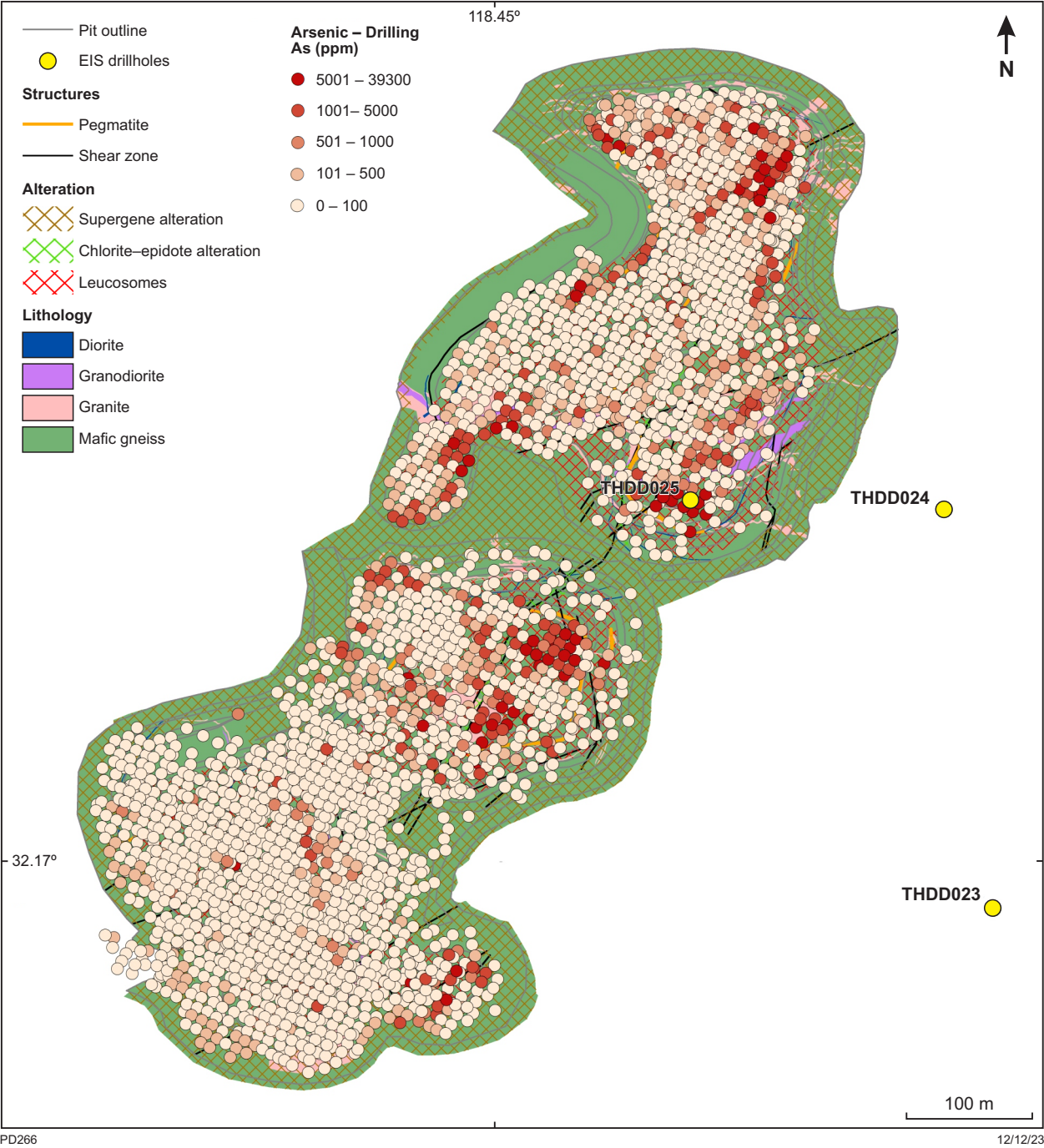


Figure 11. Arsenic values determined for drillholes intersecting the pit surface, displayed in 1 m sample intervals



Figure. 12. Arsenic values determined for drillholes intersecting the 320 mRL horizontal surface, displayed in 1 m sample intervals

Appendix I

Metadata for all digital files

File Names	320mRL_assays_As.lyr 320mRL_assays_Au.lyr 320mRL_assays_S.lyr 320mRL_collars.lyr Chlorite-epidote_alteration_interpreted.lyr Chlorite-epidote_alteration_observed.lyr Dykes.lyr EIS_drillholes.lyr Fractures-faults.lyr Grade_control_assay_As.lyr Grade_control_assay_Au.lyr Grade_control_assay_S.lyr Grade_control_lithology.lyr Grade_control_oxidation.lyr Grade_control_sulfide_content.lyr Grade_control_sulfide_species.lyr Leucosomes-foliation-lineations.lyr Leucosomes_interpreted.lyr Leucosomes_observed.lyr Lithology_interpreted.lyr Lithology_observed.lyr North_pit_outline.lyr South_pit_outline.lyr Structures_interpreted.lyr Structures_observed.lyr Supergene alteration.lyr
Description	<p>In May 2022 and March 2023, detailed geological mapping was conducted at the Tampia North and South pits at a scale of 1:500. This process involved direct observations of rock types, structural features, alteration patterns, and mineralization from the pit walls. These observations were recorded on a field tablet using an ArcGIS digital platform. Additionally, high-resolution drone imagery was employed to precisely delineate rock contacts on the pit walls, complemented by the use of a handheld GPS device for accurate location of structural measurements.</p> <p>The geological interpretation incorporates both direct field observations and extrapolations from drillhole data. This integrated approach enhances our understanding of the geological structures and the spatial distribution of mineralization, particularly away from rock contacts. The geological interpretation also utilizes drillhole lithology data, along with Au, As, and S assay values, overlaid on a two-dimensional pit outline.</p> <p>For a detailed assessment of mineralization, assay data from a specific horizontal level at 320 mRL, approximately 25 m below the current surface, are displayed to illustrate the distribution and geometry of mineralization throughout the pits. The mining operations at the Tampia pit were completed in June 2023.</p>
Geographical Extent Polygon	-32.169 118.446, -32.169 118.454, -32.160 118.454, -32.160 118.446
Reference System	GDA94
Creation Date	1 July 2023
Access Format Types	ESRI shapefiles
Lineage	The datasets were created from pit mapping and from grade control drilling
Position Accuracy	0 to 2 metres

Appendix 2

Data dictionaries for all digital files

Feature class		320mRL_assays_As.lyr 320mRL_assays_Au.lyr 320mRL_assays_S.lyr		
Feature category		320mRL_assays		
Spatial type		Point		
Description		An extract of geochemical data from Ramelius Resources Limited's Tampia grade-control drillhole database, specifically for the 320 mRL, which is located approximately 25 m below the current surface		
Item name	Item alias	Type	Width	Description
Hole_ID	Hole_ID	Text	254	Unique hole identification
Dip	Dip	Double		Drillhole dip angle in degrees relative to the horizontal
Depth_From	Depth_From	Double		Depth interval down the drillhole, from the highest elevation, in meters
Depth_To	Depth_To	Double		Depth interval down the drillhole, to the lowest elevation, in meters
Au_ppm	Au_ppm	Double		Gold concentration for the 1 m sample interval, in parts per million
As_ppm	As_ppm	Double		Arsenic concentration for the 1 m sample interval, in parts per million
S_pct	S_pct	Double		Sulfur concentration for the 1 m sample interval, in weight percent
Orig_Grid	Orig_Grid	Text	254	Geocentric Datum of Australia, Map Grid of Australia, Zone 50
Orig_East	Orig_East	Double		Geocentric Datum of Australia, Map Grid of Australia, Zone 50, Easting coordinate, in meters
Orig_North	Orig_North	Double		Geocentric Datum of Australia, Map Grid of Australia, Zone 50, Northing coordinate, in meters
Orig_RL	Orig_RL	Double		Vertical elevation above sea level, in meters

Feature class		320mRL_collars.lyr		
Feature category		320mRL_collars		
Spatial type		Point		
Description		An extract of drillhole collar positions from Ramelius Resources Limited's Tampia grade-control drillhole database, specifically for the 320 mRL, which is located approximately 25 m below the current surface		
Item name	Item alias	Type	Width	Description
Hole_ID	Hole_ID	Text	254	Unique hole identification
Max_Depth	Max_Depth	Double		Maximum depth of each drillhole
Orig_Grid	Orig_Grid	Text	254	Geocentric Datum of Australia, Map Grid of Australia, Zone 50
Orig_East	Orig_East	Double		Geocentric Datum of Australia, Map Grid of Australia, Zone 50, Easting coordinate, in meters
Orig_North	Orig_North	Double		Geocentric Datum of Australia, Map Grid of Australia, Zone 50, Northing coordinate, in meters
Orig_RL	Orig_RL	Double		Vertical elevation above sea level, in meters

Feature class		Grade_control_lithology.lyr		
Feature category		Grade_control_lithology		
Spatial type		Point		
Description		An extract of lithological descriptions from Ramelius Resources Limited's Tampia grade-control drillhole database, draped over the Tampia final pit design. The interval was determined using Leapfrog Geo software by finding the intersection between drillhole traces and the pit model surface		
Item name	Item alias	Type	Width	Description
Hole_ID	Hole_ID	Text	254	Unique hole identification
Depth_From	Depth_From	Double		Depth interval down the drillhole, from the highest elevation, in meters
start_x	start_x	Double		Geocentric Datum of Australia, Map Grid of Australia, Zone 50, Easting coordinate, in meters
start_y	start_y	Double		Geocentric Datum of Australia, Map Grid of Australia, Zone 50, Northing coordinate, in meters
start_z	start_z	Double		Vertical elevation above sea level, in meters
Depth_Fr_1	Depth_Fr_1	Double		Starting depth of the reported lithology interval in the drillhole
Depth_To	Depth_To	Double		Finishing depth of the reported lithology interval in the drillhole
Regolith	Regolith	Text	254	Regolith type
Lithology	Lithology	Text	254	Lithology type

Feature class		Grade_control_oxidation.lyr		
Feature category		Grade_control_oxidation		
Spatial type		Point		
Description		An extract of reported oxidation intensity in rocks from Ramelius Resources Limited's Tampia grade-control drillhole database, draped over the Tampia final pit design. The interval was determined using Leapfrog Geo software by finding the intersection between drillhole traces and the pit model surface		
Item name	Item alias	Type	Width	Description
Hole_ID	Hole_ID	Text	254	Unique hole identification
Depth_From	Depth_From	Double		Depth interval down the drillhole, from the highest elevation, in meters
start_x	start_x	Double		Geocentric Datum of Australia, Map Grid of Australia, Zone 50, Easting coordinate, in meters
start_y	start_y	Double		Geocentric Datum of Australia, Map Grid of Australia, Zone 50, Northing coordinate, in meters
start_z	start_z	Double		Vertical elevation above sea level, in meters
Depth_Fr_1	Depth_Fr_1	Double		Starting depth of the reported lithology interval in the drillhole
Depth_To	Depth_To	Double		Finishing depth of the reported lithology interval in the drillhole
Regolith	Regolith	Text	254	Regolith type

Feature class		Grade_control_sulfide_species.lyr Grade_control_sulfide_content.lyr		
Feature category		Grade_control_sulfide		
Spatial type		Point		
Description		An extract of reported sulfide content and species in rocks from Ramelius Resources Limited's Tampia grade-control drillhole database, draped over the Tampia final pit design. The interval was determined using Leapfrog Geo software by finding the intersection between drillhole traces and the pit model surface		
Item name	Item alias	Type	Width	Description
Hole_ID	Hole_ID	Text	254	Unique hole identification
Depth_From	Depth_From	Double		Depth interval down the drillhole, from the highest elevation, in meters
start_x	start_x	Double		Geocentric Datum of Australia, Map Grid of Australia, Zone 50, Easting coordinate, in meters
start_y	start_y	Double		Geocentric Datum of Australia, Map Grid of Australia, Zone 50, Northing coordinate, in meters
start_z	start_z	Double		Vertical elevation above sea level, in meters
Depth_Fr_1	Depth_Fr_1	Double		Starting depth of the reported lithology interval in the drillhole
Depth_To	Depth_To	Double		Finishing depth of the reported lithology interval in the drillhole
Sulfide	Sulfide species	Text	254	Sulfide mineral species observed in the 1 m sample interval
Sulfide_p	Sulfide content	Double		Sulfide mineral abundance observed in the 1 m sample interval, in volume percent

Feature class		Grade_control_assay_As.lyr Grade_control_assay_Au.lyr Grade_control_assay_S.lyr		
Feature category		Grade_control_assay		
Spatial type		Point		
Description		An extract of assay values from Ramelius Resources Limited's Tampia grade-control drillhole database, draped over the Tampia final pit design. The interval was determined using Leapfrog Geo software by finding the intersection between drillhole traces and the pit model surface		
Item name	Item alias	Type	Width	Description
Hole_ID	Hole_ID	Text	254	Unique hole identification
Depth_From	Depth_From	Double		Depth interval down the drillhole, from the highest elevation, in meters
start_x	start_x	Double		Geocentric Datum of Australia, Map Grid of Australia, Zone 50, Easting coordinate, in meters
start_y	start_y	Double		Geocentric Datum of Australia, Map Grid of Australia, Zone 50, Northing coordinate, in meters
start_z	start_z	Double		Vertical elevation above sea level, in meters
Depth_Fr_1	Depth_Fr_1	Double		Starting depth of the reported lithology interval in the drillhole
Depth_To	Depth_To	Double		Finishing depth of the reported lithology interval in the drillhole
Au_ppm	Au_ppm	Double		Gold concentration for the 1 m sample interval, in parts per million
As_ppm	As_ppm	Double		Arsenic concentration for the 1 m sample interval, in parts per million
S_pct	S_pct	Double		Sulfur concentration for the 1 m sample interval, in weight percent

Feature class		EIS_drillholes.lyr		
Feature category		EIS_drillholes		
Spatial type		Point		
Description		The starting collar positions of three Western Australian Government, Exploration Incentive Scheme (EIS) cofunded drillholes		
Item name	Item alias	Type	Width	Description
Drill_hole	Drill_hole	Text	254	Unique hole identification
Longitude_	Longitude	Double		Geocentric Datum of Australia 1994, Longitude in decimal degrees
Latitude__	Latitude	Double		Geocentric Datum of Australia 1994, Latitude in decimal degrees
Hole_eleva	Hole elevation	Double		Vertical elevation above sea level, in meters
Total_dept	Total depth	Double		Total depth of the drillhole, in meters
Drill_angl	Drill angle	Double		Drilling angle, in degrees relative to the horizontal
Drill_azim	Drill azimuth	Double		Drilling direction, in degrees relative to magnetic north

Feature class		Supergene alteration.lyr		
Feature category		Supergene_alteration_interpreted		
Spatial type		Polygon		
Description		Mapped supergene alteration in rocks defined by the presence of iron oxide and clay minerals		
Item name	Item alias	Type	Width	Description
Alteration	Alteration	Text	254	Supergene alteration in rocks

Feature class		Chlorite-epidote_alteration_interpreted.lyr		
Feature category		Chlorite-epidote_alteration_interpreted		
Spatial type		Polygon		
Description		Interpreted chlorite and epidote alteration in rocks		
Item name	Item alias	Type	Width	Description
Alteration	Alteration	Text	254	Chlorite and epidote alteration in rocks

Feature class		Structures_interpreted.lyr		
Feature category		Structures_interpreted		
Spatial type		Polyline		
Description		Interpreted shear zones or pegmatitic quartz veins cutting rocks		
Item name	Item alias	Type	Width	Description
Lithology	Structure	Text	254	Interpreted shear zones or pegmatitic quartz veins

Feature class		Leucosomes_interpreted.lyr		
Feature category		Leucosomes_interpreted		
Spatial type		Polygon		
Description		Interpreted leucosomes in mafic gneiss		
Item name	Item alias	Type	Width	Description
Alteration	Alteration	Text	254	Interpreted leucosomes in mafic gneiss

Feature class		Lithology_interpreted.lyr		
Feature category		Lithology_interpreted		
Spatial type		Polygon		
Description		Interpreted rock types in the Tampia pit		
Item name	Item alias	Type	Width	Description
Lithology	Lithology	Text	254	Interpreted rock types

Feature class		Fractures-faults.lyr Dykes.lyr Leucosomes-foliation-lineations.lyr		
Feature category		Structural_orientations		
Spatial type		Point		
Description		Structural measurements recorded from pit walls during mapping, reported as dip angle and dip azimuth convention, relative to magnetic north. The location of structural observations was recorded using a handheld GPS device with Northing and Easting accurate to about 2 m, while elevation accuracy is poor at around 30 m. Elevation measurements were later repositioned using the drone pit image and pit shell as guides		
Item name	Item alias	Type	Width	Description
GPS_location	GPS location	Double		GPS station number allocated for convenient reference
WAROX_site	WAROX_site	Text	254	Unique WAROX site number
Latitude	Latitude	Double		Geocentric Datum of Australia 1994, Latitude in decimal degrees
Longitude	Longitude	Double		Geocentric Datum of Australia 1994, Longitude in decimal degrees
Elevation	Elevation	Double		Vertical elevation above sea level, in meters
Time	Time	Text	254	Date and time of measurement
Structure	Structure	Text	254	Structure category
Dip	Dip	Double		Dip of the plane in degrees, relative to the horizontal
Azimuth	Azimuth	Double		Dip direction of the plane, relative to magnetic north
Lithology	Lithology	Text	254	Rock type intersected or characterised by the structure
Comment	Comment	Text	254	Comment about the structure, such as its relative timing

Feature class		Chlorite-epidote_alteration_observed.lyr		
Feature category		Chlorite-epidote_alteration_observed		
Spatial type		Polygon		
Description		Observed chlorite and epidote alteration in rocks		
Item name	Item alias	Type	Width	Description
Alteration	Alteration	Text	254	Chlorite and epidote alteration in rocks

Feature class		Structures_observed.lyr		
Feature category		Structures_observed		
Spatial type		Polyline		
Description		Observed shear zones or pegmatitic quartz veins cutting rocks		
Item name	Item alias	Type	Width	Description
Lithology	Structure	Text	254	Observed shear zones or pegmatitic quartz veins

Feature class		Leucosomes_observed.lyr		
Feature category		Leucosomes_observed		
Spatial type		Polygon		
Description		Observed leucosomes in mafic gneiss		
Item name	Item alias	Type	Width	Description
Alteration	Alteration	Text	254	Observed leucosomes in mafic gneiss

Feature class		Lithology_observed.lyr		
Feature category		Lithology_observed		
Spatial type		Polygon		
Description		Observed rock types in the Tampia pit		
Item name	Item alias	Type	Width	Description
Lithology	Lithology	Text	254	Observed rock types

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