

MERIDIAN MINING UK S
ESPIGÃO CU-AU POLYMETALLIC PROJECT

REASSESSMENT OF 2015-2017 STREAM SEDIMENT SAMPLING DATA
PATHFINDER VECTORS TO MINERALIZATION



CAUTIONARY NOTE REGARDING FORWARD-LOOKING STATEMENTS



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The qualified person for Meridian's projects, Dr. Adrian McArthur, B.Sc. Hons., PhD., FAusIMM, CEO and President of Meridian, has verified the technical and scientific contents of this presentation.

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2015 STREAM SEDIMENT PROGRAM



SUMMARY

A Pan Concentrate Program was initiated in 2015 with over 500 samples taken from stream sediments. Heavy minerals were concentrated for initial gold counts in the field, and cassiterite counts, from a set volume of channel gravel. In total 437 samples of mineral concentrates were sent to SGS for semi-quantitative optical mineral classification. Minerals suites can form useful indicators of igneous and hydrothermal processes for a range of deposit styles.

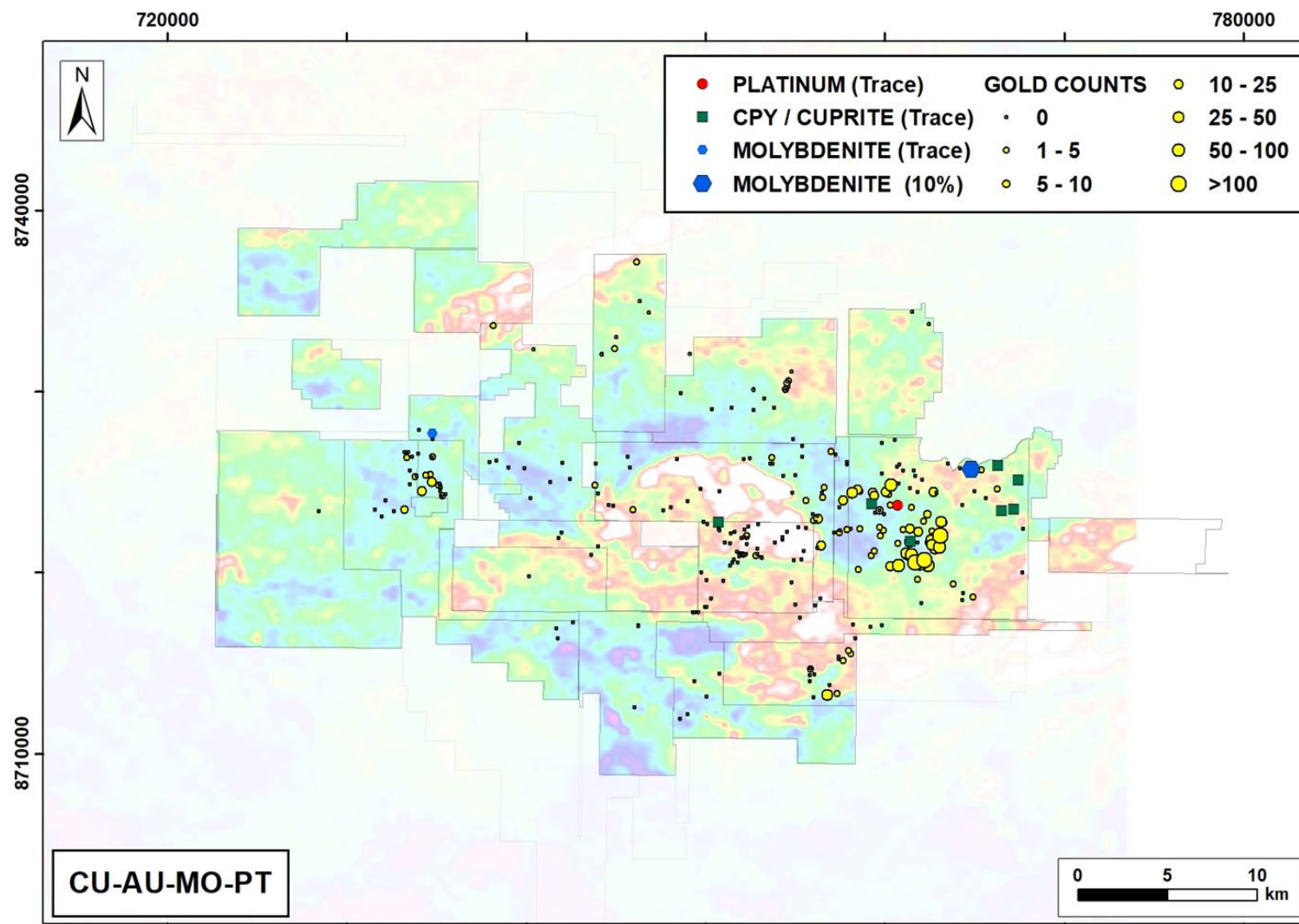
2020 REVIEW

Re-examine the mineralogy to help define the possible ore systems in Espigão, those considered:

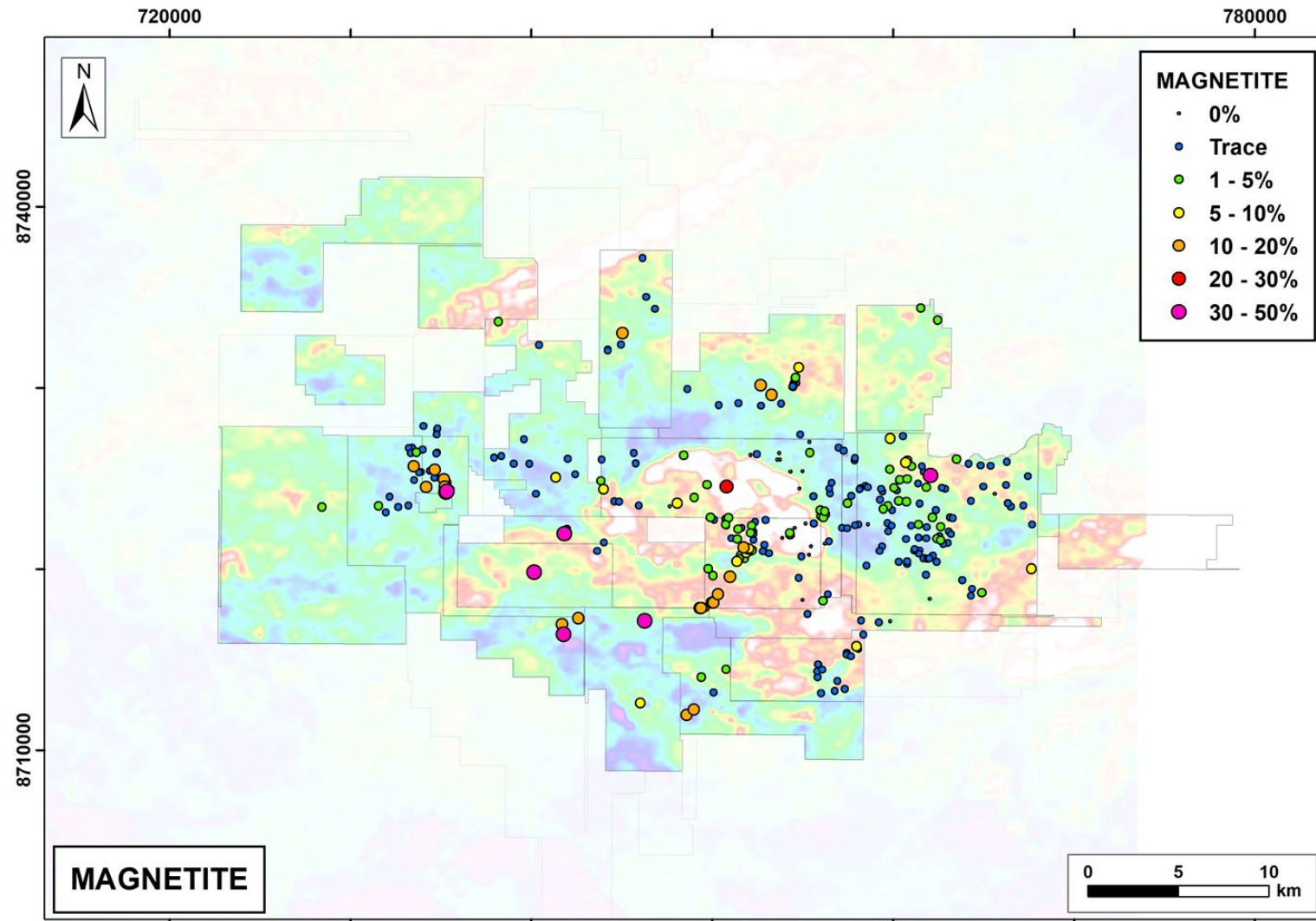
- IOCG Systems: Potential indicator minerals include: Oxides (hematite, magnetite, rutile, spinel, uraninite), Silicates (allanite, amphibole, actinolite, chlorite, epidote, garnet, titanite, tourmaline, vesuvianite, zircon), Phosphates (apatite, monazite, xenotime), and Sulphides (Bi, Cu, Co sulphide phases, pyrite). Barite and anhydrite have been described from some deposits. Uranium and Thorium can be partitioned into allanite, apatite, titanite, xenotime, and epidote, but can also occur within specific phases including uraninite, davidite, brannerite, thorite, thorianite;
- Porphyry Systems: The intrusive complexes that produce porphyry deposits generate enormous volumes of magmatic-hydrothermal fluids. This requires extreme water contents in the melts, which can be recognized by the presence of hornblende as a phenocryst phase. Oxidized magmas are essential for effective magmatic transport of copper, gold and molybdenum together with sulphur. Sulphur-bearing I-type, magnetite-series intrusions are particularly favoured for arc related or intracratonic intrusive bodies. Detailed analysis of the chemistry of specific mineral phases is undertaken to discriminate fertility (zircon, plagioclase, magnetite, apatite, titanite, rutile, epidote and chlorite); and

Various plots are presented of minerals of interest. Their presence is not necessarily diagnostic of a specific deposit style, but their the spatial distribution is supportive of hydrothermal processes that require further investigation. Additional petrography, whole rock geochemistry, and mineral chemistry can add value to discrimination of fertile areas for further exploration at Espigão do Oeste.

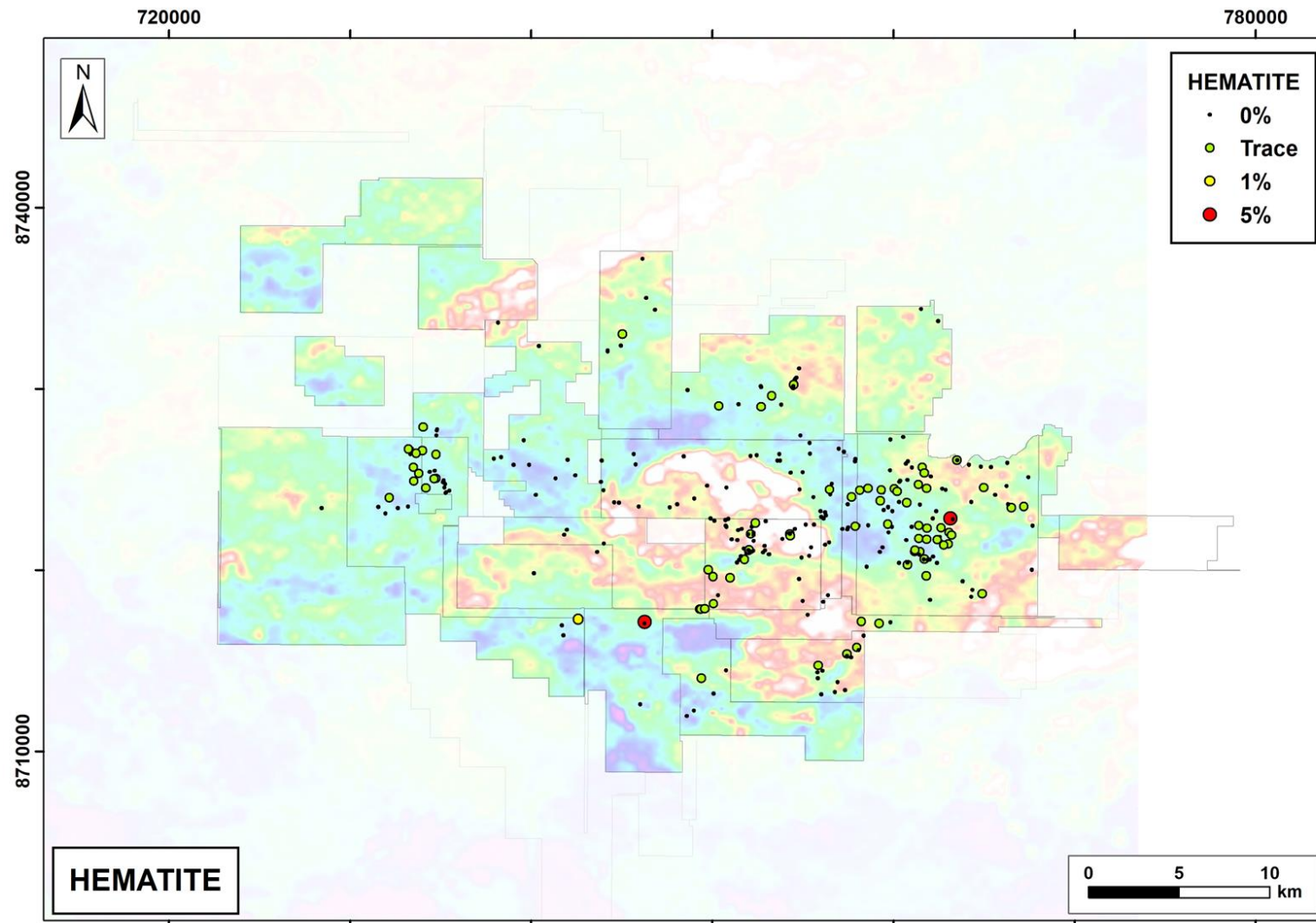
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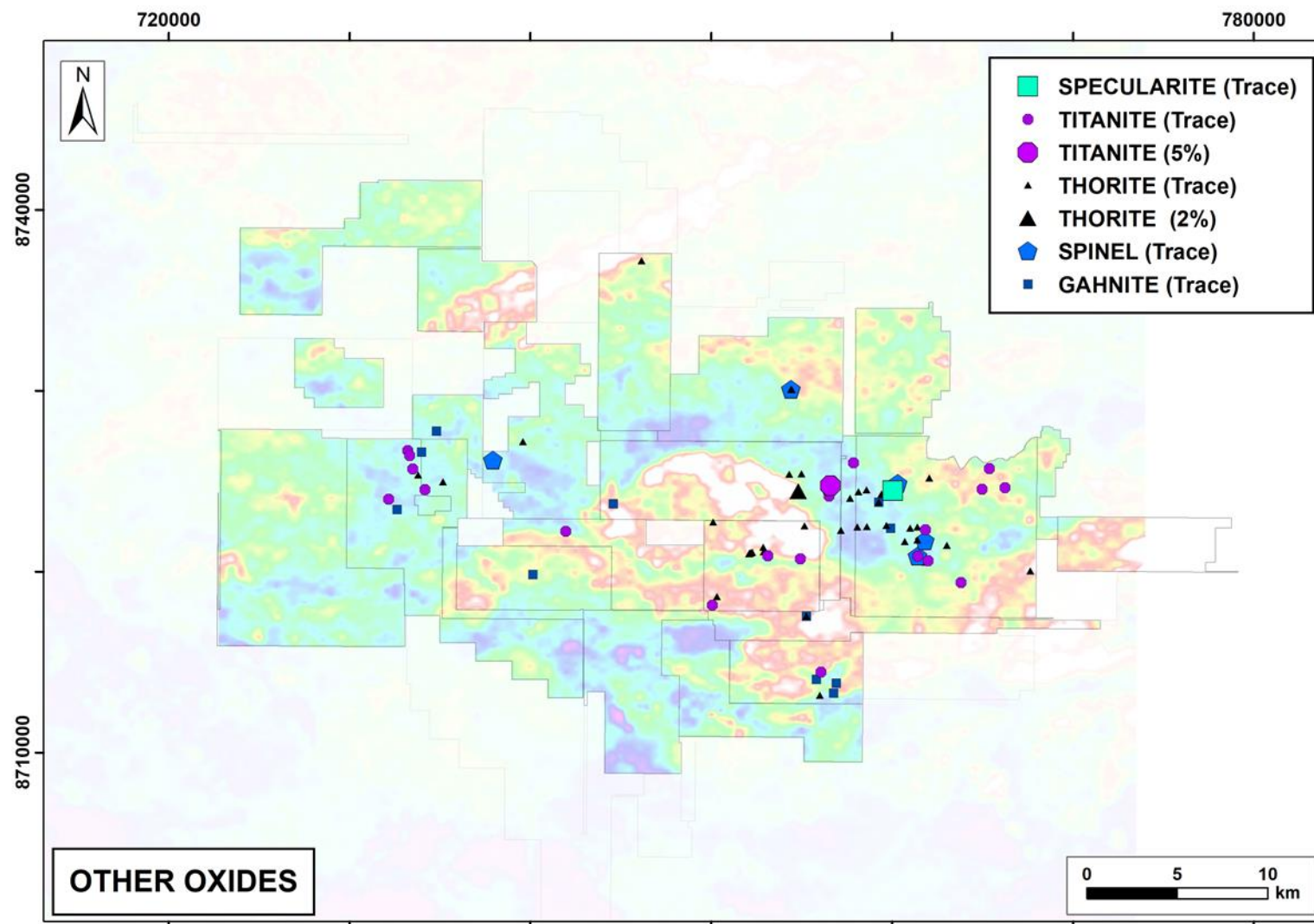
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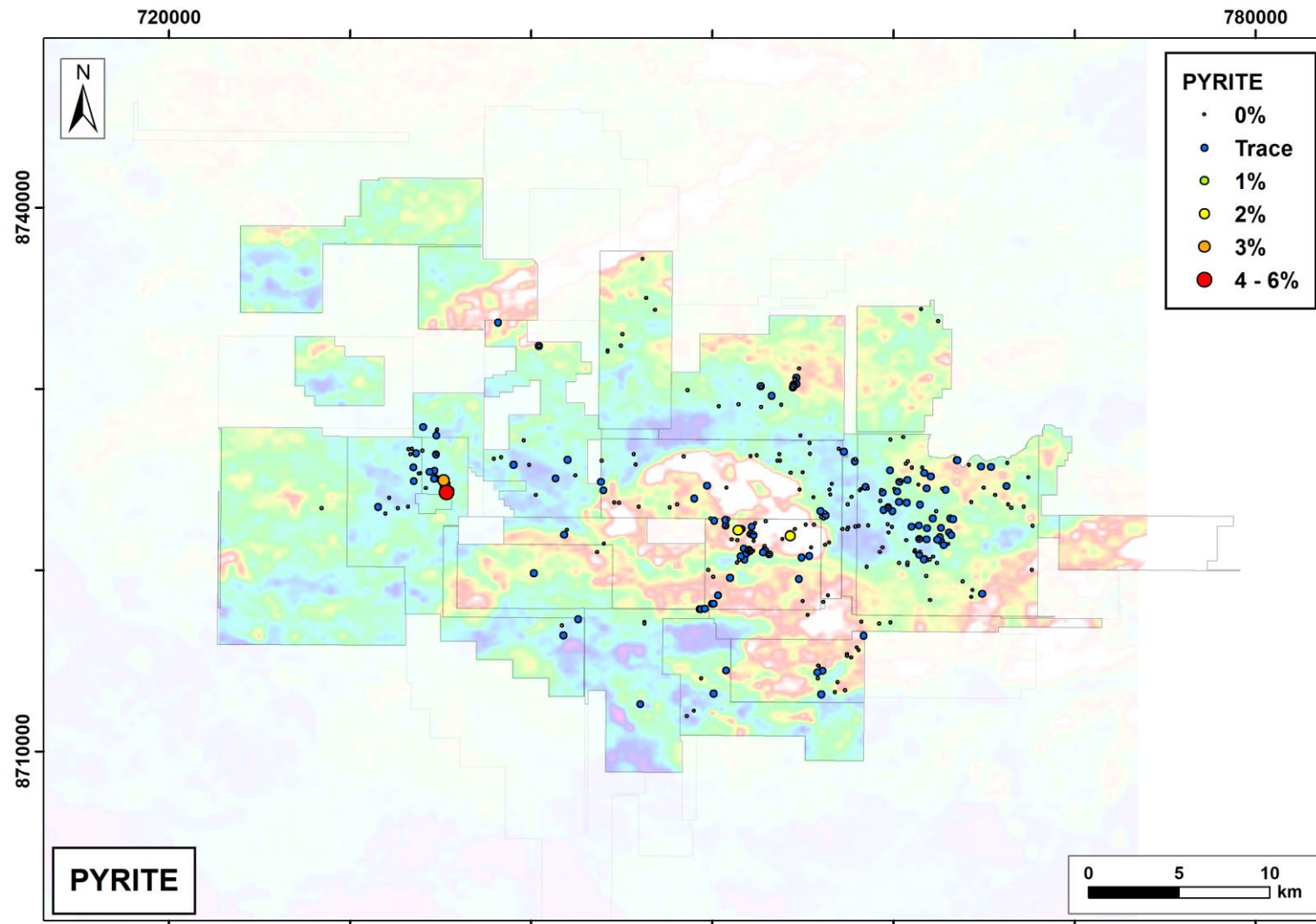
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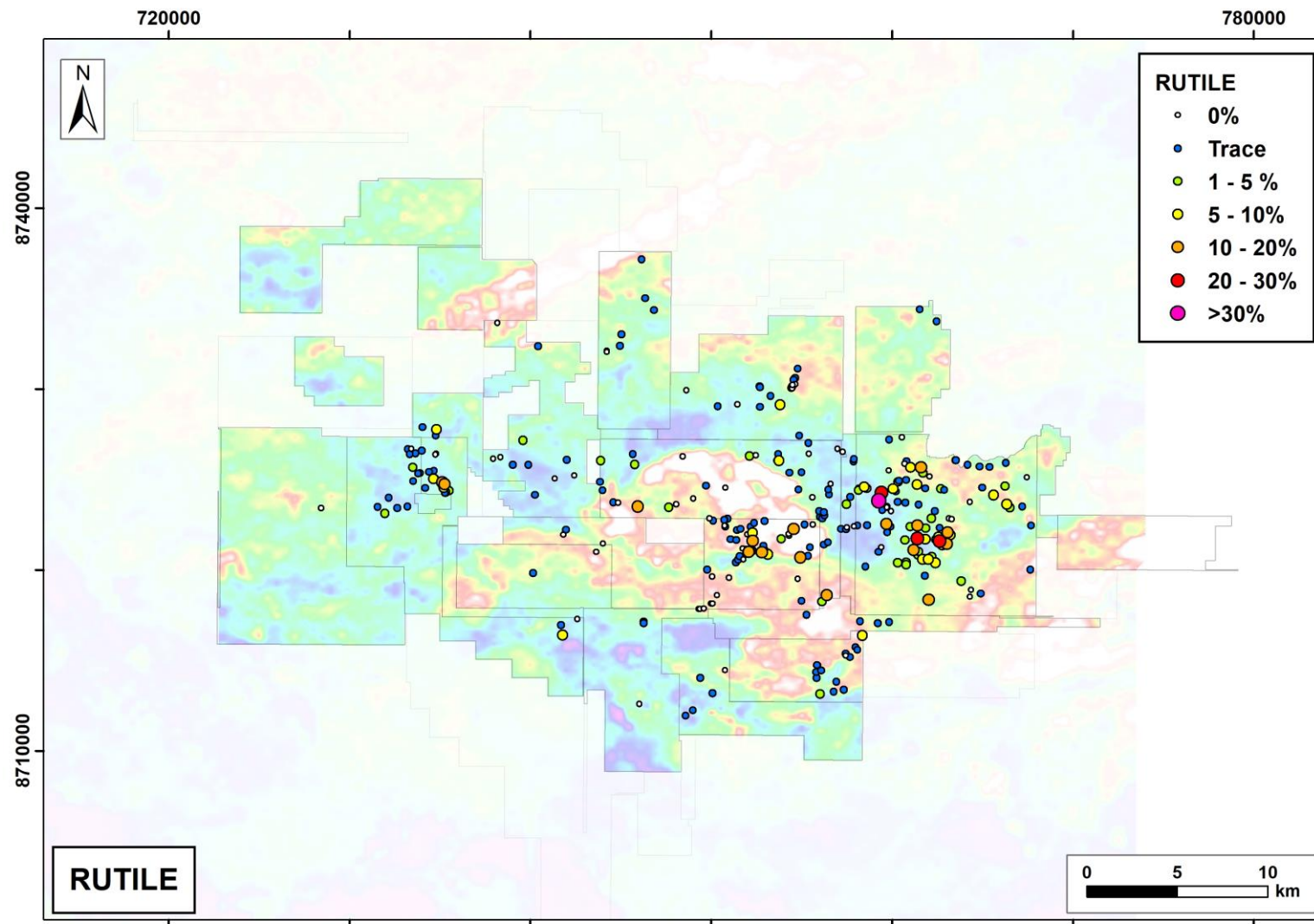
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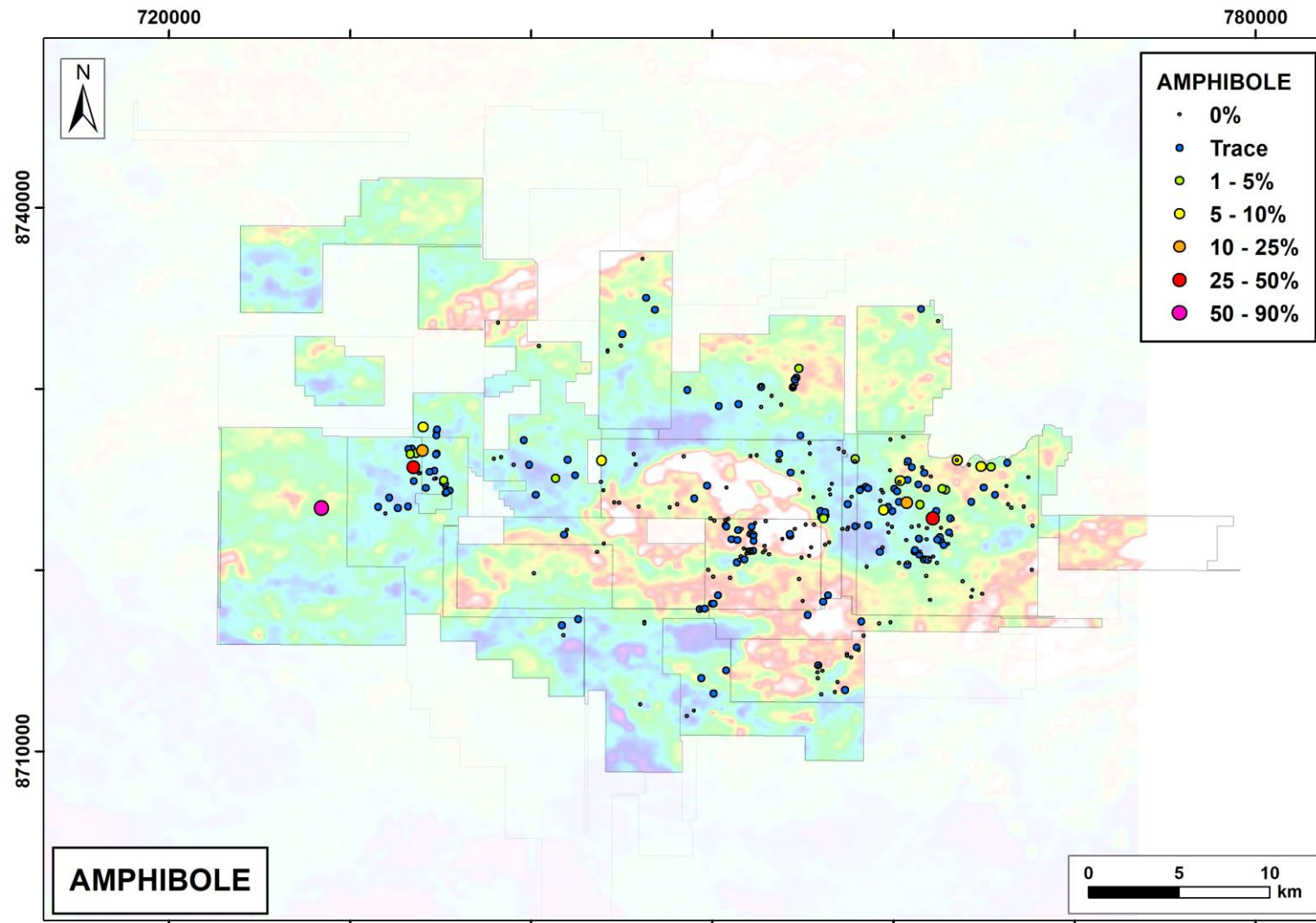
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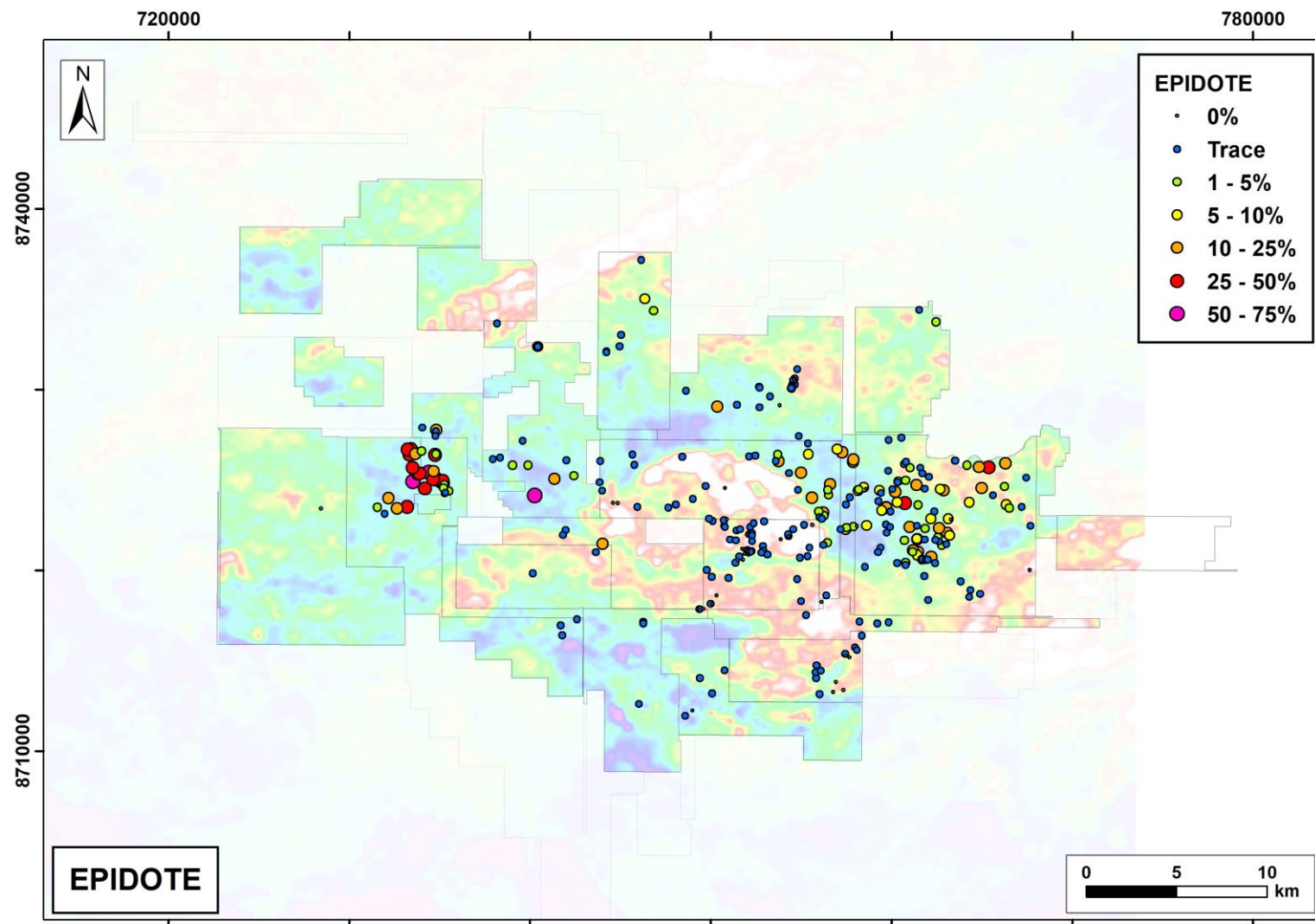
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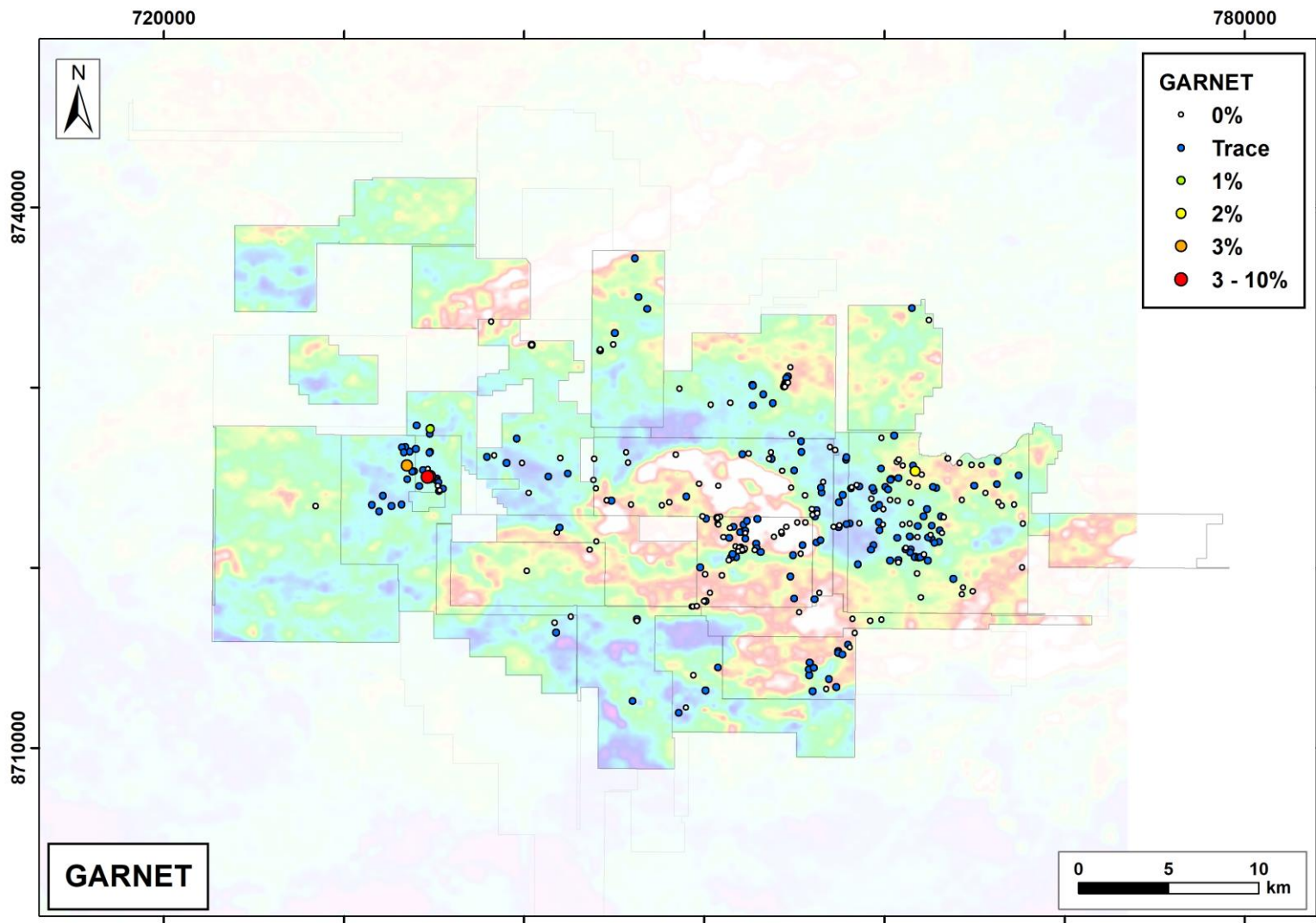
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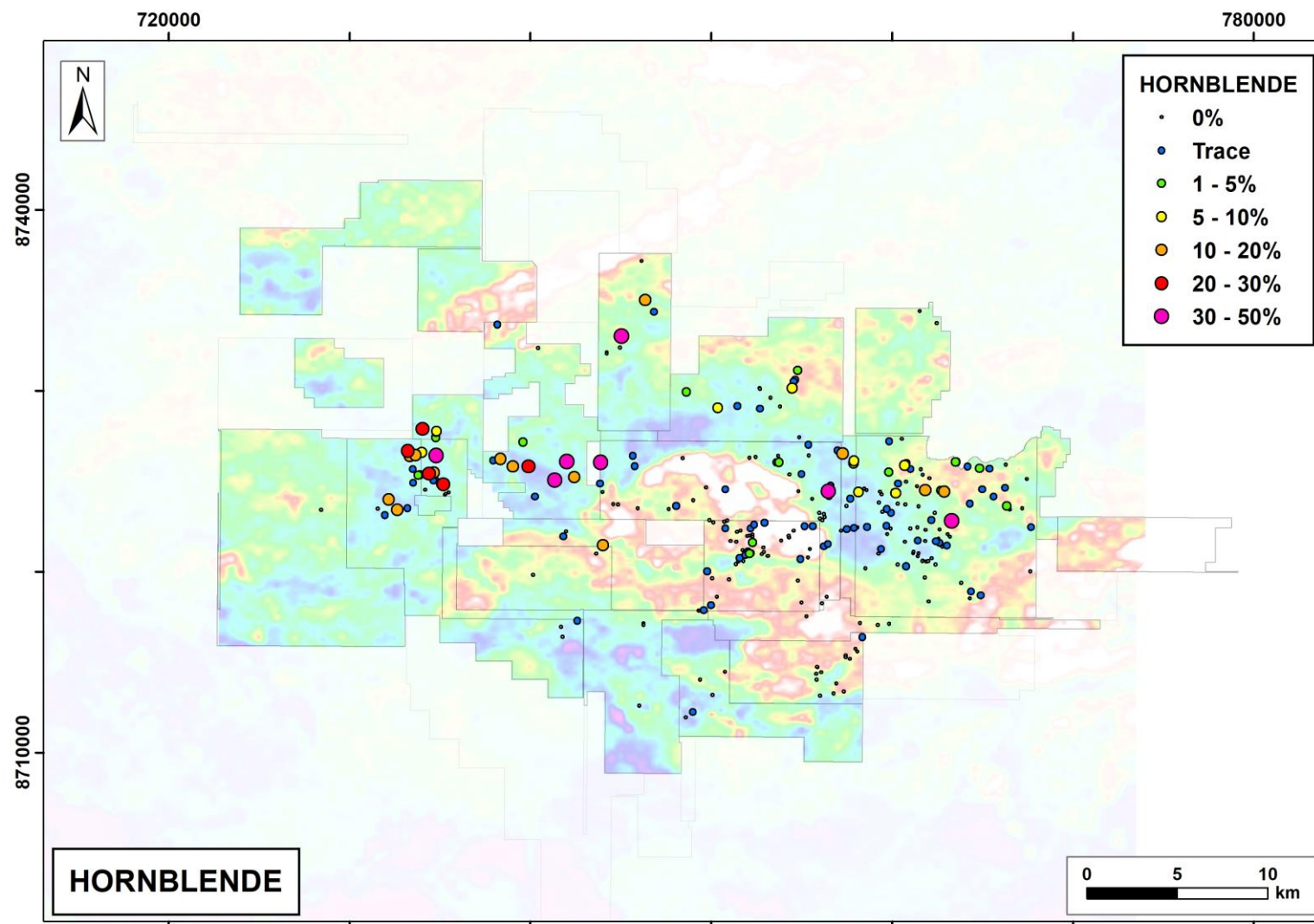
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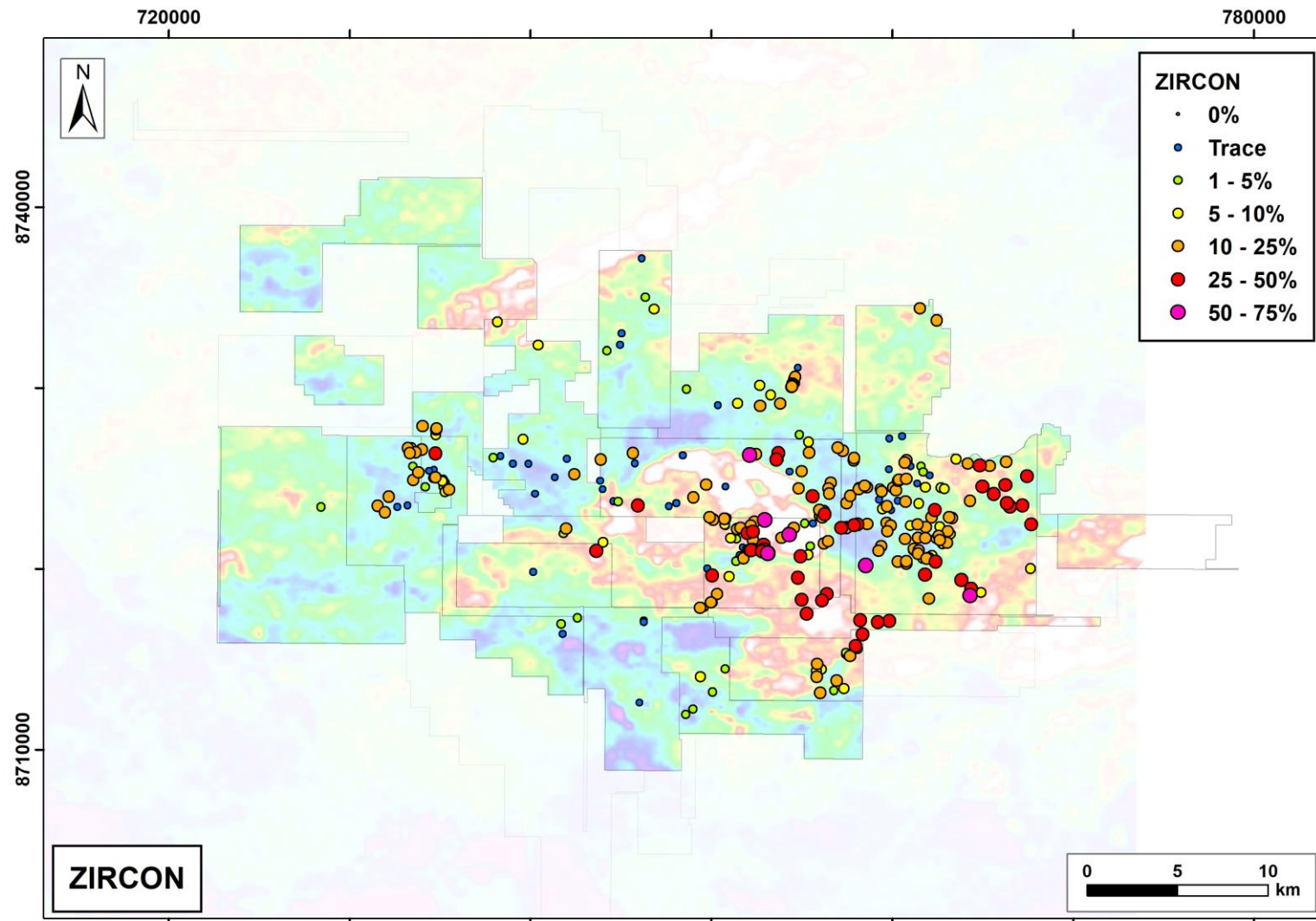
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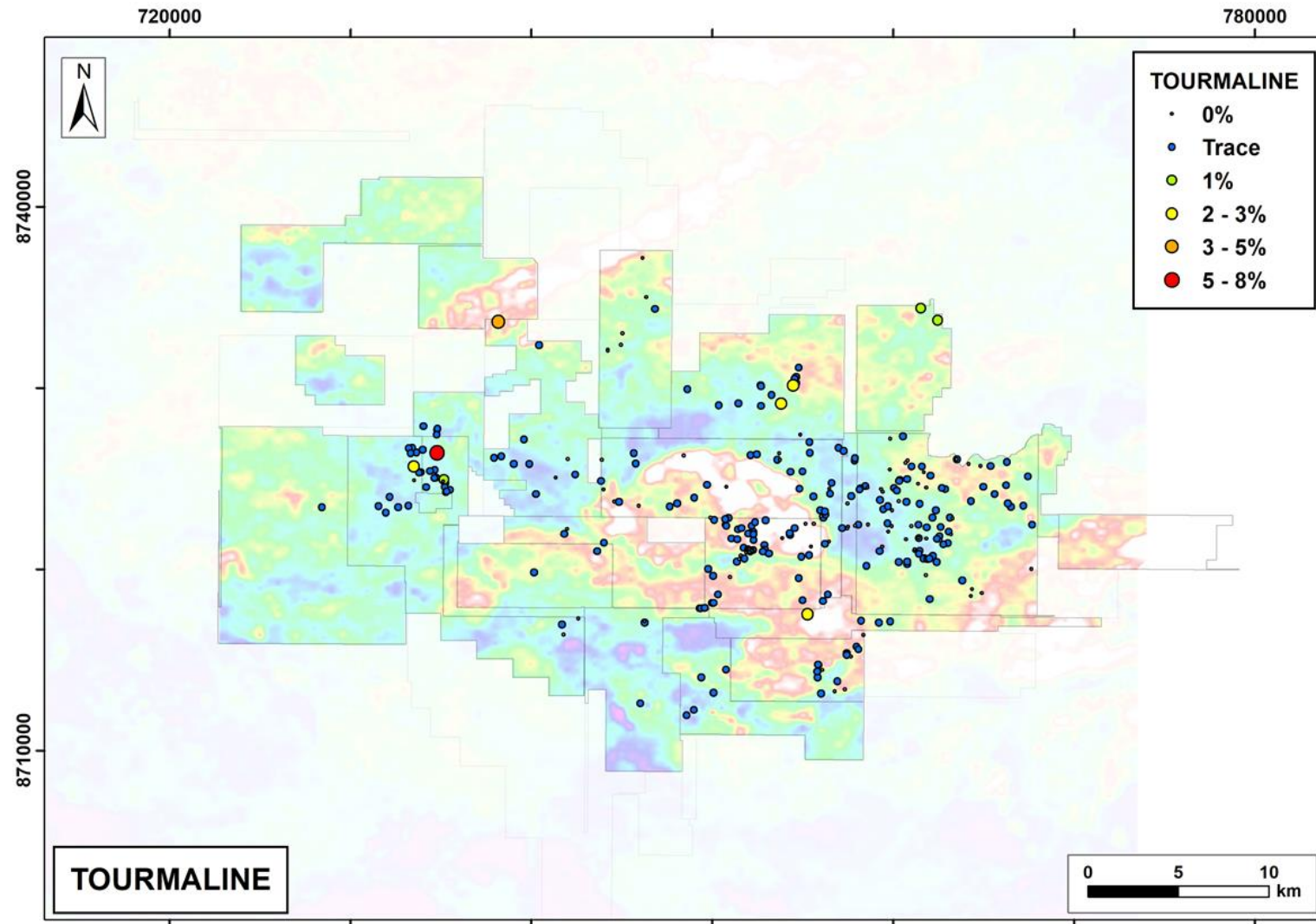
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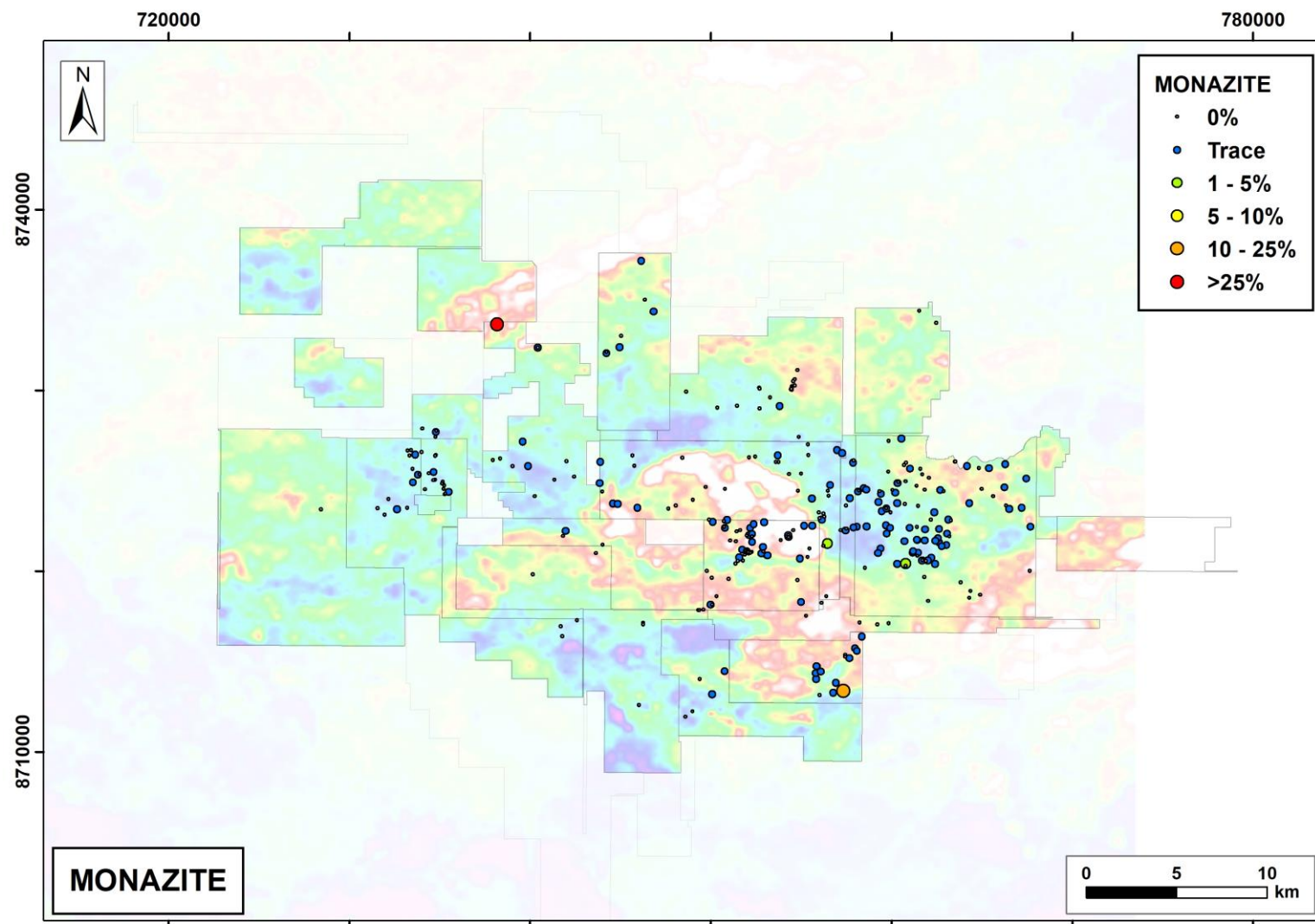
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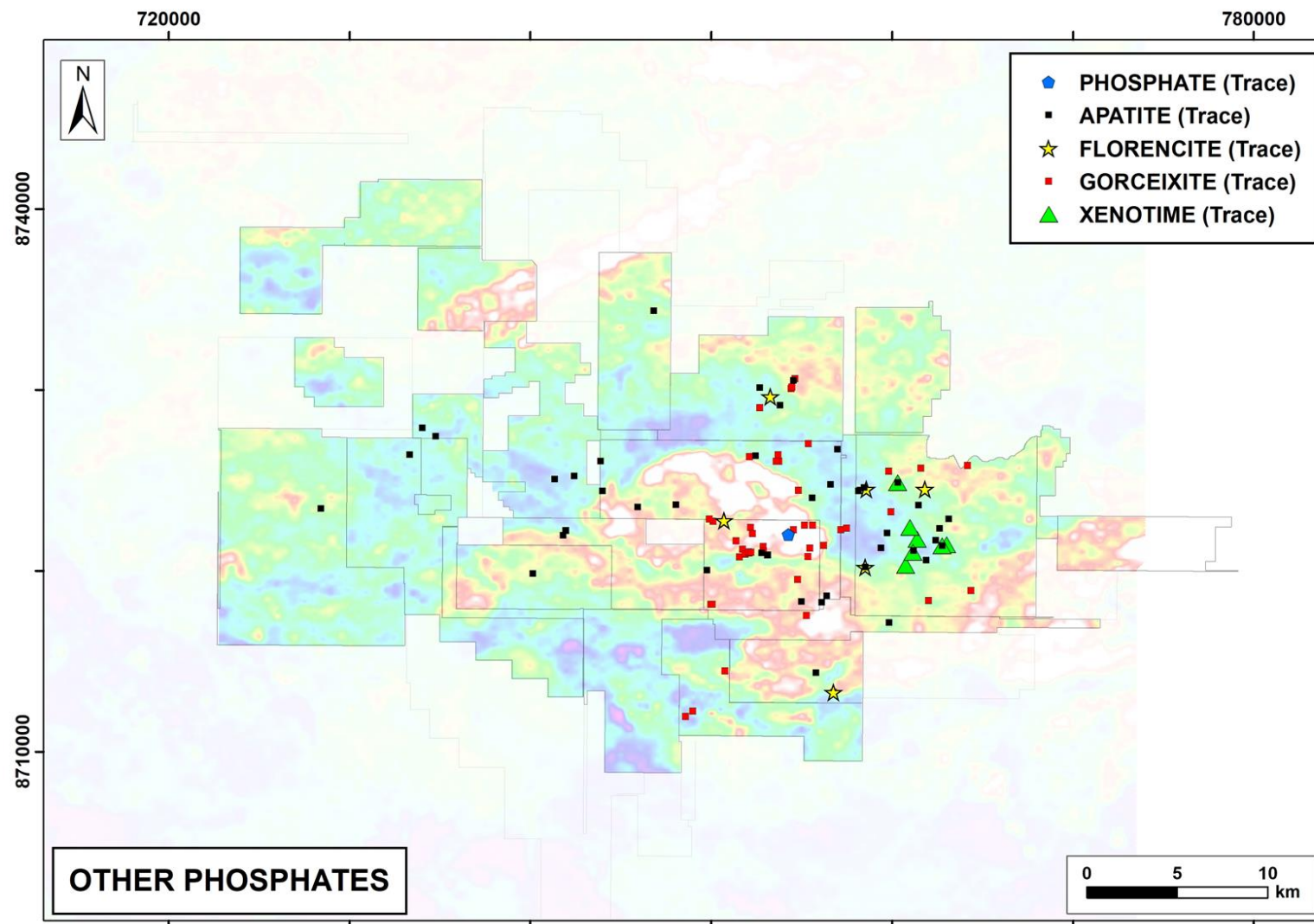
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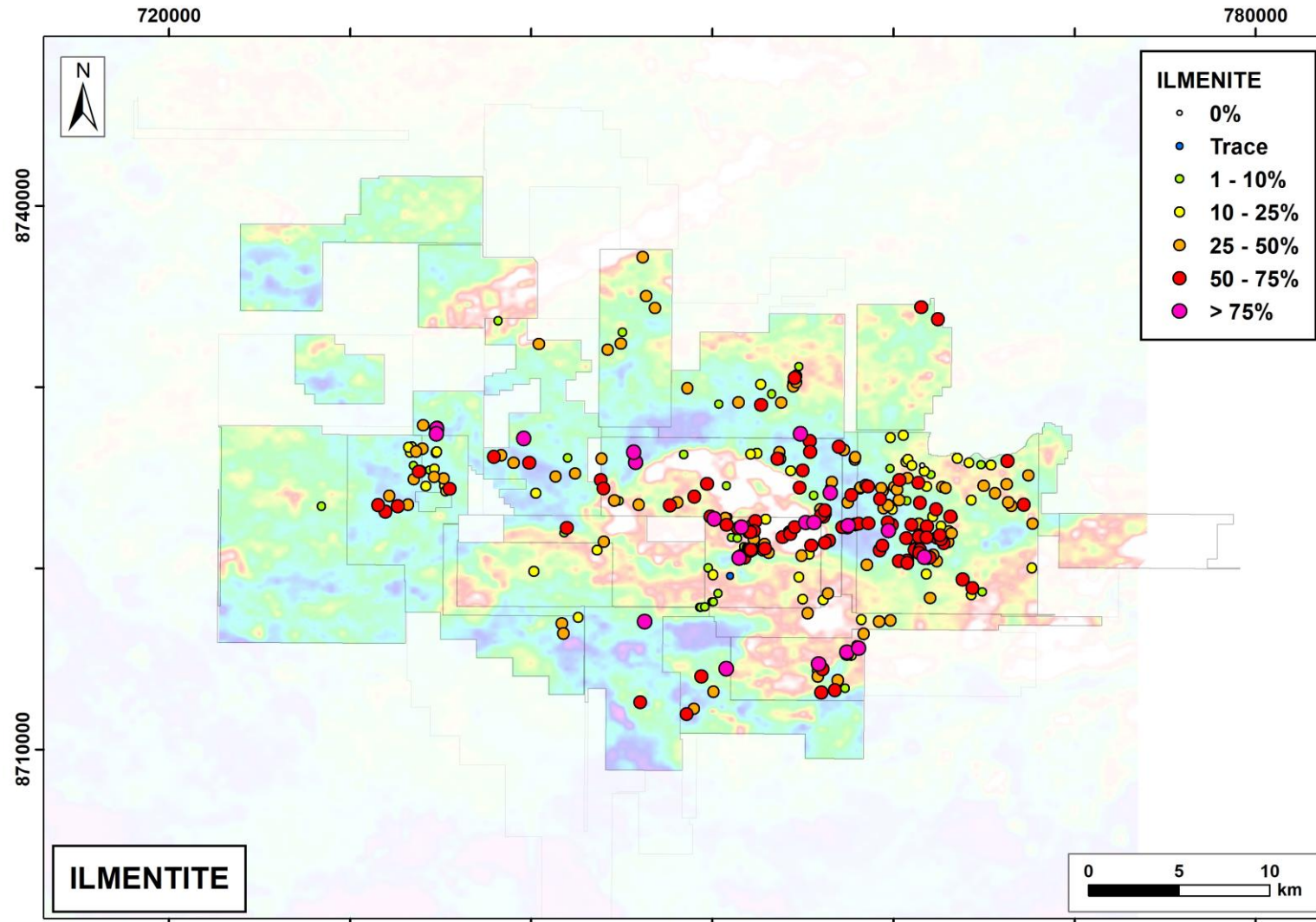
STREAM SEDIMENT DATA: MONAZITE



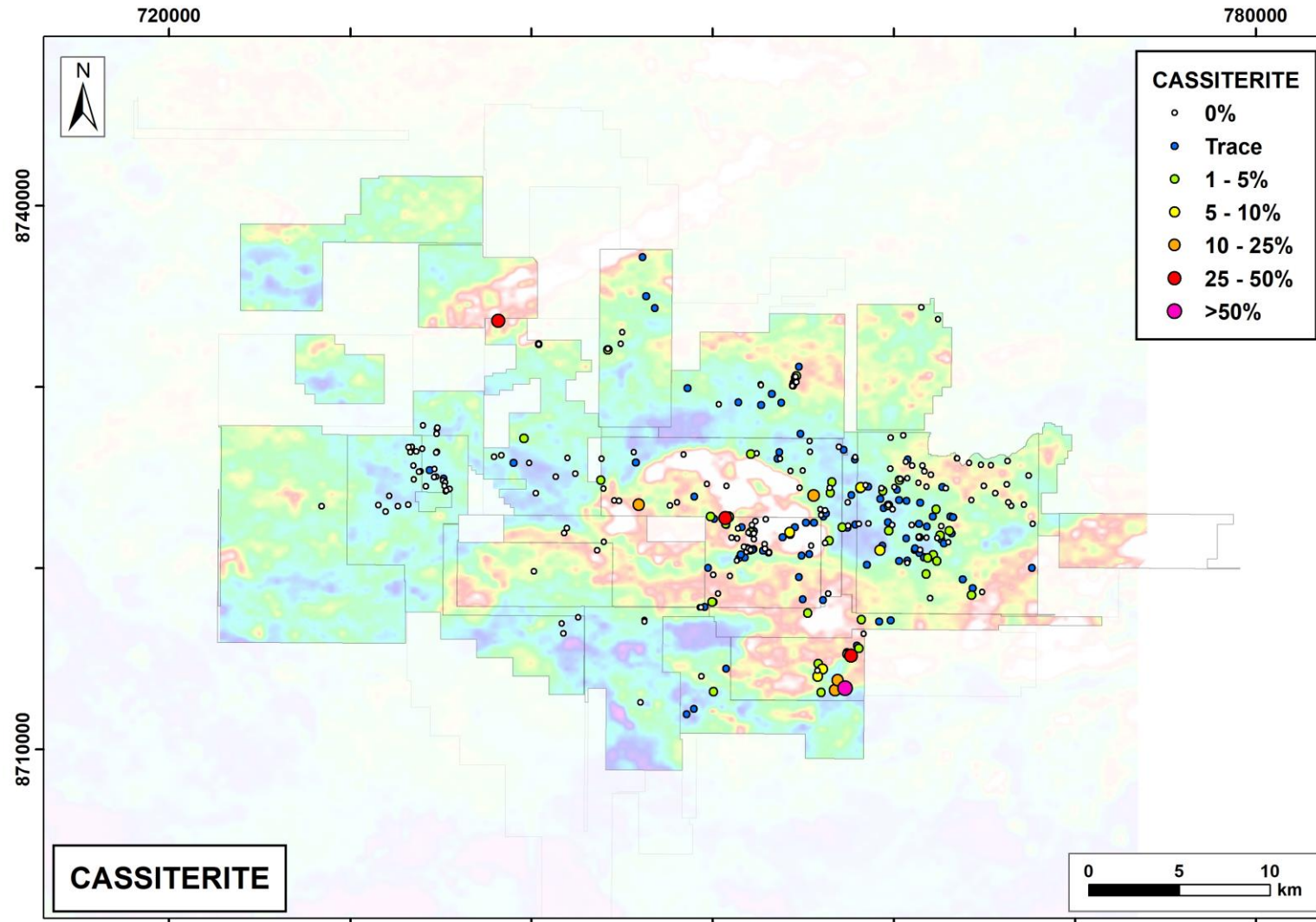
STREAM SEDIMENT DATA: OTHER PHOSPHATES



STREAM SEDIMENT DATA: ILMENITE



STREAM SEDIMENT DATA: CASSITERITE



GENERAL OBSERVATIONS

- Two prominent gold in stream anomalies are evident at Gazeta on the western flank of the project area, and Coice de Cobra to the east
- Although copper minerals are often leached by weathering, traces of cuprite and chalcopyrite were detected in the Coice de Cobra Area
- Molybdenite was seen at both the Gazeta (trace levels) and the Coice de Cobra sites (with one concentrate up to 10% molybdenite)
- Oxide Phases show variable distributions:
 - Rutile is a high-P-T titanium oxide mineral polymorph, and is present in both porphyry and IOCG systems. It shows the highest concentration and clustering in the Coice de Cobra area, where it forms up to 34% of the heavy mineral concentrate. In the Gazeta area it peaks at 13%. Subsidiary peaks in the 10-20% range are clustered elsewhere in the project area;
 - Hematite is recorded generally at trace levels. Where present in more frequently is detected in the Coice de Cobra and Gazeta areas. Peak values of 5% occur in two sample – one at Coice de Cobra, and another a few kilometres SW of the Gracioso prospect. One sample at Coice de Cobra recorded trace levels of specular hematite;
 - Trace to low percentile levels of indicator minerals Titanite, Thorite, and Spinel occur at Coice de Cobra and Gazeta regions, and locally in adjacent structural extensions. Gahnite is also locally present;
 - Magnetite is present at some level in the majority of samples. At Gazeta, it is more generally abundant. On the eastern side of the project area, there appear to be some subtle eastward and westward gradients on concentration from the flank of the central radiometric low. Scattered peaks occur elsewhere; and
 - Imenite is a common accessory mineral in the heavy mineral fraction. Although common, in a number of samples it is low, particularly in the NW of the Coice de Cobra area.

OBSERVATIONS: SILICATES

- Various silicate phases used as hydrothermal indicators for gold / Cu-Au mineralization show some spatial clustering:
 - Higher Epidote concentrations are evident at Gazeta, and more variably in the Coice de Cobra area. The pattern is suggestive of a hydrothermal influence, as opposed to regional metamorphism where a more even distribution might be expected;
 - The highest Amphibole concentrations are similarly developed in the Gazeta and Coice de Cobra region. Amphibole can form as an alteration product in both IOCG and porphyry style systems, often in association with magnetite;
 - Garnet is highest at Gazeta (peak of 10%). The peak value at Coice de Cobra is 2%, whereas elsewhere it is at trace levels;
 - Tourmaline, often an indicator of more fractionated and hydrous melts, occurs with peak values of 1-8% in the Gazeta region. It is present at trace levels elsewhere, including Coice de Cobra. Values to 2% in concentrates near Eduardo Mendes, where satellite gold counts were also evident; and
 - Zircon is present throughout the project. Proportionally less zircon is present in the Gazeta and Coice de Cobra areas, reflecting the increased abundance of other silicate and oxide phases described above. Additional studies on zircon morphology and chemistry would be required to distinguish those formed by hydrothermal and igneous processes. Studies can provide particular insights into the thermal history of the area.

OBSERVATIONS: PHOSPHATES & SULPHIDES

- Phosphate minerals are present, although at generally at low levels in the project area
 - Monazite has a relatively broad distribution. Peak values of 30% in a heavy mineral concentrate occurs on the flank of a radiometric high and likely relates to a fractionated granite phase. Isolated values of 1-15% occur on the eastern side of the project area.
 - The other phosphate minerals are present tend to be more commonly developed on the eastern margin of the project area (Apatite, Monazite, Phosphate, Florencite, Gorceixite, Xenotime). Xenotime is restricted to the Coice de Cobra area.
- Sulphides are sparse due to the tropic weathering regime. Pyrite, or partially oxidized pyrite-limonite grains, are present – generally at trace levels, but up to a peak of 6% at Gazeta. Pyrite can be an accessory mineral of both porphyry and IOCG style systems.

CONCLUSION

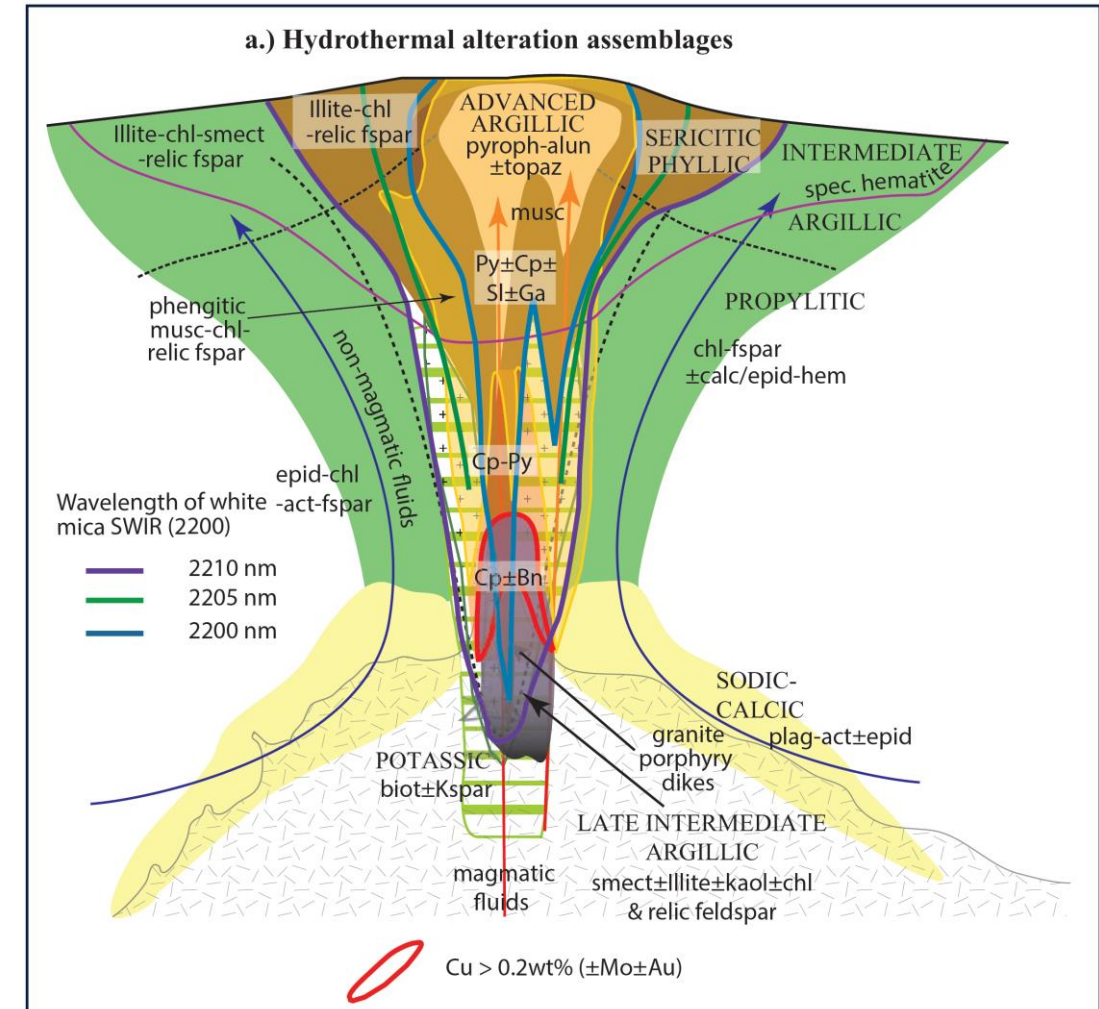
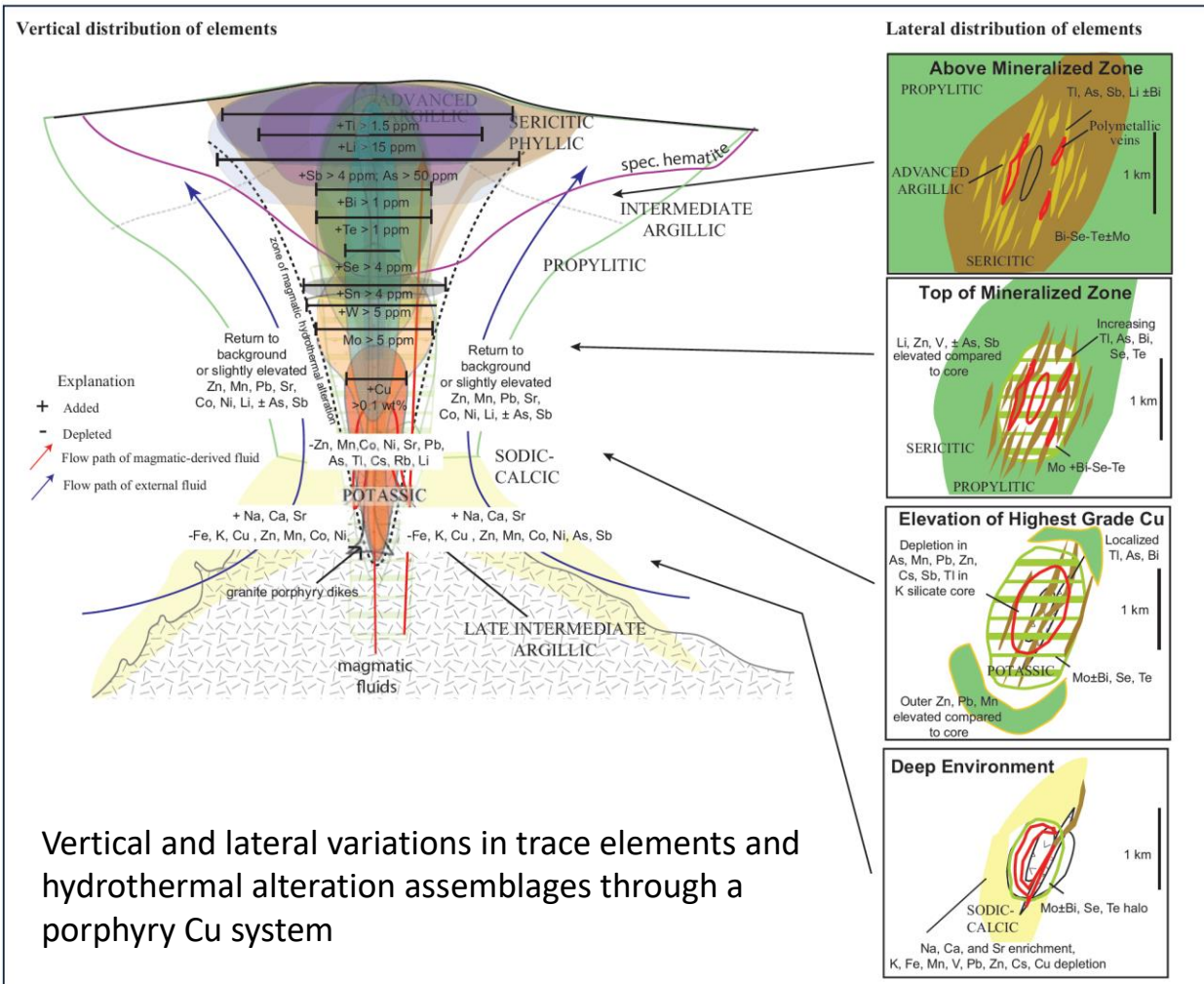


- Heavy mineral phases in the stream sediment concentrates show clustering, interpreted to reflect partitioning related to igneous and hydrothermal processes. Coupled with variation in the metal assemblages in the vein systems¹, this is consistent with the interpretation of the Espigão Project as a broad-scale, zoned polymetallic mineral system.
- The two principal gold in stream anomalies at Gazeta and Coice de Cobra to the east require further follow up subject to licence renewal, and have targets developed through initial soil sampling and initial reconnaissance exploration. Positive gold counts have also been detected in areas to the south and north within the active exploration licences which have yet to be traced to source. Further stream sampling will be required to delineate the extent of anomalous catchments, and soil sampling to target source areas. Reconnaissance stream sampling also needs to be extended to the eastern-most licence (Marafon area), to determine whether it hosts an extension of the Coice de Cobra system.
- The gold centres show some spatial correlation or overlap with mineral phases such as rutile, epidote, traces of spinel, titanite, thorite along with molybdenite and traces of copper minerals, and various phosphate phases. Hydrothermal rutile is most plentiful in sulphide-bearing deposits where it is stabilized at the expense of ilmenite. These and other mineral phases are seen in systems such as porphyry and IOCG deposit styles. Additional technical studies such as probing / mineral chemistry can assist to further understanding the nature of the mineralising system, refine the target model, and provide exploration vectors (probing may also assist in screening gossanous phases after weathered sulphides, given the tropical weathering environment).
- Away from the gold centres, concentrations of indicator minerals are locally clustered along structural corridors associated with manganese veins and iron-oxide breccias. Some corridors would benefit from an extension of the stream program, including those within more recent licences approved since 2017 when the program concluded. The manganese veins are copper-anomalous in these corridors, and an exploration objective will be to test whether these represent the shallow levels of a more diverse Cu-Au mineral system at depth.

1. Meridian News Releases of November 8, 2018; June 12, 2019.

APPENDIX

- Example of diversity of chemical and mineralogical variation in a porphyry system. From Halley, S, Dilles, JH, and Tosdal, RM (2015) Footprints: Hydrothermal Alteration and Geochemical Dispersion Around Porphyry Copper Deposits. SEG Newsletter No 100.



APPENDIX

Mineral	Formula	Qualitative Abundance ¹	Mineral	Formula	Qualitative Abundance ¹
Ore minerals			Uranium and REE minerals		
Pyrite	FeS ₂	Minor	Uraninite-pitchblende	(U,Pb,Ca,Fe,Cu,Ce,Nd,Y)O ₂	Trace
Chalcopyrite	CuFeS ₂	Minor	Coffinite	(U,P,Y,Ca,Ce,Nd,Fe)(SiO ₄) ₁₋₂ (OH) ₁₋₂	Trace
Bornite	Cu ₅ FeS ₄	Minor	Brannerite	(U,Ca,Ce)(Ti,Fe) ₂ O ₆	Trace
Chalcocite	Cu ₂ S	Minor	Zircon	(Zr,U,Th,Ca,Pb)SiO ₄	Trace
Digenite	Cu ₉ S ₅	Minor	Thorite	(Th,U,Fe,Y,P,Ca,Pb)SiO ₄	Trace
Djurelite	Cu ₃₁ S ₁₆	Minor	Thorianite	(Th,U)O ₂	Trace
Idaite	Cu ₃ FeS ₄	Sparse	Uranothorite	(U,Th,Y,P,Fe,Ca,Nd)SiO ₄	Trace
Covellite	CuS	Sparse	Bastnasite	(Ce,La,Nd,Pr,Ca)(CO ₃)F	Trace
Roxbyite	Cu ₁₁ S ₈	Sparse	Florencite	(Ce,La,Nd,Ca,Sr)(Al,Fe) ₃ (PO ₄) ₂ (OH) ₆	Trace
Carrollite	CuCo ₂ S ₄	Trace	Monazite	(Ce,La,Nd,Fe,Ca)PO ₄	Trace
Cobaltite	(Co,Fe)AsS	Trace	Synchysite	Ca(REE,Y,Fe,Th,U)(CO ₃) ₂ F	Trace
Safflorite	(Co,Fe)(As,S) ₂	Sparse	Britholite	(Ce,Ca) ₅ (SiO ₄ PO ₄) ₃ (OH,F)	Trace
Lollingite	(Fe,Co,Ni)As ₂	Sparse	Xenotime	(Y,Yb)PO ₄	Trace
Enargite	Cu ₃ As ₄	Sparse	Crandallite group	(Ce,La,Nd,Ca,Sr)(Al,Fe) ₃ (SO ₄ PO ₄) ₂ (OH) ₆	Trace
Domeykite	(Cu,Fe) ₃ As	Sparse			
Arsenopyrite	FeAsS	Sparse			
Tennantite-tetrahedrite	(Cu,Ag,Zn,Fe) ₁₂ (As,Sb) ₄ S ₁₃	Trace	Gangue minerals		
Molybdenite	MoS ₂	Trace	Hematite	Fe ₂ O ₃	Major
Sphalerite	(Zn,Fe)S	Trace	Magnetite	Fe ₃ O ₄	Minor
Galena	PbS	Trace	Chromium spinel	(Fe,Mg,Ca)(Cr,Al,Ti) ₂ O ₄	Trace ²
Stibnite	Sb ₂ S ₃	Sparse	Manganosite	(Mn,Fe,Ca)O	Sparse
Pyrrhotite	Fe _{1-x} S	Sparse	Quartz	SiO ₂	Major
Electrum	(Au,Ag,Cu,Fe) ^o	Sparse	Chlorite group	(Fe,Mg) ₅ Al(Si ₃ Al)O ₁₀ (OH,O) ₃	Major
Native copper	Cu ^o	Sparse	Biotite	K ₂ (Mg,Fe) ₃ (AlSi ₃ O ₁₀) ₂ (OH,Cl,F) ₄	Major ³
Native silver	Ag ^o	Sparse	Muscovite (sericite)	(K,Na)(Fe,Mg,Al) ₂ (Si ₃ Al)O ₁₀ (OH,F,Cl) ₂	Major
Native arsenic	As ^o	Sparse	Amphibole	(Na,K)(Ca,Na,Mn) ₂ (Fe,Mg,Al,Ti) ₅ (Si,Al) ₈ O ₂₂ (O,Cl)	Major ³
Native tellurium	Te ^o	Sparse	Orthoclase-microcline	(K,Na)AlSi ₃ O ₈	Major
Native bismuth	Bi ^o	Sparse	Plagioclase	(Na,Ca,Fe)(Si,Al) ₂ O ₈	Major ³
Calaverite	AuTe ₂	Sparse	Albite	NaAlSi ₃ O ₈	Major
Petzite	Ag ₂ AuTe ₂	Sparse	Schorl	NaFe ²⁺ Al ₆ (BO ₃) ₃ Si ₆ O ₁₈ (OH) ₄	Trace
Hessite	Ag ₂ Te	Sparse	Corundum	(Al,Fe) ₂ O ₃	Sparse
Acanthite	Ag ₂ S	Sparse	Diaspore	AlO(OH)	Sparse
Allargentum	Ag ₂ Sb	Sparse	Zunyite	Al ₁₅ Si ₂ O ₂₀ (OH,F) ₁₈ Cl	Sparse
Silver-Hg	(Ag,Hg)	Sparse	Kaolinite	Al ₂ Si ₂ O ₅ (OH) ₄	Sparse
Volynskite	Ag ₂ BiTe ₂	Sparse	Siderite	(Fe,Mn,Mg,Ca)CO ₃	Major-minor
Bismocite	(Bi,Fe)OCl	Sparse	Ankerite	Ca(Fe,Mg,Mn)(CO ₃) ₂	Minor
Kawazulite	Bi ₂ (Te,S) ₃	Sparse	Dolomite	Ca(Mg,Fe,Mn)(CO ₃) ₂	Minor
Wittichenite	Cu ₃ BiS ₃	Sparse	Calcite	(Ca,Mn,Fe)CO ₃	Minor
Clausthalite	PbSe	Sparse	Fluorite	CaF ₂	Major-minor
Altaite	PbTe	Sparse	Sellaite	MgF ₂	Trace
Coloradoite	HgTe	Sparse	Barite	(Ba,Sr)SO ₄	Major-minor
Tellurobismuthite	Bi ₂ Te ₃	Sparse	Celestite	SrSO ₄	Trace
Bismuthinite	Bi ₂ S ₃	Sparse	Anhydrite	CaSO ₄	Trace
Melonite (?)	NiTe ₂	Sparse	Fluorapatite	Ca ₅ (PO ₄) ₃ F	Trace
Cuprite	Cu ₂ O	Sparse	Rutile	TiO ₂	Trace
Tenorite	CuO	Sparse	Ilmenite	(Fe ²⁺ ,Mn)TiO ₃	Sparse
Scheelite	CaWO ₄	Sparse	Ilmenorutile	(Ti,Nb,Fe ³⁺) ₃ O ₈	Sparse
Wolframite	(Fe,Mn)WO ₄	Sparse	Sphene	CaTiSiO ₅	Trace ³
Cassiterite	SnO ₂	Sparse			

Minerals identified via optical microscopy, scanning electron microscopy, or XRD

¹ Relative abundances: major > minor > trace > sparse

² Mineral found in the minor rock units (bedded clastic facies rocks and mafic-ultramafic dikes)

³ Igneous mineral in the Roxby Downs Granite

- **Left:** Example of diversity of mineral assemblages recognized in IOCG system. From Kathy, E, McPhie, J. and Kamenetsky, V. (2012) Chapter 11: Geology and mineralogical zonation of the Olympic Dam iron oxide Cu-U-Au-Ag deposit, South Australia. Society of Economic Geologists Special Publication 16, Geology and Genesis of Major Copper Deposits and Districts of the World: A Tribute to Richard H. Sillitoe. pp. 237–267.
- Below: From Fabris A: (2019) Alteration trends and geochemical characteristics of IOCG deposits in the Olympic Cu Au Province. Geological Survey of South Australia Presentation. Iron Oxide - Copper-Gold Mineral Systems Workshop

