Ayawilca Zinc-Silver-Tin Deposit, Peru
Learnings in the exploration for CRDs

Smedg presentation: 22nd June 2023

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Tinka Resources Limited

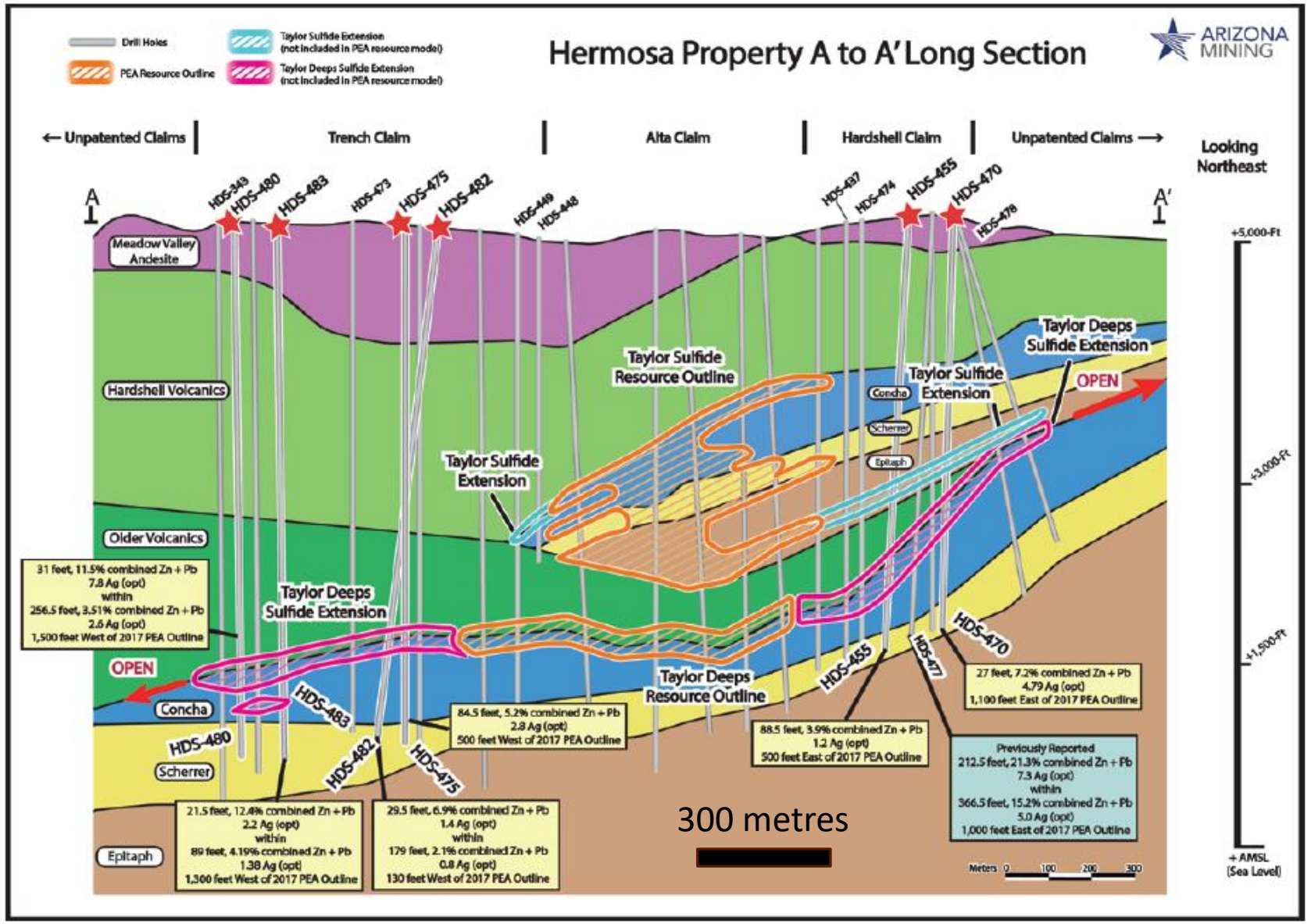
What is a CRD (Carbonate Replacement) Deposit?

- Key characteristics:
  - Typically **zinc-rich** sulphide deposits hosted in **limestones** with lead and silver (± Cu, Au, or Sn).
  - Size and grade: Typically **high to very high-grade Zn grades**, irregular bodies form moderate to large deposits.
  - Geometry & scale: Flat bodies ('mantos') and ribbons, chimneys, pipes, veins – **can be elongated over several km.**
  - Intrusions: Many CRDs have **no known intrusions** (though their presence is inferred due to alteration/geochem).
  - Replacements: **Massive to semi-massive sulphides** of pyrite, sphalerite, galena, chalcopyrite, pyrrhotite, arsenopy
  - Sulphidation: Low to intermediate sulphidation minerals (po, py, sph, dickite) predominate but high sulphidation assemblages (alunite, enargite, pyrite, pyrophyllite) can occur.
  - Volcanic domes/diatremes: Some CRD's have formed in limestones on the flanks of **dacites/rhyolite** domes.
  - **Mineralogically zoned**: copper or tin in the cores, zinc-lead zones and distal silver-carbonate-Mn veins.

What is a CRD (Carbonate Replacement) Deposit?

- Key characteristics:
  - Skarns: Are excluded from this CRD definition but some descriptions include skarns as an endmember of the CRD family.
  - Most CRD's do not contain characteristic skarn minerals (garnets, pyroxenes).
  - **CRD Examples – best examples are in Peru, Mexico, SW USA**:
    - Hermosa, Arizona (South32):
    - Cerro de Pasco / San Gregorio, Peru – (Volcan, El Brocal)
    - Ayawilca, Peru (Tinka) – subject of this talk
    - Santa Eulalia, Mexico
    - Kipushi, DRC

Type CRD examples – Hermosa, Arizona



Hermosa Deposit, Arizona

- Acquired by South32 in 2018 for US$1.3 billion.
- 101 Mt at 8.4% Zn+Pb in M&I resources at Taylor deposit at time of buy-out in 2018 and
- 63 Mt at 10% Mn in Central oxide deposit (+ Zn-Ag).
- Repeated limestones in thrust faults (blue) at depth.
- Shallow plunge from oxidised Mn-rich Ag-Zn mineralization near surface (plunging to west).
- No intrusions.

Source: Arizona Mining (2018)

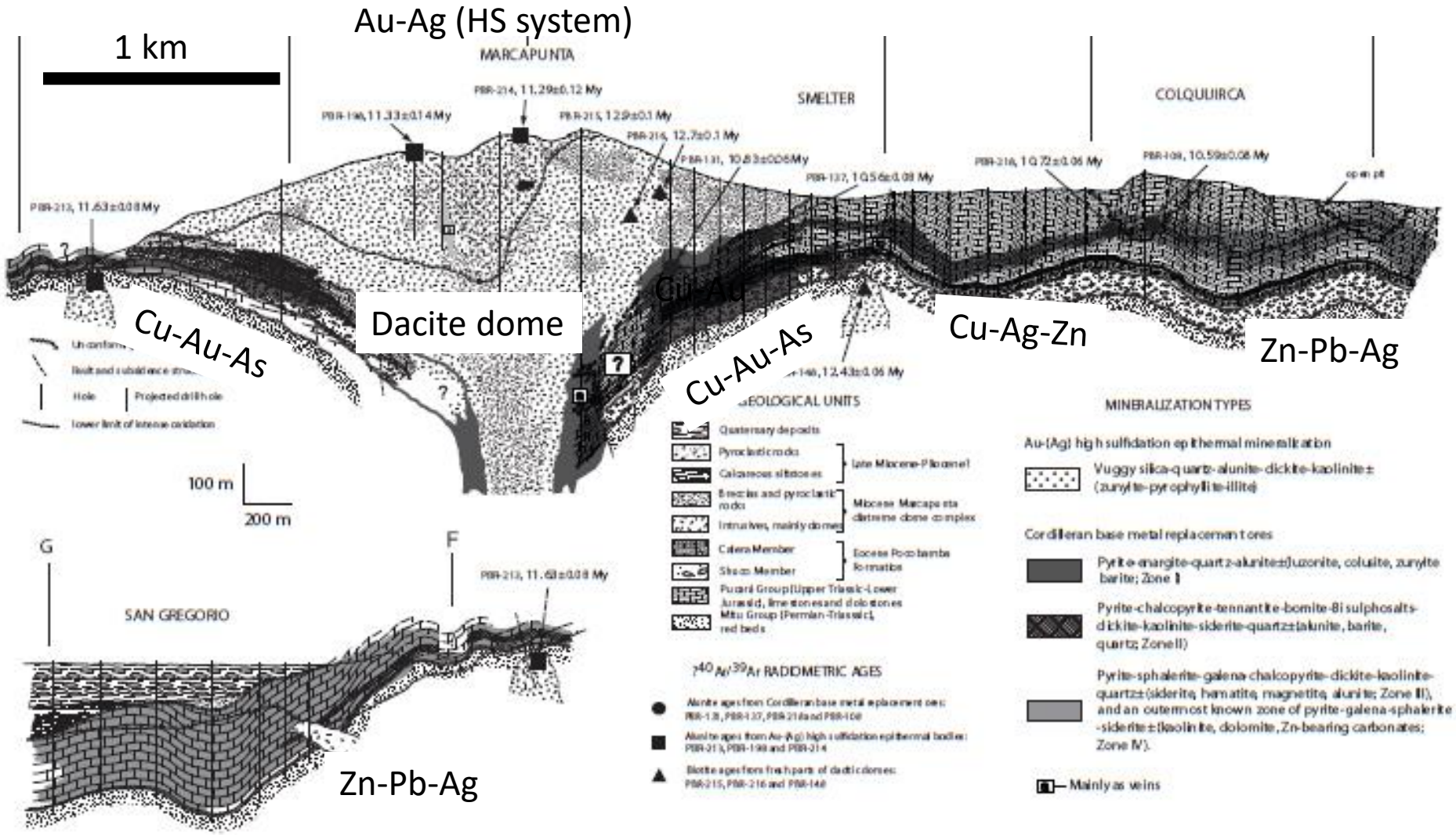
Type CRD examples – Marcapunta – Colquijirca, Peru

Marcapunta Sur

Inferred resources (2019)
44.4Mt @ 0.5% Au, 0.1% As

San Gregorio

Inferred resources (2019)
80Mt @ 5.2% Zn, 1.5% Pb, 10g/t Ag



Source: Bendezu (2007) *Note: vertical exaggeration 2:1*

CRDs can provide attractive economics

- Comparative economic metrics between VMS, CRD and Cu Porphyry mines

Parameter	Unit	Average Porphyry Mine	Average VMS Mine	Average CRD Mine
Average CuEq Head Grade	%	0.46%	3.50%	3.60%
Average Annual CuEq Produced	ktpa	316	25	30
Cash Operating Costs	$/t milled	$17.50	$87.38	$78.20
Development Capex				
Initial Capex	MUS$	$6,138	$264	$368
Sustaining Capex	MUS$	$3,037	$208	$182
Closure	MUS$	$60	$20	$20
Total Capex	MUS$	$9,235	$492	$570
Capital Intensity - CuEq produced basis	$/CuEq t	$19,445	$10,665	$12,413
Stifel Cash Costs	$/CuEq lb	$2.42	$2.12	$1.81
Stifel AISC	$/CuEq lb	$2.51	$2.44	$2.06
Stifel AIC	$/CuEq lb	$3.00	$2.80	$2.58
Financial Metrics				
NPV (8%)	MUS$	$2,691	$251	$355
IRR	%	13.7%	27.6%	28.5%
Payback	years	8	5	5
NPV/Initial Capex		0.44	0.95	0.96

Source: Stifel estimates, CapIQ

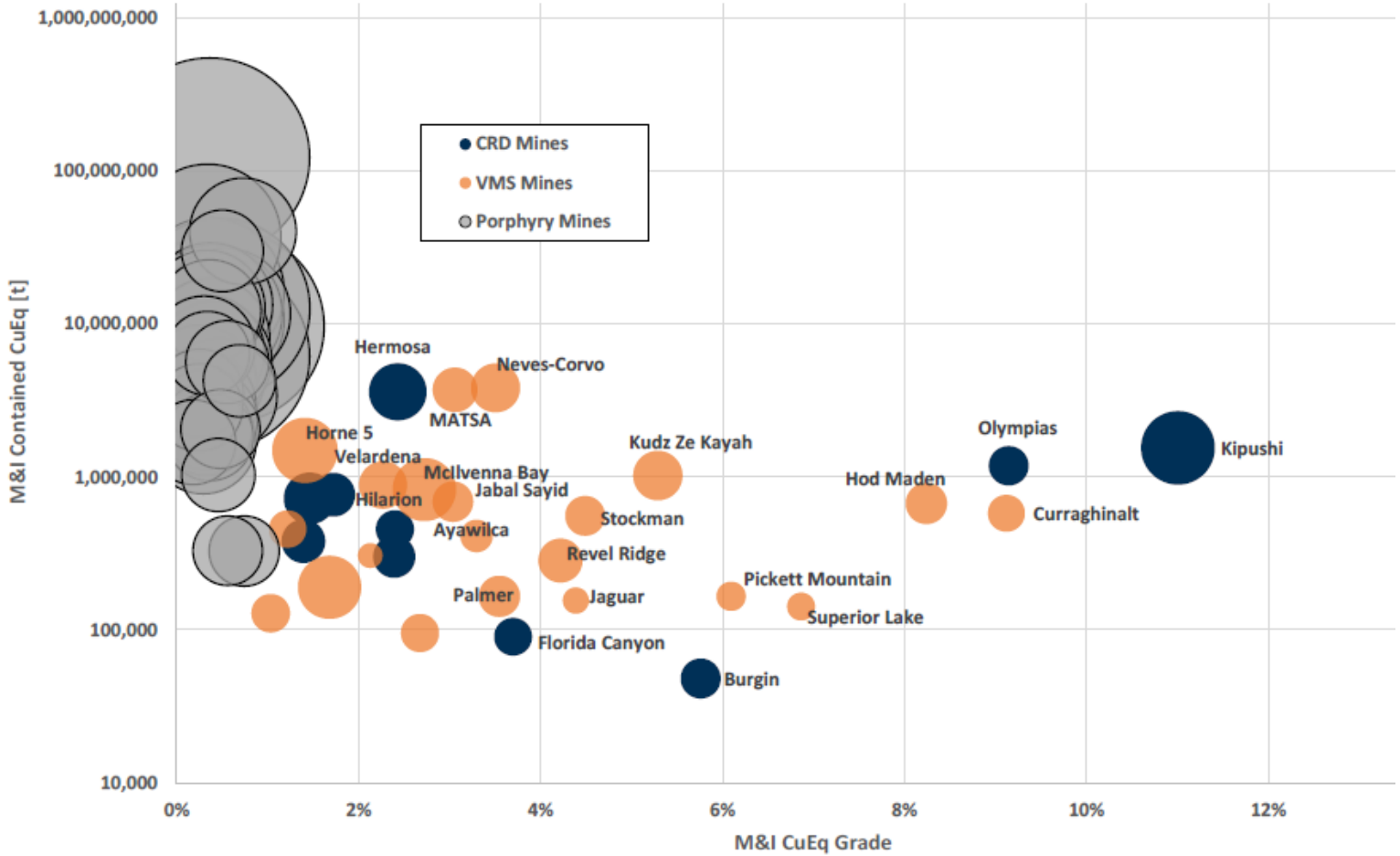
CRDs can provide:

- A manageable-scale project for a developing company to be able to finance and construct.
- Profit margins are typically robust.
- IRR values for CRD deposits are typically attractive (>25%).
- Payback period for CRDs is shorter than for porphyries.

Cu porphyry mines:

- NPVs are much higher, but the initial capital costs for porphyries are huge.
- Life of Mine is typically measured in decades due to the large size of deposit.

Grade of CRDs vs Porphyries



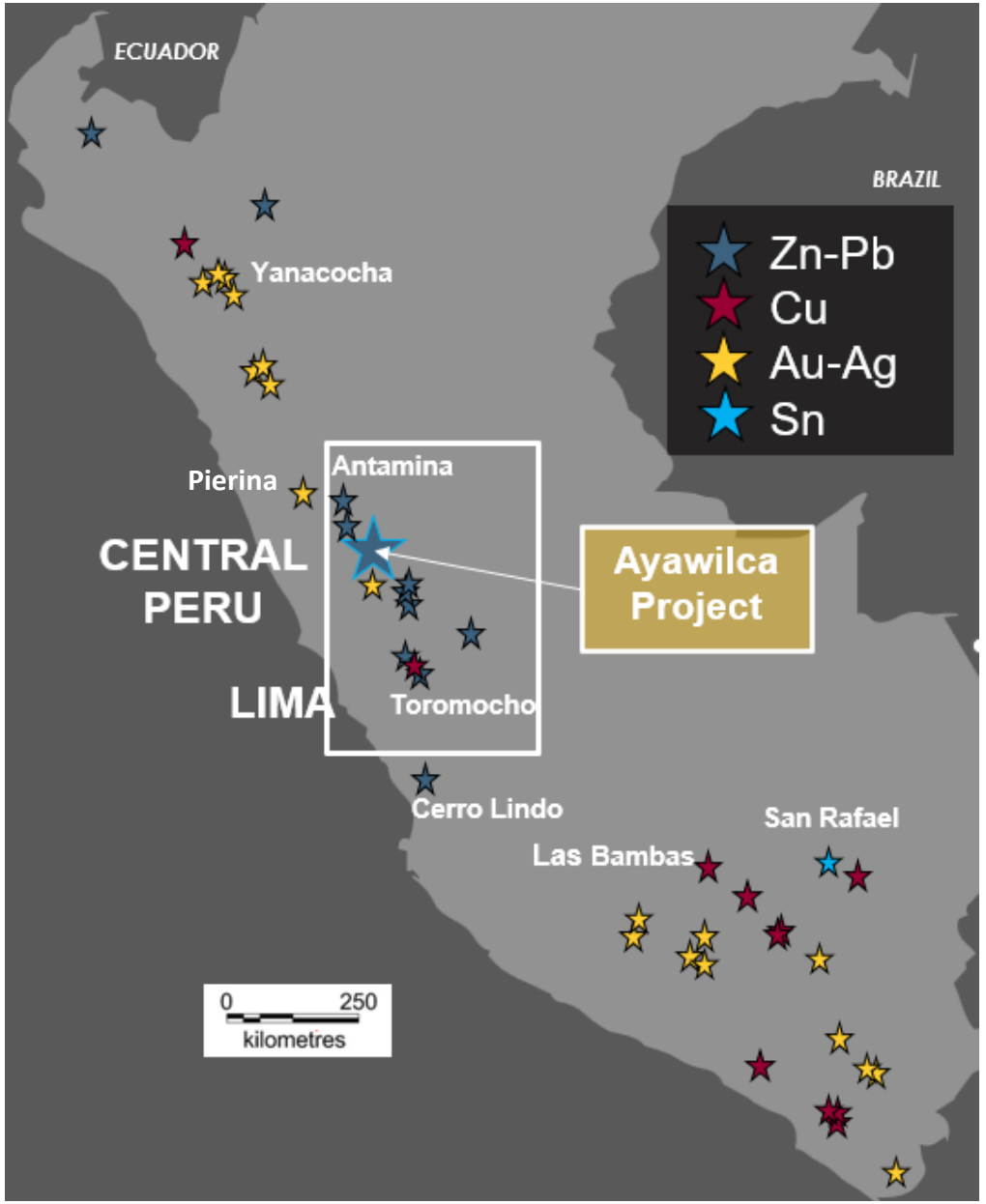
Source: Stifel, 2023

- CRD av. grades are ~ 3.5% CuEq (according to Stifel 2023) but are highly variable.
- Some deposits have exceptional grade.
- Porphyry av. grades are ~0.65% Cu (higher if Au is present).

Peru: world-class mining belt

Peru is a world mining leader in numerous commodities:

- 2nd in global **copper** production from several porphyry deps in the south of the country and the Antamina skarn deposit
- 3rd in global **zinc** production – from CRD, skarn & VMS deps
- 3rd in global **silver** production – from CRD, skarn, epithermal, VMS deps
- 1st in South American **gold** production – epithermal, porphyry deps
- 1st in South American **tin** production – sheeted vein

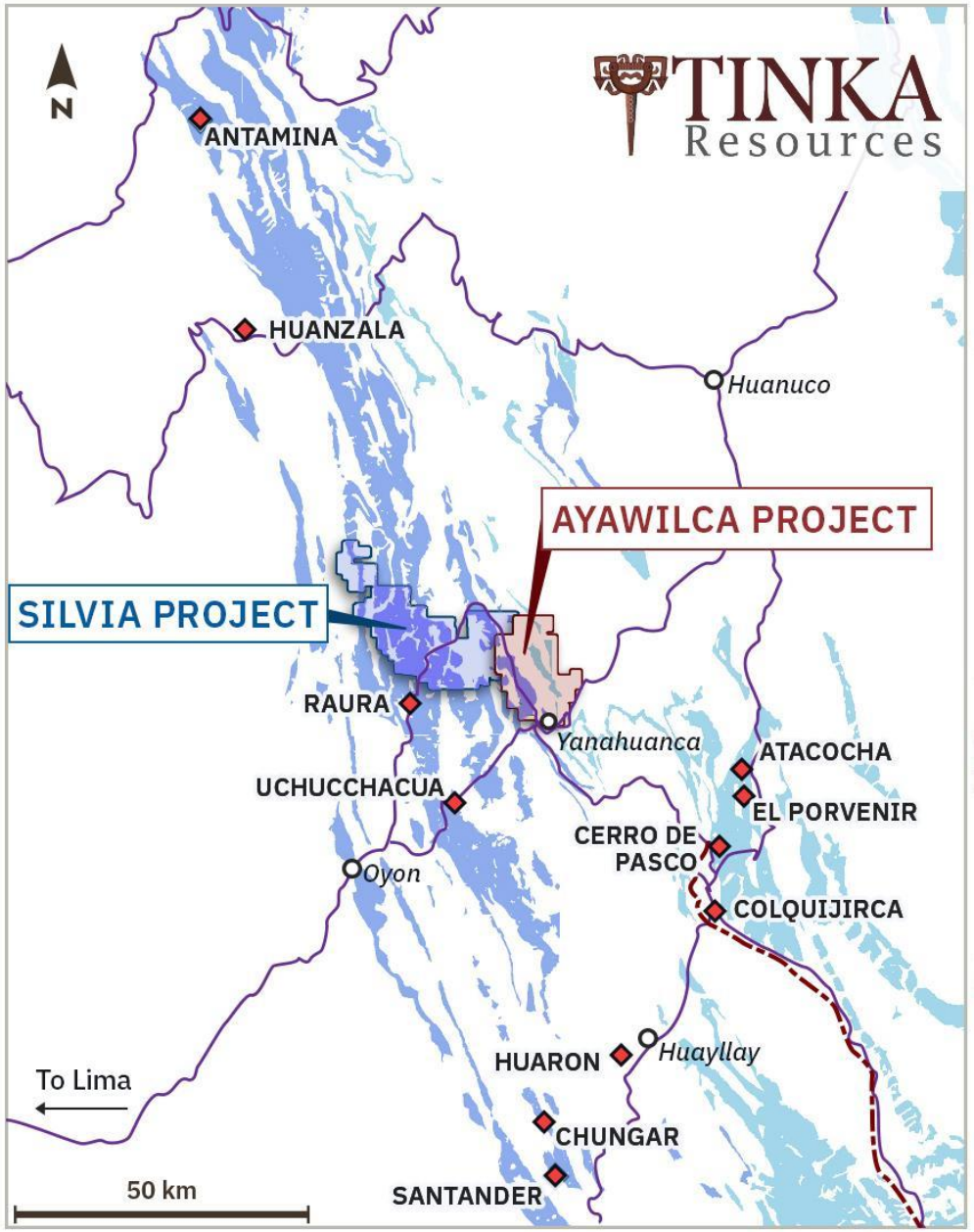


Central Peru – a major base metal province

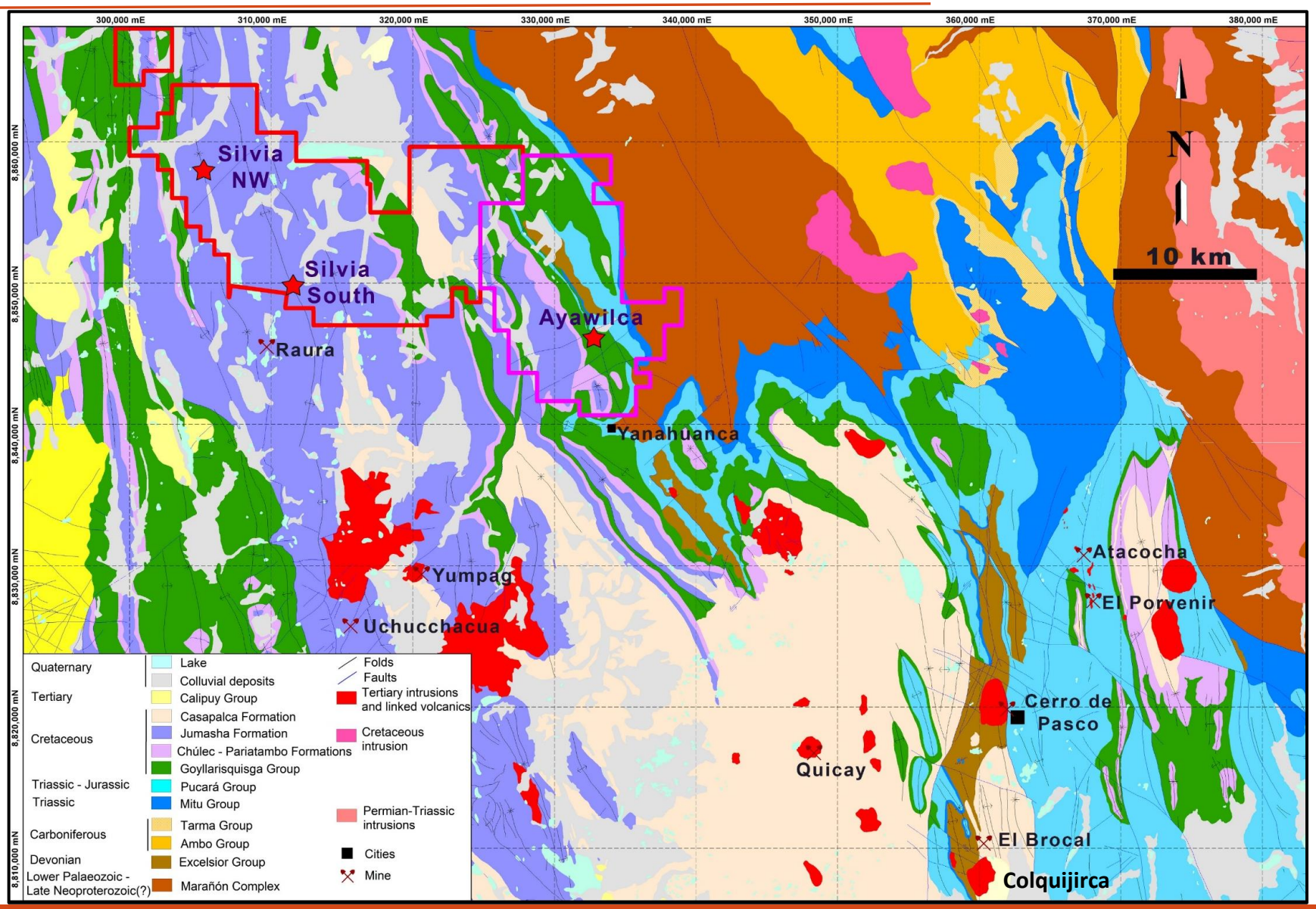
- 200 km from Lima, good access to coast / port /zinc smelter.
- From Huanuco to Ayawilca is a 3 hour drive from airport.
- 15 km straight line distance to Uchucchacua mine (Buenaventura) and 40 km to Atacocha/ El Porvenir mines (Nexa).
- Ayawilca is at 4,200 masl.
- Water sources nearby.

Central Peru – Limestones key hosts

- Two important Mesozoic-age host rocks in central Peru are the Pucara limestone (Triassic) and the Jumasha limestone (Cretaceous).
- The mineralization age is much younger (10Ma – 20Ma).
- Two types of deposits:
  - **Skarns**: Formed at depths of a few km in the earth's crust **at contacts with intrusions.**
  - **CRDs:** Formed at shallow depth (epithermal) in the earth with 'distal' intrusions often not observed.
- **Largest deposits in Central Peru**:
  - Cerro de Pasco (CRD): 175Mt at 7% Zn, 2% Pb, 90g/t Ag and 50 Mt at 2% Cu (Baumgartner, 2008)
  - Antamina (skarn): ~ 2Bt @ 0.8% Cu, 0.6% Zn, 10 g/t Ag (Minera Antamina)



Regional Geology of Central Peru



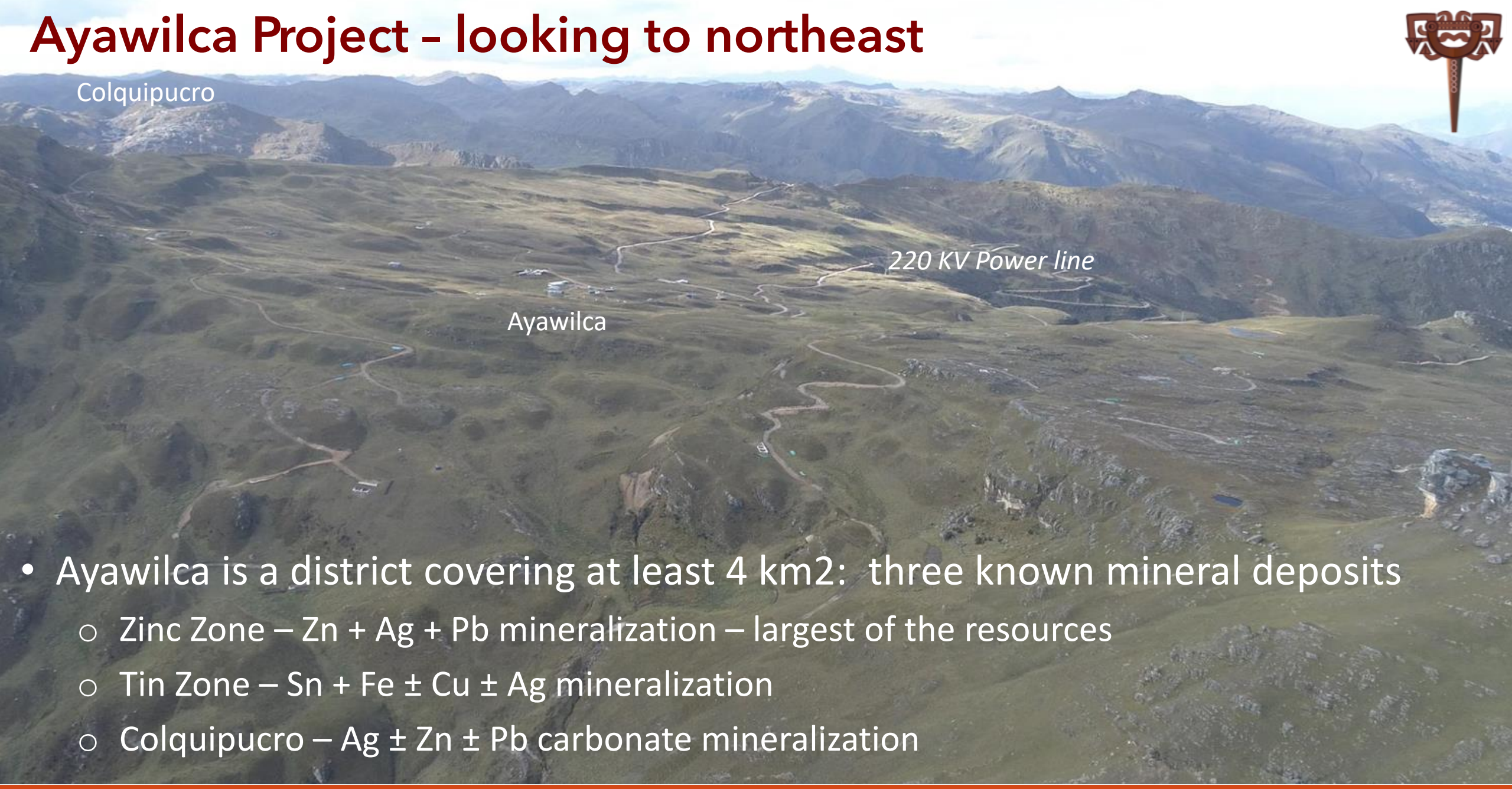
Intrusions/domes (Miocene)

Jumasha limestone (Cretaceous)

Pucara limestone (Triassic)

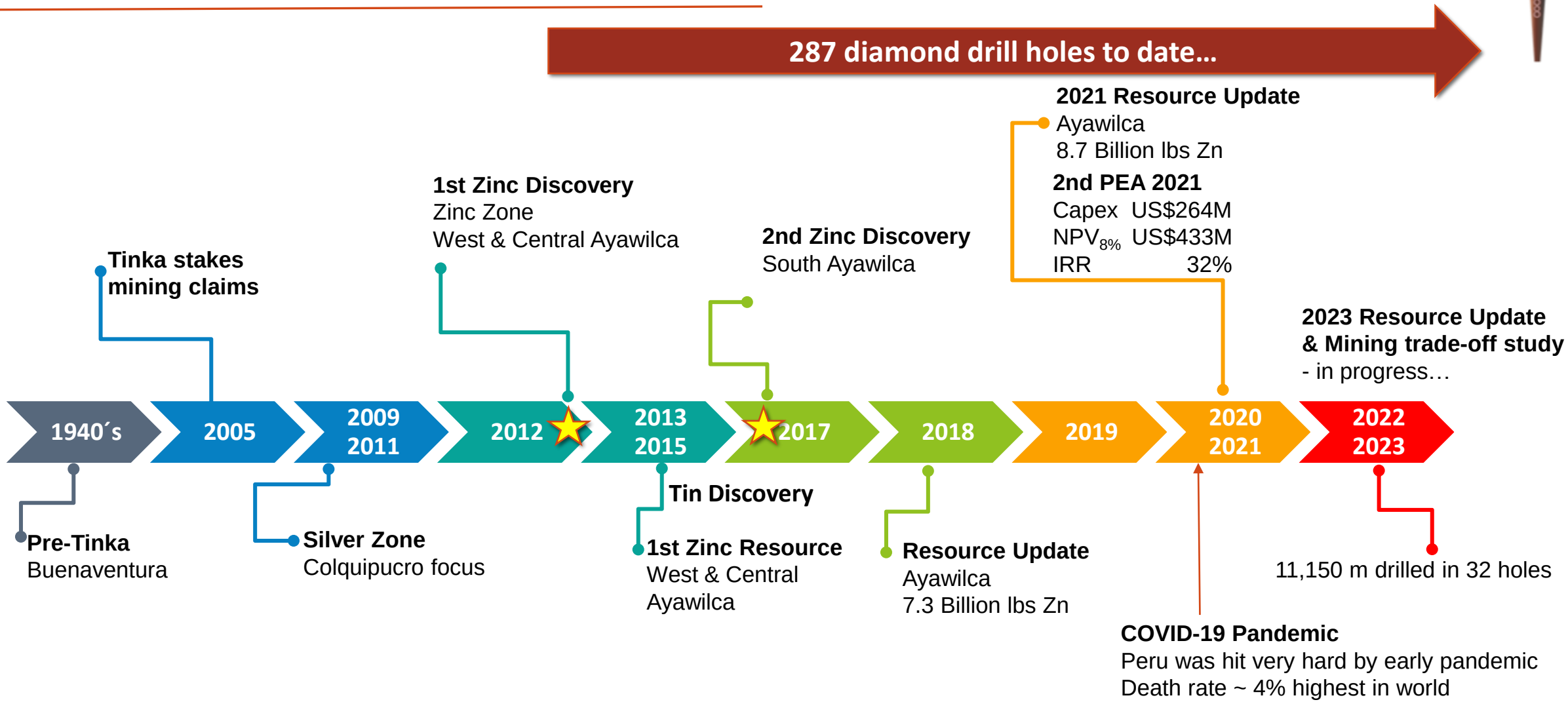
Basement rocks

Ayawilca Project – looking to northeast



- Ayawilca is a district covering at least 4 km2: three known mineral deposits
  - Zinc Zone – Zn + Ag + Pb mineralization – largest of the resources
  - Tin Zone – Sn + Fe ± Cu ± Ag mineralization
  - Colquipucro – Ag ± Zn ± Pb carbonate mineralization

Ayawilca - Exploration History



Ayawilca Zinc Zone – 2021 Mineral Resources

Indicated resource:

19.0 Million tonnes at:

- 7.15% zinc
- 0.22% lead
- 16.8 g/t silver

Contained metal (Indicated):

1.36 million tonnes Zinc

0.04 million tonnes Lead

10.3 million ounces Silver

Inferred resource:

47.9 Million tonnes at:

- 5.36% zinc
- 0.35% lead
- 20.0 g/t silver

Contained metal (Inferred):

2.56 million tonnes Zinc

0.15 million tonnes Lead

30.7 million ounces Silver

Notes:

1. *Cut-off for resources: US$55/t*
2. *Metal price assumptions were, US$1.20/lb Zn, US$22/oz Ag, and US$0.95/lb Pb. Metal recovery assumptions were, 92% Zn, 85% Ag, and 70% Pb. The NSR value for each block was calculated using the following NSR factors; US$16.23/% Zn, US$0.27/g Ag, and US$10.20/% Pb.*
3. *Payability is as follows; Zn 84%, Pb 94%, and Ag 47%*
4. *The NSR value was calculated using the following formula: NSR = Zn(%)*US$16.23+Ag(g/t)*US$0.27+Pb(%)*US$10.20*

Ayawilca Tin Zone – 2021 Mineral Resource

Inferred resource:

8.4 million tonnes @ 1.02% tin

Contained metal (Inferred):

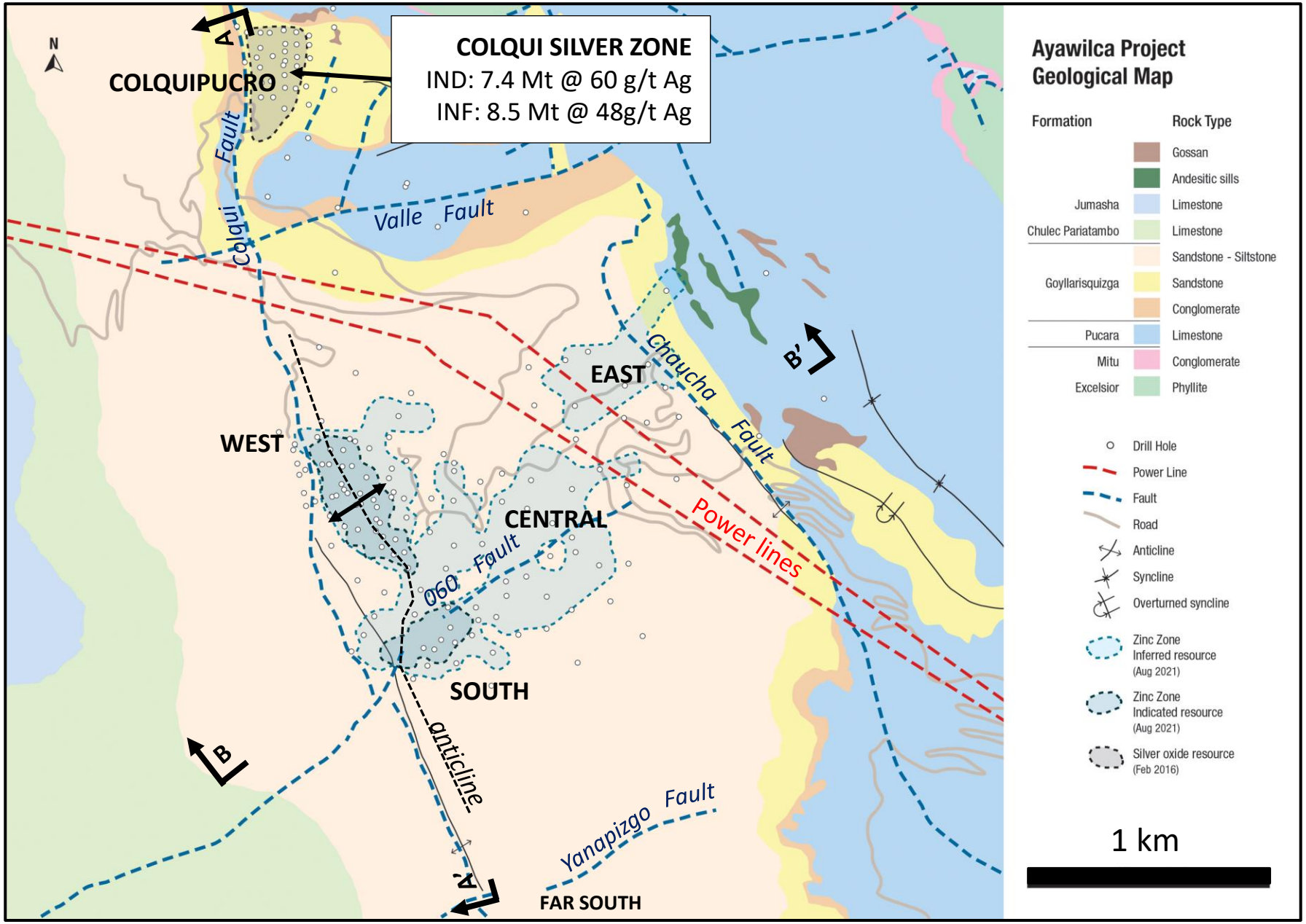
84,000 tonnes tin

- Cassiterite is the dominant tin mineral - can be separated by gravity

Notes:
1. *CIM (2014) definitions were followed for Mineral Resources.*
2. *Mineral Resources are reported above a cut-off grade NSR value of US$60/t.*
3. *The requirement of a reasonable prospect of eventual economic extraction is met by having a minimum modelling width for mineralized zones of three metres, a cut-off based on reasonable input parameters, and continuity of mineralization consistent with a potential underground mining scenario.*
4. *The NSR value was based on estimated metallurgical recoveries, assumed metal prices, and smelter terms, which include payable factors, treatment charges, penalties, and refining charges. Metal price assumptions were, US$11.00/lb Sn. Metal recovery assumptions were, 70% Sn for blocks with Sn:Cu ≥ 5 and 40% for Sn:Cu < 5. The NSR value for each block was calculated using the following NSR factors, US$141.64 per % Sn for blocks with Sn:Cu ≥ 5 and US$80.94 for blocks with Sn:Cu <5.*
5. *The NSR value was calculated using the following formulae: If Sn:Cu ≥ 5: US$NSR = Sn(%)*US$141.64, If Sn:Cu < 5: US$NSR = Sn(%)*US$80.94*
6. *Numbers may not add due to rounding.*

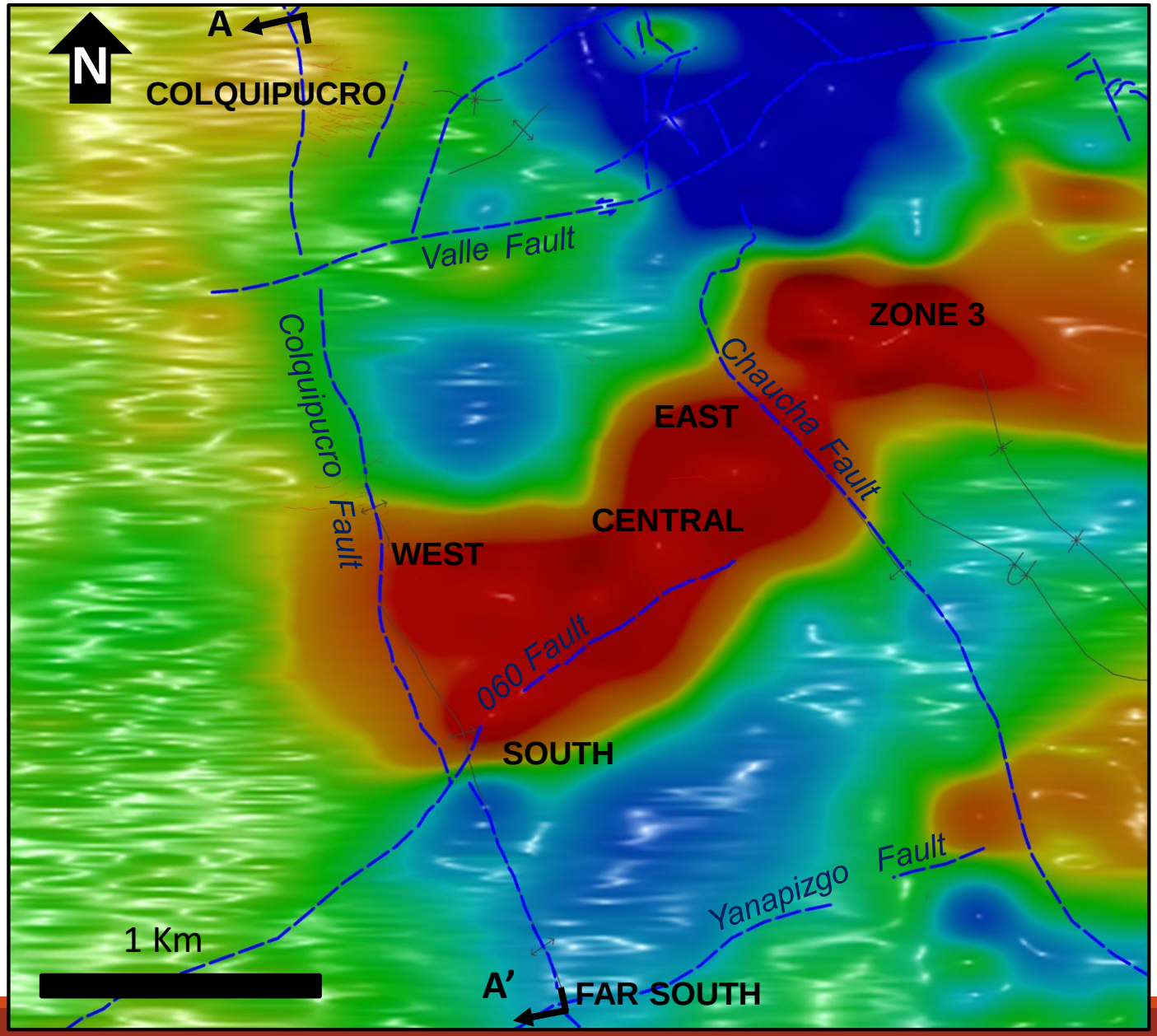
Ayawilca Geology

- The Ayawilca deposit is a “blind” discovery, lying beneath sandstone cover.
- Mineralization hosted by the Pucara limestone.
- High-grade zinc mineralization lies focused along NNW-trending Colquipucro Fault.
- Tin mineralization focused along NE trending trans-Andean structure.
- Colqui Silver Zone – outcropping mineralization at northern end has a Ag resource with abundant Mn oxides

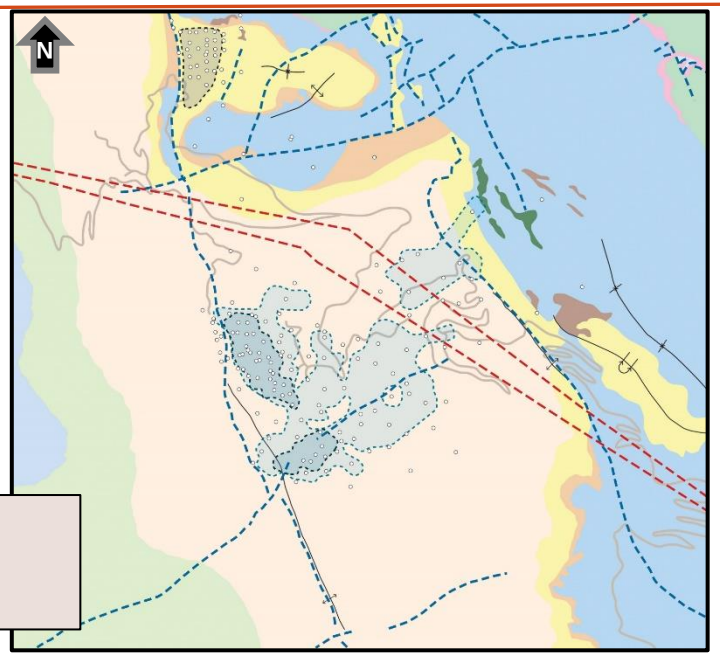


Ayawilca airborne magnetics - RTP

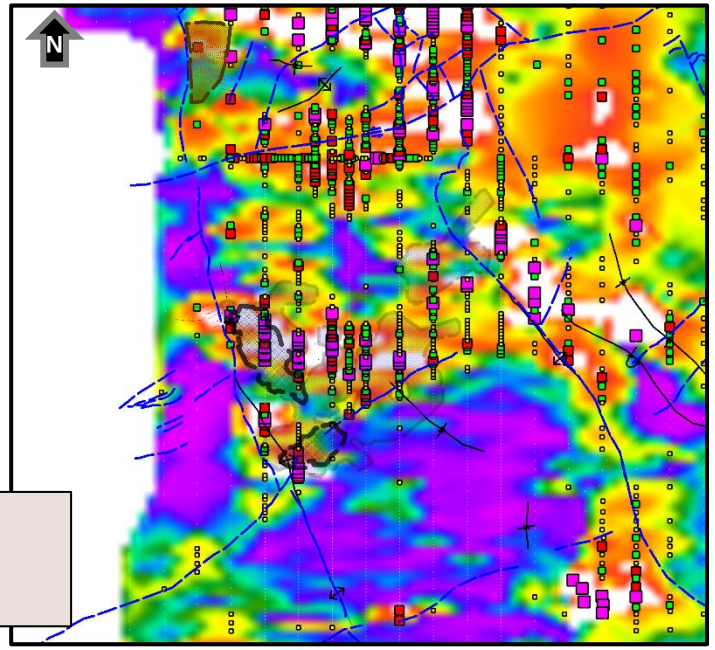
- Strong magnetic anomaly over Ayawilca along NE-SW trend (~200-300 nT in heli-borne survey)
- Magnetic anomaly caused by pyrrhotite and pre-cursor magnetite
- High-grade zinc mineralization occurs on the margins of the magnetic highs and areas of lower magnetic intensity (i.e., edges of pyrrhotite bodies)
- Two main structural trends are very important – NNW (350) and ENE (060)
- Colquipucro has no mag signature



Geochemistry and Geophysics – Mags, Gravity, Soils



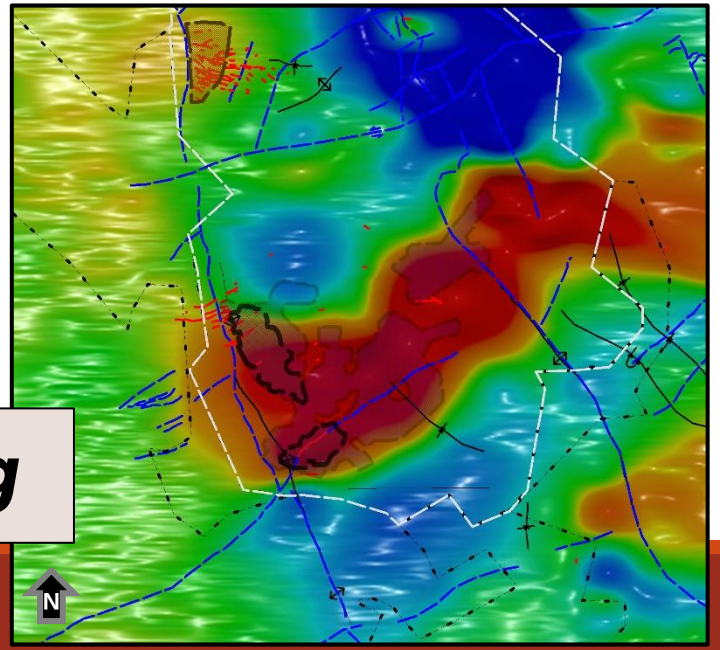
Geology



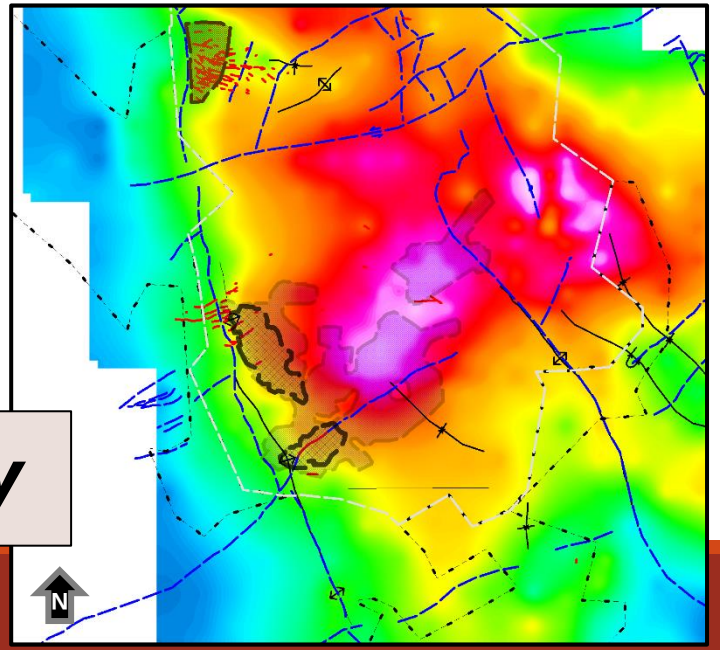
Zn Soil

Soil Samples
by Zn ppm

1,000 to	999,999	(203)
500 to	1,000	(219)
250 to	500	(436)
100 to	250	(964)
-10 to	100	(2911)



Aero Mag

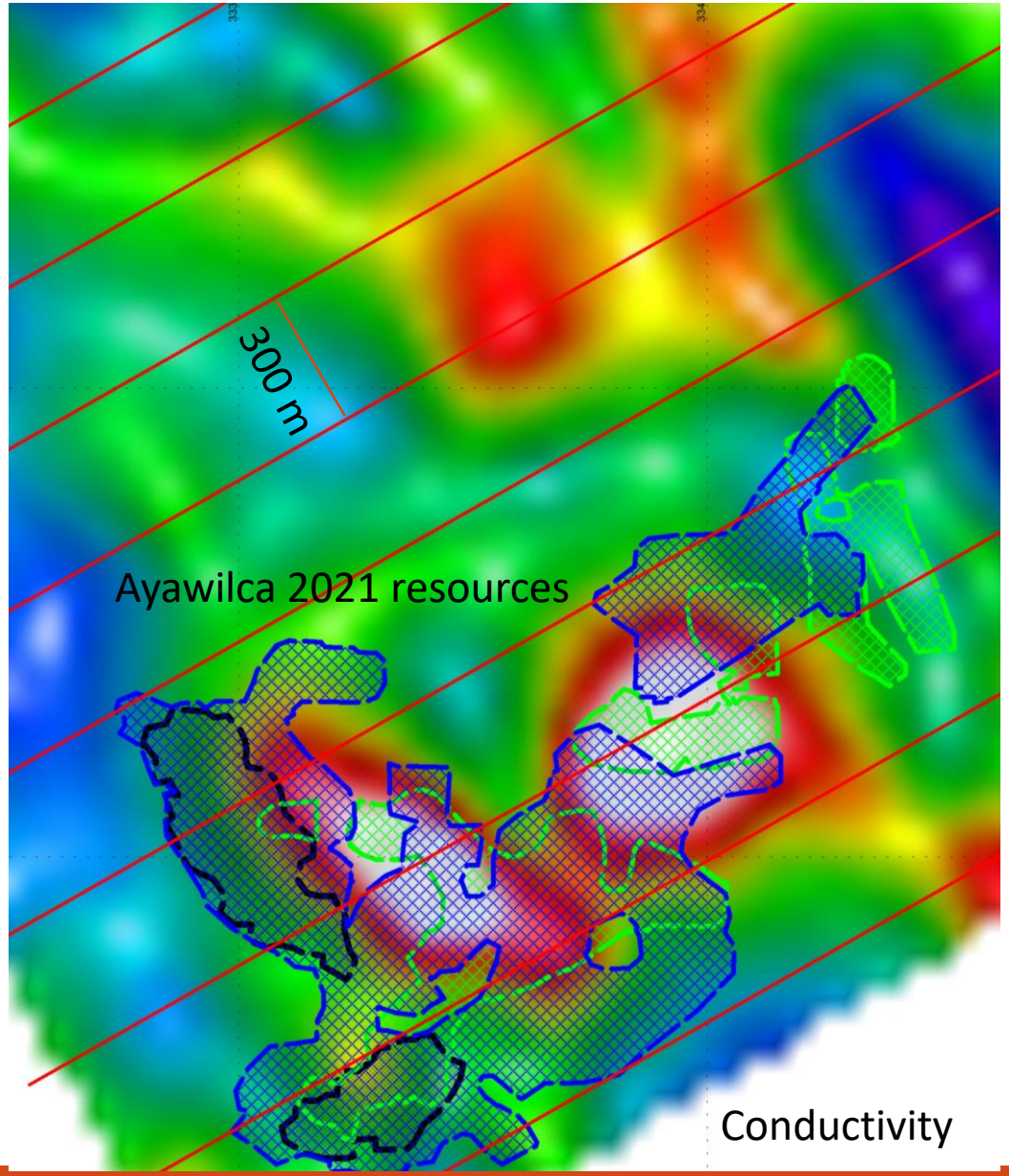


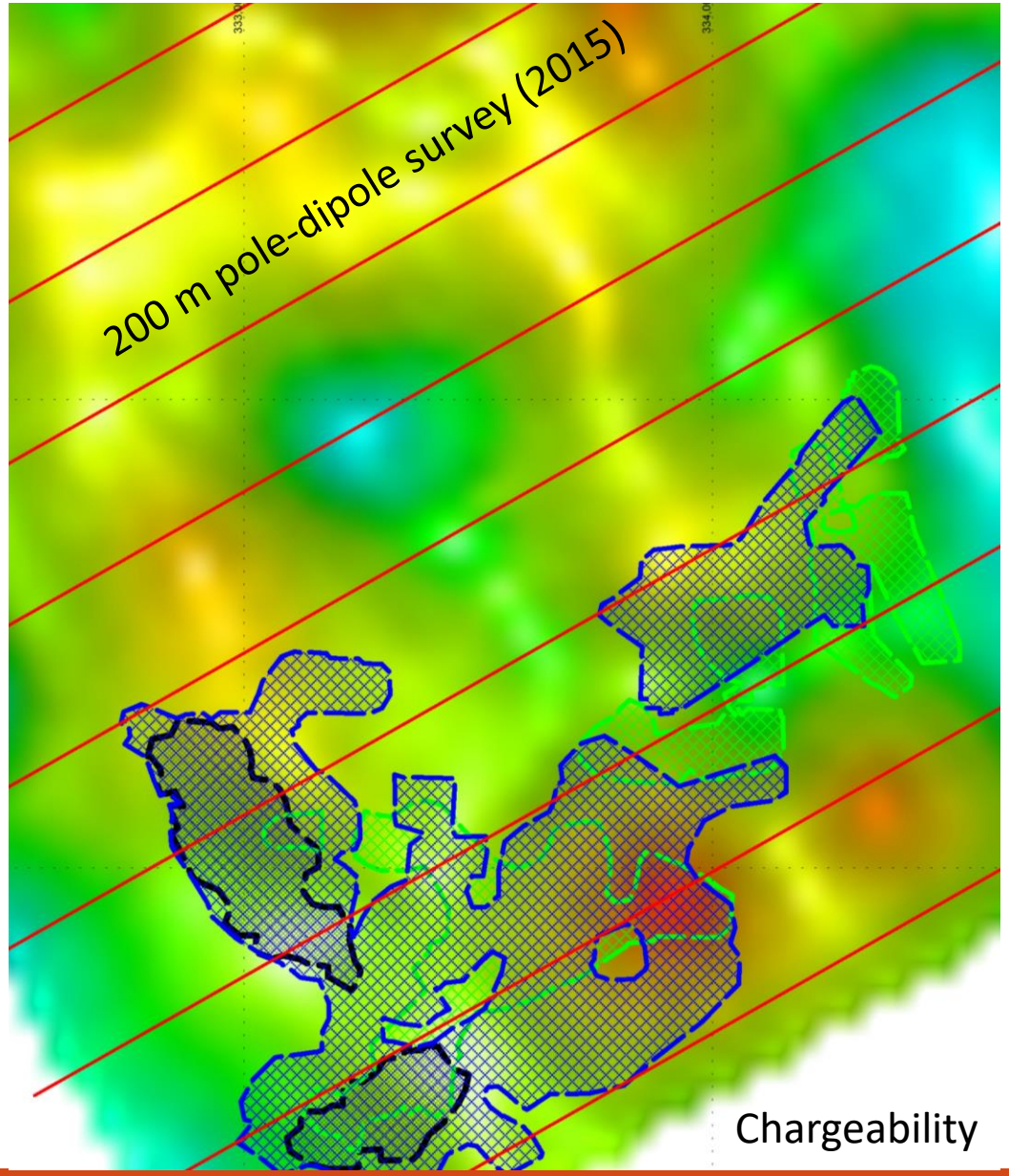
Gravity

20-30 mgal bouguer anomaly

1 Km

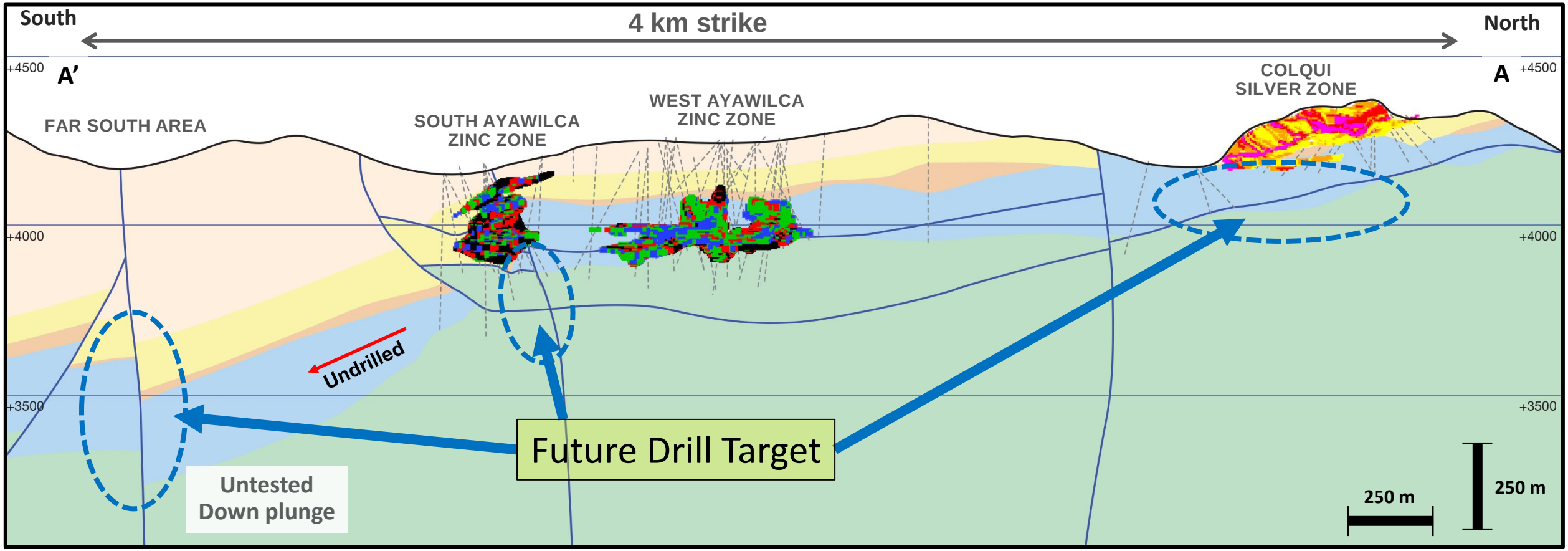
IP Resistivity and Chargeability – 350 m depth slices



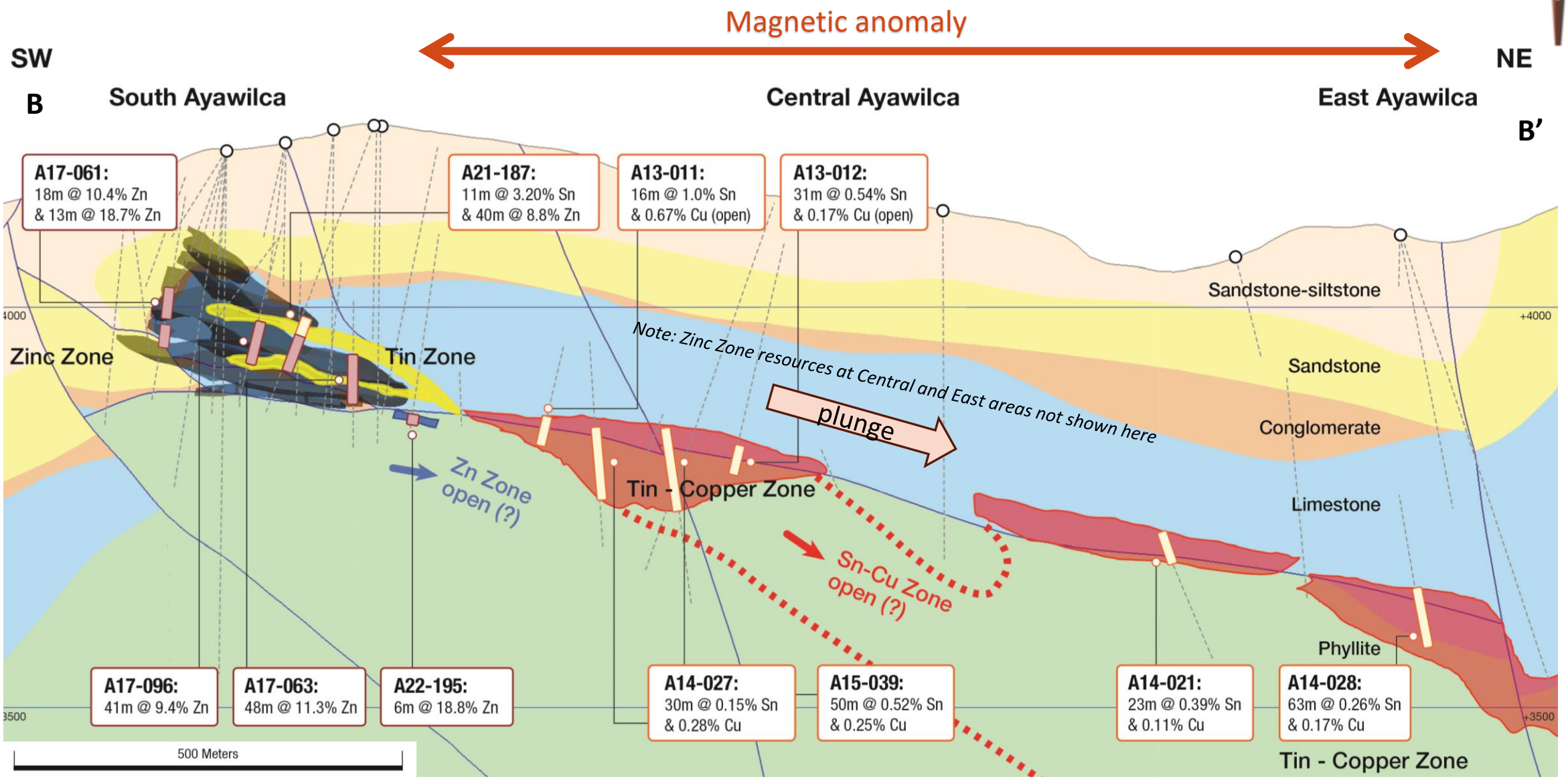


North-South cross section along Colquipucro Fault

- 4 km of known mineralization plunging at shallow angle to the south (cf. Hermoza)
- Best mineralization near intersections with trans-Andean faults
- Undrilled at southern end…



Ayawilca longitudinal section along magnetic anomaly



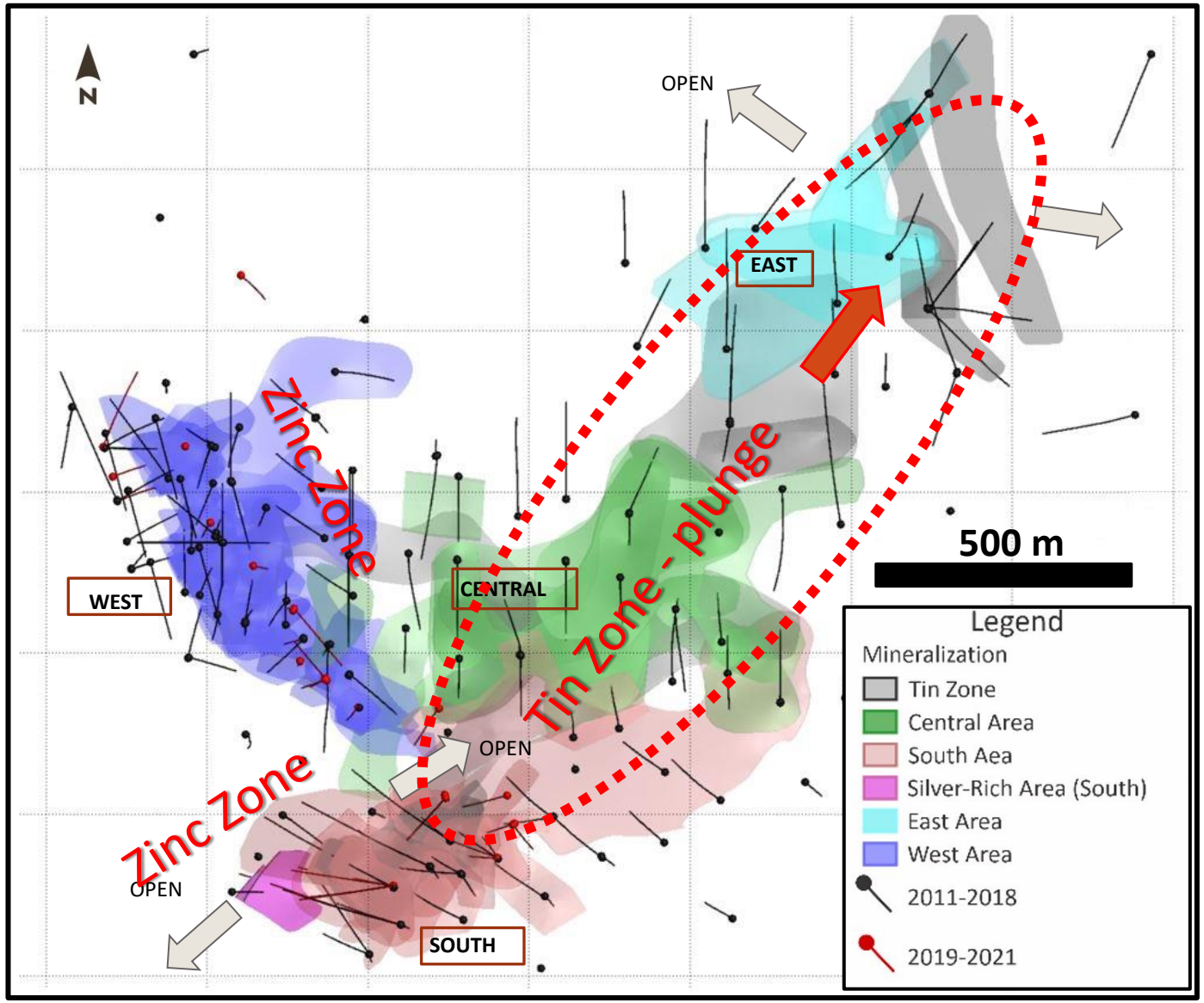
Tin at Ayawilca: Pyrrhotite (+ cassiterite) mantos

- Cassiterite is hosted in pyrrhotite-pyrite-Fe carbonate-tourmaline mantos, spongy texture
- Pyrrhotite is magnetic, replaces precursor magnetite

Hole A21-187 (South area): 12 metres at 3.1% tin from 262 metres, including 2.0 metres at 5.4% tin from 266 metres

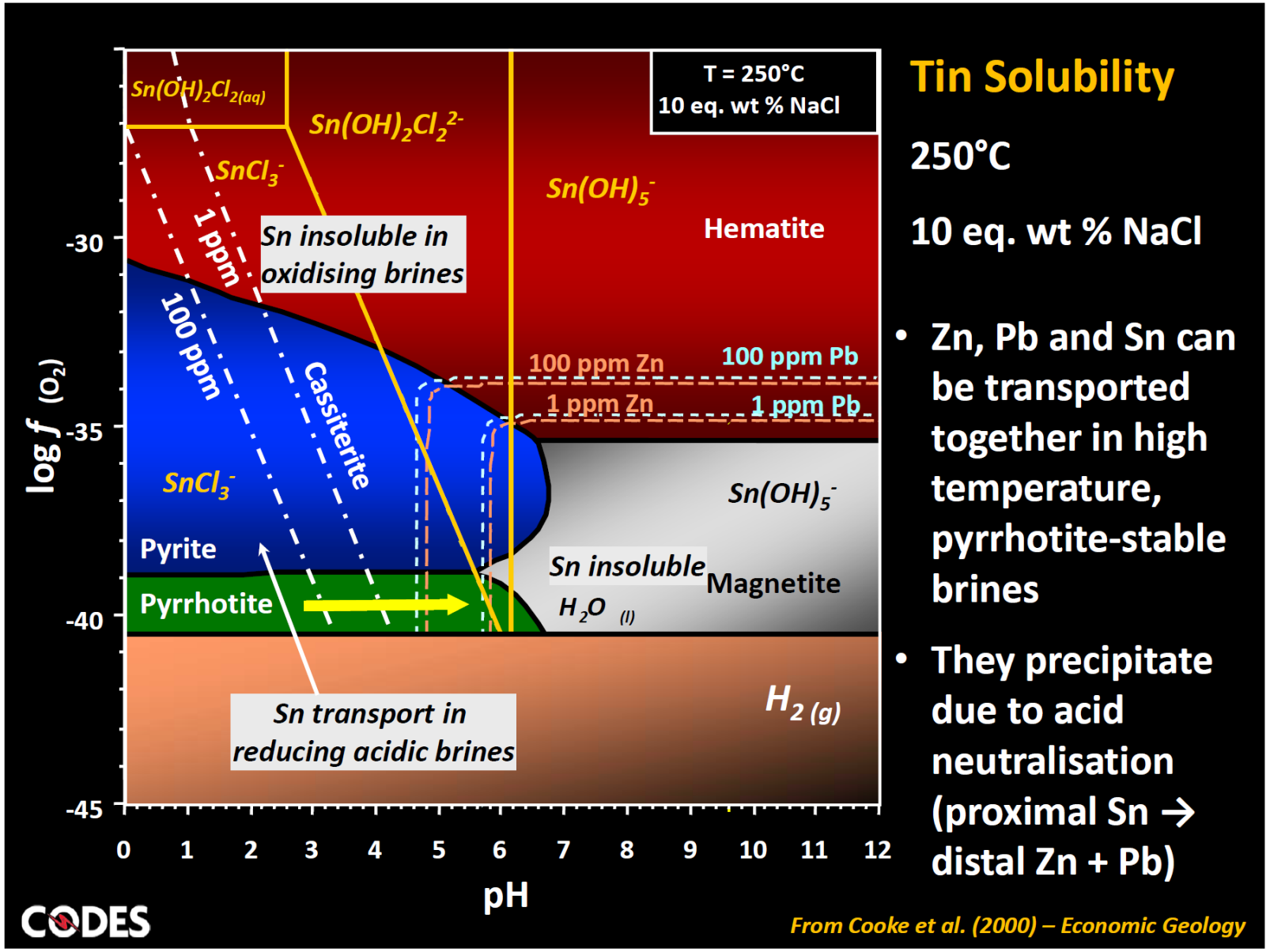
Tin and Zinc: Are they genetically related?

- Tin (pyrrhotite) mineralization correlates with the magnetic anomaly at Ayawilca and plunges to the NE
- Zinc mineralization is best developed on the edge of the pyrrhotite bodies at West and South Ayawilca
- Are the tin and zinc mineralization events related in space and time? We believe they are…



Mineral Resources Map

Tin is transported in reduced, acidic brines…



Tin Solubility

250°C

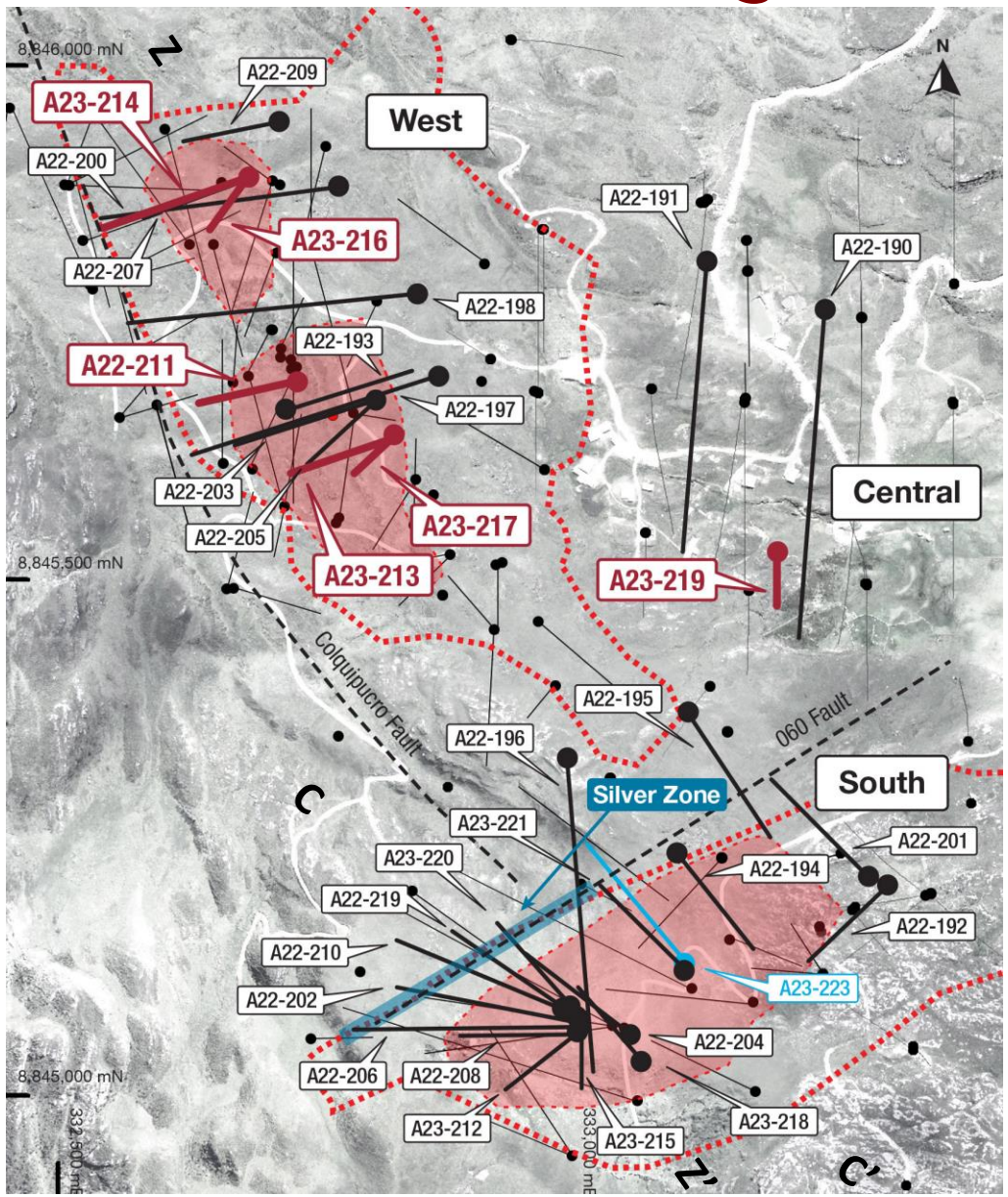
10 eq. wt % NaCl

- Zn, Pb and Sn can be transported together in high temperature, pyrrhotite-stable brines
- They precipitate due to acid neutralisation (proximal Sn → distal Zn + Pb)

From Cooke et al. (2000) – Economic Geology

- Geochemical model predicts the precipitation of cassiterite as hydrothermal fluid is neutralised.
- **Sn would be precipitated in a proximal setting, with Zn and Pb more distal in the pyrite stability field due to acid neutralisation and oxidation.**
- This is exactly what we observe at Ayawilca…

Tinka is focused on growth of Zinc Zone Resource

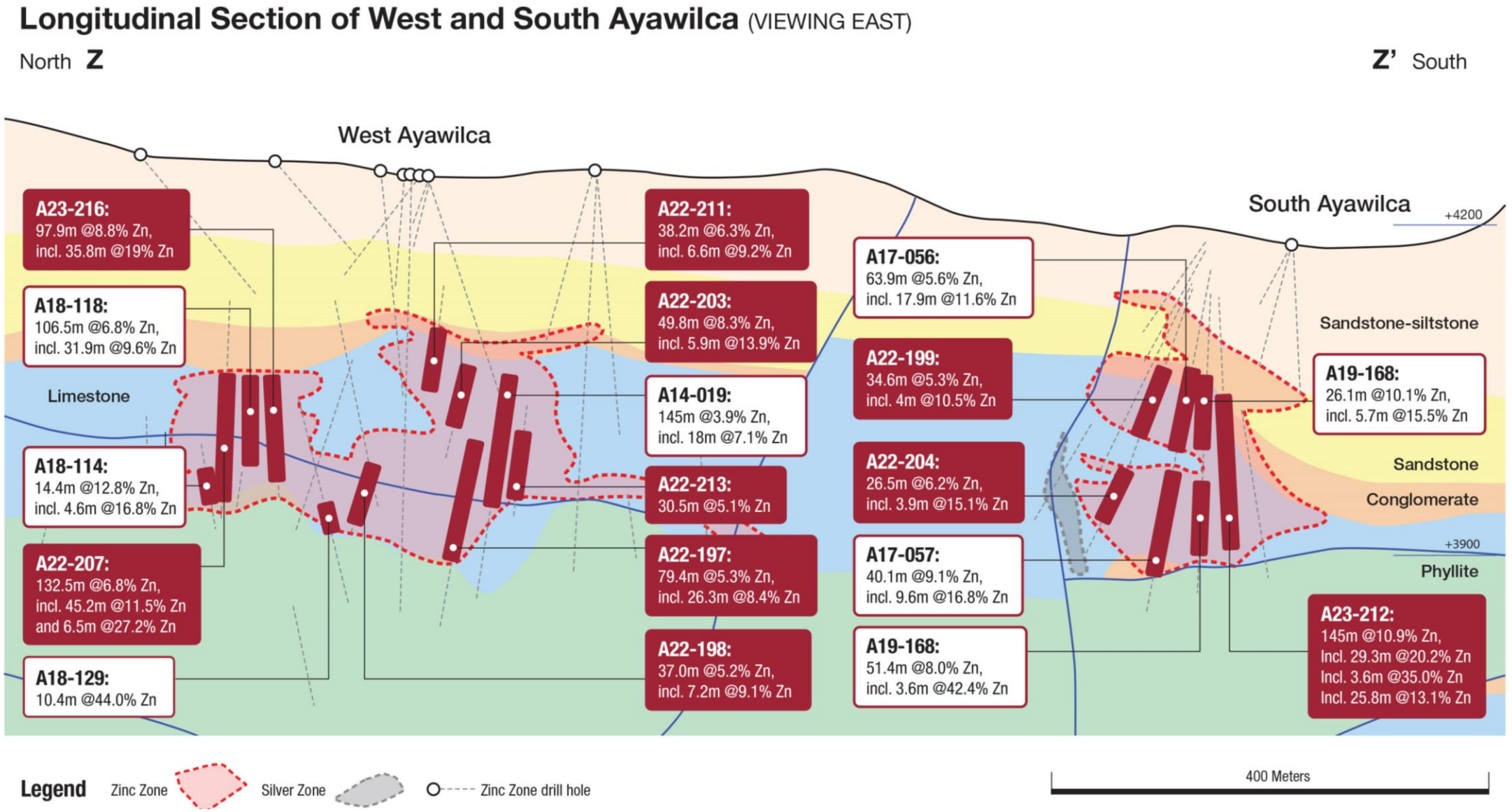


- 11,000 metres of diamond drilling was completed from June 2022 to May 2023 focusing on resource definition and expansion of the Zinc Zone.
- West Ayawilca: holes were drilled on east-west grid for the first time.
- Breccia bodies: Semi-massive to massive sulphide mineralization in pipe-like bodies connected at the base.
- South Ayawilca: Discovery of ultra high-grade zinc mineralization, defined by a series of fan holes.

Legend

- 2022/23 drill holes - Current news release
- 2022/23 drill hole - Results pending
- Footprint of zinc mineralization at West and South Ayawilca
- 2022/23 drill hole - Previously released
- Pre 2022 drill hole
- SMS pipe-like breccia bodies (West) and MS bodies (South)
- 200 Metres

Ayawilca longitudinal N-S section (2022-23 results)

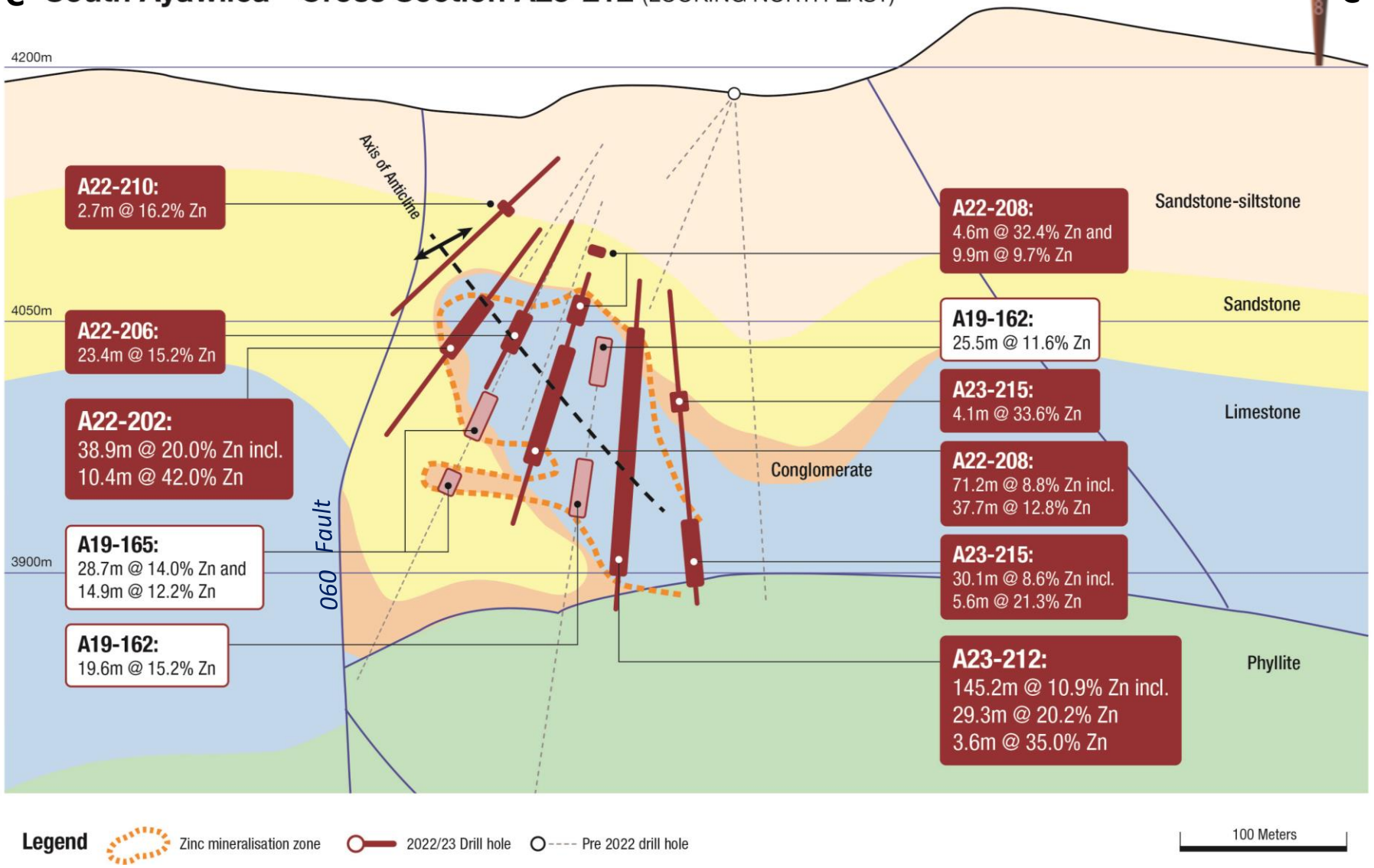


South Ayawilca – ultra high-grade zinc discovery

- **A23-212: 145 m at 1% zinc from 158 m, our best drill hole ever at Ayawilca in Jan '23**

South Ayawilca

- Massive zinc sulphide mineralization is focused within an overturned fold (“anticline”).
- Grade is concentrated along the overturned limb of fold and in the fold hinge.
- 100 m true width.



Anticline at South Ayawilca – looking south

South Ayawilca – ultra high-grade zinc discovery

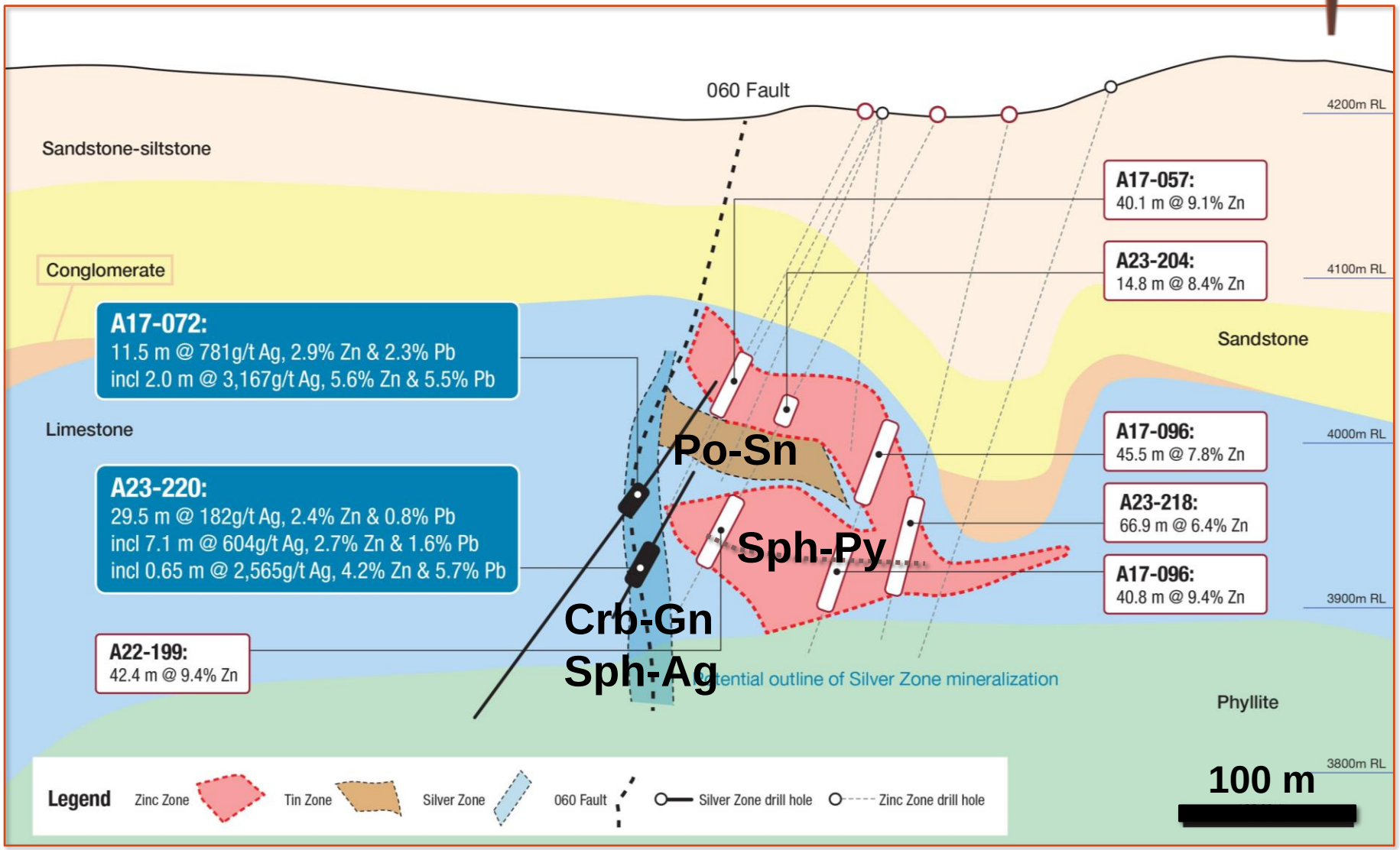
- A22-202: 39 m at 20% zinc from 170 m, including 10.4 metres at 42% zinc from 193 m.
- Best zinc grades occur along an overturned limb of an anticline next to a sandstone footwall and in hinge.

South Ayawilca –Silver Zone discovery on 060 Fault

Paragenesis

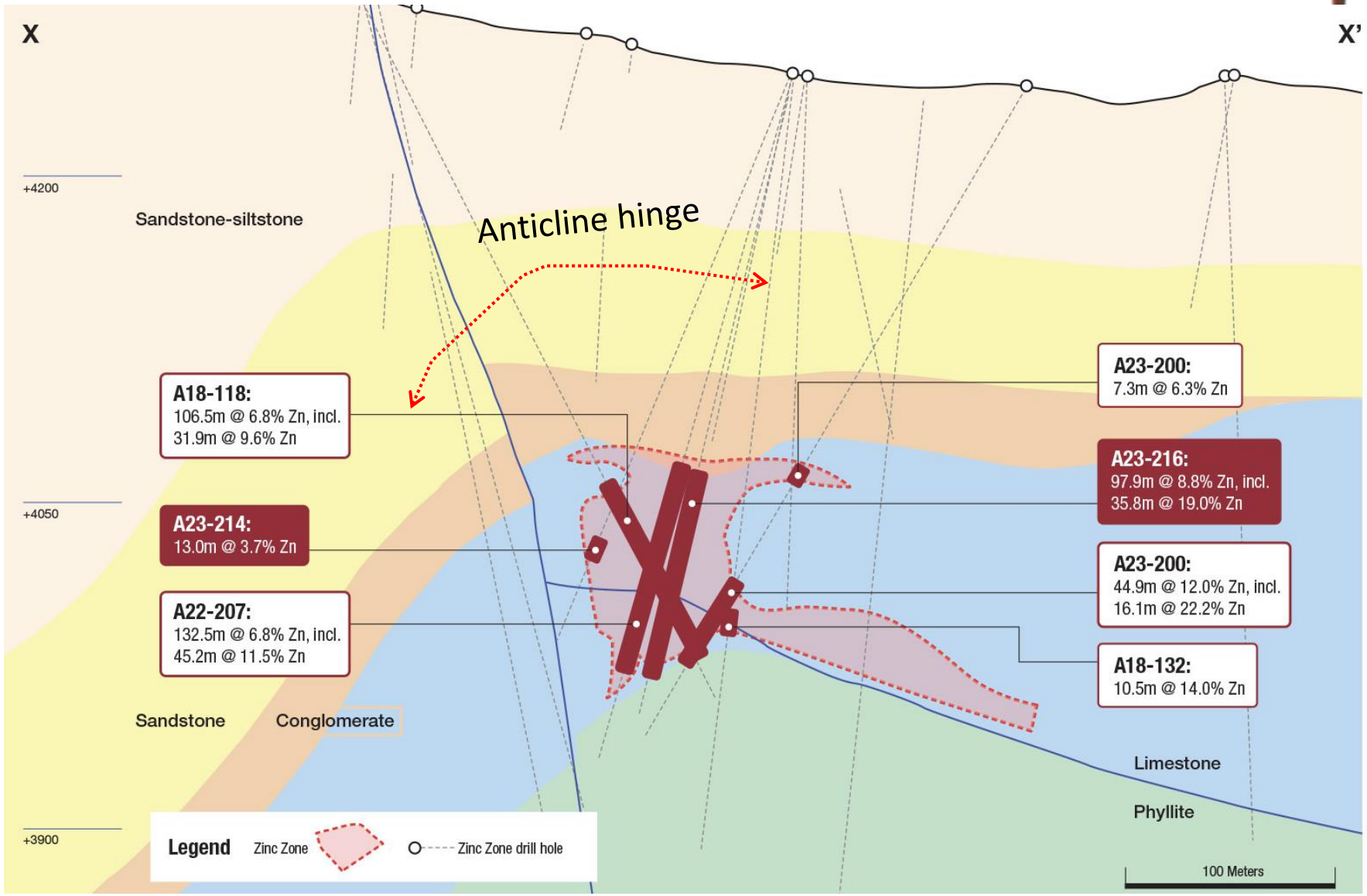
Magnetite (precursor)

- Stage 1: Pyrrhotite-cassiterite-chalcopyrite
- Stage 2: Sphalerite-pyrite-marcasite
- Stage 3: Galena-sphalerite-silver sulphosalts-Fe carbonate in veins



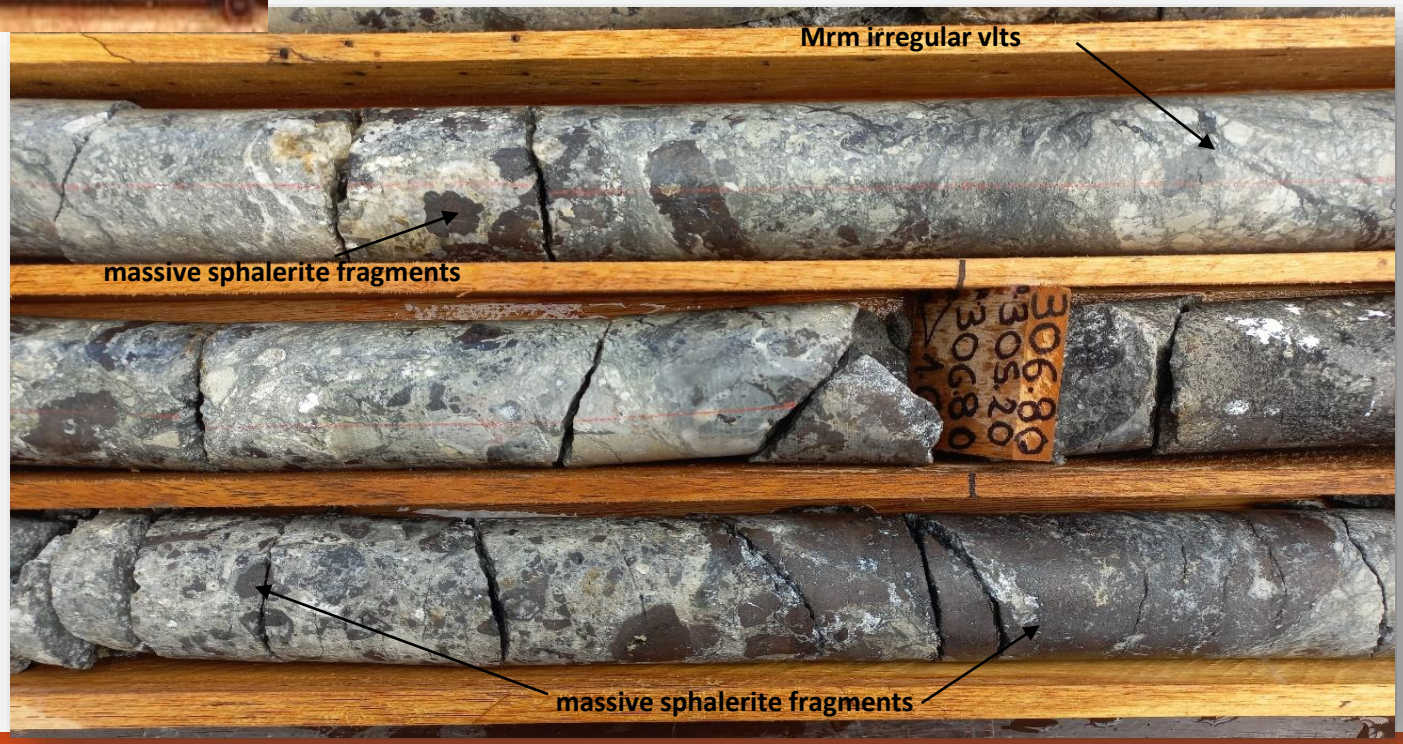
West Ayawilca cross section – looking north

- Semi-massive sulphide pipe-like bodies hosted by limestone up to the sandstone contact.
- Massive sulphide mineralization at the base of the limestone.
- Focused by the regional anticline and the Colquipucro Fault



West Ayawilca – breccia pipe-like mineralization

A22-207: 45 m at 11.5 % zinc from 248 m



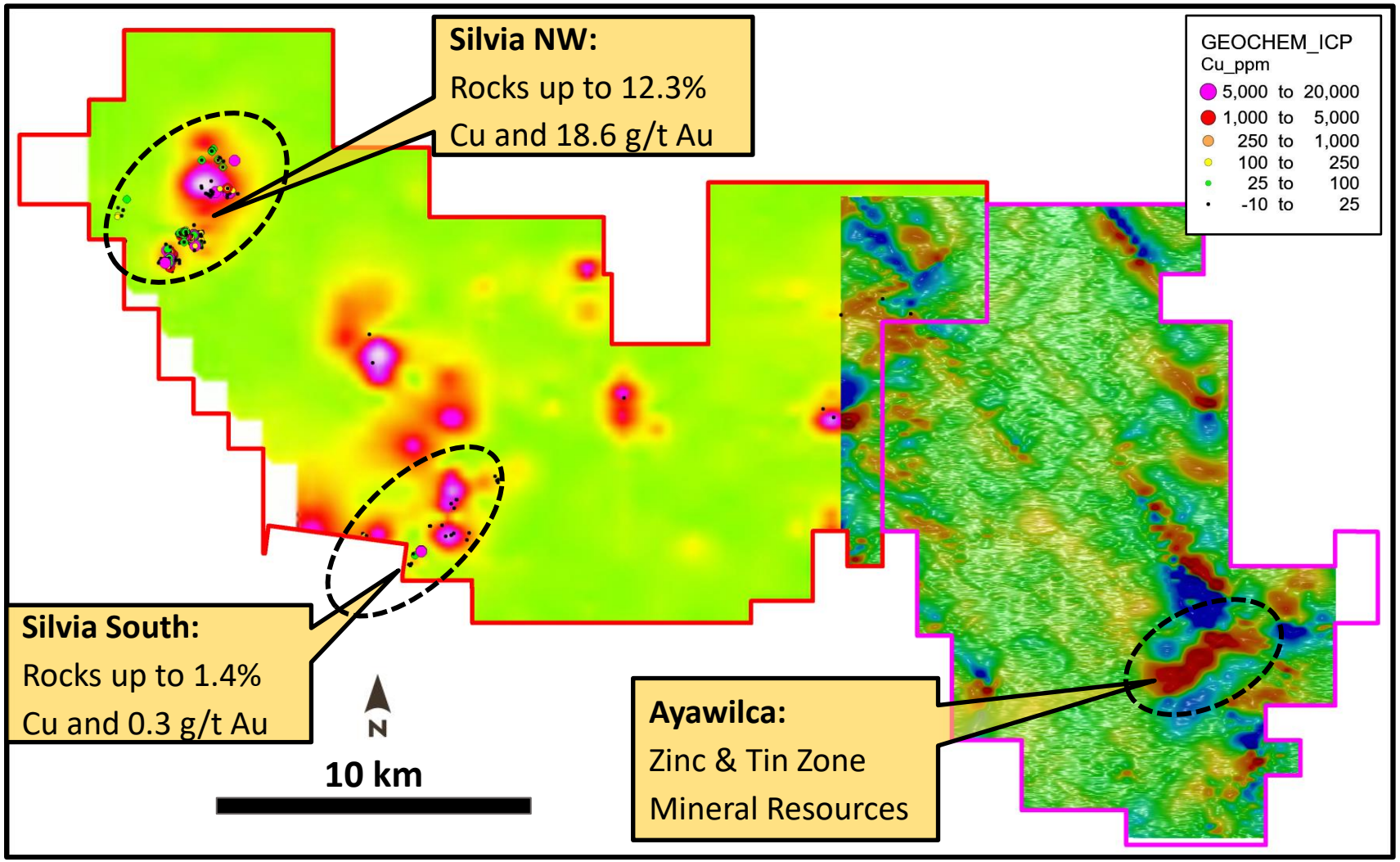
A22-197: 26 m at 8.4% zinc from 282 m

West Ayawilca – massive sulphide manto at base

A22-200: 16 m at 22% zinc from 312 m

Tinka's porphyry and skarn targets

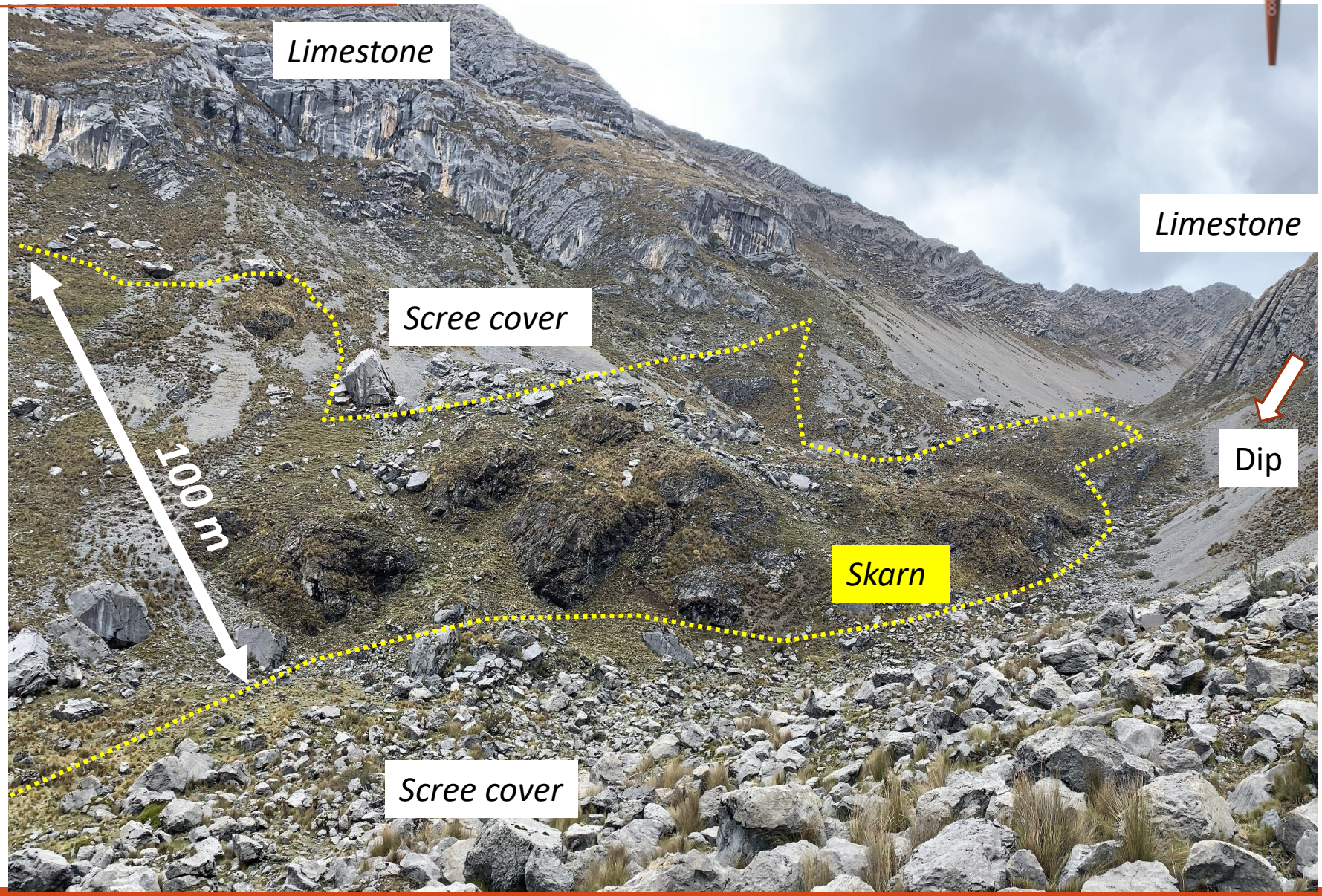
- Airborne magnetic data covers all of Tinka's mining claims (460 km2)
- Ayawilca lies on an important Andean cross structure (NE-SW) clearly shown in the magnetics
- Silvia project (acquired from BHP) has several magnetic targets with outcropping high-grade Cu-Au skarn mineralization.



Silvia NW Cu-Au target

- Undrilled
- **46m at 1.9 g/t Au & 0.8% Cu**

  (Incl. **6m at 12.8 g/t Au & 2.7% Cu** in trench sample)
- Skarn outcrop approximately 100 m wide and up to 500 m long, exposed in glaciated valley floor
- Airborne magnetic survey in progress…



Key takeaways: Tools for exploring for CRDs

- **Geophysics and surface geochemistry:** Very important to use a combination of exploration methods (magnetics was the most helpful geophysical method at Ayawilca for zinc, even though not a direct detection method for sphalerite). High conductivity anomalies in the IP survey highlighted the pyrrhotite bodies.
- **Structural controls**: Very important to understand the structural controls as early as possible, so that drilling can be well directed.
- **Zonation**: Understand and look for alteration zoning patterns in outcrops and drill holes – e.g, manganese alteration, carbonate veining, brecciation textures, Ag-Pb haloes, etc.
- **Drilling**: Drill perpendicular to the main structural controls, which can vary in different parts of the mineralized district. Drilling in different orientations early in the exploration is a good idea!
- **Grade**: Target high-grade as early as possible…

Tinka corporate

Tinka Resources Limited is listed in Canada on the TSXV exchange (Ticker TK)

Shares issued and outstanding	391 million
Options	9 million
Fully diluted shares	400 million
Market capitalization (C$0.16/share)	C$64 million
Cash (at Mar 31, 2023)	C$9 million
Debt	Nil
52 week high/low	C$0.22/$0.12

SHAREHOLDERS	
Buenaventura*	19%
Nexa Resources*	18%
Sentient Equity Partners	19%
Other institutions	14%
Total Institutional	70%
Management & Insiders	3%
Retail	27%

Thank you!

Cordillera Huayhuash, Peru