Vesiperä

Occurence type: prospect

Commodity	Rank	Total measure	Total production	Total resource	Importance
gold	1	0,75 t	NA	0,75 t	Occurrence
arsenic	5	2400 t	NA	2400 t	Medium sized deposit

Easting EUREF: 401135
Northing EUREF: 7109967

Easting YKJ: 3401267
Northing YKJ: 7112946

Discovery year: 1984
Discovered by: Outokumpu Oy
Province: Laivakangas (Au, Cu)
District: Vesiperä (Au, Cu, Ag)
Comments: Gold-bearing quartz veins and shear zones found in outcrop during regional gold exploration. In the same year, also an arsenopyrite-rich sample was found from outcrop (75 ppm Au, 15 % As) by an amateur prospector. This led to the find of the biggest lode 250 m SSE from the first outcrop sample.
References: 5, 9

Mineral deposit type

Group: Metallogenic deposit
Main type: Orogenic (metamorphic hydrothermal)
Comments: Gold mineralisation took place at or soon after the regional metamorphic peak (löllingite cores in arsenopyrite, fibrous amphibole in proximal zones), at about 3 kbar and slightly below 500°C, in structurally favourable sites close to the major shear zones.
References: 9, 11

Dimension

Expression: exposed
Form: discordant
Shape: NA
Length (m): NA
Width (m): NA
Thickness (m): NA
Depth (m): NA

Area (ha): NA
Dip azim: 45
Dip: 70
Plunge azim: NA
Plunge dip: NA
Orientation method: NA

Holder history

Current holder: Lakeuden Malmi Oy
Years: 2020
Holding type: Application for exploration permit
Comments: Lakeuden Malmi Oy is Northgold’s wholly owned Finnish subsidiary

Previous holders:

Company	Years	Holding type	Comments
BR Gold Mining Oy	2014	Exploration permit	NA
Belvedere Resources Ltd	2006-2011	Claim (old law)	NA
Endomines Oy	2001	NA	NA
Geological Survey of Finland	1985-1991	Claim (old law)	NA

EXPLORATION ACTIVITY

Belvedere Resources Ltd

Years	Activity type	Geologist	Exploration result	Ref
2006-2006	core drilling	NA	NA	1
	Core drilling (reconnaissance drilling): one diamond-drill hole of 112 m.			
	Intersections			
	HoleID	BELVES1		
	From-To	NA		
	Length	83,7m		
	gold	1ppm		

University of Turku

Years	Activity type	Geologist	Exploration result	Ref
1998-1999	detailed geology	NA	NA	9
1998-1999	detailed geochemistry	NA	NA	3

Geological Survey of Finland

Years	Activity type	Geologist	Exploration result	Ref
1986-1988	core drilling	Esko Sipilä.	NA	8, 10
	Diamond drilling, 34 holes, in total 2079 m within the area			
	Intersections			
	HoleID	R307		
	From-To	NA		
	Length	5m		
	gold	9,4ppm		
	HoleID	R310		
	From-To	NA		
	Length	4,5m		
	gold	2,2ppm		
	HoleID	R376		
	From-To	NA		
	Length	3m		
	gold	2,5ppm		
	HoleID	R376		
	From-To	NA		
	Length	1,5m		
	gold	4,4ppm		
	HoleID	R379		
	From-To	NA		
	Length	4m		
	gold	1,6ppm		
	HoleID	R379		

	From-To	NA
	Length	5m
	gold	2ppm

1986-1987	excavation	E. Sipilä	NA	

1985-1987	detailed geochemistry	Esko Sipilä.	NA	3
	An Au anomaly (>20 ppb), slightly scattered, 100–200 m wide, >4 km long, defined by samples from partially weathered bedrock surface; also, a local Cu-Co anomaly (>220 ppm Cu, >100 ppm Co) and Pb and Ag anomalies of minor extent in the area			

1985-1987	percussion drilling	Esko Sipilä.	NA	2, 3, 4, 6, 8, 9, 10

1985-1988	detailed geology	Esko Sipilä.	NA	2, 3, 4, 6, 8, 9, 10
	An arsenopyrite-rich sample from outcrop: 75 ppm Au, 15 % As (found by an amateur prospector); This led to the find of the biggest lode 250 m SSE from the first outcrop sample.			

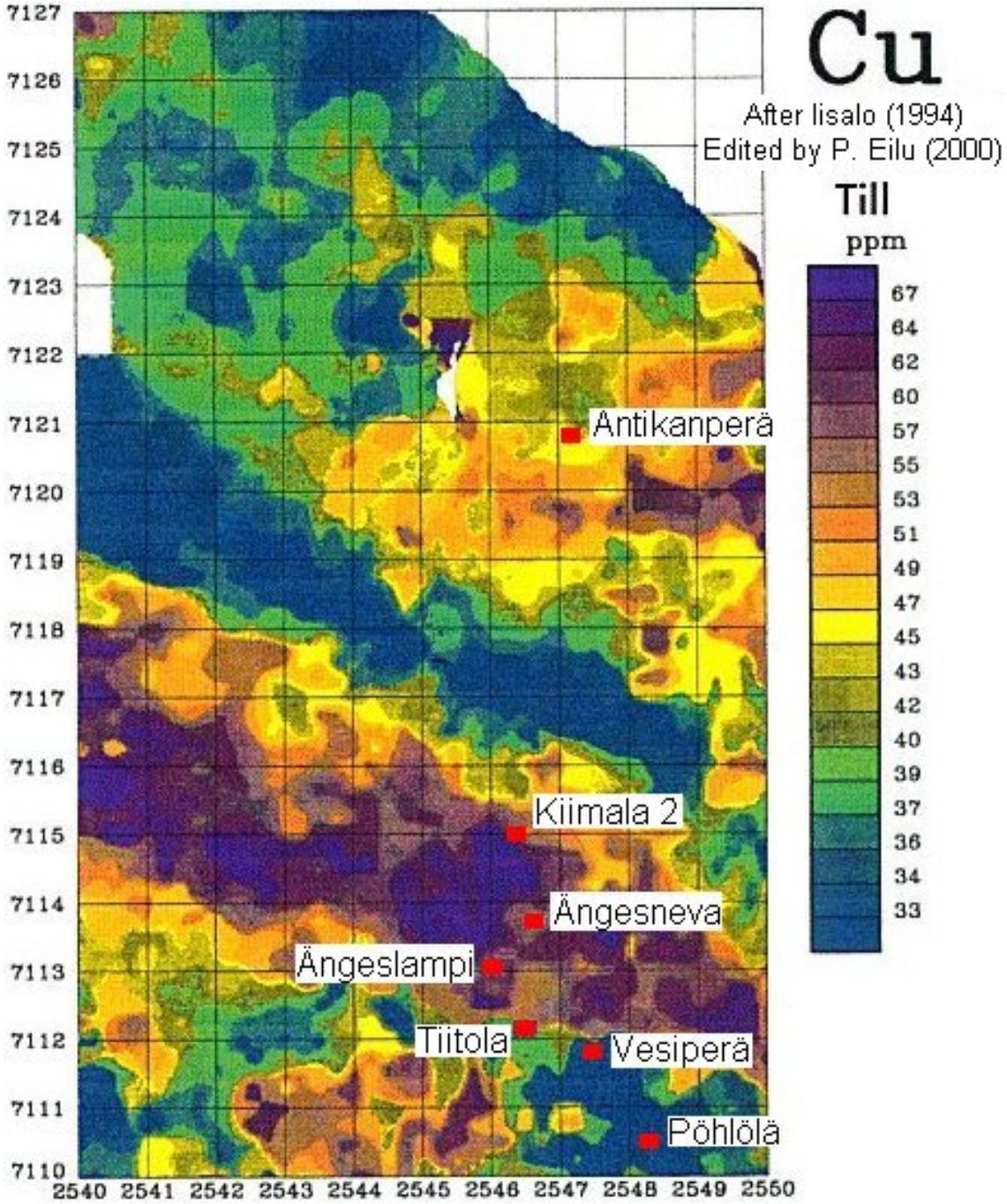
1985-1988	detailed geophysics	Esko Sipilä.	NA	8, 9
	Response on IP due to sulphide dissemination. The deposit is within a major, 10 km long, NNW-trending, electromagnetic anomaly.			

1983-1983	regional geochemistry	NA	NA	
	Regional geochemical till survey			

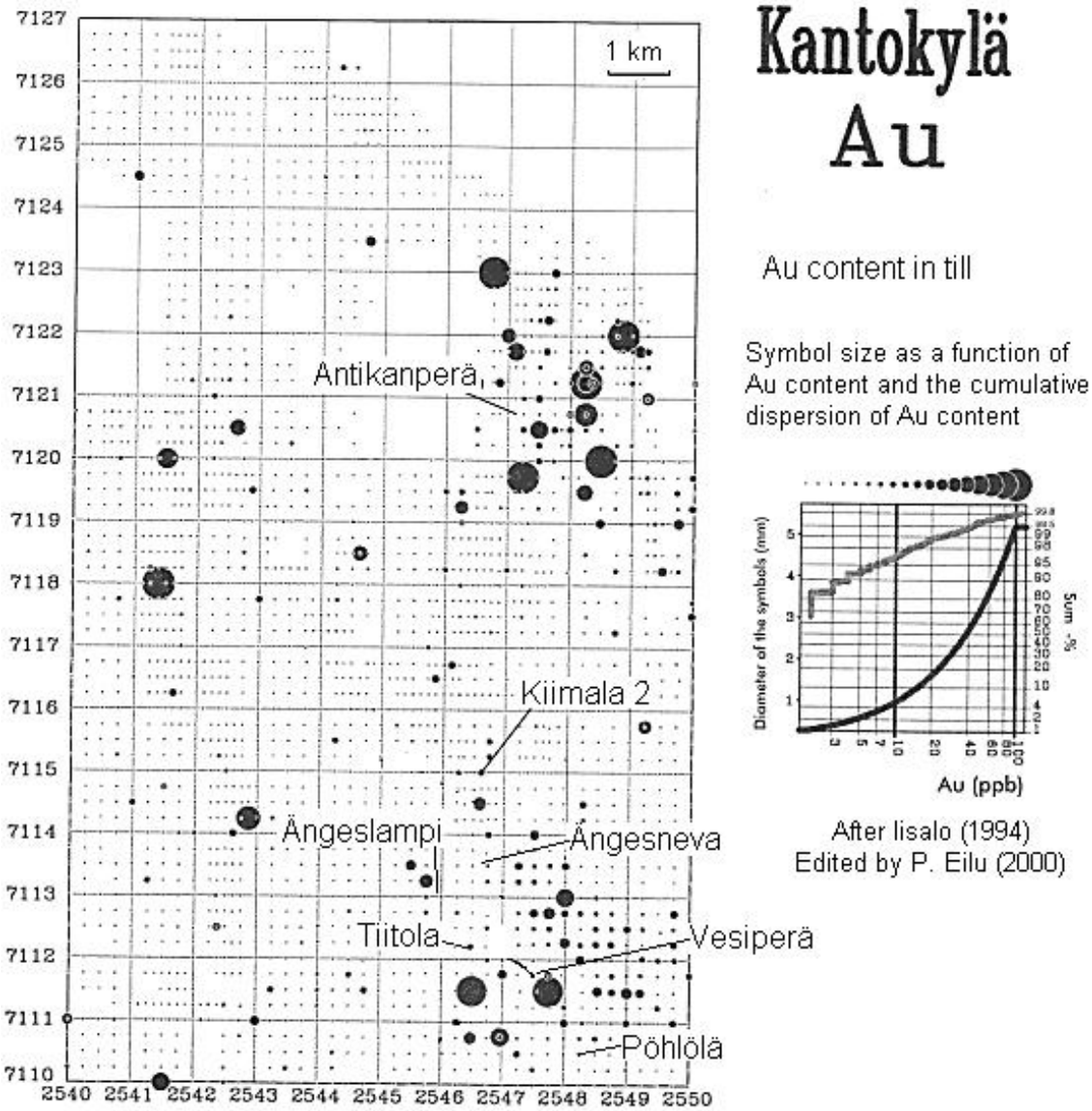
1976-1976	regional geophysics	Esko Sipilä	key geological features	2, 3, 4, 6, 8, 9, 10
	Low-altitude airborne magnetic, electromagnetic and radiometric survey			

Figures

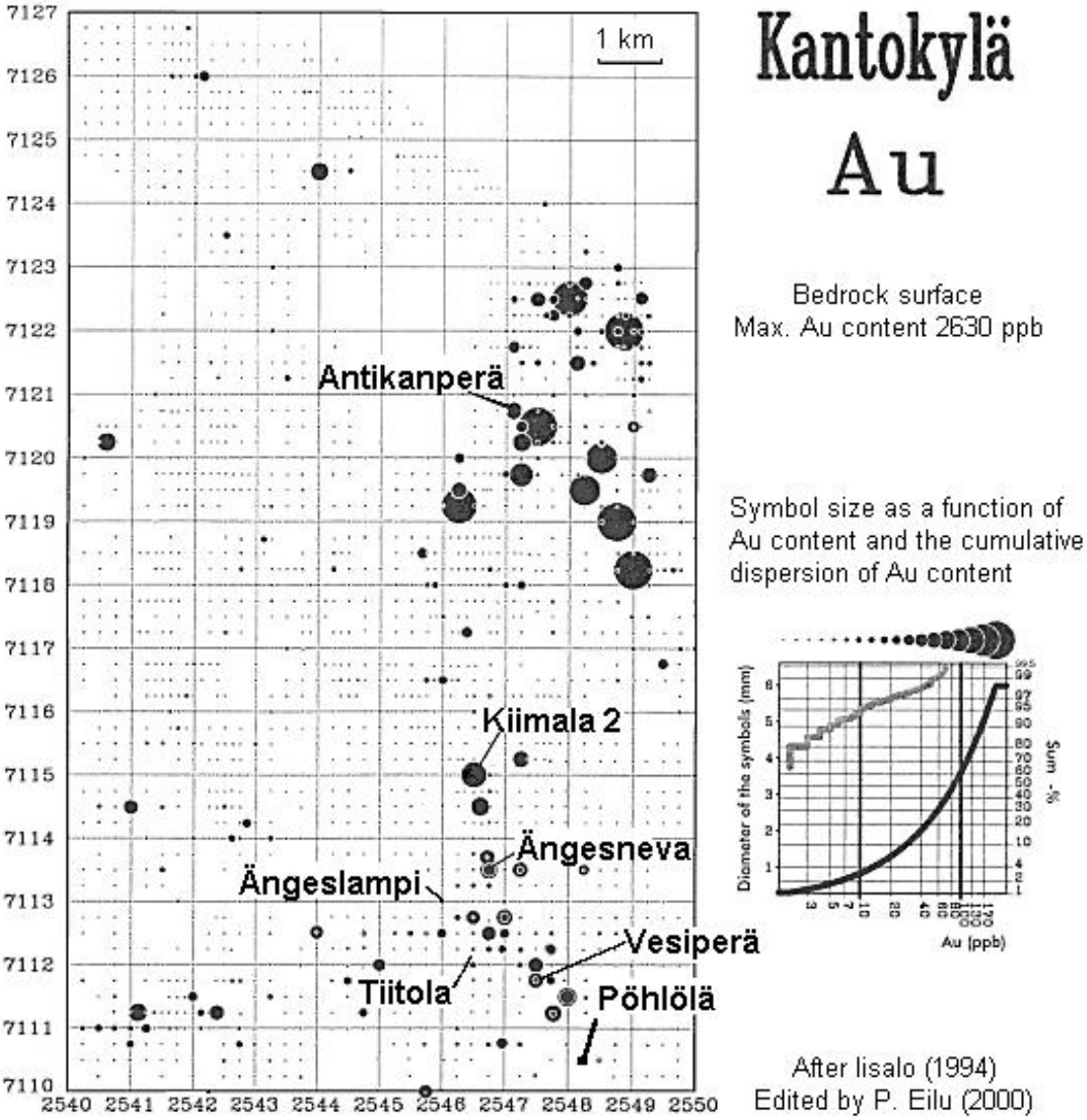
Secondary anomaly; Cu content in till:



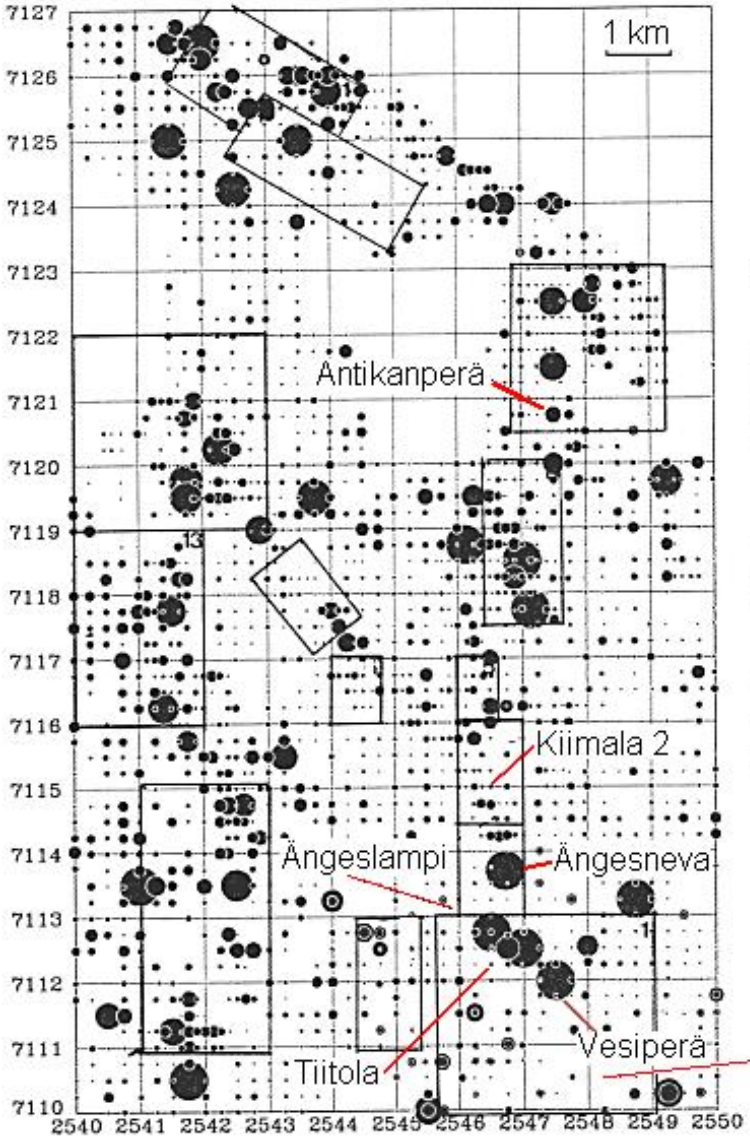
Secondary anomaly; Au content in till:



Primary anomaly; Au content at the surface of bedrock:



Primary anomaly; Co content at the surface of bedrock:

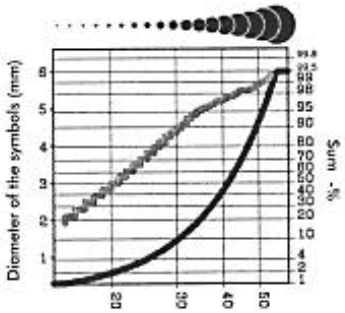


Kantokylä

Co

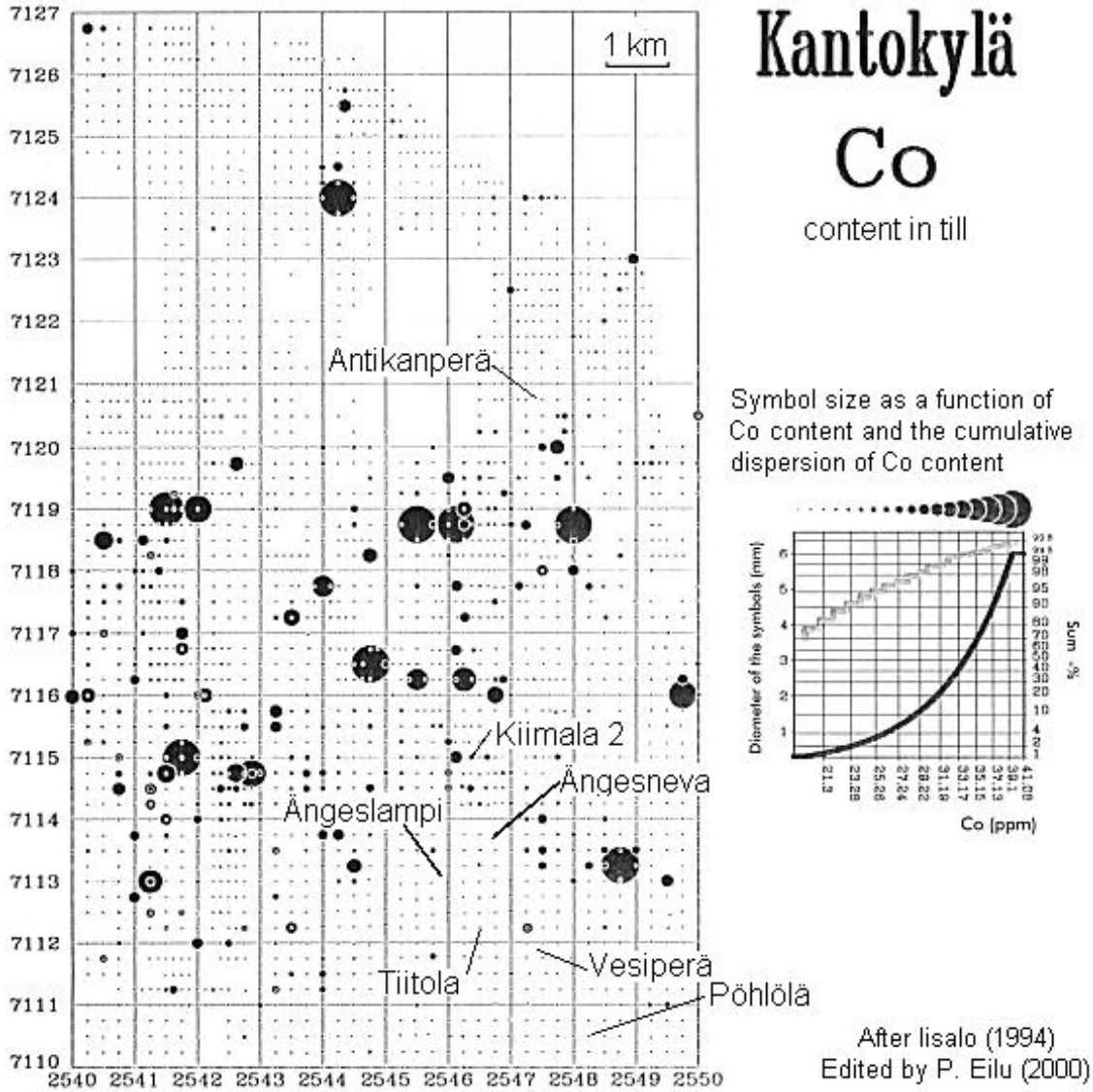
Bedrock surface
Max. Co content 224 ppm

Symbol size as a function of Co content and the cumulative dispersion of Co content



After Iisalo (1994)
Edited by P. Eilu (2000)

Secondary anomaly; Co content in till:



RESOURCES AND RESERVES

Most recent

Type:	Company:	Year:	Date:	Calc Method:	Reference:
Resource	Geological Survey of Finland	1988	NA	Non-compliant resource estimate	8
	Comments: Several parallel, narrow, Au-mineralised zones.				
	Category:	**Inferred mineral resource**			
	Tonnage:	**0,3 Mt**			
	gold	2,5 ppm			
	arsenic	0,8 %			
	Cutoff:	**NA**			

GEOLOGY

Host rock: Quartz vein, Plagioclase porphyrite

Quartz vein (Host rock)

Rock type: Host rock
Proportion: minor
Grain size: NA
Color: NA
References: 8
Comments: Mineralised quartz veins and thin shear bands, and comprises several subparallel lodes in a plagioclase porphyry. The deposit is close to the NW-trending Ruhaperä shear zone which is one of the main structures of the Raahe-Ladoga suture zone.

Plagioclase porphyrite (Host rock)

Rock type: Host rock
Proportion: major
Grain size: NA
Color: NA
References: 4, 7, 8, 9, 10, 11
Comments: The host rock is intruded into a sequence of Palaeoproterozoic metasedimentary and metavolcanic rocks. A hypabyssal gabbro (plagioclase porphyry) hosts the mineralisation and the sequence is intruded by synorogenic 1.89–1.88 Ga granitoids. The gabbro can be regarded as a subvolcanic sill. The hosting sequence is intruded by synorogenic gabbro, diorite and tonalite stocks.

Ore minerals:

Mineral	Proportion	Mineral texture
Arsenopyrite	major	
Aurostibite	minor	
Bismuth	minor	
Chalcopyrite	minor	
Electrum	minor	
Gold	minor	
	Gold occurs with native bismuth and electrum, as inclusions in arsenopyrite and free grains, as inlusions and in fractures of silicates.	
Hematite	minor	
Hessite	minor	
Ilmenite	minor	
Löllingite	minor	
Marcasite	minor	
Molybdenite	minor	
Pyrite	major	
Pyrrhotite	major	
Rutile	minor	
Sphalerite	minor	
Tetrahedrite	minor	

Other minerals:

Mineral	Proportion	Mineral texture
Plagioclase	present	
Quartz	present	
Tremolite	present	

Textures
Porphyritic
Granoblastic

Alteration:	Distribution:	Degree:	Relation to mineralization:
silicification	NA	NA	NA
sericitic alteration	NA	NA	NA
chloritic alteration	NA	NA	NA
Comments: most or all of chloritisation can be a retrograde, post-mineralisation feature			
biotite alteration			
Comments: Biotitisation may be the most extensive feature of gold-related alteration			

Metamorphic description:

Type:	Facies:	Degree:	Relation to mineralization:	Min P- Max P (kbar)	MIn T- Max T (°C)
Regional	amphibolite metamorphic facies	medium metamorphic grade	NA		
Comments: At least, two major metamorphic stages, at ca. 1.90-1.87 (peaked at 1.88 Ga) and 1.84-1.83 Ga.					

Geological age:

Geological era:	Max age - Minage (Ma):	Inferred age (Ma):	Age of mineralization:
Paleoproterozoic (2500-1600 Ma)	1600-2500		N

Figures

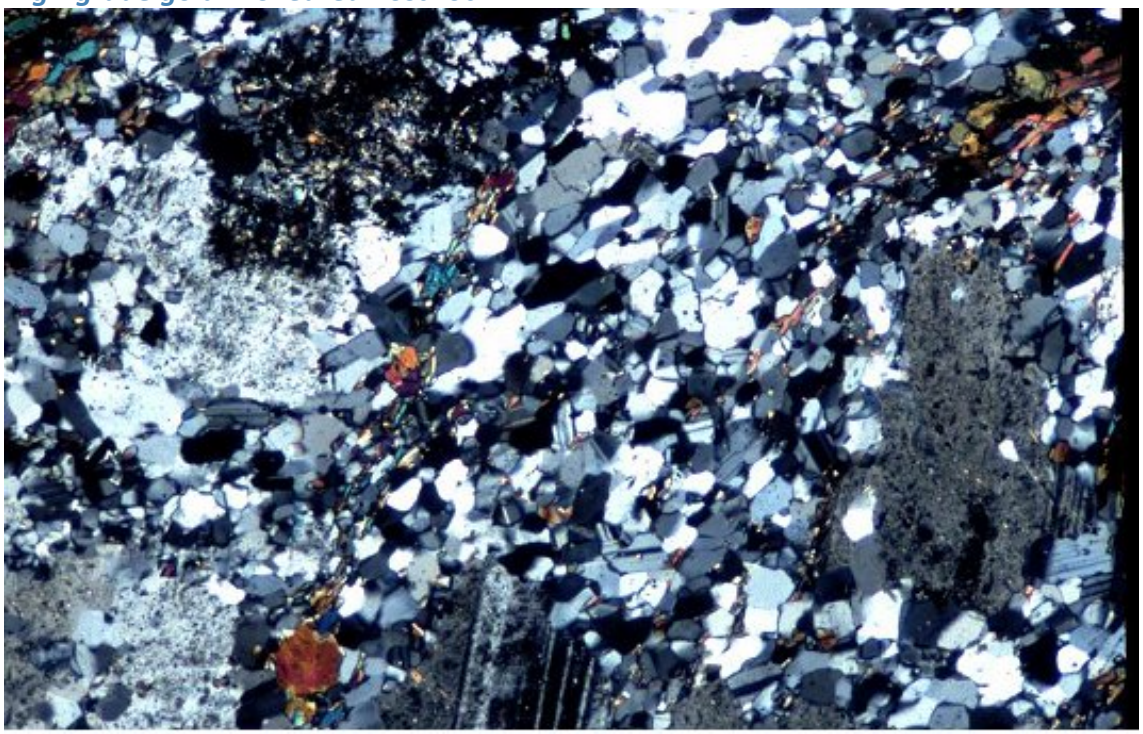
Structure; a set of narrow Au-bearing shear zones:

A set of narrow, arsenopyrite- and gold-bearing shear zones, and a post-gold fracture with reddish retrograde alteration envelope at Vesiperä. Photo Pasi Eilu 1/10/1997.

Structure; a set of narrow Au-bearing shear zones:

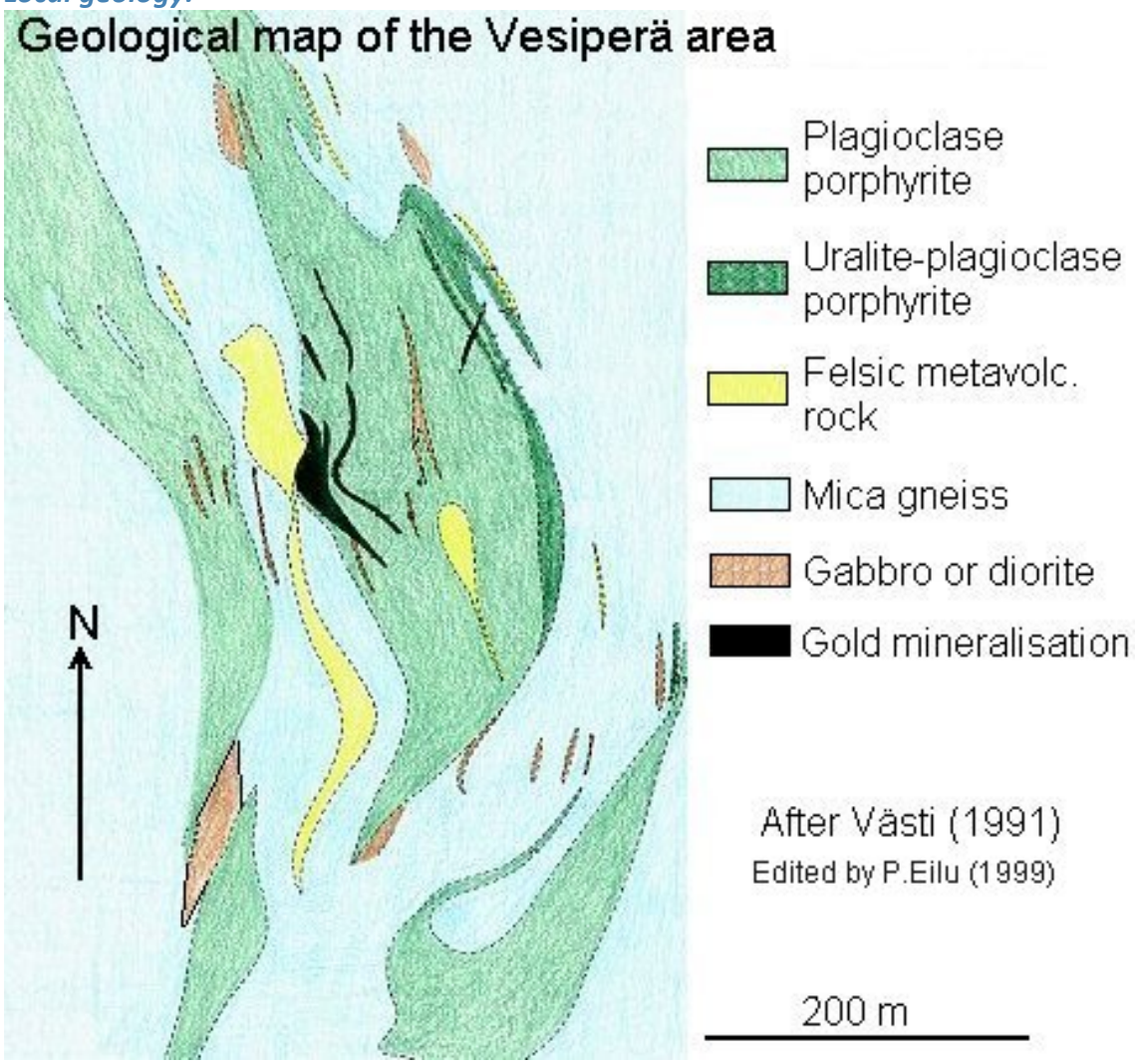
A set of narrow, arsenopyrite- and gold-bearing shear zones at Vesiperä. Scale bar is 20 cm. Photo Pasi Eilu 1/10/1997.

High-grade gold in sheared host rock:

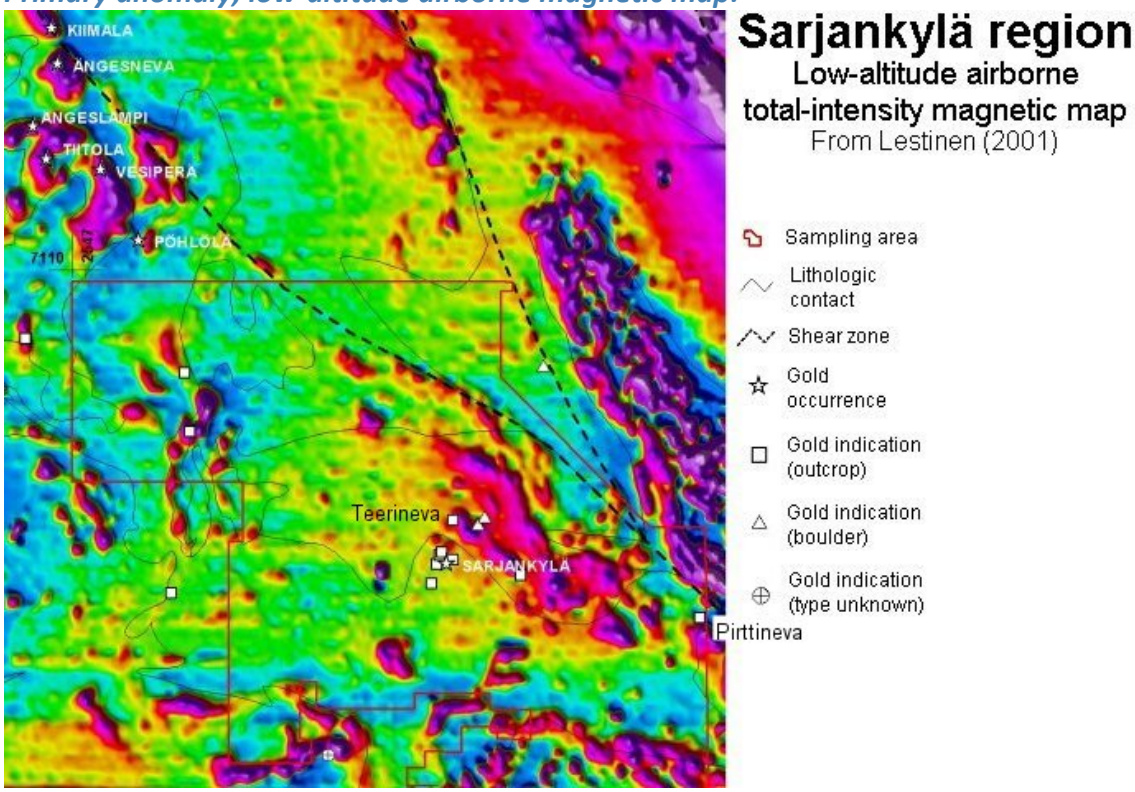


High-grade gold mineralisation in sheared host rock at Vesiperä. Mineral assemblage: plagioclase - quartz - hornblende - biotite ± arsenopyrite, pyrrhotite, gold. Field of view 3.2 mm. Photo Pasi Eilu.

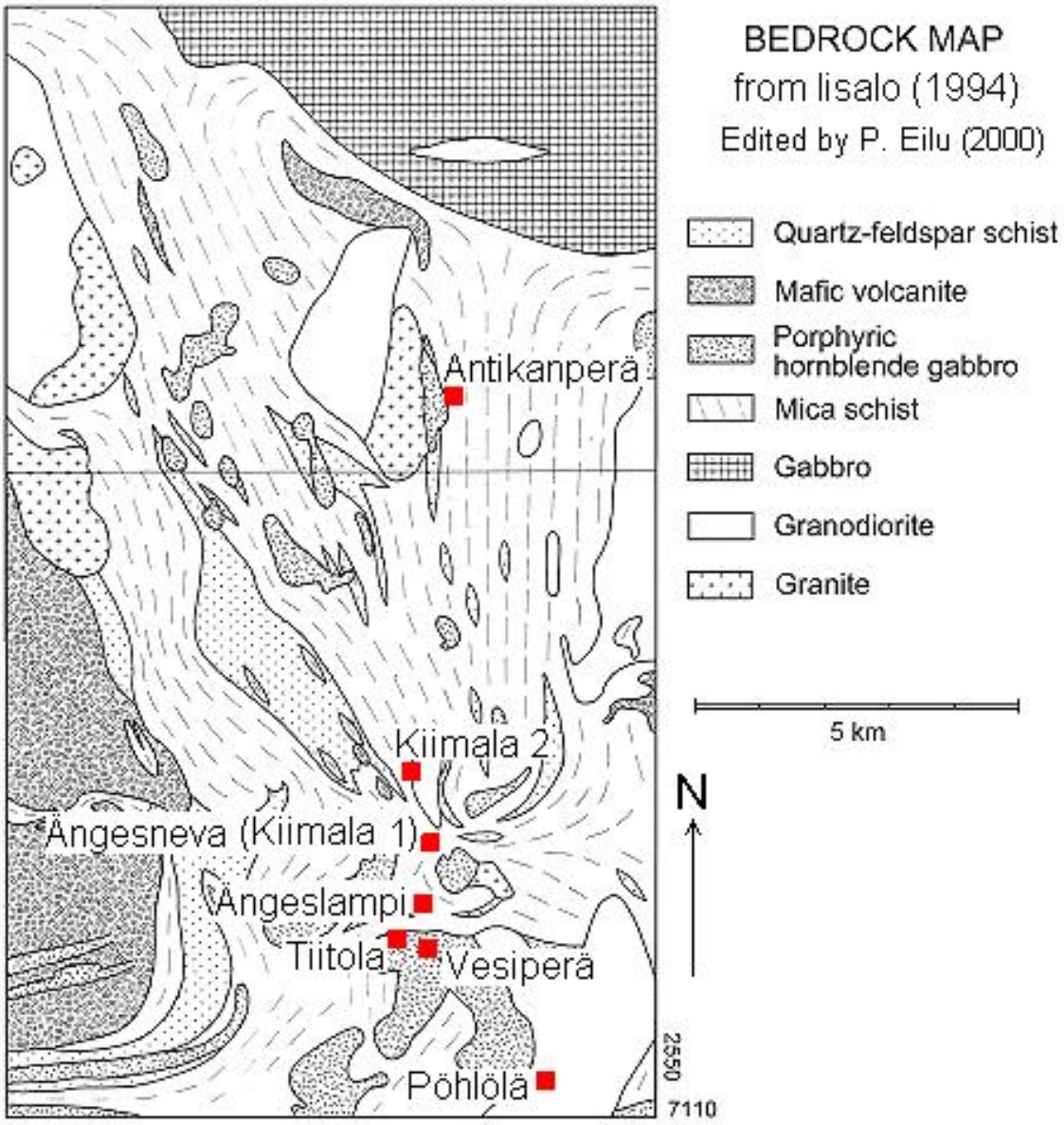
Local geology:



Primary anomaly; low-altitude airborne magnetic map:



Regional geology:



REFERENCES

1. Belvedere Resources Ltd. 2007. Press release 19 February 2007.
http://tupa.gtk.fi/karttasovellus/mdae/references/302_%C3%84ngesneva/302_Belvedere_PressRelease_190207.pdf

2. Iisalo, E. 1987. Haapaveden Ängesnevan (Kiimalan) Au-, Cu-aiheen geokemialliset tutkimukset vuosina 1986-1987. Geological Survey Finland, Report S/4119/2433/1/87. 5 p. (in Finnish)
http://tupa.gtk.fi/raportti/arkisto/s41_2433_1_1987.pdf

3. Iisalo, E. 1994. Kantokylän kohdentava geokemiallinen kartoitus ja sen tuottamat kulta- ja sulfidianomaliat. Geological Survey Finland, Report S/41/2433/1/1994. 20 p. (in Finnish)
http://tupa.gtk.fi/raportti/arkisto/s41_2433_1_1994.pdf

4. Kojonen, K. 1987. Monttutukimukset Haapaveden Vesiperällä, Ängesnevalla ja Veihtinevalla kesäkuussa 1987. Geological Survey Finland, Report M19/2433/78/1/51. 5 p. (in Finnish)
http://tupa.gtk.fi/raportti/arkisto/m19_2433_87_1_51.pdf

5. Korsman, K. (ed.) & Glebovitsky, V. (ed.) 1999. Raahe-Ladoga Zone structure-lithology, metamorphism and metallogeny: a Finnish-Russian cooperation project 1996-1999. Map 2: Metamorphism of the Raahe-Ladoga Zone 1:1000000. Geological Survey of Finland.

6. Lestinen, P. 2001. Kallio- ja moreenigeokemialliset kultatutkimukset Sarjankylän alueella vuosina 1999-2001. English summary: Bedrock and till geochemical gold survey in the Sarjankylä area during 1999?2001. Geological Survey of Finland, Report S/41/2433/1/2001. 51 p.
http://tupa.gtk.fi/raportti/arkisto/s41_2433_1_2001.pdf

7. Nurmi, P. A., Lestinen, P. & Niskavaara, H. 1991. Geochemical characteristics of mesothermal gold deposits in the Fennoscandian Shield, and a comparison with selected Canadian and Australian deposits. Geological Survey of Finland, Bulletin 351. 101 p.
http://tupa.gtk.fi/julkaisu/bulletin/bt_351.pdf

8. Sipilä, E. 1988. Kultatutkimukset Haapaveden Vesiperällä ja sen ympäristössä 1985-1988. Geological Survey Finland, Report M19/2433/-88/1/10. 4 p. (in Finnish)
http://tupa.gtk.fi/raportti/arkisto/m19_2433_88_1_10.pdf

9. Taipale R. 2000. Haapaveden Vesiperän kultamineralisaatio ja sen sivukivien geokemiallisen muuttumisen arviointi massatasapainomenetelmiä käyttäen. Unpublished MSc thesis. Department of Geology, University of Turku. 74 p. (in Finnish)

10. Västi, K. 1991. Tutkimustyöselostus Haapaveden kunnassa valatusalueella Vesiperä 1, kaiv. rek. nro. 3853/1, suoritetuista malmitutkimuksista. Geological Survey of Finland, Report M06/2433/-91/1/10. 3 p. (in Finnish)*http://tupa.gtk.fi/raportti/valtaus/m06_2433_91_1_10.pdf*

11. Weihed, P. & Mäki, T. 1997. Volcanic hosted massive sulfide deposits and gold deposits in the Skellefte district and Western Finland. Geological Survey of Finland, Guide 41. 81 p.
http://tupa.gtk.fi/julkaisu/opas/op_041.pdf