Pahkosuo

Alternative Names: Pahkolampi, Rytisuo, Tulivaara
Occurence type: prospect

Commodity	Rank	Total measure	Total production	Total resource	Importance
gold	1	0,15 t	NA	0,15 t	Occurrence
tellurium	3	NA	NA	NA	NA
silver	3	NA	NA	NA	NA

Easting EUREF: 608933,488
Northing EUREF: 7247635,833
Easting YKJ: 3609150
Northing YKJ: 7250669

Discovery year: 1995
Discovered by: Geological Survey of Finland
Province: Kuhmo (Ni, Ag, Au)
District: Tormua (Au)
Comments: Discovery by drilling into a structurally favourable location in a combined till geochemical and ground IP anomaly. First indication was an extensive Au anomaly in till detected in early 1990s.
References: 2, 8, 9, 11

Mineral deposit type

Group: Metallogenic deposit
Main type: Orogenic (metamorphic hydrothermal)
Comments: Formed after the peak metamorphic event under slightly retrograde conditions near the ductile-brittle transition. An orogenic "mesothermal" deposit with a distinct structural control and having formed under amphibolite-facies conditions.
References: 3, 4

Dimension

Expression: exposed
Form: discordant
Shape: irregular
Length (m): NA
Width (m): NA
Thickness (m): NA
Depth (m): NA
Area (ha): NA
Dip azim: 90
Dip: 80
Plunge azim: NA
Plunge dip: NA
Orientation method: NA
Dimension comments: Several 1-5 m wide lodes dipping at 80° to the east, open along strike and at depth.

Holder history

Previous holders:

Company	Years	Holding type	Comments
Mineral Exploration Network (Finland) Limited	2011	Exploration permit	Under moratorium in June 2020

Mineral Exploration Network (Finland) Limited	2009-2010	Claim reservation (old law)	NA
Polar Mining Oy	2003	NA	NA
Outokumpu Oy	2002-2003	NA	NA
Geological Survey of Finland	1995-2001	NA	NA

Figures

Location of the Pahkosuo claims in 2001:

EXPLORATION ACTIVITY

Mineral Exploration Network (Finland) Limited

Years	Activity type	Geologist	Exploration result	Ref
2010-2013	detailed geochemistry	NA	geochemical anomaly	8
	A number of till geochemical anomalies detected			

Outokumpu Oy

Years	Activity type	Geologist	Exploration result	Ref
2002-2003	core drilling	Jarmo Vesanto	mineral occurrences	1, 5
	Core drilling (reconnaissance drilling): ten diamond-drill holes. "Narrow, but scattered high-grade gold intercepts encountered". Metal grades possibly included into a CD appendix of the report by Lahtinen (2007)			
	Intersections			
	HoleID	SMS/PAH-1		
	From-To	82,5-83,5		
	Length	1m		
	gold	1,69ppm		
	silver	14,4ppm		
	tellurium	9,65ppm		
	HoleID	SMS/PAH-10		
	From-To	90,9-91,9		
	Length	1m		
	gold	3,11ppm		
	silver	0,31ppm		
	HoleID	SMS/PAH-10		
	From-To	104,6-105,6		
	Length	1m		
	gold	2,93ppm		
	silver	0,21ppm		
	HoleID	SMS/PAH-5		
	From-To	119-119,6		
	Length	0,6m		
	gold	2,07ppm		
	silver	0,25ppm		

Geological Survey of Finland

Years	Activity type	Geologist	Exploration result	Ref
1995-1998	core drilling	Kimmo Pietikäinen	mineralized zone identified	7, 10, 12
	Core drilling (reconnaissance drilling): 43 diamond-drill holes and 19 RC holes, total drilling 4732 m; Drilling into a structurally favourable location in a combined till geochemical and ground IP anomaly.			
	Intersections			
	HoleID	NA		
	From-To	NA		

	Length	1m
	gold	1ppm
	HoleID	NA
	From-To	NA
	Length	4m
	gold	3,5ppm
	HoleID	NA
	From-To	NA
	Length	4m
	gold	2,92ppm
	HoleID	NA
	From-To	NA
	Length	2,1m
	gold	4,2ppm
	HoleID	NA
	From-To	NA
	Length	1m
	gold	5,2ppm
	HoleID	NA
	From-To	NA
	Length	1m
	gold	10,1ppm
	HoleID	NA
	From-To	NA
	Length	1m
	gold	8,18ppm
	HoleID	NA
	From-To	NA
	Length	1m
	gold	6,7ppm
	HoleID	NA
	From-To	NA
	Length	1m
	gold	6,1ppm
	HoleID	NA
	From-To	NA
	Length	1m
	gold	16,6ppm

1991-1999	detailed geophysics	Kimmo Pietikäinen	geophysical anomaly	10, 12
	Ground IP, VLF-R and magnetic survey. The two main IP anomalies indicate Au lodes and metakomatiitic units in the area. The trends of the IP anomalies also suggest the presence of NW-trending faults.			

1991-1999	detailed geology	Kimmo Pietikäinen	identification of an anomalous area	3, 7, 10, 12

1991-1999	detailed geochemistry	Kimmo Pietikäinen	geochemical anomaly	7, 10
	Au-As-Te anomaly in till 200-400 m wide. A strong positive correlation between gold and scheelite detected in quartz veins.			

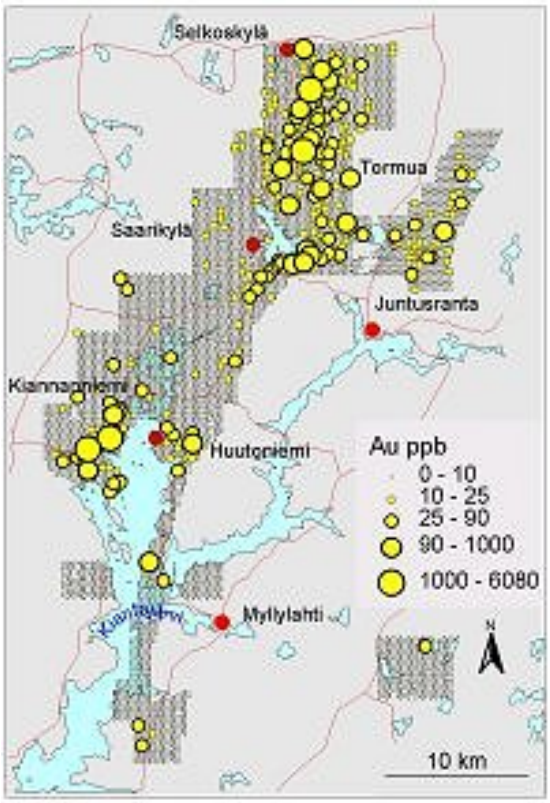
1990-2001	regional geochemistry	Markku Tenhola	favorable geological environment	
	Greenstone belt-wide till-geochemical survey with 16 damples per one sq.km. Au-As-Te anomaly in till 200-400 m wide, extends along strike several km to the N and S from the detected Au occurrence; total length of the Au-As-Te anomaly in till is, at least, 10 km.			

1987-1987	regional geochemistry	Markku Tenhola	geochemical anomaly	7
	Country-wide till-geochemical survey			

1977-1977	regional geophysics	NA	key geological features	
	Low-altitude airborne magnetic, electromagnetic and radiometric survey			

Figures

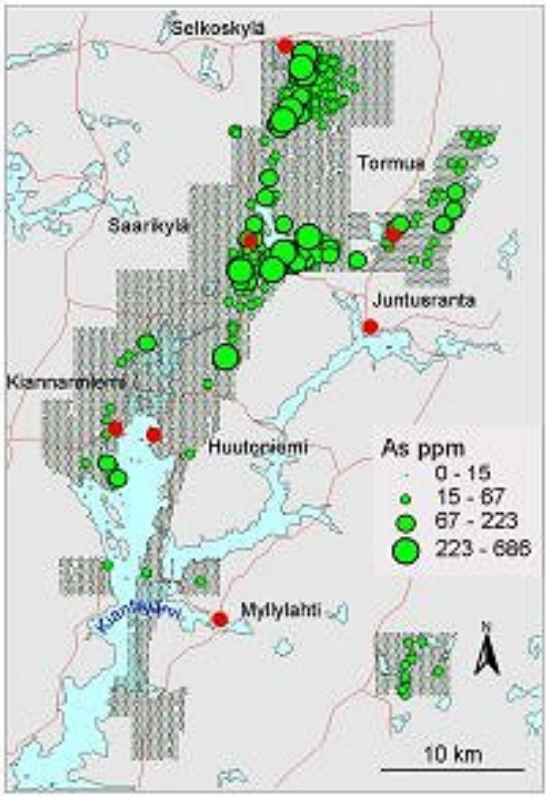
Suomussalmi greenstone belt: aeromagnetic image and gold occurrences:

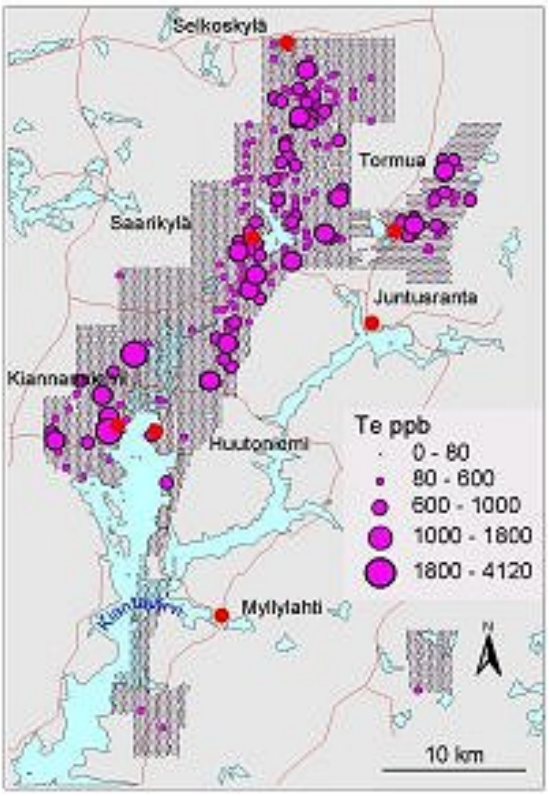


Suomussalmi greenstone belt

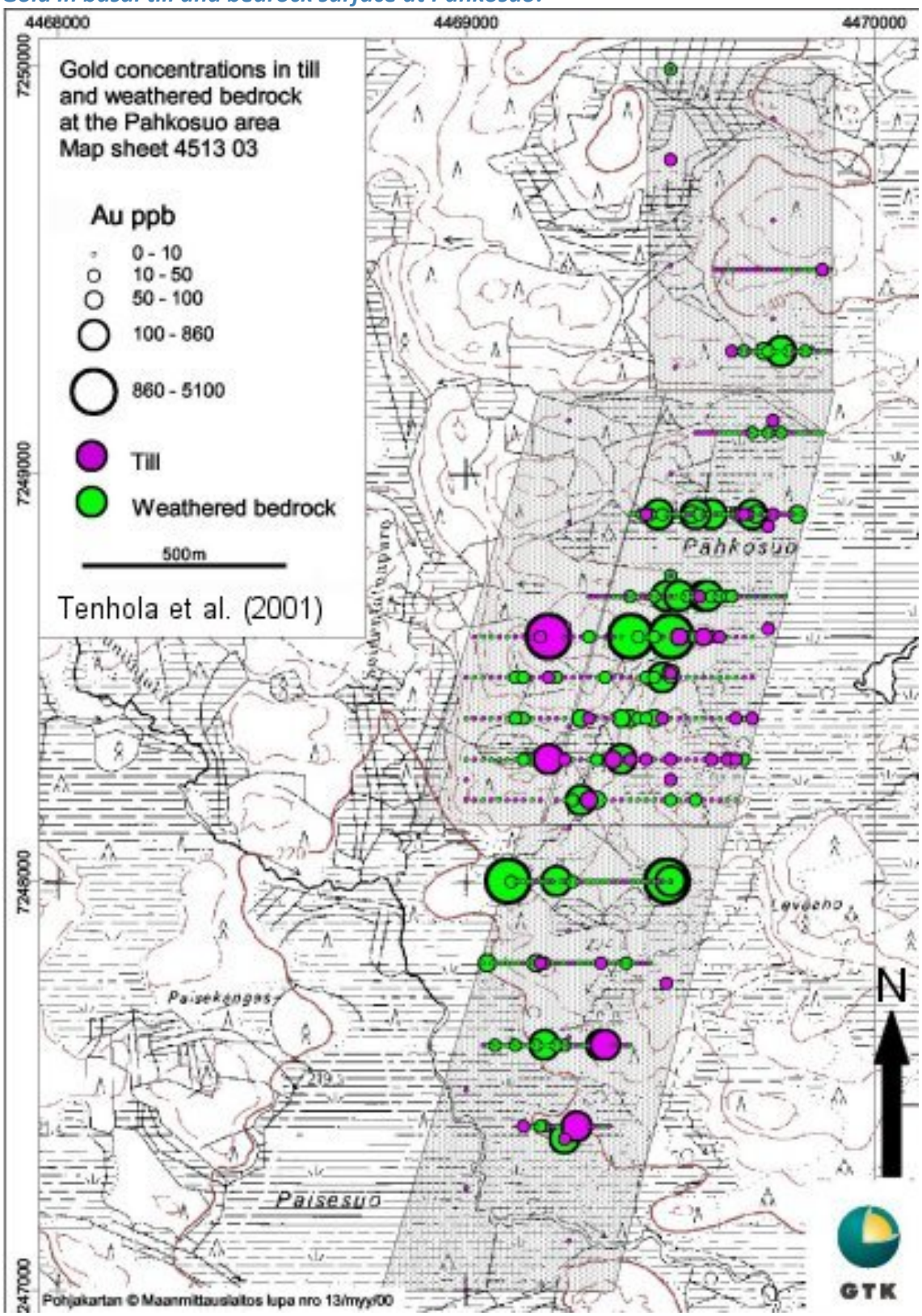
As, Au and Te in till

(Luukkonen et al. 2002)





Gold in basal till and bedrock surface at Pahkosuo:



RESOURCES AND RESERVES

Most recent

Type:	Company:	Year:	Date:	Calc Method:	Reference:
Resource	Geological Survey of Finland	2001	NA	Non-compliant resource estimate	4
	Category:	**Inferred mineral resource**			
	Tonnage:	**0,1 Mt**			
	gold	1,55 ppm			
	Cutoff:	**NA**			

GEOLOGY

Host rock: Tholeiitic basalt, Tonalite, Quartz porphyry, Granodiorite

Tholeiitic basalt (Host rock)

Rock type: Host rock
Proportion: major
Grain size: NA
Color: NA
References: 3, 6, 7, 10, 12
Comments: Auriferous, pyritic, quartz veins are common. The deposit is between the greenstones and a TTG-series granitoid. The mineralisation is within a second-order D3 or D4 fault or shear zone [1], in N-trending shear zone in the contact zone between the Suomussalmi Greensotne Belt and adjacent granitoids, possibly also controlled by NW-trending faults.

Ore minerals:

Mineral	Proportion	Mineral texture
Arsenopyrite	minor	
Chalcopyrite	minor	
Gold	minor	
	Native gold associated with scheelite in quartz veins.	
Pyrite	major	
Pyrrhotite	major	

Other minerals:

Mineral	Proportion	Mineral texture
Scheelite	present	

Alteration:	Distribution:	Degree:	Relation to mineralization:
sulphidation	Disseminated	NA	Syn
sericitic alteration	Disseminated	NA	Syn

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		

Geological age:

Geological era:	Max age - Minage (Ma):	Inferred age (Ma):	Age of mineralization:
Archean (4000-2500 Ma)	2500-4000		N

Tonalite (Host rock)

Rock type: Host rock
Proportion: minor
Grain size: NA

Color: NA
References: 3, 6, 7, 10

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		

Geological age:

Geological era:	Max age - Minage (Ma):	Inferred age (Ma):	Age of mineralization:
Archean (4000-2500 Ma)	2500-4000		N

Quartz porphyry (Host rock)

Rock type: Host rock
Proportion: minor
Grain size: NA
Color: NA
References: 3, 6, 7, 10
Comments: A TTG granitoid, with an age of 2740-2720 Ma, at the contact of the mineralised zones [1], sets of granitoid and felsic porphyry dykes, that have intruded the mafic volcanic sequence, predate mineralisation

Metamorphic description:

Other minerals:

Mineral	Proportion	Mineral texture
Quartz	present	

Type:	Facies:	Degree:	Relation to mineralization:	Min P- Max P (kbar)	MIn T- Max T (°C)
Regional	amphibolite metamorphic facies	medium metamorphic grade	NA		

Geological age:

Geological era:	Max age - Minage (Ma):	Inferred age (Ma):	Age of mineralization:
Neoarchean (2800-2500 Ma)	2720-2740		N

Granodiorite (Host rock)

Rock type: Host rock
Proportion: minor
Grain size: NA
Color: NA
References: 3, 6, 7, 10
Comments: A TTG granitoid, with an age of 2740-2720 Ma, at the contact of the mineralised zones

[1], sets of granitoid and felsic porphyry dykes, that have intruded the mafic volcanic sequence, predate mineralisation

Metamorphic description:

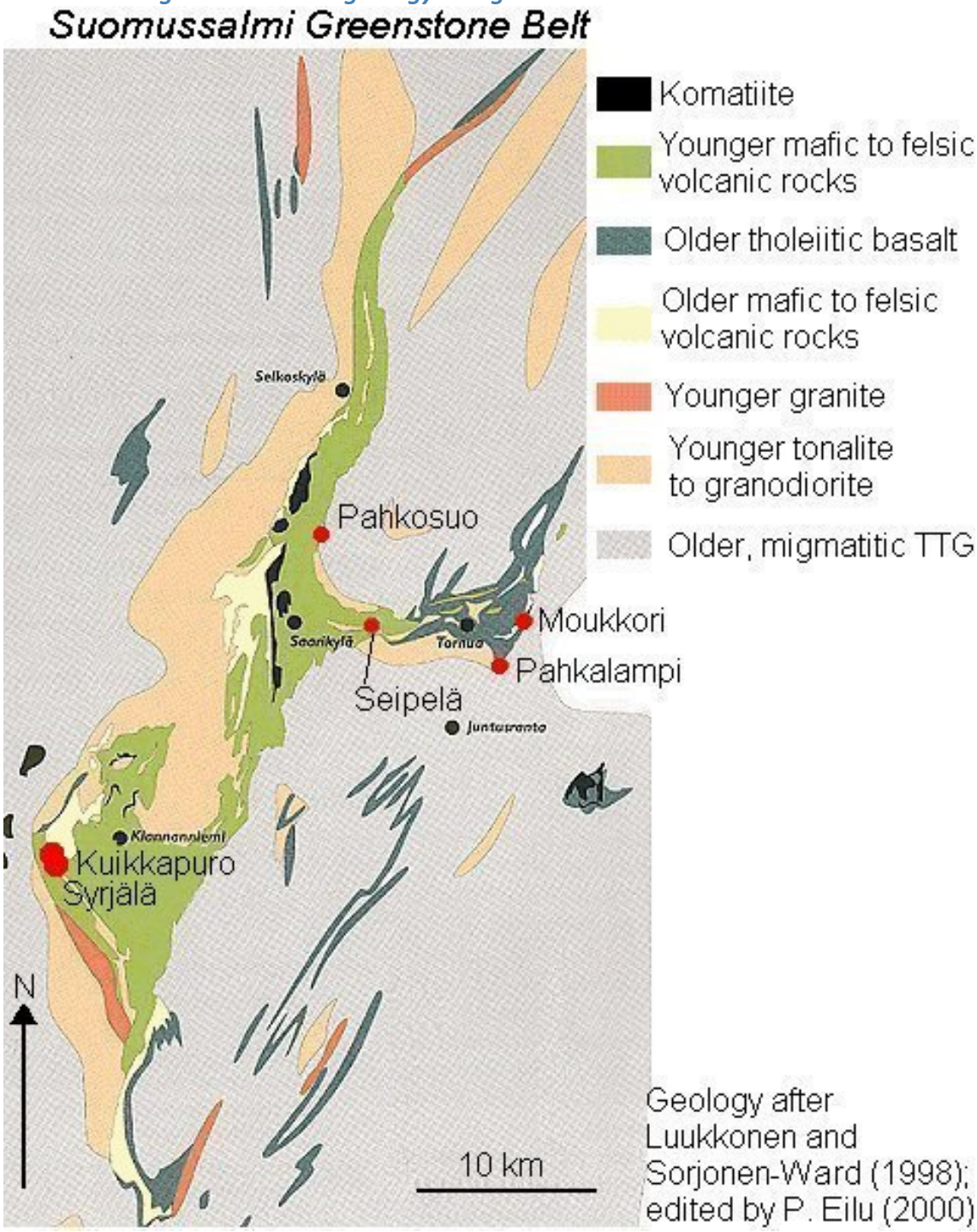
Type:	Facies:	Degree:	Relation to mineralization:	Min P- Max P (kbar)	MIn T- Max T (°C)
Regional	amphibolite metamorphic facies	medium metamorphic grade	NA		

Geological age:

Geological era:	Max age - Minage (Ma):	Inferred age (Ma):	Age of mineralization:
Neoarchean (2800-2500 Ma)	2720-2710		N

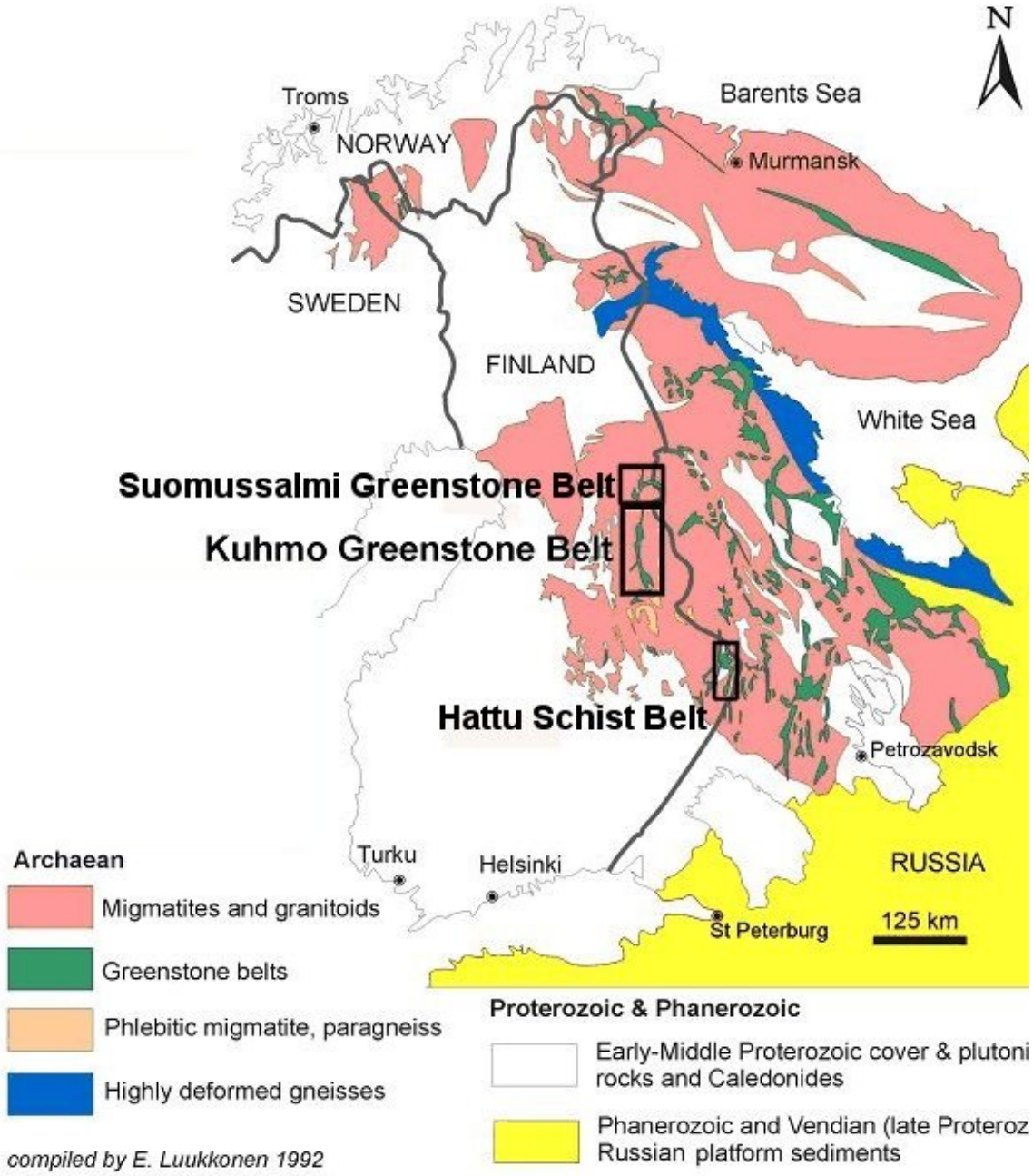
Figures

Suomussalmi greenstone belt geology and gold occurrences:

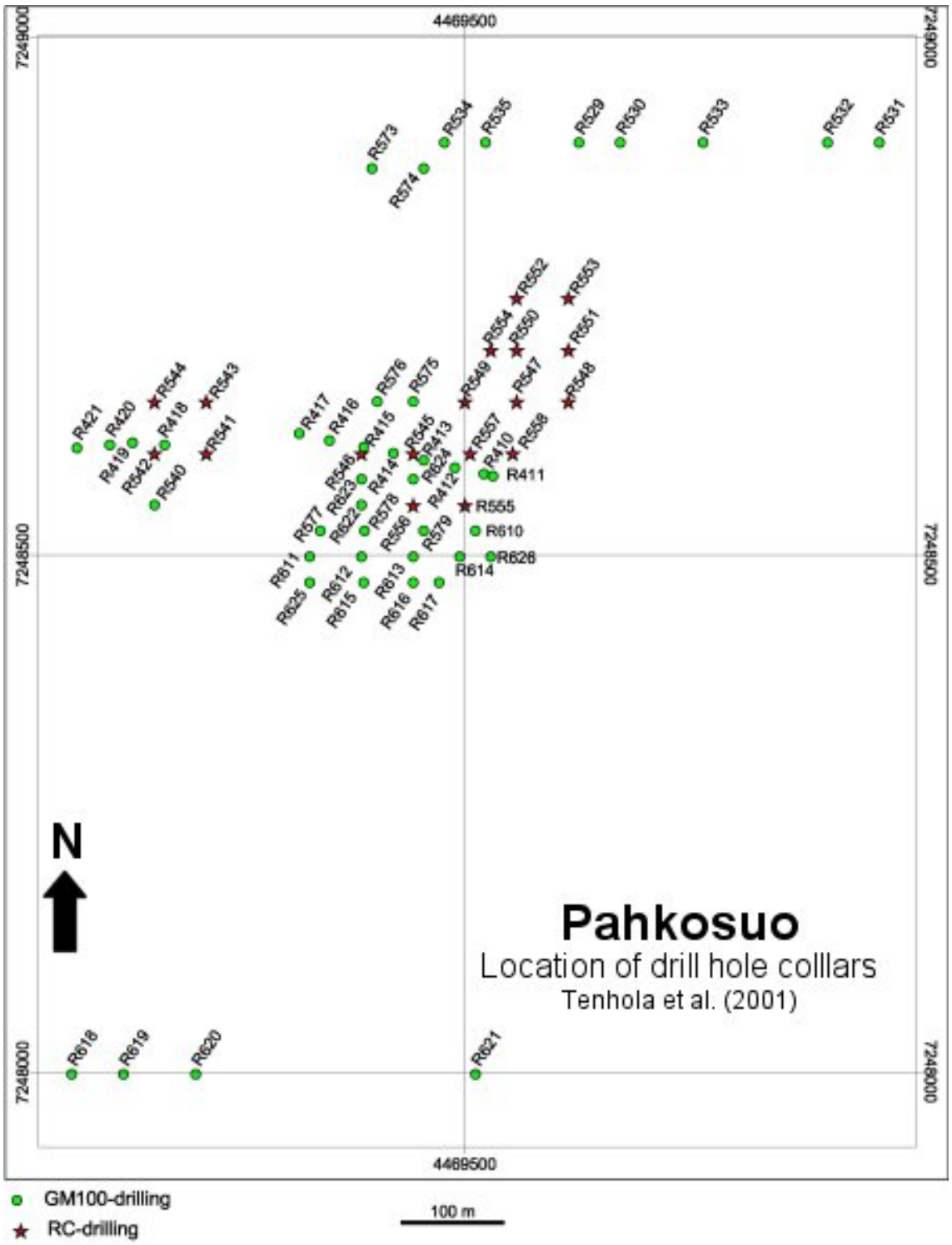


Geology after Luukkonen and Sorjonen-Ward (1998); edited by P. Eilu (2000)

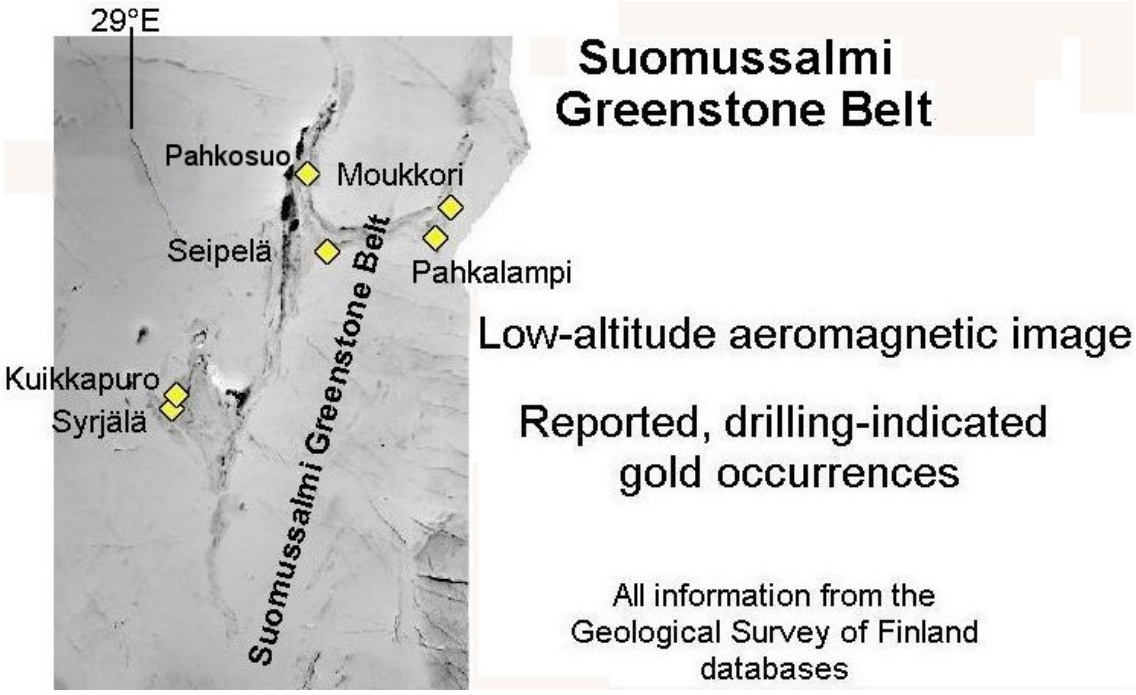
East Finland greenstone belts in the Archaean of Fennoscandia:



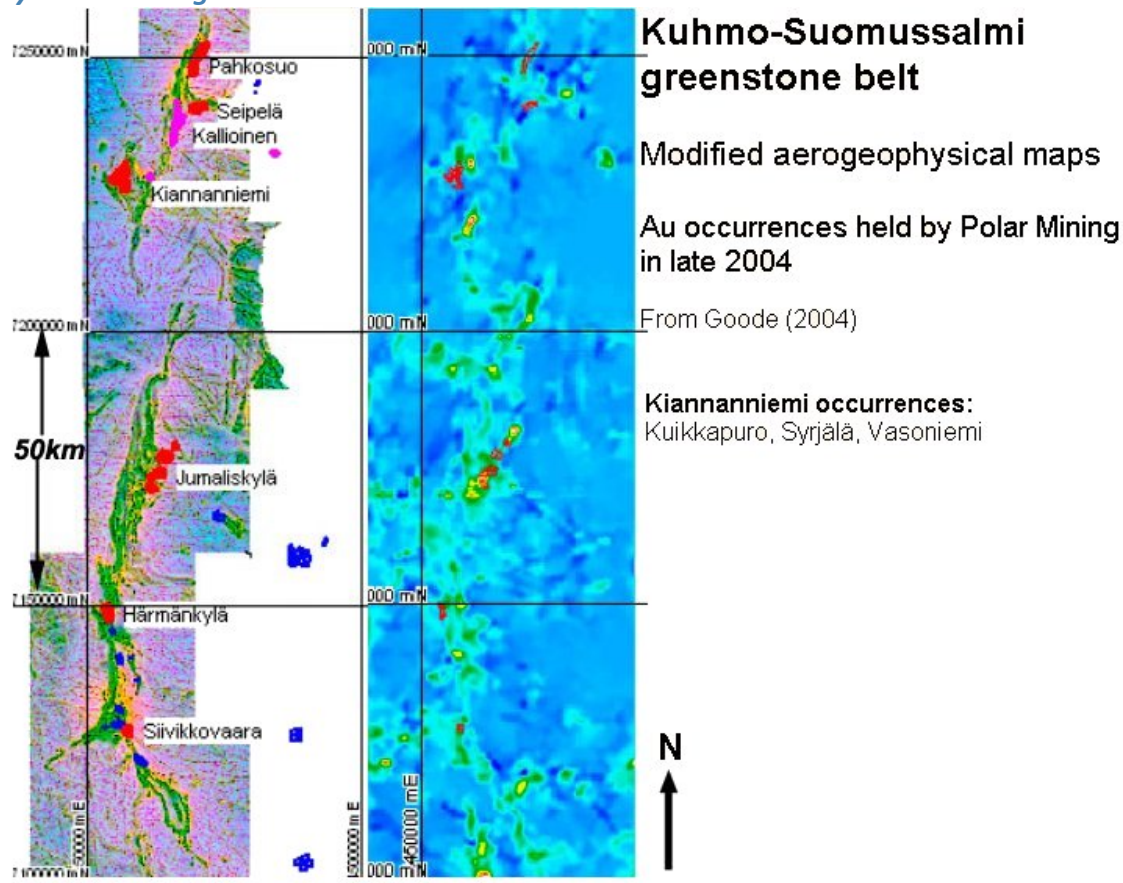
Pahkosuo drill hole collars:



Suomussalmi greenstone belt: aeromagnetic image and gold occurrences:



Kuhmo and Suomussalmi greenstone belts: processed aerogeophysics and tenements held by Polar Mining in 2004:



REFERENCES

1. Dragon Mining NL 2004. Quarterly Activities Report for the Quarter Ended 31st December 2003. Perth, Australia. 8 p.*http://tupa.gtk.fi/karttasovellus/mdae/references/284_Pampalo/2004(1).pdf*

2. Goode, K. 2004. Dragon Mining NL (DRA) - Bringing Scandinavian Gold Mines into Production. 12 p. *http://en.gtk.fi/export/sites/en/informationservices/explorationnews/2004/k_goode_report.pdf*

3. Halkoaho, T. & Pietikäinen, K. 1999. Ni and Au prospects of the Kuhmo and Suomussalmi greenstone belts. In: H. Papunen & P. Eilu (eds.) Geodynamic Evolution and Metallogeny of the Central Lapland, Kuhmo and Suomussalmi Greenstone Belts, Finland. University of Turku, Inst. Geol. Mineral. Publ. 42, 60-63.

4. Heino, T. 2001. Mineral Resource Assesment of the Pahkosuo gold mineralization, claims Pahkosuo 1 (mine reg. N:o 5621/1), Pahkosuo 2 (N:o 6272/1), Pahkosuo 3 (N:o 6272/2) and Pahkosuo 4 (N:o 6410/1). Geological Survey of Finland, Report M19/4513/2001/1. 3 p., 19 app. *http://tupa.gtk.fi/raportti/arkisto/m19_4513_2001_1.pdf*

5. Lahtinen, J. 2007. Tutkimustyöselostus Suomussalmen Tulivaaran-Pahkosuon alueella valtauksilla Tulivaara 1-2 sekä Pahkosuo 1-2 vuosina 2002-2003 suoritetuista malmitutkimuksista. Polar Mining Oy Report 17.1.2007. 5 p., 3 app. appended data: http://tupa.gtk.fi/raportti/aineistotallenne/7633_7_8_7500_36_37.zip *http://tupa.gtk.fi/raportti/valtaus/7633_7_8_7500_36_37.pdf*

6. Luukkonen, E. 1992. Late Archaean and Early Proterozoic structural evolution in the Kuhmo-Suomussalmi Terrain, eastern Finland. Annales Universitatis Turkuensis. Ser. A. II 78, 1-37.

7. Luukkonen, E., Halkoaho, T., Hartikainen, A., Heino, T., Niskanen, M., Pietikäinen, K. & Tenhola, M. 2002. Itä-Suomen arkeeiset alueet -hankkeen (12201 ja 210 5000) toiminta vuosina 1992-2001 Suomussalmen, Hyrynsalmen, Kuhmon, Nurmeksen, Rautavaaran, Valtimon, Lieksan, Ilomantsin, Kiihtelysvaaran, Enon, Kontiolahden, Tohmajärven ja Tuupovaaran alueella. Geological Survey of Finland, Report M19/4513/2002/1. 265 p. (in Finnish) *http://tupa.gtk.fi/raportti/arkisto/m19_4513_2002_1.pdf*

8. MEN Finland 2013. Rytisuo

9. Papunen, H., Halkoaho, T., Liimatainen, J. & Luukkonen, E. 2001. Metallogeny of the Archaean Tipasjärvi-Kuhmo-Suomussalmi greenstone belt, Finland. AGSO - Geoscience Australia, Record 2001/37, 456-458.

10. Parkkinen, J. 2001. Quality control of mineral resource estimates: Laivakangas, Hosko, Kuivisto E, Other, Osikonmäki, Pirilä, Housuvaara, Pahkalampi. Geological Survey of Finland, Upadate to GTK Report C/M19/2441/2000/1. 27 p.*http://tupa.gtk.fi/raportti/arkisto/25_2020.pdf*

11. Sorjonen-Ward, P. & Luukkonen, E.J. 2005. Archean rocks. In: Precambrian Geology of Finland - Key to the Evolution of The Fennoscandian Shield. Elsevier Science B.V., Amsterdam, 19-99.

12. Tenhola, M., Pietikäinen, K., Hartikainen, A. & Niskanen, M. 2001. The Pahkosuo gold prospects in Suomussalmi, eastern Finland in 1991-1998 (registen numbers of claims: Pahkosuo 1, 5621/1; Pahkosuo 2, 7272/2; Pahkosuo 3 6272/2; Pahkosuo 4, 6410/1. Geological Survey of Finland, Report M 06/4513/2001/1. 15 p.*http://tupa.gtk.fi/raportti/valtaus/m06_4513_2001_1.pdf*