Kutuvuoma

Occurence type: deposit

Commodity	Rank	Total measure	Total production	Total resource	Importance
gold	1	0,52 t	0,03 t	0,49 t	Occurrence
copper	2	68 t	0 t	68 t	Occurrence

Easting EUREF: 445819,432
Northing EUREF: 7497836,621
Easting YKJ: 3445970
Northing YKJ: 7500970

Discovery year: 1993
Discovered by: Outokumpu Oy
Province: Kittilä (Au, Cu)
District: Sirkka (Cu, Au, Ni, Co)
Comments: The deposit has been test mined
References: 5, 6, 11, 14

Mineral deposit type

Group: Metallogenic deposit
Main type: Orogenic (metamorphic hydrothermal)
Sub type 1: Au-Co-Cu
Comments: Clearly epigenetic, "mesothermal" mineralisation with a distinct structural control.
References: 15

Dimension

Expression: exposed
Form: discordant
Shape: irregular
Length (m): 1100
Width (m): NA
Thickness (m): NA
Depth (m): NA
Area (ha): NA
Dip azim: NA
Dip: 80
Plunge azim: NA
Plunge dip: NA
Orientation method: NA
Dimension comments: At least, two ore bodies, about 150 m apart. The deposit is open in all directions. The deposit has a west plunging gold grade trend.

Holder history

Current holder: B2Fingold Oy
Years: 2014
Holding type: Mining concession (old law)
Comments: Joint Venture with Aurion Resources from 13 Aug 2019: Aurion/B2Gold = 49/51 %

Previous holders:

Company	Years	Holding type	Comments

Dragon Mining Oy	2011-2014	Mining concession (old law)	NA
Polar Mining Oy	2003-2011	Mining concession (old law)	NA
Outokumpu Oy	1998-2003	Mining concession (old law)	NA
Outokumpu Oy	1994-1998	Claim (old law)	NA

EXPLORATION ACTIVITY

B2Gold

Years	Activity type	Geologist	Exploration result	Ref
2020-2023	core drilling	NA	mineral occurrences	7, 8
	Drilling confirms lateral extensions to the west and east of the main zone, and indicates another mineralised zone to the SW of the main ore body at Kutuvuoma. 2023: for diamond holes, in total 1,457.25 m.			
	Intersections			
	HoleID	KU20006		
	From-To	121,2-126,8		
	Length	5,6m		
	gold	6,74ppm		
	HoleID	KU20008		
	From-To	28,2-30,9		
	Length	2,8m		
	gold	12,28ppm		
	HoleID	KU23011		
	From-To	258,2-274,6		
	Length	16,4m		
	gold	0,99%		

Aurion Resources Oy

Years	Activity type	Geologist	Exploration result	Ref
2016-2016	core drilling	NA	NA	10
	5 drill holes, in total 535 m			
	Intersections			
	HoleID	KU16001		
	From-To	38,6		
	Length	8,9m		
	gold	1,76ppm		
	Comments	*370 m west of the Deposit*		
	HoleID	KU16002		
	From-To	42,6		
	Length	5,1m		
	gold	1,43ppm		
	Comments	*100 m east of the Deposit*		
	HoleID	KU16003		
	From-To	21,4		
	Length	2,2m		
	gold	8,59ppm		
	Comments	*drilled into the known Deposit*		
	HoleID	KU16003		
	From-To	71,9		
	Length	13,3m		
	gold	11,37ppm		
	Comments	*drilled into the known Deposit*		

2014-2015	excavation	NA	mineralized zone identified	4, 6, 9

	Exploration trenches excavated; extends gold mineralization at Kutuvuoma over 1000 m strike. Assays from trenches; 8.00 m @ 4.7 ppm Au, 4.00 m @ 5.3 ppm Au, 9.8 m @ 6.5 ppm Au

2014-2015	detailed geochemistry	NA	mineral occurrences	6, 9
	Trenching, soil and till sampling, outcrop sampling. Resulted in detection of extension of the mineralised zone (or detection of two additional mineralised domains) 90 m to the west and 560 m to the east of the previously known mineralised domain.			

Terra Mining Oy

Years	Activity type	Geologist	Exploration result	Ref
1998-2000	excavation	Tapio Lehto	NA	15

Outokumpu Oy

Years	Activity type	Geologist	Exploration result	Ref
1994-1995	core drilling assessment	Erkki Ilvonen, Risto Anttonen	mineral resource defined	1, 2, 3, 6, 15
	Core drilling (reconnaissance drilling): 47 shallow diamond-drill and RC holes, totalling 3425 m; max drilling depth was 160 m (Aurion Resources media release, January 15, 2015).			
	Intersections			
	HoleID	KTÄ/KUV-14		
	From-To	25-33		
	Length	8m		
	gold	8,1ppm		
	HoleID	KTÄ/KUV-9		
	From-To	10-21		
	Length	11m		
	gold	16,47ppm		
	copper	0,47%		
	Comments	*RC-drill hole, including 6 m @ 27.88 ppm Au and 0.43 % Cu from 14.00 m*		
	HoleID	KTÄ/KUV13		
	From-To	12-21		
	Length	9m		
	gold	13,55ppm		
	HoleID	KUV-19RC		
	From-To	6-22		
	Length	16m		
	gold	8,7ppm		
	HoleID	KUV-29RC		
	From-To	26-33		
	Length	7m		
	gold	12,7ppm		
	HoleID	KUV-35		
	From-To	88,1-96,7		
	Length	8,6m		
	gold	8,5ppm		
	HoleID	KUV-36		
	From-To	64,6-84		
	Length	19,4m		
	gold	7,2ppm		
	HoleID	KUV-46		
	From-To	147,1-152,2		
	Length	5,1m		

	gold	9,7ppm		

1993-1998	detailed geophysics	Erkki Ilvonen, Risto Anttonen	NA	2, 14, 15

1993-1998	percussion drilling	Erkki Ilvonen, Risto Anttonen	NA	2, 14, 15
	Dilling in an Au anomaly in till originally detected by GTK.			

1993-1998	detailed geology	Erkki Ilvonen, Risto Anttonen	NA	2, 14, 15

1993-1998	detailed geochemistry	Erkki Ilvonen, Risto Anttonen	NA	6, 15
	Au anomaly in till. The gold and pathfinder anomalies are open along strike both to the west and east.			

Geological Survey of Finland

Years	Activity type	Geologist	Exploration result	Ref
1976-1976	regional geophysics	NA	key geological features	
	Low-altitude airborne magnetic, electromagnetic and radiometric survey			

RESOURCES AND RESERVES

Most recent

Type:	Company:	Year:	Date:	Calc Method:	Reference:
Resource	Outokumpu Oy	2006	NA	Non-compliant resource estimate	11, 14
	Category:	**Inferred mineral resource**			
	Tonnage:	**0,068 Mt**			
	gold	7,3 ppm			
	copper	0,1 %			
	Cutoff:	**gold 1 ppm**			
	Comments: The conventional estimate for the mineral resources contained in the Kutuvuoma ore deposit, employing a cut-off value of Au 1.0 g/t and a cutting point of 20 g/t Au. The estimate is based on 47 drill holes arranged in cross-sections at intervals of 20 m and comprising 4–5 drill holes each.				

MINING

Kutuvuoma

Easting EUREF: 445819,432
Northing EUREF: 7497836,621
Status: Test mining
Operating years: 1999-1999
Years in production: 1
Total ore mined: 9167 t
References: 13, 15

Total production:

Product	Product measure
gold	30,24 kg

Other materials:

Material type	Material measure
Waste rock	17080 t

Mining activity:

Year	Ore mined	Ore processed	Activity type	Production	Other material
1999	9167 t	6048 t	open-pit mining		
				gold 30,24 kg	Waste rock 17080 t

Figures

Open pit of Kutuvuoma:

Open pit of Kutuvuoma:

Ore dump field:

GEOLOGY

Host rock: Komatiite, Quartz vein, Intermediate tuff, Phyllite

Komatiite (Host rock)

Rock type: Host rock
Proportion: major
Grain size: NA
Color: NA
References: 11, 12, 13, 15, 16, 17

Ore minerals:

Mineral	Proportion	Mineral texture
Arsenopyrite	minor	
Chalcopyrite	minor	
Gold	present	
	Gold is associated with pyrrhotite and pyrite. Free gold is common in the quartz veins. Gold introduction post-dated development of both regional foliation and local shear fabrics	
Pyrite	minor	
	a possible precursor phase to development of pyrrhotite	
Pyrrhotite	major	
	good correlation exists between logged pyrrhotite percentage and gold grades	

Other minerals:

Mineral	Proportion	Mineral texture
Albite	present	
Calcite	present	
Chlorite	present	Alteration product
Fuchsite	present	Alteration product
Quartz	present	
Talc	present	Alteration product

Alteration:	Distribution:	Degree:	Relation to mineralization:
albitic alteration	NA	NA	Syn
Comments: Albitised zones are 1¿90 m wide and threir lateral and vertical extents are several hundreds of metres.			
carbonate alteration	NA	NA	Syn
silicification	NA	NA	Syn
Comments: high grade gold intersections and highest hydrothermal alteration (silicification) with the hinge zone of a deposit-scale anticline			
sulphidation	NA	NA	Syn
sericitic alteration			
biotite alteration			
Comments: commonly present in the immediate hanging wall of well mineralized gold-bearing intercepts			

Metamorphic description:

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

Comments: Metamorphic peak during D2, thrusting during D3 was at least partly post-peak, late metamorphic.

Geological age:

Geological era:	Max age - Minage (Ma):	Inferred age (Ma):	Age of mineralization:
Paleoproterozoic (2500-1600 Ma)	2050-2500	2050	N

Quartz vein (Host rock)

Rock type: Host rock
Proportion: minor
Grain size: NA
Color: NA
References: 5, 13, 15
Comments: Sulphide breccias and sulphide bearing quartz veins and quartz breccias within quartz-carbonate altered, meta-sedimentary and meta-volcanic rocks. The mineralization is in the contact zone between komatiite and phyllite, in a E-W or ENE-trending shear zone apparently branching from the Sirkka Shear Zone.

Intermediate tuff (Host rock)

Rock type: Host rock
Proportion: minor
Grain size: NA
Color: NA
References: 2, 12, 13, 15, 16

Metamorphic description:
Ore minerals:

Mineral	Proportion	Mineral texture
Chalcopyrite	present	
Pyrite	present	
Pyrrhotite	present	

Type:	Facies:	Degree:	Relation to mineralization:	Min P- Max P (kbar)	MIn T- Max T (°C)
Regional	greenschist metamorphic facies	medium metamorphic grade	NA		
Comments: Metamorphic peak during D2, thrusting during D3 was at least partly post-peak, late metamorphic.					

Geological age:

Geological era:	Max age - Minage (Ma):	Inferred age (Ma):	Age of mineralization:
Paleoproterozoic (2500-1600 Ma)	2050-2500		N

Phyllite (Host rock)

Rock type: Host rock

Proportion: minor
Grain size: NA
Color: NA
References: 2, 12, 13, 15, 16

Metamorphic description:

Other minerals:

Mineral	Proportion	Mineral texture
Calcite	present	

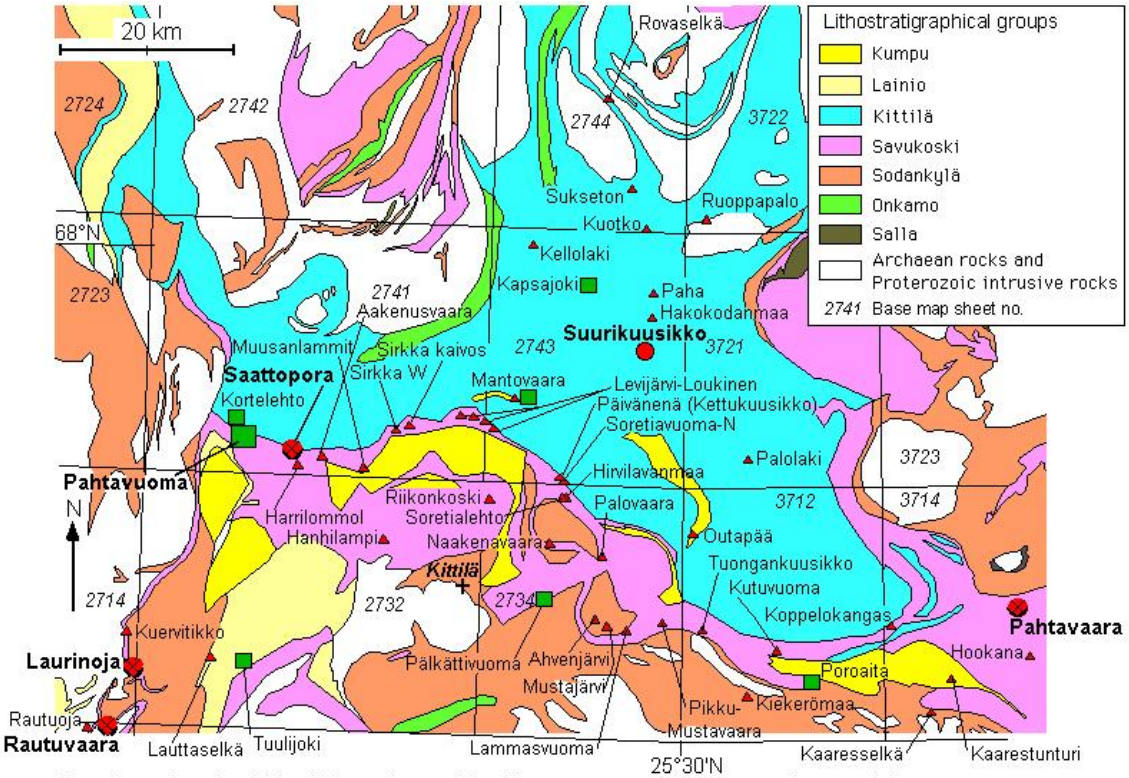
Type:	Facies:	Degree:	Relation to mineralization:	Min P- Max P (kbar)	MIn T- Max T (°C)
Regional	greenschist metamorphic facies	medium metamorphic grade	NA		
Comments: Metamorphic peak during D2, thrusting during D3 was at least partly post-peak, late metamorphic.					

Geological age:

Geological era:	Max age - Minage (Ma):	Inferred age (Ma):	Age of mineralization:
Paleoproterozoic (2500-1600 Ma)	2050-2500		N

Figures

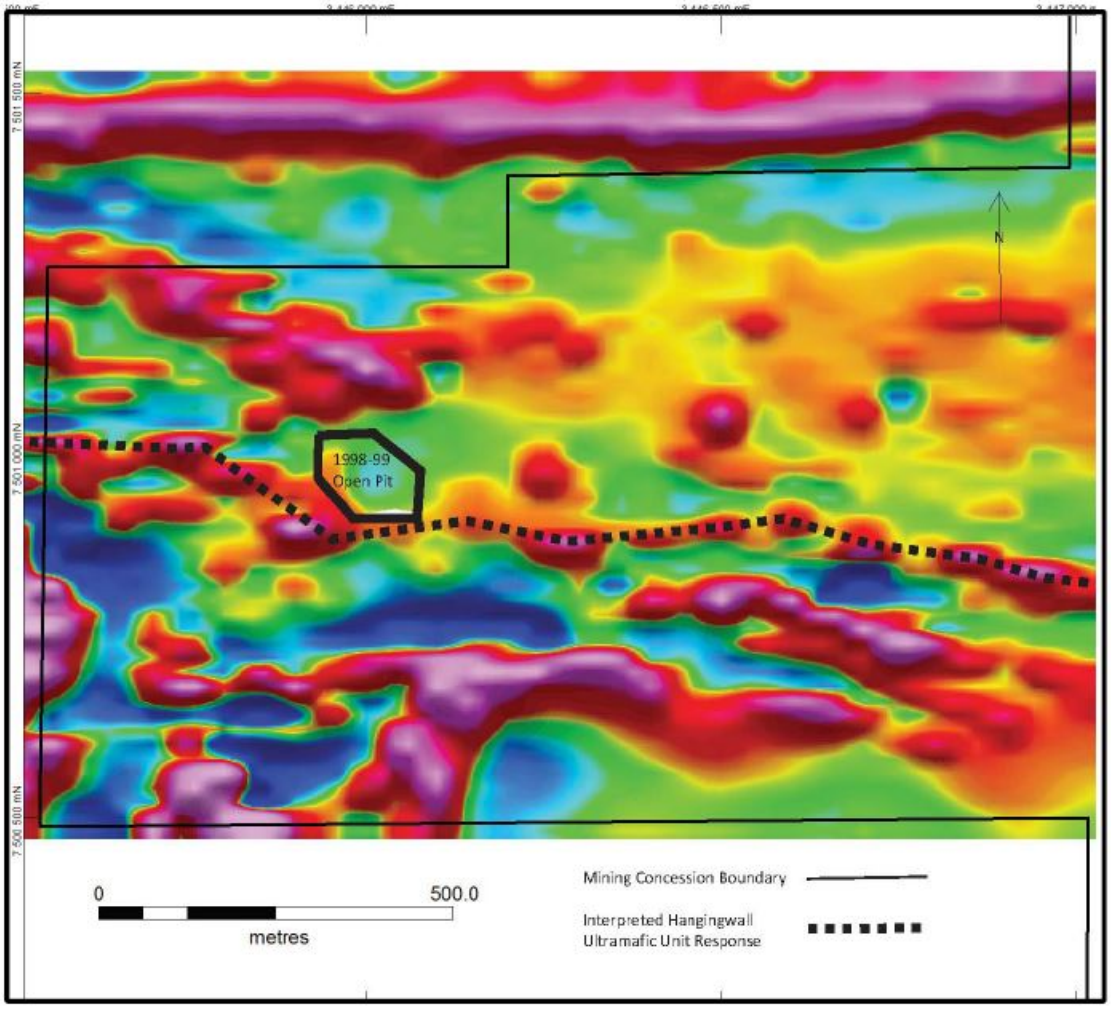
Regional geology:



Zinc (green) and gold (red) deposits and significant prospects in the central parts of the Central Lapland greenstone belt. Lithostratigraphy from Lehtonen et al. (1998). Edited by P. Eilu (2007)

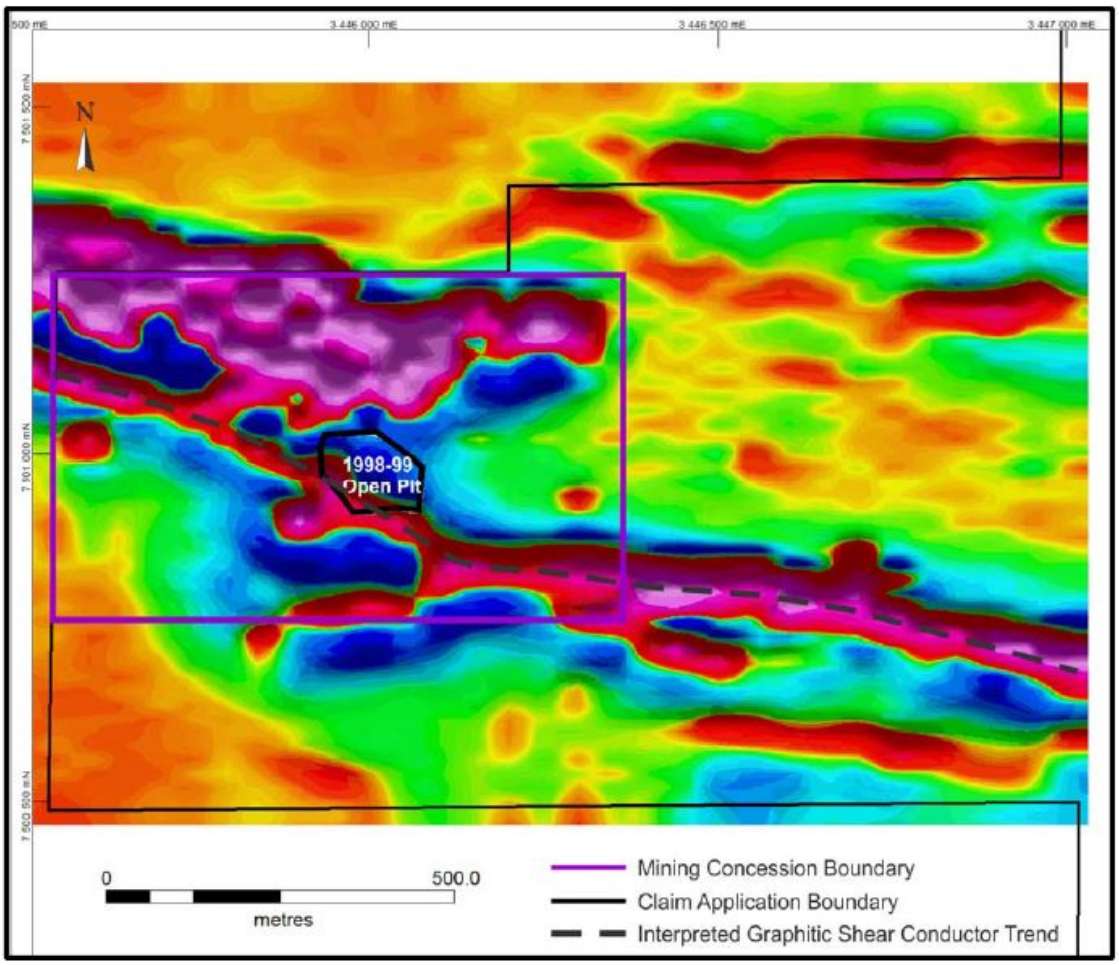
Ground magnetic map with interpreted hangingwall ultramafic unit (Cullen, M. 2014):

Figure 6.8: Ground magnetic gradient survey results (From Dragon files)



Ground electromagnetic map with interpreted graphitic shear conductor (Cullen, M. 2014):

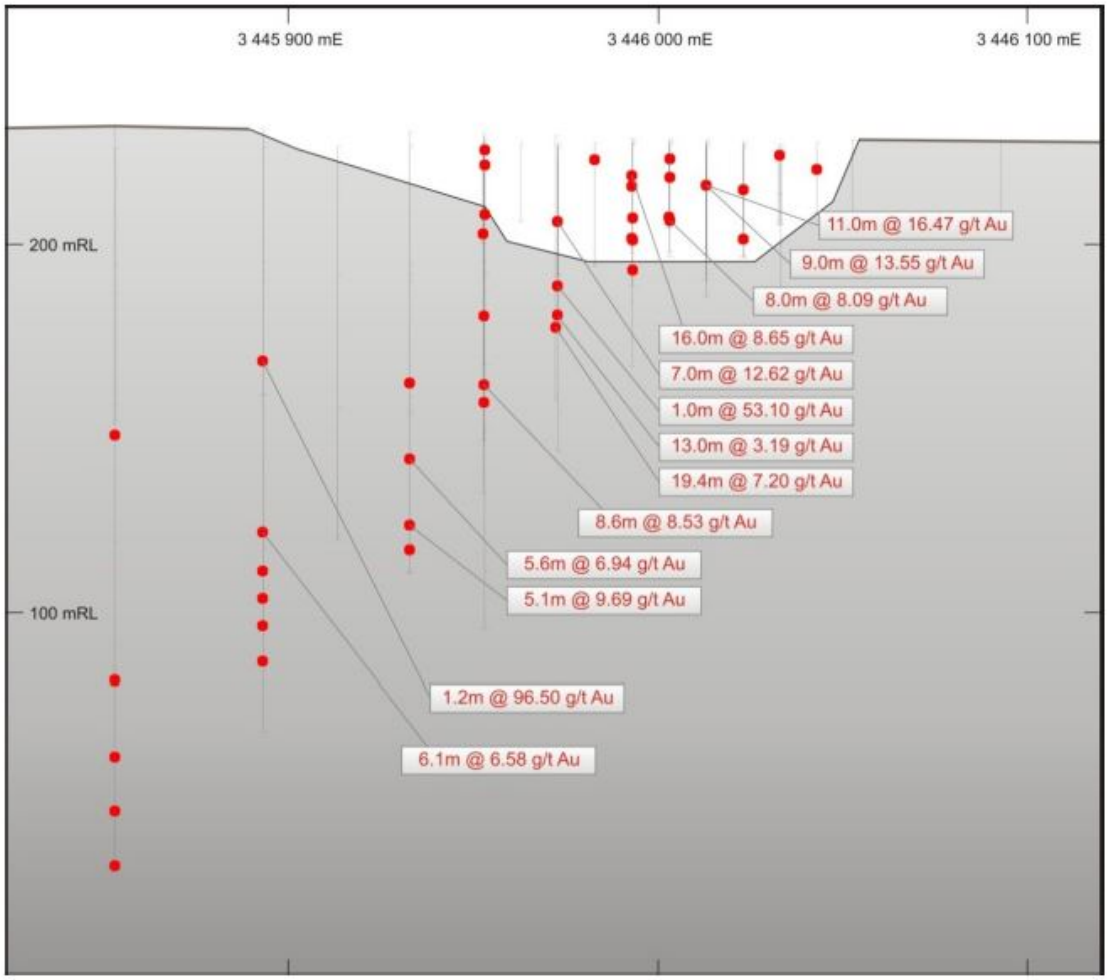
Figure 6.9: Ground HLEM survey results (From Dragon files)



A longitudinal section with weighted avarage gold grades derived from Outokumpu drilling results showing an elongated west-plunging character of gold mineralization

(Cullen, M. 2014):

Figure 6.10: Longitudinal section of drilling intercepts (From Dragon files)

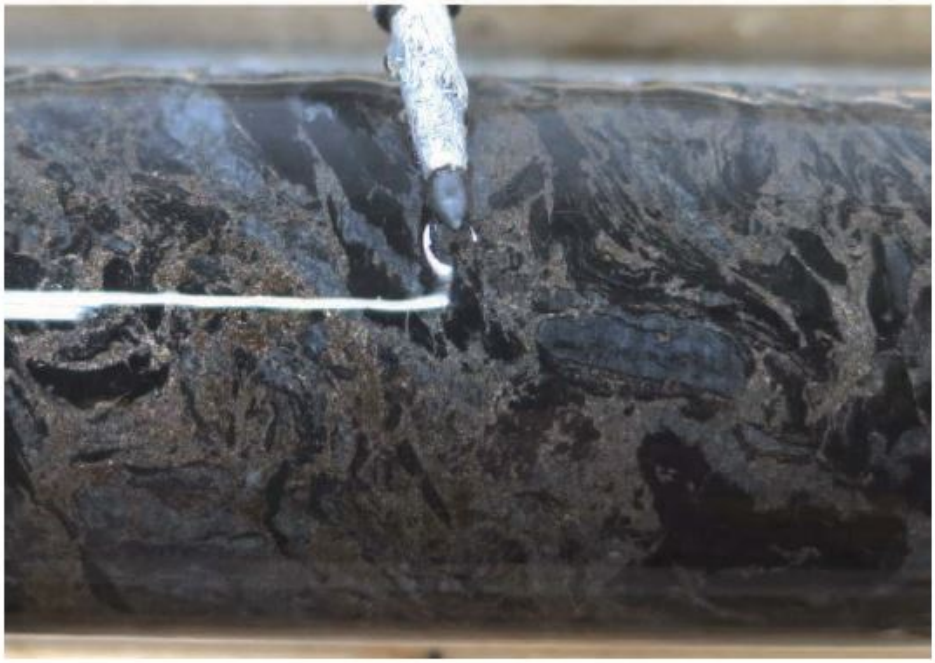


Gold in fracture (Cullen, M. 2014):

Figure 6.11: Coarse gold in post-foliation fracture - KUV-36 @74.5m (From Pratt, 2014)

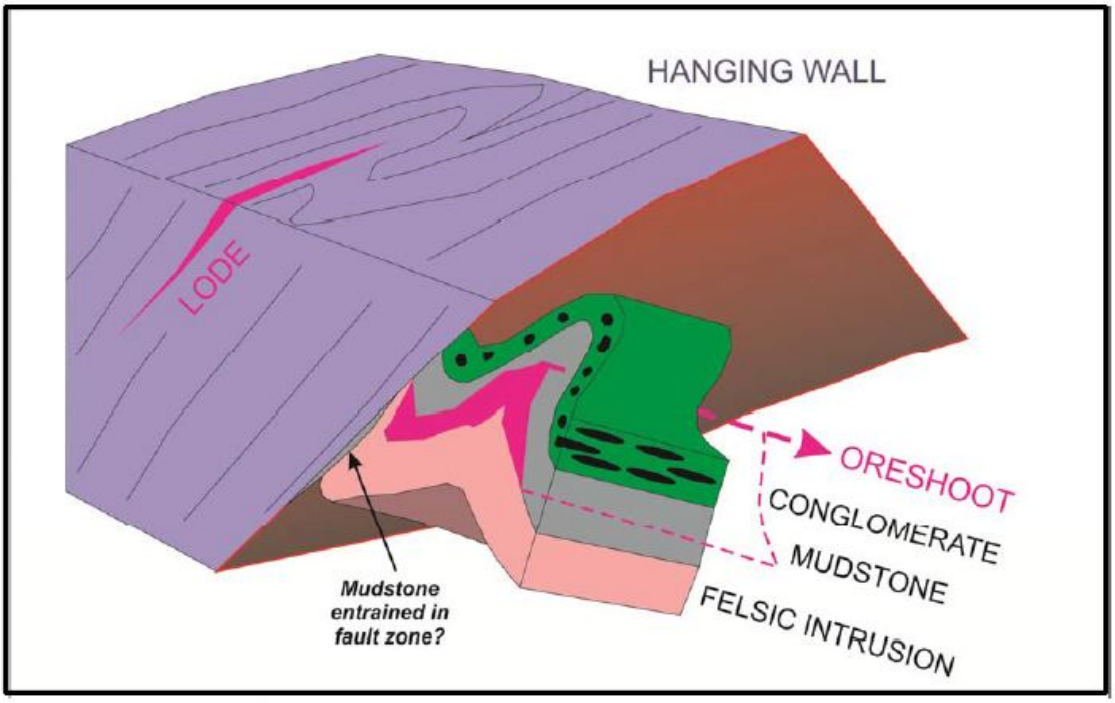
Gold-bearing breccia (Cullen, M. 2014):

Figure 6.13: Gold-bearing sulphide (pyrrhotite) matrix breccia (From Pratt, 2014)



Schematic model for Kutuvuoma (Cullen, M. 2014):

Figure 6.14: Schematic model for Kutuvuoma gold localization proposed by Pratt (2014)



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