

# TANAMI EXPLORATION NL

ABN 45 063 213 598

# **FINAL REPORT**

# EL 23650 'DEPOT CREEK'

# **WINNECKE PROJECT**

From 11 April 2003 to 26 September 2006

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October 2006

## Distribution:

- ☐ Department of Business, Industry, & Resource Development (1)
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File: cr32dpifmFR2006\_ Depot Creek

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#### 1.0 SUMMARY

EL 23650 'Depot Creek' covers the Winnecke Goldfield, Central Australia, approximately 65 kilometres northeast of Alice Springs (Figure 1). The tenement was granted on 11 April 2003 to Tanami Exploration NL (TENL), a wholly owned subsidiary of Tanami Gold NL (TGNL), a publicly listed company. After three years of tenure the tenement was reduced in size pursuant to the requirements of section 26 of the *NT Mining Act*. The remaining tenement area was surrendered on 26 September 2006. Exploration on the portion of EL 23650 relinquished in September 2006 is the subject of this report.

The relinquished tenement area is interpreted to be underlain by Cadney Metamorphics. Geo Discovery Group Pty Ltd (Geodiscovery) on behalf of BHP Billiton / Teck Cominco Australia Pty Ltd (Teck) completed geochemical sampling (9 rock chip samples) together with two ground magnetic traverses. No significant base metal anomalism was detected.

TENL completed an assessment of previous exploration, regional geological mapping and geochemical sampling. Rockchip sampling in 2003 at the Glancroil workings on EL 23650 'Depot Creek' returned significant results with values up to 5.8 ppm Au. In 2004 a stratigraphic traverse with rock chip sampling (3 samples) across the western part of EL 23650 'Depot Creek' returned no elevated gold results.

#### 2.0 INTRODUCTION

EL 23650 is located approximately 65 kilometres northeast of Alice Springs (**Figure 1**) on the Alice Springs 1:250 000 map sheet (SF53-14) and the Laughlen 1:100 000 map sheet (5751). Access is gained from the Stuart Highway along an unsealed road leading to "The Garden", "Ambalindum" and "Claraville" Stations.

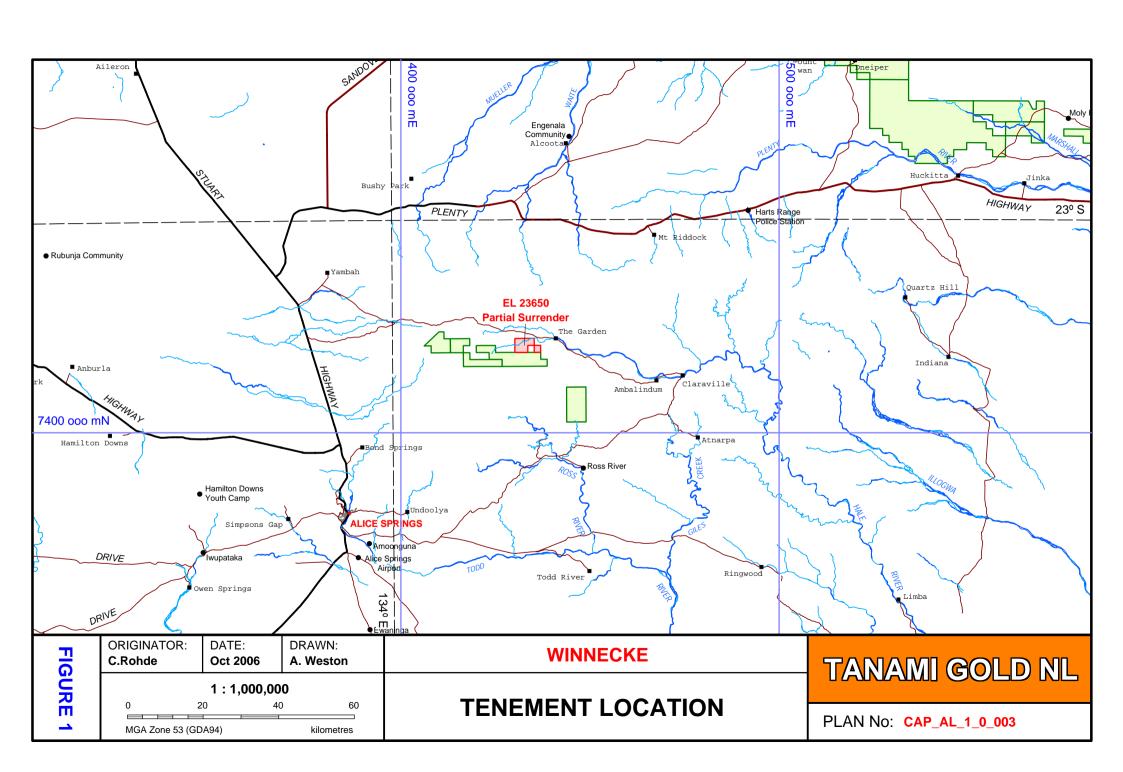
An assessment of the Palaeoproterozoic Arunta Province, undertaken by Geo Discovery Group Pty Ltd on behalf of BHP Billiton / Teck Cominco Australia Pty Ltd and TGNL in 2002 highlighted the potential for polymetallic (Cu-Pb-Zn-Ag-Au) metamorphosed massive sulphide deposits within the central Arunta region area. The possibility that Iron Oxide Copper Gold (IOCG) and epigenetic gold deposits could occur within the project area was also recognised.

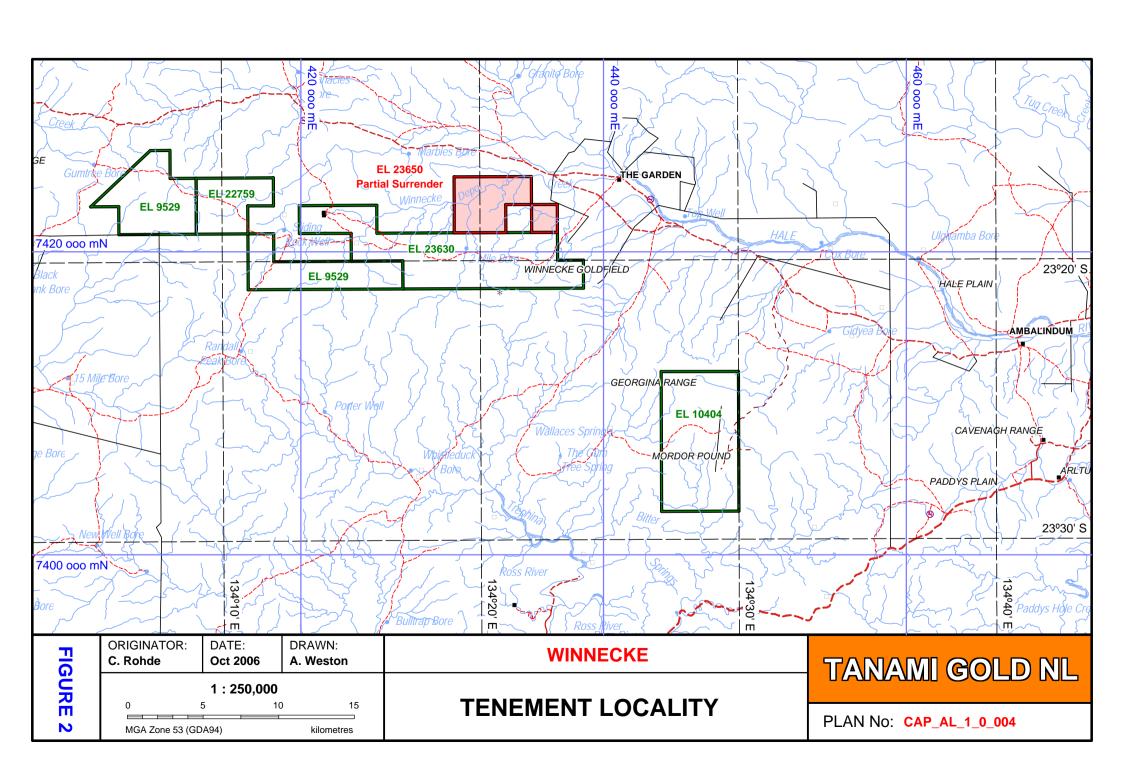
Teck had carried out exploration in 2002 on EL's 9529, 9774 and 23650 under a JV agreement with TGNL, commissioning GeoDiscovery as consultants/contractors to undertake exploration activities. Work was conducted on EL 23650 prior to grant under the provisions of sub section 11(1)(b) of the Mining Act whereby the Warden can grant access to conduct reconnaissance under a Miners Right.

This report covers exploration conducted by Teck and TENL on the final surrendered tenement area of EL 23650.

#### 3.0 TENURE

EL 23650 'Depot Creek' was granted to Tanami Exploration NL on 11 April 2003. At the end of the third year of term the tenement was reduced by 5 blocks pursuant to the requirements of Section 26 of the *NT Mining Act*. The remaining six blocks were surrendered on 26 September 2006, see **Table 1** and **Figure 2**.





**Table 1: Tenement Details** 

Tenement	Tenement No	Blocks Granted	Blocks Relinq Apr 2006	Blocks Surr Sep 2006	Grant Date	Expiry Date
Depot Creek	EL 23650	11	5	6	11 Apr 03	10 Apr 09

## 4.0 GEOLOGY

The Winnecke Goldfield is located in the southeast of the Strangways Range Region, within the eastern section of the Arunta Block. The Strangways Range Region (Shaw and Langworthy, 1984) consists of mainly Proterozoic crystalline and metamorphic rocks of the Arunta Block unconformably overlain by nappes and folded outliers of the Neoproterozoic Heavitree Quartzite and Bitter Springs Formation of the Amadeus Basin. The regional interpreted geology of the area of the Winnecke Project is shown on Plate 1. Aeromag TMI is shown on Plate 2.

EL 23650 is interpreted to be mainly underlain by Cadney Metamorphics, just to the north of a wide corridor of intense and complex, laterally continuous east-west-trending greenschist facies shear zone within a predominantly gneissic terrane. This corridor is known as the Winnecke Shear Zone, and is bounded by two major northwest-trending lineaments, the Woolanga and Pinnacles Shearzones to the east and west, respectively. The shear formed during the Alice Springs Orogeny when Neoproterozoic Amadeous Basin sediments to the south were thrust over the Palaeoproterozoic Arunta basement to the north.

The Cadney Metamorphics (1770Ma) are interpreted to overlie the Narwietooma Package in the central Arunta region, and are dominated by calc-silicate rocks, marbles and sillimanite and biotite-bearing gneiss.

# 5.0 Exploration Completed

## 5.1 BHP Billiton / Teck Cominco Australia Pty Ltd

Exploration was carried out on the relinquished portion of EL 23650 by Teck in 2002 and in 2003 and 2004 by TENL. All geochemical sampling is shown on **Plate 3** together with ground magnetic traverses, while all sampling and assay data are included in the digital appendix.

Teck Cominco Australia Pty Ltd carried out exploration on the North Wigley project in 2002 encompassing the EL Application 23650 (Mc Lean, Walters, 2003). The exploration was carried out by the Geodiscovery Group and was conducted prior to grant of the Exploration Licence under the provisions of sub section 11(1)(b) of the Mining Act whereby the Warden can grant access to conduct reconnaissance under a Miners Right.

EL 23650 lies within the 'Gardens' area, where a package of felsic gneiss and biotite-rich metasediments were targeted. The Strangways Range 1:100,000 geological map shows the felsic gneiss sequence at the 'Gardens' to be cordierite-bearing, thus providing evidence for localised Mg-rich alteration. In addition the package contains some significant magnetic anomalies that may reflect alteration.

The field program was designed to investigate the magnetic features for possible alteration with an emphasis on the transitional contact zone between the felsic sequence and metasediments. In total 9 rock chip samples were taken on the surrendered portion of EL 23650 (Plate 3). Also two north – south ground magnetic traverses were completed on the surrendered tenement area.

All rock chip samples were analysed for a suite of elements by ALS Chemex using its MS-ICP61 method. Elements analysed for were Ag, Al, As, Ba, Bi, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Sr, Ti, V, W, Zn, Zr and Rb. Complete results are presented in the digital Appendix.

The ground magnetic surveying was undertaken by Euro Exploration Services of Adelaide during September and October 2002. Geometrics G-856 Proton Procession Magnetometers were used to conduct the survey along the regional traverses. Readings were generally taken at 20m intervals, closed to 10m in areas of interest. A base station was set up at The Garden Station homestead (AMG 440918E/7424918N) and diurnal corrections were applied to the data using "Infield", with a base station average value of 53000nT. The ground magnetic data is included in the digital Appendix.

With the exception of known base metal occurrences, the sampling undertaken by Teck did not detect any significant base metal anomalism.

# 5.2 Tanami Exploration NL

Exploration by TENL was carried out in 2003 and 2004. During a reconnaissance field trip in May 2003 the area of a 38.9g/t Au rock chip in the open file database was revisited (Rohde, 2004). The recorded site of the rockchip turned out to be a historic mine working, probably the Glancroil occurrence, which is incorrectly plotted 0.5km to the southwest in the NTGS 'Modat' database.

The workings comprise two mineralised lodes trending N-S and NE-SW at a steep angle to local E-W trending metamorphic stratigraphy. Although the metal association is similar to the meta-VHMS deposits in the district the lodes are clearly structurally controlled, not stratiform, probably epigenetic and possibly similar in age to Winnecke-Arltunga mineralisation.

Texturally the lodes comprise steeply dipping boudinaged breccia zones up to 1m in thickness but pinching along strike. The breccia consists of gossanous pods of ironstone ± malachite, azurite, galena and native copper in a matrix of quartz and ironstone. Cataclastic overprinting indicates continued movement on the structure post-mineralisation which has likely attenuated the lode.

The eastern lode strikes over approximately 150m, whereas the western lode has very limited strike extent of approximately 25m. Brief reconnaissance locally found no further evidence of mineralisation at surface other than the workings.

A total of 16 rock chip samples (WNK121 – 136) were taken around the workings (Plate 3) and were assayed by Genalysis for the following elements:

Au (B/ETA – 1ppb) Ag (B/AAS – 1ppm) Bi (B/AAS – 2ppm) Cu, Pb, Zn (B/AAS – 1ppm). Repeat assay results were completed using the following methods and detection limits:

Au (FA25/AAS - 0.01ppm) Ag (AX/MS – 1ppm) Bi (AX/MS – 0.1ppm) Cu, Zn (AX/OES – 10ppm) Pb (AX/OES – 50ppm)

Rockchip sampling at the Glancroil workings returned significant results with values up to 5.8 ppm Au. There appears to have been no systematic geochemical exploration in the district and the workings have not been drilled. Better assay results are listed below in **Table 2**.

Table 2: Rockchip sampling assays from Glancroil workings

	Comp	Au	Au-Rp1	Ag	Ag-Rp1	Bi	Cu-Rp1	Pb-Rp1	Zn-Rp1
	Width	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppm
WNK121		2,954	3.47	>301.1	361	6	20,195	21,249	6,069
WNK122		332		59.5	71	Χ	3,409	8,759	3,129
WNK123		75		9	9	Χ	4,273	11,212	3,880
WNK124	1.2	2,539		17.1	27	105	864	6,574	493
WNK125		301		3.5	5	11	1,651	6,224	354
WNK126	0.4	5,872	6.61	>17.5	36	84	3,006	32,917	845
WNK127	0.3	3,333	3.23	>59.0	75	170	1,546	23,506	1,161
WNK128		96		1.3	2	3	60	658	34
WNK129		14		3.6	5	3	134	3,001	193
WNK130		1,659	2.24	>212.2	392	38	4,954	404,504	2,841
WNK131	0.3	2,794	4.97	>193.0	217	16	10,434	10,867	2,955
WNK132		81		18.5	16	5	298	14,087	210
WNK133		4,039	6.51	>158.0	207	231	10,040	25,570	1,171
WNK134		20		12.1	13	19	66	3,645	253
WNK135		14		3.6	3	4	120	341	139
WNK136		27		0.4	1	Χ	15	144	55

NB. Composite width shown where taken, otherwise grab sample taken.

In 2004 a northerly traverse was undertaken across the eastern part of **EL 23650** (Rohde, 2005). In general, EL 23650 comprises metasedimentary gneiss cut by wide east-trending retrograde shear zones. These schist zones contain moderate amounts of vein quartz. A total of three rock chip samples were collected from veins and epidote-altered mafic rocks during the traverse. No anomalous Au or base metal values were returned and thus downgrade the regional prospectivity.

## 6.0 REHABILITATION

No ground disturbing work was conducted and therefore no rehabilitation is required.

#### 7.0 EXPENDITURE

Expenditure with respect to the third and final year of tenure is shown in **Table 3** below:

Table 3 - EL 23650 Expenditure 11 April 2006 - 26 September 2006

Cost Element	\$
Salaries and Wages	1,752
Consultants/Contractors	565
Camp and Field Costs	18
Administration/Overheads	350
Total	\$2,685

#### 8.0 BIBLIOGRAPHY

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#### Weathering and Other Events Base of transported BOA Base of complete oxidation BOCO Top of palaeochannel Top of saprolite TOP **TOSA** Top of saprock **TOSR** Top of fresh rock **TOFR** Top of basement TOB Water table WT

Colour		
Black	bk	
Blue	bl	
Blue-green	bg	
Brown	br	
Cream	CW	
Green	gr	
Green-grey	gg	
Grey	gу	
Grey-brown	gb	
Olive green	og	
Orange	or	
Orange-brown	ob	
Pink	pk	
Purple	pu	
Red	rd	
Red-brown	rb	
Transluscent	tt	
White	wh	
Yellow	ye	
Yellow-brown	yb	
Yellow-green	уg	
* Light (I) and dark (d) prefix optional		

# GEOLOGY LOGGING CODES May 2006

Regolith Group	
Aeolian	EO
Alluvium	AL
Calcrete	CT
Clay Zone	CY
Colluvium	CV
Ferricrete	FK
Gossan	GS
Lacustrine	LA
Lacustrine Evaporites	LE
Lag	LG
Lateritic Residuum	LT
Mottled Zone	ΜZ
Saprock	SR
Saprolite	SA
Silcrete	SC
Soil	SL
Transported	TR

Sample Condition	
Dry – no water	D
Moist – can be moulded by	Μ
hand but not wet to the touch	
Wet – a slurry that is wet to	W
the touch, but no free water	
Saturated – sample suspende	S
in free running water, note	
that water may contain	
suspended clay particles and	
therefore be discoloured	

Regolith Variant	
Bleached	bl
Breccia	bx
Calcareous	ca
Carbonaceous	cs
Chert	ch
Clay	су
Duricrust	du
Ferruginuous	fe
Goethite	go
Gravel	gv
Gypsum	gm
Haematite	hm
Halides	ha
Hardpanised/Indurated	hp
Iron Segregation	is
Kaolinite	kn
Lateritic	lt
Lignite/Plant material	lg
Limonitic	li
Lithic Fragments	lk
Loess	lo
Mega-Mottled	mb
Mn-Co-Fe	mf
Mottled	mu
Mud	md
Nodules	nd
Nontronitic	no
Pisoliths	ps
Quartz	qt
Sand	sd
Siliceous	Si
Silt	st
Silty clay	ys
Smectite	sg
Oxidised sulphides	os
Talc	tc
White mica	wm

Weathering		
Fresh rock	No visible signs of rock weathering	FR
Slightly weathered	Stained along discontinuity surfaces, original colour and texture recognisable	SW
Moderately weathered	Stained throughout, original texture recognisable throughout	MW
Highly weathered	Original colour and hardness severely altered, some texture visible	HW
Completely weathered	Rock exhibits soil-like properties (ie can be remoulded), some rock fragments may remair	CW

Hardness	
Unconsolidated	UC
Very weak - may be broken by hand	VW
Weak - Crumbles under firm blow with sharp end of geological hammer	W
Moderately weak - Cannot be cut by hand into triaxial specimen	MW
Moderately strong - 5mm indentation with sharp end of geological hammer	MS
Strong - Hand held specimen can be broken with single blow of geological hammer	S
Very strong - More than one blow of geological hammer required to break specimen	VS
Extremely strong - More than one blow of geological hammer required to break specimen	ES

Grainsize		Sed	Ig/Meta
Clay	су	<1/256 mm	NA
Silt	st	1/256 - 1/32 mm	NA
Very Fine	vf	1/32 - 1/8 mm	<0.1 mm
Fine	fg	1/8 - 1/4 mm	0.1 - 1mm
Medium	mg	1/4 - 1/2 mm	1 - 3 mm
Coarse	cg	1/2 - 1mm	3 - 10 mm
Very coarse	vg	1 - 2 mm	>10mm
Granule	gn	2 - 4mm	NA
Pebble	pb	4 - 64 mm	NA
Cobble	cb	64 - 256 mm	NA
Boulder	bu	>256	NA
Pegmatitic	ра	NA	>30mm

Facing	
Up	
Down	
Both	

Contact	
Sharp	S
Undulose	U
Gradational	G
Vein	V
Faulted/sheared	F

Stratigraphy/Beds					
Formal		Informal		Regolith	
Gardiner Sandstone	GS	Phat Sandstone	PS	Regolith Layer A	LA
Antrim Plateau Basalt	AP	Marker Siltstone	MS	Regolith Layer B	LB
Killi Killi Fm	KK	Marker Siltstone, inferred	iMS	Regolith Layer C	LC
Bald Hill Sequence	BH	Irvine Conglomerate	IG	Regolith Layer D	LD
		Black Shale Bed	BS	Upper Mobile Zone	UM
		Coyote No.1 Fault	CF	Lower Mobile Zone	LM
		Coyote fold hinge	FA		

<b>Deformation Type</b>		
Boudinaged	BD	
Brecciated	BX	
Crenulated	CR	
Folded	FD	
Fractured weakly	CW	more than 10cm fracture spacing
Fractured moderately	CM	2-10cm fracture spacing
Fractured strongly	CS	less than 2cm fracture spacing
Foliation weak	FW	most grains undeformed, deformation restricted to disrete planes
Foliation moderate	FM	more than half grains broken, flattened or elongated
Foliation strong	FS	primary textures completely destroyed
Lineated	LN	

# **Alteration Style**

Fracture Controlled FC
Foot wall (VMS) FW
Hanging wall (VMS) HW
Patchy PT
Pervasive PV
Selective Replacement SR
Vein Selvedge SV

Structure / Lithology Events	
Bedding	BED
Cleavage	CLV
Contact	CNT
Crenulation	CRN
Fault	FLT
Fold axis (plane)	FLD
Fold hinge (lineation)	HNG
Foliation	FOL
Fracture	FRK
Joint	JNT
Lineation	LIN
Layering	LYR
Schistocity (s-fabric)	SCH
Shear zone/plane (c-fabric)	SHZ
Slickenside	SLK
Vein	VEIN

## **Alteration Intensity**

Weak:partial replacement of primary minerals

MA

Moderate: alteration approx. equal proportion to primary minerals

Strong: alteration dominant, some primary minerals remain

SA

Intense: total replacement of primary minerals

IA

Vein Style	
Anastomosing	AN
Boudinage	ВО
En echelon	EE
Folded	FD
Planar	PL
Ptygmatic	PT
Sigmoidal	SG
Stockwork	SW

Mineralisation Style	
Blebs	BB
Disseminated	DS
Interstitial Network	NW
Massive	MA
Stockwork	MW
Stringers/Veinlets	SE
Vein halo	VH

Vein texture	
Buck	BK
Breccia	BX
Comb-cockade	CB
Colloform	CF
Chalcedonic	CH
Fibrous	FB
Infill	IN
Laminated	LM
Recrystallised	RX
Replacement	RP
Saccaroidal	SC
Vuggy	VG
Tension gashes	VT

Rock Group		Rock Type		Rock Group		Rock Type	
Ultramafic Extrusive	U	Komatiite Undifferentiated Ultramafic Basaltic Komatiite	K U B	Sediment	S	Undifferentiated Mudstone Siltstone	U M T
Ultramafic Intrusive	U	Undifferentiated	U			Sandstone	S
Olifamane intrasive	U	Pyroxenite	Х			Interbedded - mud & silt	F
		Peridotite	P			Interbedded - sand & silt	N
		Dunite	D			Conglomerate	C
		Hornblendeite	Н			Breccia	В
						Limestone	L
Mafic Extrusive	В	Undifferentiated	٧			Dolomite	D
		Tholeiitic Basalt	Т			Coal	K
		High-mag Basalt	М				
		Picritic Basalt	Р	Chemical Sediments	С	Undifferentiated	U
		Spilitic Basalt	S			BIF	ı
Mafic Intrusive	0	Undifferentiated	U			Chert	Н
		Gabbro	G			Evaporites	E
		Troctolite	Т			Massive Ironstone	F
		Norite	N			Phosphorites	Z
		Anorthosite	Α				
		Dolerite	D	Metamorphic	M		L
		Gabbronorite	В	Unknown protolith		Schist	S
		Magnetitite	M			Gneiss	G
						Granulite	N
Intermediate Extrusive	I	Undifferentiated	U			Marble	В
		Andesite	V			Amphibolite	Α
		Trachyte	T			Hornfels	H
		Trachy-andesite	Y	Metamorphic	Р		Q
Intermediate Intrusive	ı	Undifferentiated	I	Sedimentary protolith		Psammite	M
		Diorite	D			Semipelite	E
		Monzonite Svenite	M			Pelite Slate	P
		Syenite Porphyry	S P			Metacarbonate/marble	ᆸ
		Рогрију	Р			Calcsilicate	B X
Acid Extrusive	F	Undifferentiated	U			Schist	S
Acid Extrusive	г	Rhyolite	R			Gneiss	G
		Dacite	C			Granulite	N
		Rhyodacite	0			Amphibolite	A
Acid Intrusive	G	Undifferentiated	U			Hornfels	Ĥ
Aloid IIII dolve	Ŭ	Granite	G	Metamorphic	R	Metafelsic	F
		Monzogranite	М	Igneous protolith	11	Metamafic	М
		Syenogranite	S	ignocus protonti		Meta-ultramafic	Ü
		Alkali feldspar granite	Ā			Schist	S
		Granodiorite	D			Gneiss	G
		Tonalite	Т			Granulite	N
		Porphyry	Р			Amphibolite	Α
		Pegmatite	z	Metamorphic	Υ	Mylonite	М
		Aplite	L	Intensely deformed		Cataclasite	С
Lamprophyre/	L	Undifferentiated	U	Hydrothermal	н	Undifferentiated	U
Kimberlites	_	Phyric lamprophyre	P	,		Mylonite	Y
1411100111100		Lamproite	Ĺ			Skarn	S
		Kimberlite	K				J
		Carbonatite	C	Mining Codes	w	Mullock/Waste	W
		Carbonanto	J	January Codes	74	Tailings	T
Vein material	VN						
Massive sulphide	VN AM					cavity Stope	C
Contamination	XX					Backfill	S B
Contamination	^^					Stockpile	P
						Lost Core	r

Lost Core

Albite ab Actinolite ac Andalusite ad Anhydrite ai Ankerite ak Amphibole am Asbestos ao Apatite ba Biotite bi Calcite ca Carbonate cb Chloritoid cd Chlorite cl Cordierite co Carbonaceous cs Clay cy Clinopyroxene cx Dolomite(ic) bi Obiopside dp Epidote ep Feldspar fd Ferruginous fe Fluorite fi Fuchsite fu Garnet ga Graphite gf Gypsum gm Goethite gu Halite ha Hornblende hb Haematite li Leucite kn K-feldspar ks Kyanite ky Limonite ii Leucoxene k Magnesite me Manganese mn Montmorillonite mr Muscovite ms	Albite Actinolite Andalusite Anhydrite Ankerite Amphibole Asbestos Apatite	ab ac ad ai ak am ao ap ba bi ca cb
Actinolite Andalusite Andalusite Ankerite Ankerite Ankerite Asbestos Apatite Barite Barite Biotite Calcite Carbonate Chloritoid Chlorite Cordierite Cordierite Cordiopyroxene Carbonaceous Clay Clinopyroxene Dolomite(ic) Diopside Epidote Feldspar Ferruginous Ferruginous Ferruginous Ferruginous Ferruginous Ferruginous Ferruginous Ferruginous Ferughite Garnet Garnet Garnet Garnet Garnet Garnet Garnet Gypsum Goethite Gossan Grunerite Halite Halite Ha Hornblende Hb Haematite Ili Leucite Leucoxene Manganese-Co-Fe Mica Manganese Mnontmorillonite Mr Muscovite Muscovite Misa Manganese Mn Montmorillonite Mr Muscovite Misa Manganese Mn Montmorillonite Mr Muscovite Misa Manganese Mn Muscovite Ms Manganese Ms Manganese Mn Ms	Actinolite Andalusite Anhydrite Ankerite Amphibole Asbestos Apatite	ac ad ai ak am ao ap ba bi ca cb
Andalusite ai Anhydrite ai Ankerite ak Amphibole am Asbestos ao Apatite ap Barite ba Biotite bi Calcite ca Carbonate cb Chloritoid cd Chlorite cl Cordierite co Carbonaceous cs Clay cy Clinopyroxene cx Dolomite(ic) do Diopside dp Epidote ep Feldspar fd Ferruginous fe Fluorite fi Fuchsite fu Garnet ga Graphite gf Gypsum gm Goethite go Gossan gs Grunerite gu Halite ha Hornblende hb Haematite lim Kaolinite kn K-feldspar ks Kyanite ky Limonite li Leucoxene kx Magnesite me Manganese mn Montmorillonite mr Muscovite ms	Andalusite Anhydrite Ankerite Amphibole Asbestos Apatite	ad ai ak am ao ap ba bi ca cb
Anhydrite ak Ankerite ak Amphibole am Asbestos ao Apatite ap Barite ba Biotite bi Calcite ca Carbonate cb Chloritoid cd Chlorite cl Cordierite co Carbonaceous cs Clay cy Clinopyroxene cx Dolomite(ic) do Diopside dp Epidote ep Feldspar fd Ferruginous fe Fluorite fi Fuchsite fu Garnet ga Graphite gf Gypsum gm Goethite go Gossan gs Grunerite gu Halite ha Hornblende hb Haematite im Kaolinite kn K-feldspar ks Kyanite ky Limonite li Leucoxene kx Magnesite me Manganese-Co-Fe Mica mi Manganese Muscovite ms	Anhydrite Ankerite Amphibole Asbestos Apatite	ai ak am ao ap ba bi ca cb
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Amphibole am Asbestos ao Apatite ap Barite ba Biotite bi Calcite ca Carbonate cb Chloritoid cd Chlorite cl Cordierite co Carbonaceous cs Clay cy Clinopyroxene cx Dolomite(ic) do Diopside dp Epidote ep Feldspar fd Ferruginous fe Fluorite fi Fuchsite fu Garnet ga Graphite gf Gypsum gm Goethite go Gossan gs Grunerite ha Hornblende hb Haematite hm Ilmenite im Kaolinite kn K-feldspar ks Kyanite ky Limonite li Leucoxene lx Magnesite me Manganese mn Montmorillonite mr Muscovite ms	Amphibole Asbestos Apatite	am ao ap ba bi ca cb
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Limonite li Leucite lu Leucoxene lx Magnesite me Manganese-Co-Fe mf Mica mi Manganese mn Montmorillonite mr Muscovite ms	•	ky
Leucoxene Ix Magnesite me Manganese-Co-Fe mf Mica mi Manganese mn Montmorillonite mr Muscovite ms	,	•
Magnesite me Manganese-Co-Fe mf Mica mi Manganese mn Montmorillonite mr Muscovite ms	Leucite	lu
Manganese-Co-Fe mf Mica mi Manganese mn Montmorillonite mr Muscovite ms	Leucoxene	lx
Mica mi Manganese mn Montmorillonite mr Muscovite ms	Magnesite	me
Manganese mn Montmorillonite mr Muscovite ms	Manganese-Co-	Fe mf
Montmorillonite mr Muscovite ms	_	
Montmorillonite mr Muscovite ms	Manganese	mn
		mr
Magnetite	Muscovite	ms
Inagricuic IIII	Magnetite	mt
Monazite mz	_	mz
Nontronite no	Nontronite	no
Nepheline np	Nepheline	np
Oxide od	•	•
Olivine ol	Olivine	ol
Onalicad	Opalised	ор

Variants - Minerals	
Oxidised sulphide	os
Orthopyroxene	ОХ
Phlogopite	pg
Phosphate(ic)	ph
Plagioclase	pl
Pyroxene	рх
Quartz	qt
Rutile	ru
Sanidine	se
Sphene	sf
Smectite	sg
Siderite	sj
Sillimanite	sm
Cassiterite	sn
Staurolite	SO
Sphalerite	sp
Serpentine	sr
Sulphur	sv
Sylvite	sy
Talc	tc
Tremolite	tm
Tourmaline	to
Wolframite	wf
White Mica	wm
Zircon	zr
Zeolite	zt
	·

Variants - Sulphides	/ Ore
Minerals	
Arsenopyrite	as
Azurite	az
Bornite	bn
Chalcocite	CC
Chalcopyrite	ср
Chromite	cr
Copper, native	cu
Covellite	CV
Cuprite	ct
Electrum	el
Enargite	en
Galena	gl
Gold, native	au
Malachite	ml
Molybdenite	mo
Nickeliferous	nk
Pentlandite	pn
Pyrite	ру
Pyrrhotite	po
Scheelite	sc
Silver	ag
Stibnite	sb
Sulphide	su
Tellurides	te

Variants - Texture	
Adcumulate	at
Agglomerate	al
Amygdaloidal	ay
Banded	bd
Breccia	bx
Cherty	ch
Chill margin	CZ
Coarse-grained	cg
Crystal Tuff	tx
Cumulus	cm
Downhole fining	df
Fine-grained	fg
Flaser bedding	fz
Flow top breccia	fx
Gradational	gt
Granophyric	gp
Groundmass	gd
Lamination	ga Im
Lapilli Tuff	tl
Lenticular bedding	lc
Lithic	lk
Massive	ma
Matrix	mx
Medium-grained	mg
Mesocumulate	mc
Migmatitic	mm
Muddy	md
Oolitic	00
Orthocumulate	OC
Phyllitic	pi
Pillowed	pw
Poorly sorted	ps
Porphyritic	pp
Porphyroblastic	pb
Porphyroclastic	pc
Sandy	sd
Shaley	sh
Silicification	si
Silty	st
Spinifex	sx
Tuff	tf
Uphole fining	uf
Volcanic breccia	vb
Volcaniclastic	VC
Wallrock	wr
Welded Tuff	tw

