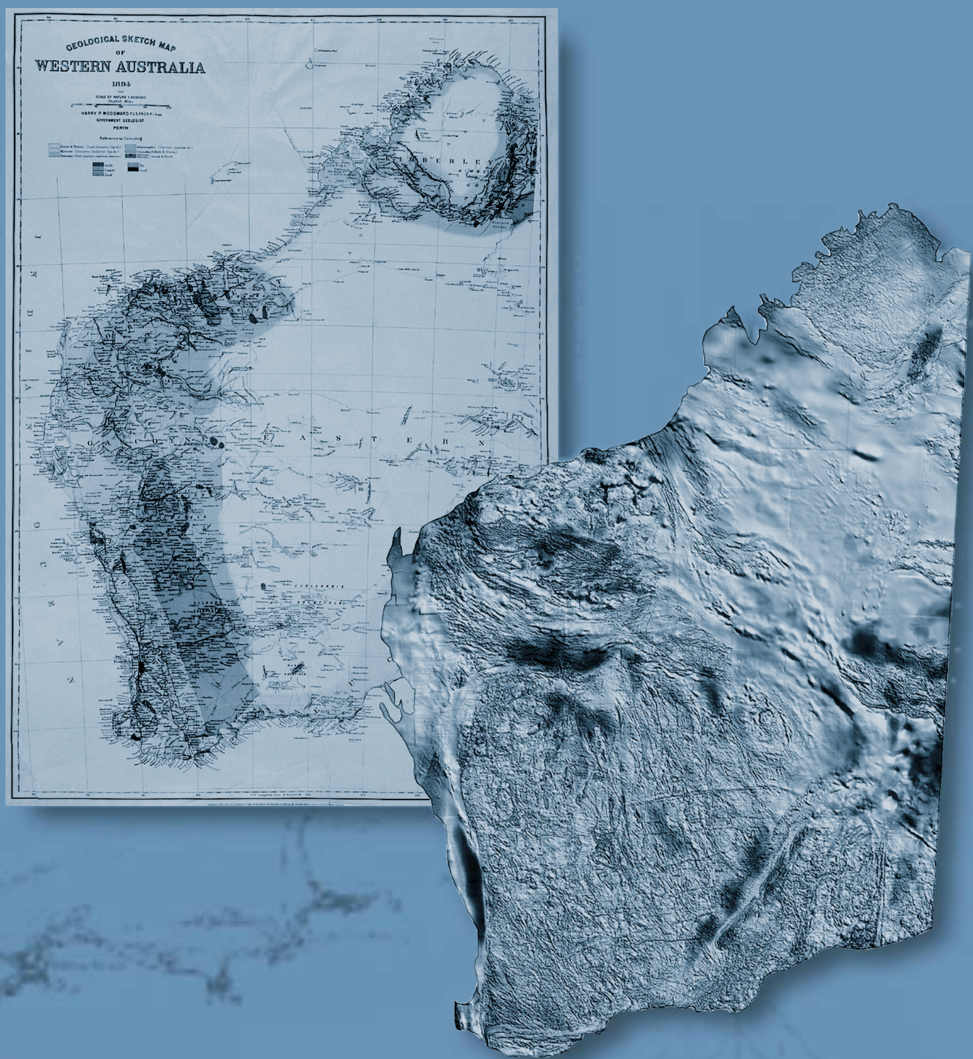
Department of
Mineral and Petroleum Resources

RECORD 2002/13

COMPILATION OF WHOLE-ROCK GEOCHEMICAL DATA FOR THE GORDON AREA, EASTERN GOLDFIELDS WESTERN AUSTRALIA

by F. I. Roberts and W. K. Witt



Geological Survey of Western Australia

GEOLOGICAL SURVEY OF WESTERN AUSTRALIA

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COMPILATION OF WHOLE-ROCK GEOCHEMICAL DATA FOR THE GORDON AREA, EASTERN GOLDFIELDS, WESTERN AUSTRALIA

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F. I. Roberts and W. K. Witt

Perth 2002

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REFERENCE
The recommended reference for this publication is:
ROBERTS, F. I., and WITT, W. K., 2002, Compilation of whole-rock geochemical data for the Gordon area, Eastern Goldfields, Western Australia: Western Australia Geological Survey, Record 2002/13, 23p.

National Library of Australia Card Number and ISBN 0 7307 5730 7

Grid references in this publication refer to the Geocentric Datum of Australia 1994 (GDA94). Locations mentioned in the text are referenced using Map Grid Australia (MGA) coordinates, Zone 51. All locations are quoted to at least the nearest 100 m.

Published 2002 by Geological Survey of Western Australia

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Compilation of whole-rock geochemical data for the Gordon area, Eastern Goldfields, Western Australia

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F. I. Roberts and W. K. Witt

Abstract

The Gordon area, about 40 km north-northeast of Kalgoorlie, is underlain by a succession of mafic and ultramafic volcanic rocks, and felsic volcanic and sedimentary rocks. It is one of the few areas in the Kalgoorlie Terrane where there is local-scale interleaving of mafic and felsic volcanic rocks. As part of a study of the volcanic rocks of this area, 33 samples of the main rock units were obtained from drillholes and analysed for major, trace, and rare earth element chemistry. Brief descriptions of each rock unit sampled and the rock sequence penetrated by the drillholes are presented, and data are tabulated according to rock type.

KEYWORDS: Gordon, Kalgoorlie, mafic rocks, ultramafic rocks, felsic rocks, drillholes, whole-rock chemistry, rare earth elements.

Introduction

This Record presents whole-rock geochemical data for a series of volcanic and associated rocks from the Gordon area, which is part of the Eastern Goldfields Granite–Greenstone Terrane. Samples for analysis were obtained from diamond drillcore from the Gordon–Sirdar gold mine, and the East Samson Dam, Trumpeter South, and New Gordon Dam gold prospects (Figs 1 and 2; Table A1 in the Appendix).

The Gordon area is about 40 km north-northeast of Kalgoorlie on the eastern limb of the Kanowna–Scotia dome (Fig. 1). The area lies entirely within the Boorara Domain of the Kalgoorlie Terrane (Swager et al., 1995), and occupies the southwestern corner of the GINDALBIE* 1:100 000 sheet (SH 51-10, 3237; Ahmat, 1995a).

Ahmat (1995b) estimated the greenstone succession on KANOWNA, south of the Gordon area, to be 16 km thick, and suggested that it structurally overlies the Scotia–Kanowna granitoid complex. Ahmat (1995b) argued that D_1 thrusts caused repetition of the stratigraphy, and this is indicated on KANOWNA by the recurrence of an ultramafic horizon at least four times.

The geochemistry of the volcanic rocks may have implications for the location and nature of terrane boundaries within the Eastern Goldfields Granite–Greenstone Terrane, as well as for an understanding of the alteration history of the volcanic succession. Morris (1998) noted that the Gordon area is one of the few in the Kalgoorlie Terrane where there is local-scale interleaving of mafic and felsic volcanic rocks, the latter dominated by rhyolite and subordinate dacite.

The felsic volcanic rocks in this area are potentially prospective for volcanogenic massive sulfide (VMS) deposits (Witt et al., 1996). With the exception of the Kanowna area, south of Gordon, where an 18.5 m-thick horizon of lapilli tuff containing pyrite and minor sphalerite, galena, and chalcopyrite was discovered by Great Boulder Mines – Noranda (1968–75; Ferguson, 1999), exploration in the region has not revealed any targets for VMS deposits. The focus of exploration has continued to be gold mineralization.

Rock units analysed

Mafic rock units

Fine grained basalt[†] is the principal mafic volcanic rock of the greenstone succession, comprising actinolite, albitized plagioclase, chlorite, epidote–clinozoisite, and

* Capitalized names refer to standard 1:100 000 map sheets.

† All lithologies have undergone regional metamorphism; however, because original textures are preserved, the appropriate protolith nomenclature has been used.

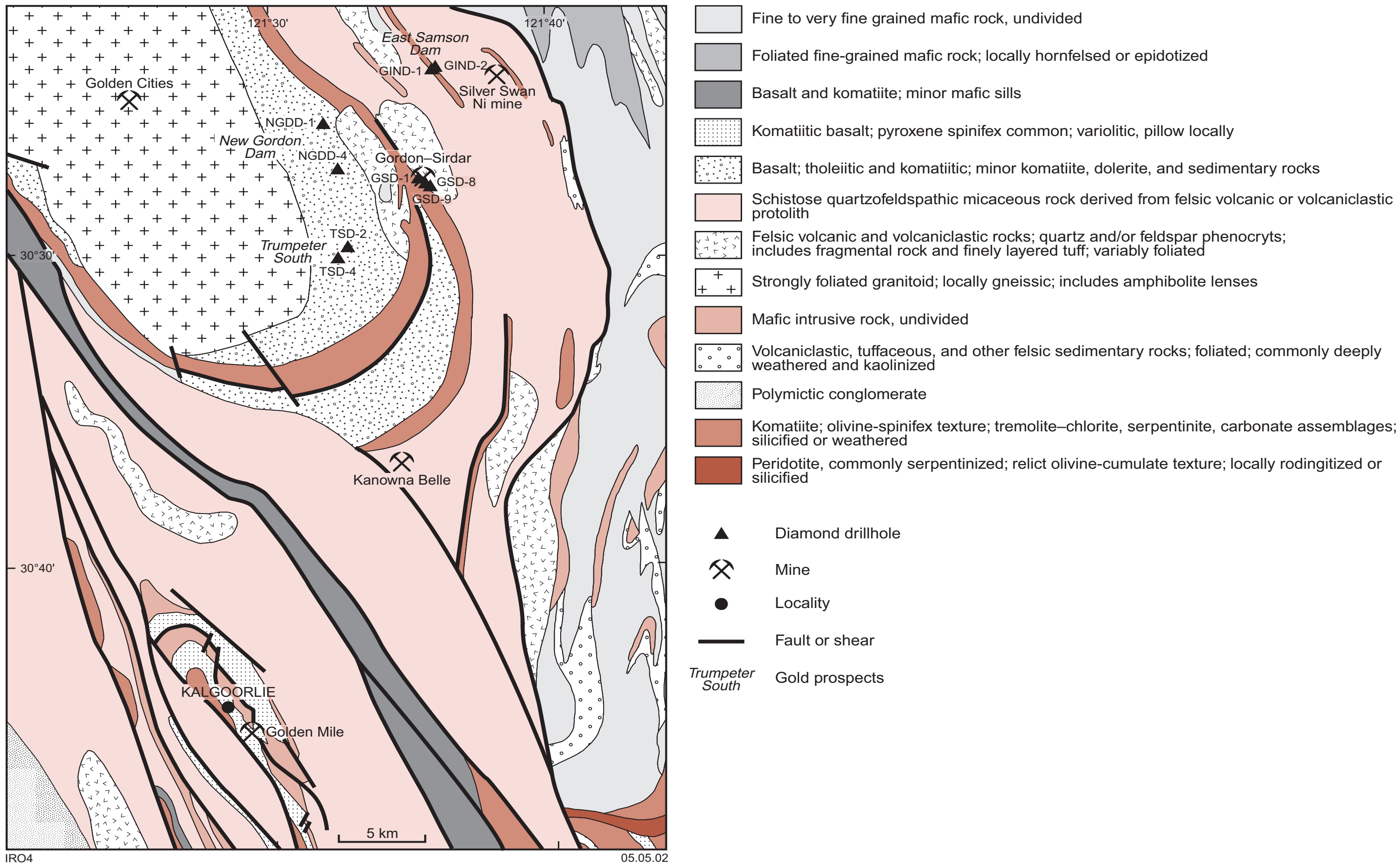


Figure 1. Interpreted distribution of the main rock types in the Kalgoorlie–Kanowna–Gordon region (after Swager and Griffin 1990), showing drillholes described in the text

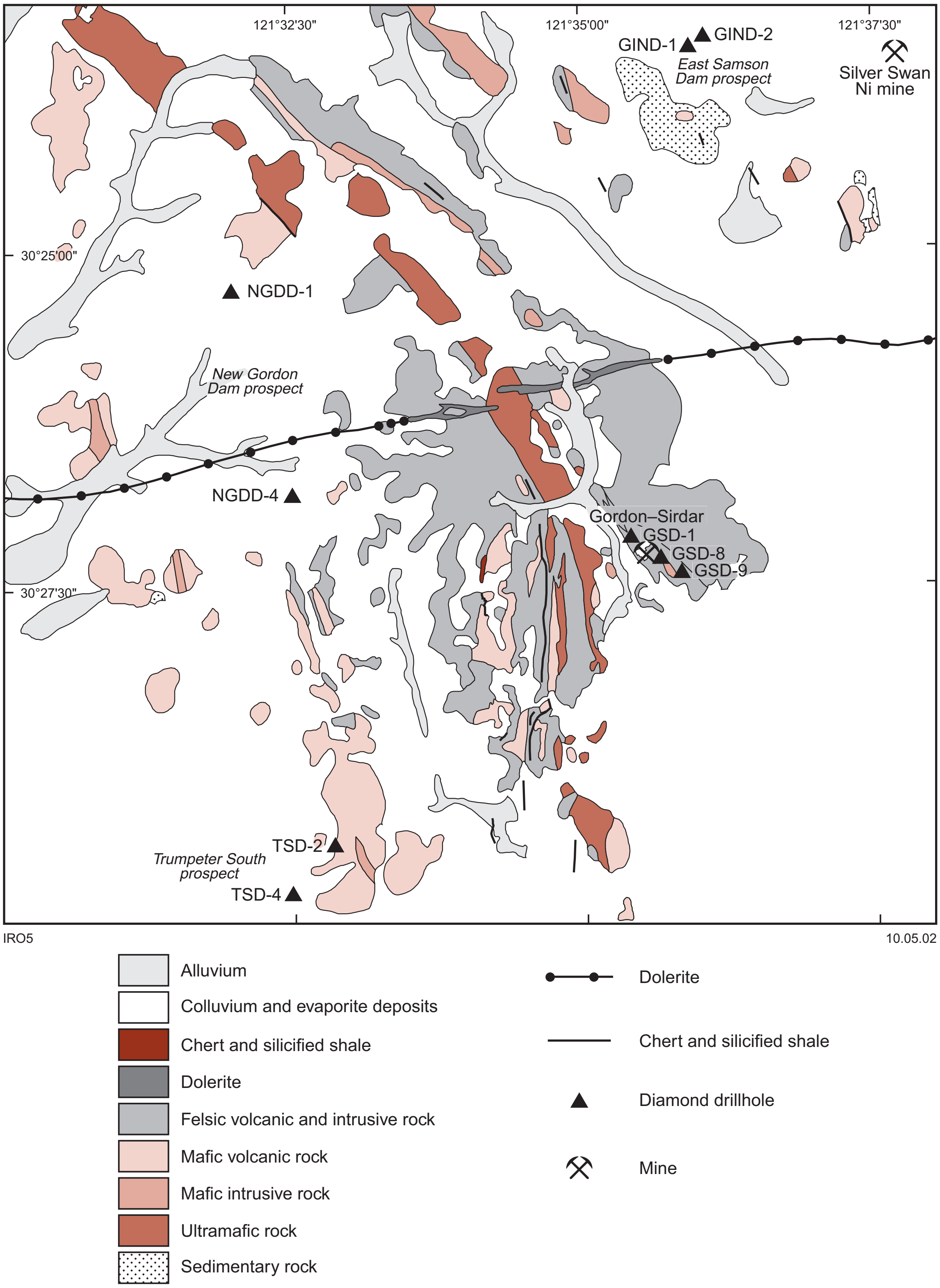


Figure 2. Geology of the Gordon area (after Ahmat, 1995a), showing drillholes described in text

Table 1. Main rock units from the Gordon–Sirdar gold mine

Rock unit	*Composition*	*Alteration*
Felsic volcaniclastic units		
Fine-grained crystal-lithic felsic volcaniclastic rock	20% felsic clasts <2 mm in size; 10% quartz crystal fragments; 10–20% pyrite in fragments of early quartz veins	Pyrite disseminated throughout; cream quartz–sericite alteration; minor secondary carbonate
Crystal-lithic felsic volcaniclastic rock	30% irregular chloritic clasts; 15% quartz crystal fragments; felsic groundmass; 10% disseminated pyrite	Abundant sericite; chloritized lithic clasts; pyrite associated with lithic clasts and undeformed quartz–chlorite veins
Quartz-rich lithic-crystal felsic volcaniclastic rock	<30% coarse quartz fragments; fine-grained felsic matrix; 5–15% tabular altered feldspar phenocrysts; <20% felsic lithic clasts	Bands of secondary sericite; minor carbonate
Lithic-crystal felsic volcaniclastic rock	<20% quartz crystal fragments; <30% feldspar crystals; <20% felsic lithic clasts; felsic matrix	Secondary hematite and sericite; high degree of carbonate alteration may be present
Lithic-rich felsic volcaniclastic rock	40% felsic lithic clasts (chloritic); rare quartz fragments <1 mm in size; fine-grained felsic matrix; <5% disseminated pyrite	Secondary sericite alteration; minor secondary carbonate; fine quartz–chlorite veins common
Vitric-crystal felsic volcaniclastic rock	20–30% dark grey shards of volcanic glass <2 mm in size; 10–20% rounded quartz fragments <4 mm in size; fine grained felsic matrix; <20% tabular altered feldspar phenocrysts; 20% felsic lithic clasts	Secondary carbonate and sericite alteration; secondary chlorite alteration <10% disseminated opaque minerals;
Vitric-lithic felsic volcaniclastic rock	<30% carbonated chloritic clasts; <40% felsic lithic clasts 20–30% shards of volcanic sericitized glass	Secondary sericite alteration; lithic clasts replaced by sericite and chlorite; abundant fine quartz–carbonate veins
Medium-grained crystal-rich felsic volcaniclastic rock	<20% felsic lithic clasts; 20–30% altered feldspar crystals, 1–2 mm in size; <10% biotite crystals; <5% quartz crystal fragments; felsic groundmass	Strong secondary sericite alteration; moderate secondary carbonate alteration; hematite alteration
Felsic hyaloclastite units		
Felsic hyaloclastite	<80% felsic vitric clasts; <10% quartz crystal fragments; felsic matrix; <2% andalusite	<40% sericite alteration; minor secondary carbonate and chlorite; <10% pyrite; as 'clasts' and disseminations
Fine-grained felsic hyaloclastite	50–60% felsic clasts; <5% quartz crystal fragments; felsic groundmass	<40% secondary chlorite; <30% secondary sericite; <10% secondary carbonate; intensely chloritized clasts; minor fuchsite clasts
Conglomerate		
Polymictic conglomerate	Felsic volcanic lithic clasts; mafic–intermediate clasts; quartz crystal fragments	<30% carbonate; minor disseminated pyrite; chloritic matrix; discontinuous sericitic seams in foliation fabric post-date carbonation
Intrusive units		
Porphyritic intermediate–mafic intrusion	20% altered feldspar phenocrysts; minor xenoliths of chloritized felsic material; 20–30% chloritic mafic crystals; fine-grained felsic groundmass	<60% secondary carbonate alteration; patchy hematitic alteration; 5% disseminated pyrite
Lamprophyre	30–40% biotite phenocrysts; carbonated groundmass	Intense secondary carbonate and sericite and chlorite alteration of the groundmass; chloritic alteration of phenocrysts

Table 1. (continued)

Rock unit	*Composition*	*Alteration*
Intermediate volcaniclastic units		
Crystal-rich intermediate volcaniclastic rock	20% chloritic lithic clasts; <30% sericitized hornblende crystals; <20% sericitized biotite crystals; <10% altered feldspar crystals; 20% carbonate grains; felsic matrix	Secondary sericite; two stages of carbonate alteration; post- and pre-sericitic foliation fabric; hematitic alteration
Lithic-rich intermediate volcaniclastic rock	30–40% chloritic lithic clasts; <10% felsic lithic clasts; felsic matrix; <10% pyrite	Major secondary carbonate alteration
Crystal-lithic intermediate volcaniclastic rock	20–30% chloritic clasts; 10% felsic lithic clasts; 20% quartz crystal fragments; felsic matrix	10% secondary carbonate; <5% pyrite; secondary hematite alteration
Andesite	5–10% lithic clasts; minor quartz crystal fragments; plagioclase–chlorite matrix	30–40% secondary carbonate as disseminations and irregular aggregates; chlorite alteration of matrix; discontinuous chloritic folia define a weak foliation; little or no sericite, and minor pyrite

SOURCE: Modified from Garner (1996)

minor amounts of opaque oxides (leucoxene) showing an intergranular to intersertal texture. The groundmass consists of fine-grained sericite and carbonate. Komatiitic basalt is characterized by a spinifex texture consisting of acicular amphibole after pyroxene.

Varioles (or ocelli) are also present in the komatiitic basalt and basalt, and both contain pillow structures in places. Basalt intersected in a diamond drillhole at the Trumpeter South prospect contains well-preserved pillow structures. Some basaltic flows are porphyritic (plagioclase phenocrysts typically 10–15% of rock) and amygdaloidal.

Felsic volcaniclastic rocks

A variety of metamorphosed felsic volcaniclastic rocks are present in the Gordon area (Table 1; Garner, 1996). They have been subdivided on the basis of composition and clast size by Garner (1996). The felsic volcaniclastic rocks are interpreted as variably deformed volcaniclastic siltstone, sandstone, and minor breccia, or possibly a pyroclastic ash.

Felsic hyaloclastite

Hyaloclastite units comprise felsic clasts with minor quartz fragments within a felsic matrix (Garner, 1996). The fine-grained unit of the hyaloclastites was subdivided on the basis of felsic clast size (<3 mm; Garner, 1996). Secondary chlorite, sericite, and carbonate are alteration minerals, and andalusite is present within drillholes GSD-1 and GSD-9, (Figs 3 and 4). Texturally, the hyaloclastites grade from jigsaw fit to chaotically arranged clasts (Garner, 1996).

Sedimentary rocks

Sedimentary rocks largely consist of pyritic chert and black shale. They are moderately to highly deformed with a pronounced foliation. Fine-grained quartz-dominated layers, commonly several millimetres thick, are interleaved with layers of coarser grained quartz and carbonate. Chlorite and sericite are locally developed within the layers. Carbonaceous material and pyrite define foliation planes, and some quartz-rich lithic clasts have pressure shadows. Elongate aggregates of carbonaceous material are oriented parallel to the foliation. Veins of coarse quartz and carbonate post-date the foliation.

Lamprophyres

Garner (1996) described lamprophyres in terms of a fine-grained, highly altered groundmass (individual grains typically <0.5 mm in size) with phenocrysts of variably altered biotite. The groundmass is typically felsic, with secondary carbonate and less common chlorite. Biotite phenocrysts are typically about 1 mm in size, and, where altered, have been replaced by secondary sericite and chlorite. Extensive alteration can render identification of primary features very difficult.

Altered mafic–ultramafic rocks

Garner (1996) reported that this rock unit is massive and medium grained with an allotriomorphic texture comprising mafic phenocrysts (now altered to chlorite) within a felsic groundmass. Drillcore from the Gordon–Sirdar gold mine (GSD-1 and GSD-8; Figs 3 and 5)

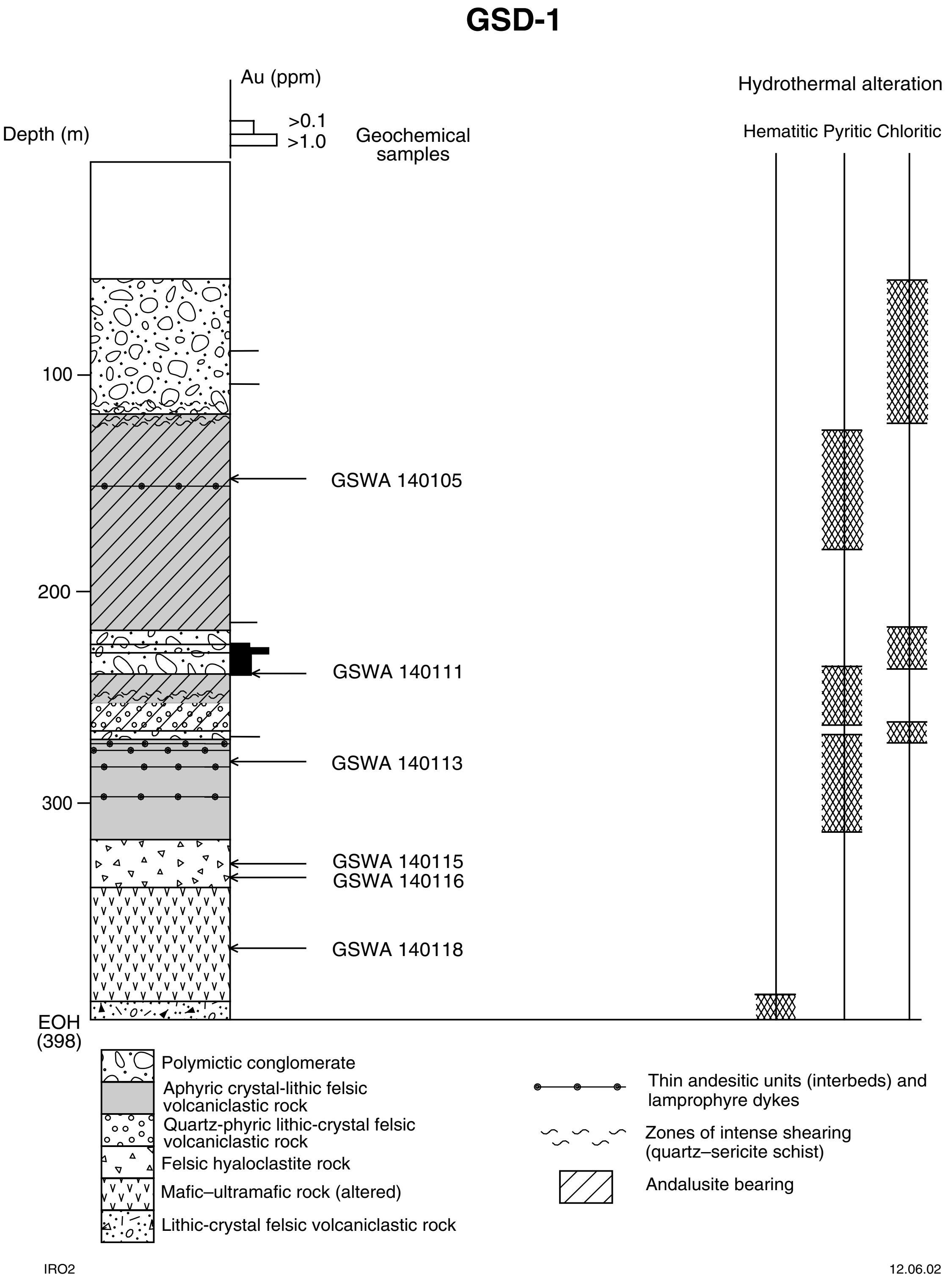


Figure 3. Summary drillhole log, GSD-1, Gordon–Sirdar gold mine

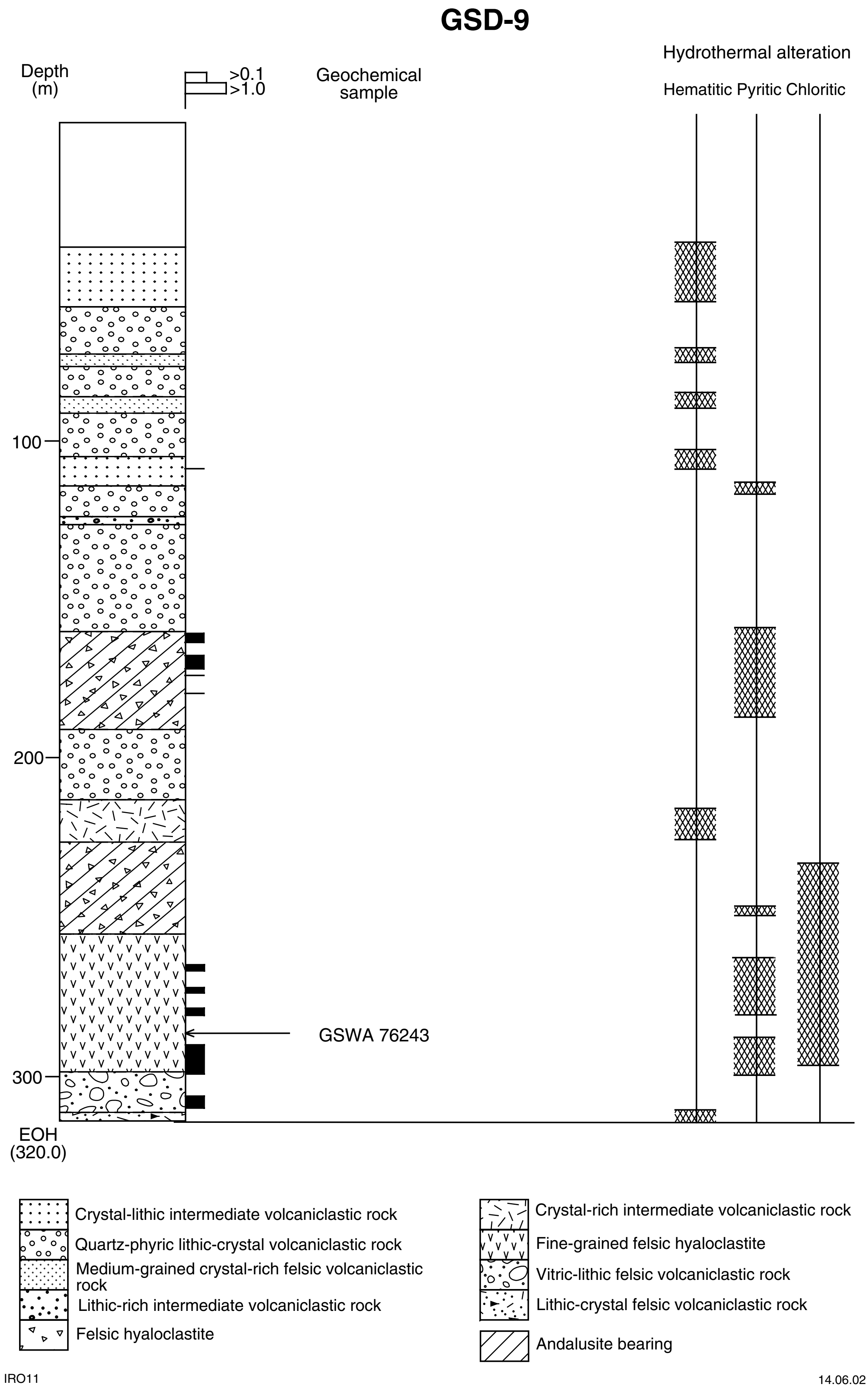


Figure 4. Summary drillhole log, GSD-9, Gordon–Sirdar gold mine

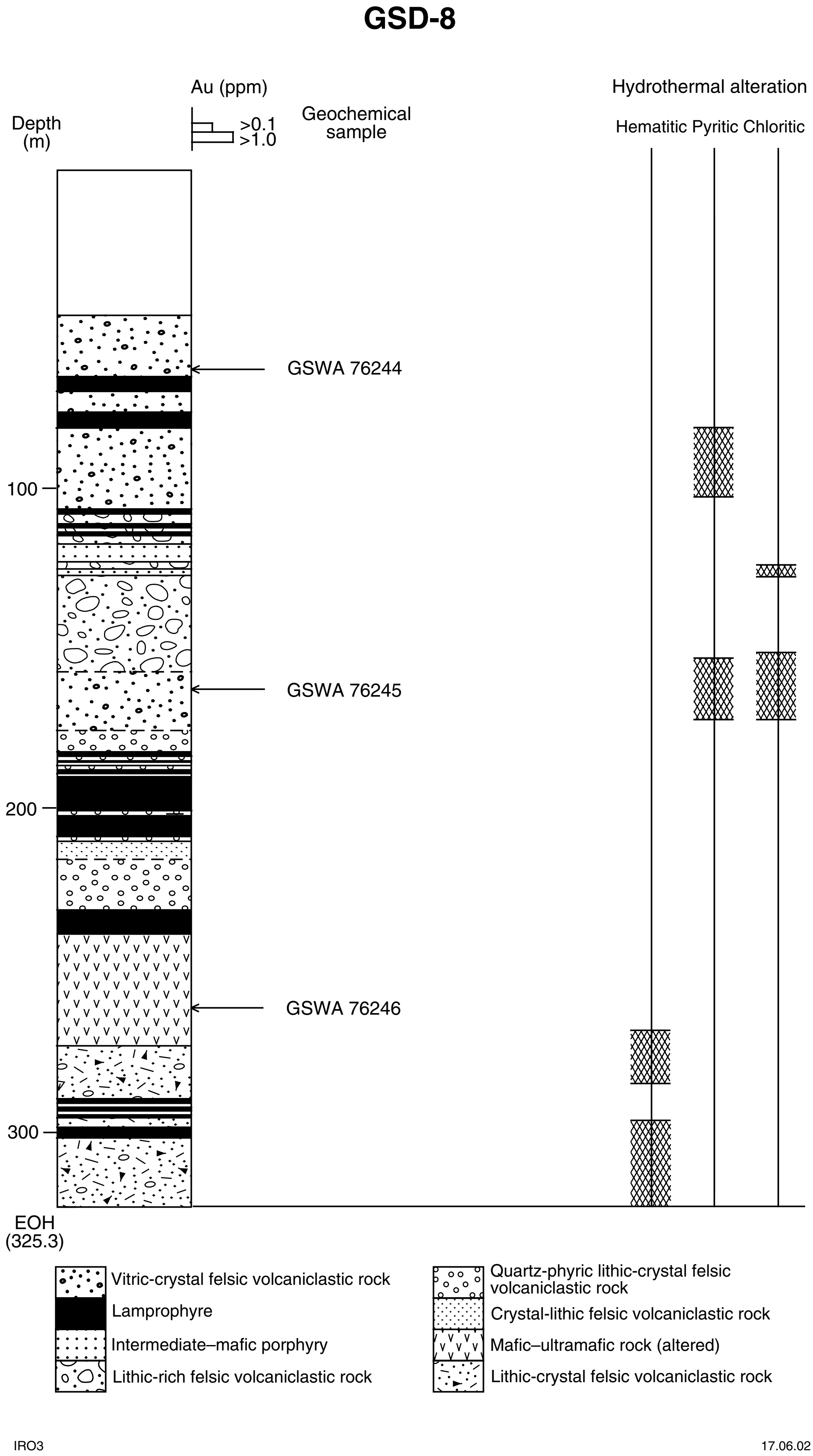


Figure 5. Summary drillhole log, GSD-8, Gordon–Sirdar gold mine

indicate that this rock unit has undergone carbonate alteration and has sharp upper and lower contacts. The unit may have been intruded as dykes, although Garner (1996) observed that GSD-1 drillcore grades from a massive crystalline rock at the base to a volcaniclastic rock that becomes progressively finer grained towards the top of the unit.

Description of diamond drillcores

Gordon mining centre

The Gordon mining centre, about 40 km north-northeast of Kalgoorlie (Fig. 1), is in a felsic volcanic rock succession that hosts the Gordon–Sirdar gold mine.

Samples for whole-rock geochemical analysis were obtained from diamond drillcores GSD-1, GSD-8, and GSD-9 (Fig. 2; Table A1 in the Appendix) that were drilled by North Exploration to test for the continuity of gold mineralization outside the existing Gordon–Sidar opencut operation.

Drillhole GSD-1 intersected a succession of fine- to coarse-grained felsic volcaniclastic rocks, including hyaloclastites, and polymictic conglomerates (Fig. 3). An altered mafic–ultramafic unit is present between 339 and 393 m. Drillhole GSD-8 penetrated a sequence of felsic volcaniclastic rocks of variable grain size (Fig. 5). Numerous lamprophyric dykes intruded the volcaniclastic rocks and an altered mafic–ultramafic unit is present between 239.1 and 274.55 m. Drillhole GSD-9 intersected a succession of felsic volcaniclastic rocks and hyaloclastites of variable grain size (Fig. 4).

New Gordon Dam prospect

Samples for whole-rock geochemical analysis were obtained from NGDD-1 and NGGD-4 that were drilled by North Exploration northwest and west of the Gordon mining centre respectively, at the New Gordon Dam prospect (Fig. 2; Table A1 in the Appendix). Drillhole NGDD-1 intersected a sequence of felsic lava and volcaniclastic rock units (Fig. 6) intruded by a number of felsic intrusive rocks, a lamprophyre unit, and a quartz monzonite porphyry dyke. Drillhole NGDD-4, about 3 km south-southeast of NGGD-1, intersected felsic lava, with 28 m (drillhole thickness) of basalt from 133.4 to 161.6 m (Fig. 7).

East Samson Dam prospect

The East Samson Dam prospect is about 6 km north-northeast of the Gordon mining centre. Samples for whole-rock geochemical analysis were obtained from GIND-1 and GIND-2 (Fig. 2; Table A1 in the Appendix) drilled by Mt Kersey Mining. Drillhole GIND-1 intersected an ultramafic (talc–carbonate) rock and basalt interleaved with thin units of felsic rocks of dacitic composition (Fig. 8). Drillhole GIND-2 intersected a sequence of ultramafic rocks

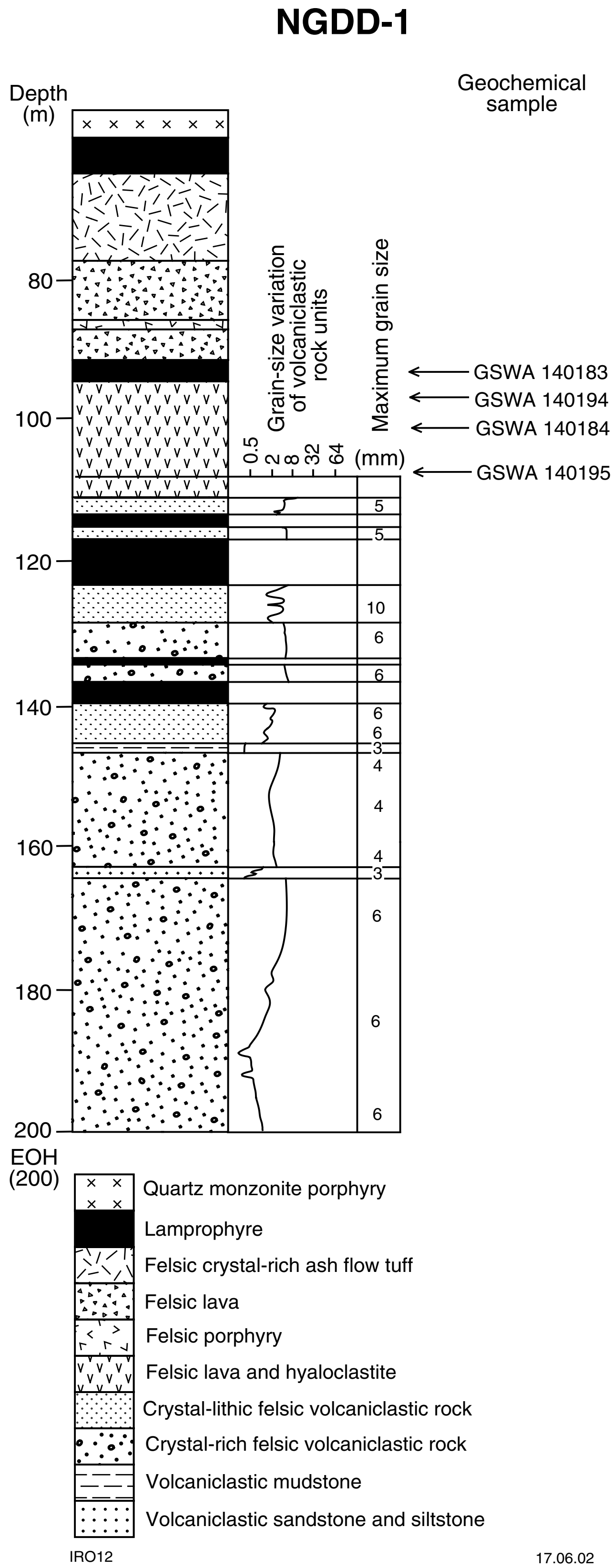


Figure 6. Summary drillhole log, NGDD-1, New Gordon Dam prospect

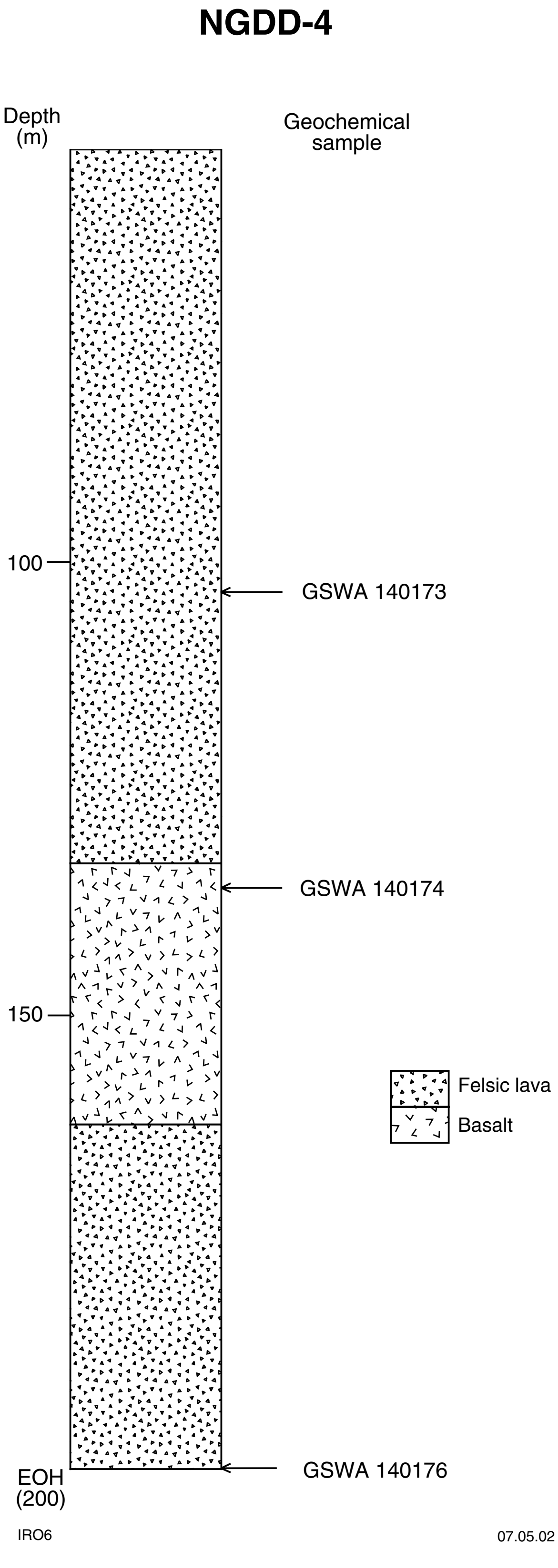


Figure 7. Summary drillhole log, NGDD-4, New Gordon Dam prospect

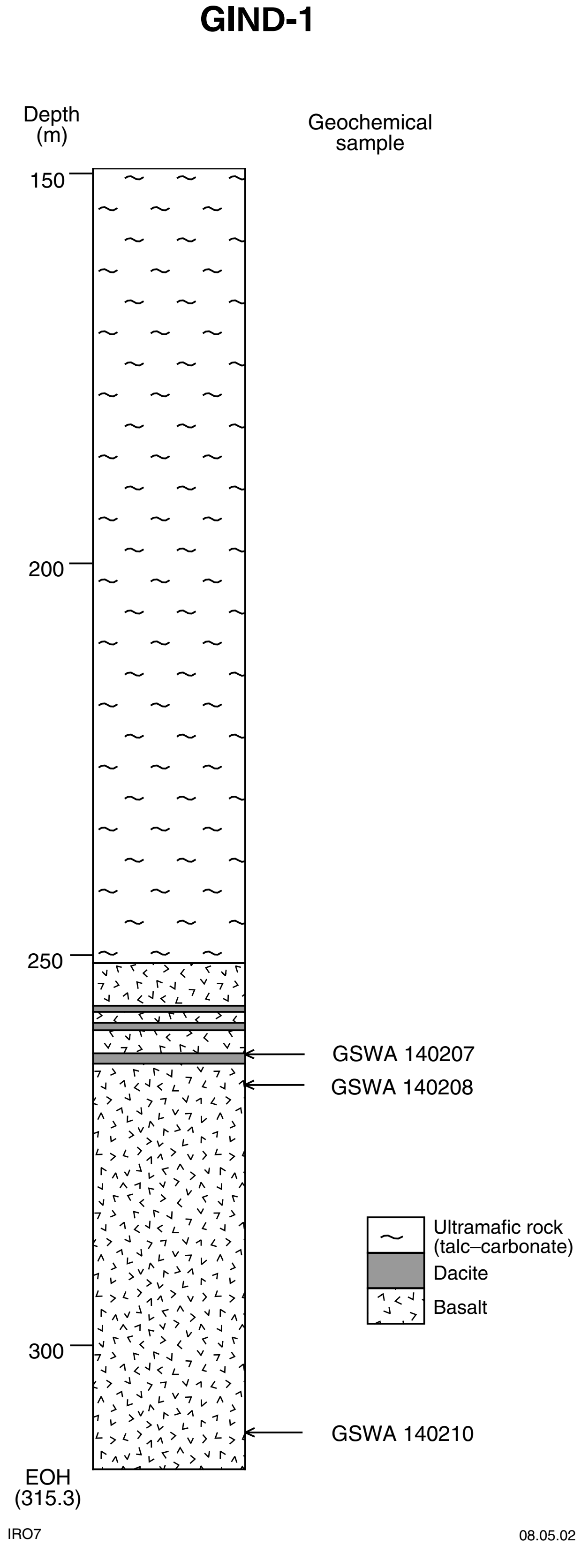
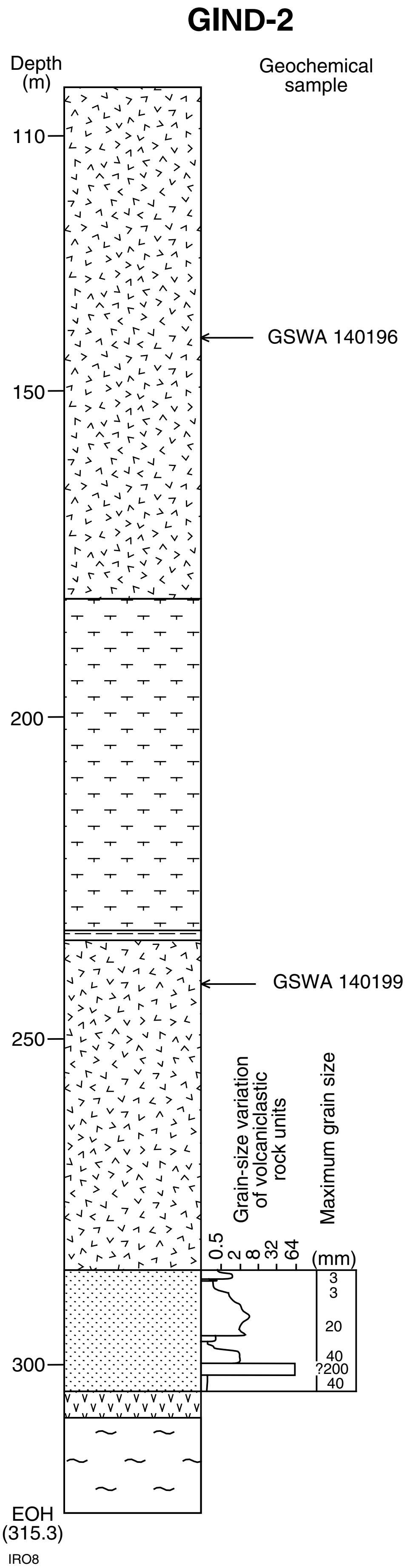


Figure 8. Summary drillhole log, GIND-1, East Samson Dam prospect



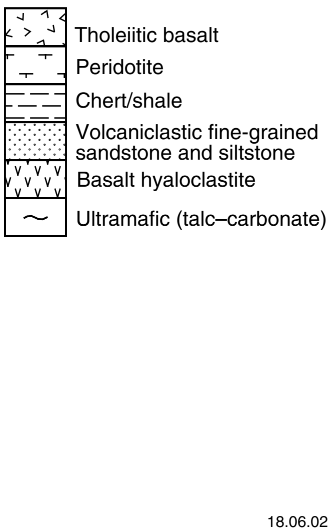


Figure 9. Summary drillhole log, GIND-2, East Samson Dam prospect

(peridotite and talc–carbonate) and komatiitic basalt, as well as chert and shale, volcaniclastic fine-grained sandstone and siltstone, and basalt hyaloclastite units (Fig. 9).

Trumpeter South prospect

The Trumpeter South prospect is about 6.5 km southwest of the Gordon mining centre. Samples for whole-rock geochemical analysis were obtained from TSD-2 and TSD-4 (Fig. 2; Table A1 in the Appendix) drilled by North Exploration. Both drillcores contain a succession of interbedded felsic volcanic rocks, basalts, dolerites, and sedimentary rocks. The succession intersected by drillhole TSD-2 consists of carbonate-altered basalt and dolerite interbedded with minor black carbonaceous shale, intruded by a felsic rock of dacitic composition (Fig. 10). The dolerite between 137.3 and 154.0 m is compositionally zoned, whereas the basalt from 169.7 m to the end of the hole (EOH) at 250 m commonly shows pillow structures (Fig. 10). Drillhole TSD-4 (Fig. 11) intersected a succession of carbonated basalt intruded by a strong to intense, sericite-altered and quartz stockwork-veined dacite porphyry. Local zones of semi-massive sulfide (mainly pyrite, minor Fe-rich sphalerite, and chalcopyrite) are also present within this porphyry. Lenses of sulfidic black shale are between 68.4 to 68.83 m and 190.32 to 191.6 m.

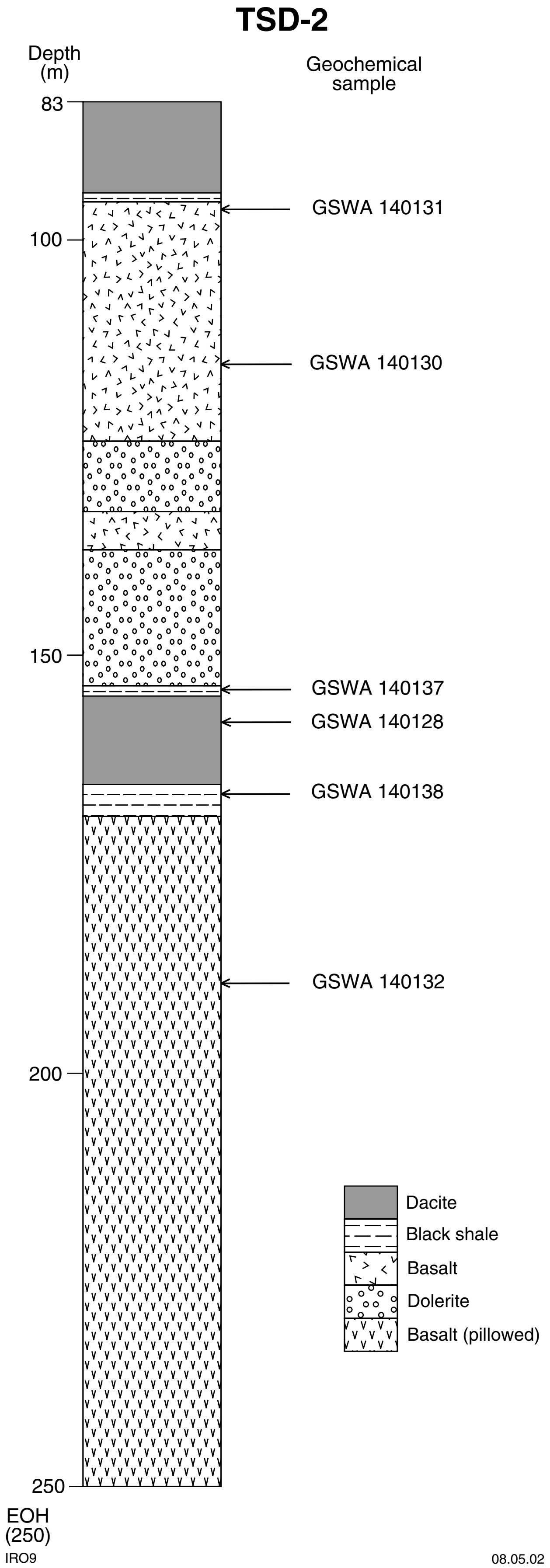


Figure 10. Summary drillhole log, TSD-2, Trumpeter South prospect

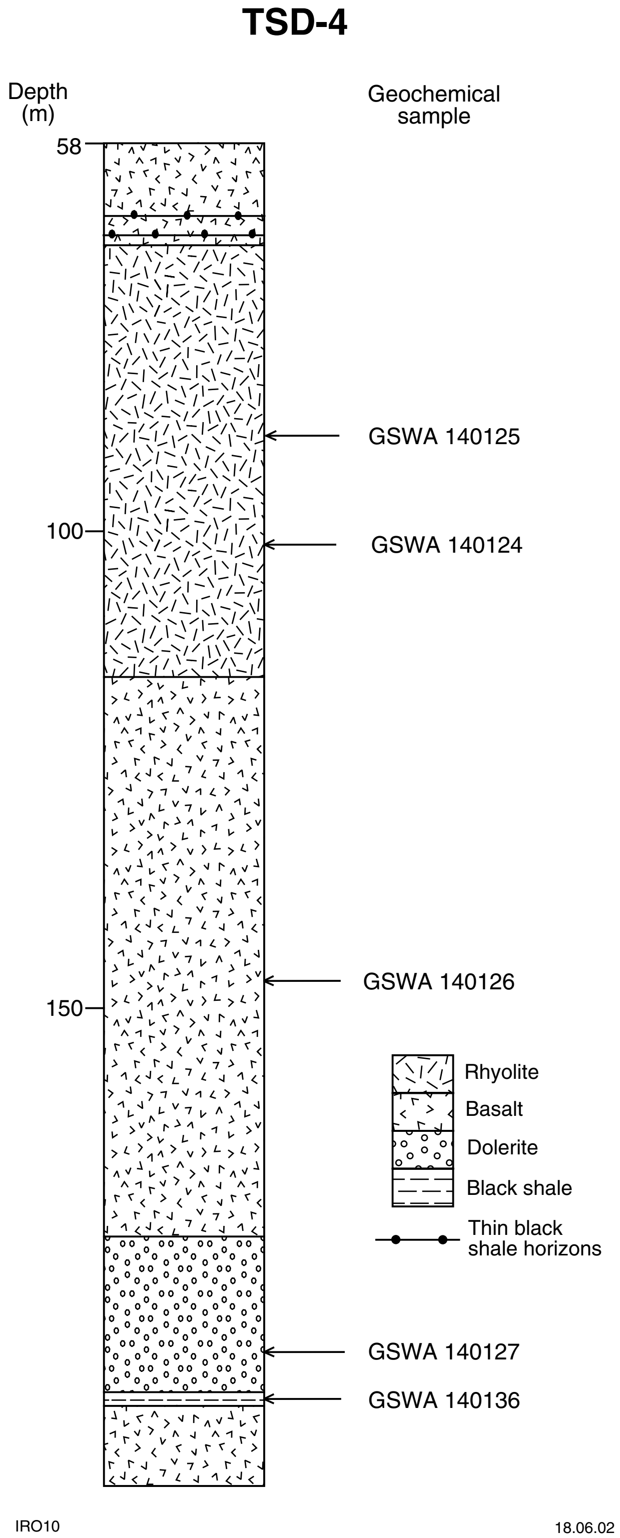


Figure 11. Summary drillhole log, TSD-4, Trumpeter South prospect

Metamorphism and alteration

As is typical of the Archaean rocks of the Eastern Goldfields Granite–Greenstone Terrane, all of the samples analysed in this study have undergone pervasive regional metamorphism to lower–middle greenschist facies, although primary textures and structures are commonly preserved.

In mafic rocks the mineral assemblage is actinolite–chlorite–albite–epidote–quartz–zoisite, whereas ultramafic rocks comprise actinolite–talc–carbonate–chlorite – opaque minerals. The felsic volcaniclastic samples are composed of quartz and feldspar fragments and felsic lithic clasts in a felsic matrix, and many show hydrothermal alteration and are weakly to moderately foliated. Despite alteration of the groundmass, the clastic structure can be recognized in hand specimen and under plane-polarized light in thin section.

Garner (1996) noted three alteration styles associated with mineralization at the Gordon–Sirdar gold mine:

- hematite alteration, associated with relatively undeformed quartz–carbonate veins;
- quartz–sericite alteration related to early deformed quartz–pyrite veining;
- chlorite alteration, which is related to the primary rock porosity in hyaloclastites, and is fracture controlled in felsic volcaniclastic units. Chlorite alteration is also present in more mafic rocks.

Carbonate alteration has affected some of the rock units in the Gordon area, and many of the rock units near the Gordon–Sirdar gold mine are intensely altered with at least two generations of carbonate alteration in some rocks (Garner, 1996). Chloritoid and andalusite are present within the felsic volcaniclastic rocks (Figs 3 and 4), and because these minerals are not common in unaltered volcanic rocks, they may result from metamorphism following leaching of sodium and calcium during sea-floor hydrothermal activity (Garner, 1996).

Whole-rock geochemical data

Thirty-three whole-rock analyses for major element oxides, trace elements, and rare earth elements were carried out (Tables 2–15) comprising mafic volcanic rocks (seven samples), altered mafic volcanic rocks (three samples), felsic volcanic rocks (twelve samples), altered felsic volcanic rocks (five samples), sedimentary rocks (three samples), lamprophyre (one sample), and altered mafic–ultramafic rocks (two samples). Details on sample collection and analytical techniques are presented in the Appendix. Whole-rock geochemistry data are supplied in digital form on the CD.

Table 2. Rare earth element analyses of mafic volcanic rocks, Gordon area

GSWA number	*140130*	*140132*	*140126*	*140127*	*140208*	*140196*	*140199*
	Parts per million						
La	3.1	3.3	2.9	2.7	3.0	10.4	10.8
Ce	8.9	8.9	8.1	7.8	7.7	26.0	26.0
Pr	2.2	1.4	1.7	1.0	1.9	–	2.4
Nd	5.7	5.2	5.2	4.7	4.4	16.2	15.4
Sm	2.25	2.00	2.10	2.00	1.69	4.90	4.90
Eu	0.88	0.76	0.79	0.75	0.67	1.56	1.66
Ho	0.6	0.60	0.65	0.60	0.45	1.30	1.25
Yb	2.05	1.82	1.94	1.89	1.26	3.60	3.60
Lu	0.42	0.35	0.40	0.38	0.23	0.65	0.63

Table 3. Rare earth element analyses of altered mafic volcanic rocks, Gordon area

GSWA sample number	*140210*	*140131*	*149174*
	Parts per million		
La	3.05	3.25	2.40
Ce	8.2	8.2	7.1
Pr	1.1	1.8	2.3
Nd	4.8	4.7	4.4
Sm	1.78	1.91	1.86
Eu	0.68	0.79	0.78
Ho	0.55	0.50	0.55
Yb	1.40	1.60	1.73
Lu	0.26	0.32	0.32

Table 4. Rare earth element analyses of altered felsic volcanic rocks, Gordon area

GSWA sample number	*140105*	*140113*	*140125*	*140194*	*140195*
	Parts per million				
La	24.5	21.5	21.5	9.3	10.0
Ce	46.5	40.5	38.0	15.7	17.0
Pr	5.0	4.9	4.3	1.4	2.5
Nd	19.4	14.6	12.4	5.7	6.3
Sm	2.95	2.05	1.78	1.04	1.12
Eu	0.79	0.53	0.53	0.23	0.27
Ho	0.20	0.20	0.20	0.10	0.20
Yb	0.39	0.43	0.32	0.18	0.20
Lu	0.05	0.06	0.035	0.025	0.027

Table 5. Rare earth element analyses of felsic volcanic rocks, Gordon area

GSWA sample number	*140111*	*140115*	*140116*	*76244*	*76245*	*76243*	*140207*	*140128*	*140124*	*140184*	*140173*	*140176*
						Parts per million						
La	27.0	22.5	23.0	22.5	20.5	14.8	30.5	15.8	22.0	10.0	9.6	9.9
Ce	46.5	43.5	45.5	42.5	40.5	28.0	55.0	29.5	39.0	17.0	16.4	16.4
Pr	3.7	2.8	3.5	4.7	4.2	1.6	2.4	3.0	3.7	1.3	1.1	1.9
Nd	15	17.8	19	18.2	18	11.8	21	11.6	12.6	6.1	6	6.1
Sm	2.25	2.95	3.00	3.00	3.25	2.10	3.20	1.96	1.84	1.16	1.09	1.12
Eu	0.72	0.86	0.82	0.89	0.93	0.68	0.81	0.60	0.55	0.27	0.27	0.27
Ho	0.20	0.25	0.25	0.25	0.30	0.20	0.40	0.20	0.25	0.15	0.15	0.15
Yb	0.25	0.56	0.49	0.46	0.70	0.47	0.62	0.44	0.35	0.21	0.20	0.20
Lu	0.028	0.08	0.06	0.06	0.12	0.07	0.08	0.07	0.036	0.028	0.026	0.028

Table 6. Rare earth element analyses of sedimentary rocks, Gordon area

GSWA sample number	*140137*	*140138*	*140136*
		Parts per million	
La	5.9	6.1	1.9
Ce	14.2	13.2	4.8
Pr	2.7	1.5	1.6
Nd	5	5.7	2.2
Sm	1.59	1.21	0.66
Eu	0.38	0.34	0.22
Ho	0.35	0.25	0.15
Yb	–	0.57	–
Lu	–	0.14	–

NOTE: – below detection limit

Table 7. Rare earth element analyses of lamprophyre, Gordon area

GSWA sample number	*140183*
	Parts per million
La	32.5
Ce	67.0
Pr	7.2
Nd	33.5
Sm	6.20
Eu	1.68
Ho	0.75
Yb	1.30
Lu	0.20

Table 8. Rare earth element analyses of altered mafic–ultramafic rocks, Gordon area

GSWA sample number	*140118*	*76246*
	Parts per million	
La	45.5	26.0
Ce	97.0	57.0
Pr	9.5	5.8
Nd	47.5	28
Sm	8.00	5.30
Eu	1.98	1.32
Ho	0.40	0.40
Yb	1.11	0.83
Lu	0.18	0.15

Table 9. Whole-rock analyses of felsic volcanic rocks, Gordon area

GSWA sample number	*140111*	*140115*	*140116*	*76244*	*76245*	*76243*	*140207*	*140128*
Laboratory number	*gwa278*	*gwa280*	*gwa281*	*gwa274*	*gwa275*	*gwa273*	*gwa303*	*gwa287*
Locality	*Gordon–Sirdar gold mine*						*East Samson Dam*	*Trumpeter South*
Drillhole	*GSD-1*			*GSD-8*		*GSD-9*	*GIND-1*	*TSD-2*
Lithology	*Polymictic conglomerate*	*Felsic hyaloclastite*		*Vitric-crystal felsic volcaniclastic rock*		*Fine-grained felsic hyaloclastite*	*Dacite*	
Depth (m)	*240.9 – 241.5*	*331.0 – 332.0*	*332.0 – 332.2*	*64.0 – 66.0*	*165.0*	*281.3*	*262.1 – 262.3*	*157.6 – 157.9*
Easting	*364767*	*364767*	*364767*	*365177*	*365177*	*365467*	*365547*	*360717*
Northing	*6630407*	*6630407*	*6630407*	*6630117*	*6630177*	*6629927*	*6637137*	*6626157*
Specific gravity (g/cm³)	*2.78*	*2.76*	*2.72*	*2.74*	*2.85*	*2.77*	*2.69*	*2.69*
				Percentage				
SiO_2	77.1	67.3	73.5	76.1	69.7	67.8	65.3	69.2
TiO_2	0.31	0.49	0.52	0.49	0.61	0.33	0.49	0.37
Al_2O_3	19.7	15.0	16.2	15.4	18.0	14.4	14.4	14.9
Fe_2O_3	0.17	0.97	0.45	0.83	2.19	1.99	0.57	0.46
FeO	0.27	2.58	0.24	0.16	2.60	0.41	2.60	2.19
MnO	>0.01	0.04	0.01	>0.01	0.06	0.24	0.05	0.04
MgO	0.03	1.00	0.18	0.19	0.41	2.44	2.43	1.06
CaO	0.13	2.35	0.74	0.32	0.33	1.99	3.55	2.12
Na_2O	0.34	1.94	2.87	1.61	1.32	1.28	5.98	5.91
K_2O	0.67	2.88	3.02	2.24	1.64	3.37	0.35	1.15
P_2O_5	0.09	0.18	0.20	0.18	0.24	0.09	0.14	0.10
LOI	1.30	4.58	2.14	2.48	2.64	5.16	4.04	2.41
S	0.07	0.17	0.04	0.41	0.44	1.47	0.03	0.17
Rest[(a)]	0.07	0.17	0.14	0.12	0.10	0.14	0.12	0.09
Subtotal	100.26	99.65	100.25	100.54	100.28	101.11	100.05	100.17
O=S[(b)]	-0.04	-0.08	-0.02	-0.20	-0.22	-0.74	-0.02	-0.09
Total[(c)]	100.22	99.57	100.23	100.34	100.06	100.37	100.03	100.08
				Parts per million				
Ag	0.1	0.7	–	–	0.1	7.0	0.1	0.1
As	30	31	11	6	78	64	24	6
Ba	123	749	688	476	133	367	217	368
Bi	0.6	–	–	0.3	0.4	–	0.9	0.8
Br	0.3	0.3	0.2	0.2	0.3	0.4	0.4	0.3
Cd	0.2	0.3	0.1	0.3	0.1	0.9	0.3	0.2
Co	–	6	–	–	8	–	4	–
Cr	15	28	31	28	54	10	126	29
Cs	–	2	2	3	<1	3	–	–
Cu	3	62	8	5	8	18	17	11
Ga	24	21	21	20	24	17	20	20
Ge	3.8	1.8	1.5	1.2	2.1	0.6	1.0	1.5
Hf	5.2	4.7	5.0	5.5	4.8	6.0	5.0	4.5
I	–	0.2	1.2	0.9	–	–	–	–
In	–	–	–	–	–	–	–	–
Mo	1.1	1.0	0.7	1.0	1.3	1.1	1.1	0.8
Nb	4.0	4.2	3.9	3.9	5.1	2.4	3.4	2.9
Ni	7	14	5	5	25	5	64	11
Pb	12	16	10	12	11	194	6	6
Rb	16	77	76	52	40	92	8	31
Sb	2.3	6.5	3.0	4.3	6.9	19.4	0.3	0.3
Sc	3	7	6	9	10	5	9	6
Se	–	–	–	–	–	–	–	–
Sn	1.2	1.0	0.9	1.1	1.0	0.9	1.1	1.1
Sr	192	223	234	212	155	157	204	132
Ta	1.9	–	2.2	2.3	1.8	–	–	1.3
Te	–	–	–	–	–	–	–	–
Th	10.1	4.6	4.5	4.5	3.6	8.1	12.5	3.4
Tl	0.7	1.5	1.0	1.0	1.2	1.4	0.5	1.0
U	2.4	0.8	1.0	1.4	0.9	1.0	1.9	0.8
V	24	47	35	48	66	38	58	36
W	1.1	–	–	–	0.7	–	1.3	2.4
Y	3	6	4	6	9	5	7	5
Zn	3	115	9	13	49	177	61	52
Zr	149	153	157	154	171	106	177	148

NOTES: All samples are from the GINDALBIE 1:100 000 map sheet
(a) The sum of all trace elements after they are converted to oxides
(b) The oxygen equivalent value (O=S) subtracted from the subtotal
(c) The sum of all components with the exception of S
LOI loss on ignition
– below detection limit

Table 9. (continued)

GSWA sample no.	*140124*	*140184*	*140173*	*140176*
Laboratory no.	*gwa283*	*gwa298*	*gwa294*	*gwa296*
Locality	*Trumpeter South*	------------- *New Gordon Dam* -----------		
Drillhole	*TSD-4*	*NGDD-1*	*NGDD-4*	*NGDD-4*
Lithology	*Rhyolite*	------------------ *Felsic lava* ---------------		
Depth (m)	*100.9–101.1*	*101.1–101.3*	*103–103.75*	*199.2–200*
Easting	*360137*	*359282*	*360122*	*360122*
Northing	*6625487*	*6633757*	*6630957*	*6630957*
Specific gravity (g/cm³)	*2.67*	*2.70*	*2.67*	*2.68*
		Percentage		
SiO_2	71.2	73.2	74.4	74.0
TiO_2	0.26	0.06	0.06	0.06
Al_2O_3	14.8	14.7	14.2	14.0
Fe_2O_3	0.41	0.88	0.28	0.23
FeO	1.54	0.39	0.71	0.75
MnO	0.02	0.02	0.02	0.02
MgO	1.21	0.23	0.18	0.21
CaO	1.27	1.27	1.26	1.72
Na_2O	5.61	4.60	5.51	5.20
K_2O	1.41	2.33	1.57	1.63
P_2O_5	0.07	0.03	0.02	0.03
LOI	2.36	2.25	1.99	2.44
S	0.06	0.42	0.08	0.05
Rest[(a)]	0.16	0.10	0.09	0.09
Subtotal[(b)]	100.38	100.48	100.37	100.43
O=S	-0.03	-0.21	-0.04	-0.02
Total[(c)]	100.35	100.27	100.33	100.41
		Parts per million		
Ag	0.1	0.3	–	0.1
As	5	22	36	5
Ba	756	543	429	411
Bi	0.7	0.5	–	0.2
Br	0.7	0.1	0.2	0.2
Cd	0.2	0.1	0.1	0.2
Co	–	–	–	–
Cr	10	<1	–	–
Cs	<1	<1	<1	1
Cu	10	16	4	3
Ga	19	18	18	18
Ge	0.9	1.0	1.0	1.0
Hf	4.8	3.3	3.2	3.2
I	0.7	0.3	0.6	0.3
In	–	–	–	–
Mo	0.8	1.1	0.2	0.4
Nb	2.8	2.0	2.0	2.1
Nd	9.8	5.9	6.0	4.0
Ni	9	2	2	2
Pb	9	22	11	8
Rb	40	64	50	51
Sb	–	1.6	0.8	0.8
Sc	3	<1	<1	1
Se	–	–	–	–
Sn	1.1	0.8	0.6	0.7
Sr	397	223	249	274
Ta	1.2	0.4	1.5	1.8
Te	–	–	–	–
Th	6.6	2.3	2.0	1.9
Tl	1.1	1.1	0.8	0.8
U	2.1	0.6	1.0	0.9
V	19	2	2	1
W	4.2	–	–	–
Y	3	3	3	3
Zn	49	9	35	26
Zr	130	47	46	46

Table 10. Whole-rock analyses of altered mafic volcanic rocks, Gordon area

GSWA sample number	*140210*	*140131*	*140174*
Laboratory number	*gwa305*	*gwa289*	*gwa286*
Locality	*East Samson Dam*	*Trumpeter South*	*New Gordon Dam*
Drillhole	*GIND-1*	*TSD-2*	*NGDD-4*
Lithology	--------------------- *Basalt* -----------------------		
Depth (m)	*311.2 – 311.8*	*96.0 – 96.5*	*137.6 – 138.3*
Easting	*365547*	*360717*	*360122*
Northing	*6637137*	*6626157*	*6630957*
Specific gravity (g/cm³)	*2.87*	*2.86*	*2.81*
		Percentage	
SiO_2	51.8	39.9	44.3
TiO_2	0.88	0.81	0.91
Al_2O_3	16.3	12.6	13.0
Fe_2O_3	1.55	4.23	1.42
FeO	5.73	4.95	9.16
MnO	0.20	0.18	0.17
MgO	3.53	5.74	6.77
CaO	8.96	9.40	9.94
Na_2O	3.33	1.16	1.71
K_2O	0.43	2.82	0.41
P_2O_5	0.07	0.06	0.07
LOI	6.32	15.2	11.0
S	0.05	3.10	0.24
Rest[(a)]	0.16	0.30	0.15
Subtotal	99.31	100.45	99.25
O=S[(b)]	-0.02	-1.55	-0.12
Total[(c)]	99.29	98.90	99.13
		Parts per million	
Ag	–	1.2	0.9
As	29	67	51
Ba	228	492	152
Bi	2.0	1.6	3.2
Br	0.7	0.8	0.4
Cd	–	0.9	0.5
Co	43	63	7
Cr	474	335	391
Cs	–	–	–
Cu	91	280	83
Ga	18	13	18
Ge	1.8	5.4	2.2
Hf	1.2	6.5	–
I	–	–	–
In	–	–	–
Mo	1.0	1.6	1.9
Nb	3.0	3.1	3.3
Ni	145	112	157
Pb	2	22	4
Rb	22	89	19
Sb	0.4	1.0	0.7
Sc	33	49	42
Se	–	4.3	0.7
Sn	0.7	9.6	0.7
Sr	122	187	149
Ta	–	–	–
Te	–	–	–
Th	–	–	–
Tl	0.6	3.1	1.6
U	0.1	0.3	0.3
V	230	256	245
W	–	–	–
Y	19	19	24
Zn	79	943	107
Zr	59	56	61

NOTES: All samples are from the GINDALBIE 1:100 000 map sheet
(a) The sum of all trace elements after they are converted to oxides
(b) The oxygen equivalent value (O=S) subtracted from the subtotal
(c) The sum of all components with the exception of S
LOI loss on ignition – below detection limit

Table 11. Whole-rock analyses of mafic volcanic rocks, Gordon area

GSWA sample number	*140130*	*140132*	*140126*	*140127*	*140208*	*140196*	*140199*
Laboratory number	*gwa288*	*gwa290*	*gwa285*	*gwa286*	*gwa304*	*gwa301*	*gwa302*
Locality	*Trumpeter South*				*East Samson Dam*		
Drillhole	*TSD-2*	*TSD-2*	*TSD-4*	*TSD-4*	*GIND-1*	*GIND-2*	*GIND-2*
Lithology	*Basalt*			*Dolerite*	*Basalt*	*Tholeiitic basalt*	
Depth (m)	*115.0 – 116.0*	*188.5 – 189*	*146.0 – 146.8*	*186.3 – 187.1*	*266.8 – 267.8*	*140.6 – 141.0*	*240.1 – 240.5*
Easting	*360717*	*360717*	*360137*	*360137*	*365547*	*365747*	*365747*
Northing	*6626157*	*6626157*	*6625487*	*6625487*	*6637137*	*6637287*	*6637287*
Specific gravity (g/cm³)	*3.03*	*3.05*	*3.02*	*3.03*	*2.81*	*2.86*	*2.86*
				Percentage			
SiO_2	49.7	48.3	48.9	49.6	51.4	46.9	45.8
TiO_2	0.95	0.88	0.92	0.87	0.80	2.16	2.10
Al_2O_3	14.8	14.6	14.4	14.5	15.2	12.4	11.5
Fe_2O_3	2.46	2.96	2.13	2.08	1.40	2.62	1.61
FeO	8.12	9.38	9.61	9.51	4.94	13.83	12.08
MnO	0.23	0.20	0.20	0.22	0.14	0.28	0.26
MgO	5.73	7.16	7.99	7.68	4.27	4.32	3.51
CaO	11.7	10.6	10.8	10.3	10.8	6.16	9.63
Na_2O	1.72	2.21	1.63	1.30	2.74	2.95	2.45
K_2O	0.04	0.10	0.08	0.06	0.17	0.85	0.05
P_2O_5	0.07	0.07	0.07	0.07	0.07	0.26	0.27
LOI	3.48	2.69	2.67	3.06	7.11	6.11	9.59
S	0.13	0.17	0.10	0.14	0.34	0.05	0.11
Rest[(a)]	0.14	0.13	0.13	0.13	0.13	0.15	0.13
Subtotal	99.27	99.45	99.63	99.52	99.51	99.04	99.09
O=S[(b)]	-0.06	-0.09	-0.05	-0.07	-0.17	-0.02	-0.05
Total[(c)]	99.21	99.36	99.58	99.45	99.34	99.02	99.04
				Parts per million			
Ag	0.4	0.9	0.4	0.9	0.6	1.2	1.2
As	2	7	5	14	–	9	36
Ba	15	20	30	10	53	301	68
Bi	2.6	3.2	2.8	2.8	2.1	2.1	3.5
Br	0.4	0.5	0.8	0.6	0.3	0.3	0.4
Cd	0.7	0.5	0.5	0.6	0.5	1.7	0.9
Co	36	46	27	36	41	29	41
Cr	380	252	341	331	418	46	26
Cs	1	2	1	1	1	3	<1
Cu	104	149	101	87	95	94	48
Ga	19	18	17	17	17	22	22
Ge	2.1	1.9	1.8	2.1	1.9	1.8	2.1
Hf	0.4	–	1.1	–	2.7	0.7	2.7
I	–	–	–	0.3	–	–	–
In	–	–	–	–	–	0.2	0.1
Mo	1.5	1.6	1.8	1.6	1.2	3.3	3.4
Nb	3.1	3.3	3.1	3.2	2.9	8.9	9.6
Ni	146	149	147	174	111	42	43
Pb	2	3	1	4	4	<1	4
Rb	<1	2	2	1	4	41	1
Sb	0.5	0.3	0.3	0.5	1.2	0.5	0.2
Sc	48	43	47	45	31	40	46
Se	0.4	0.6	0.3	0.3	0.3	–	0.3
Sn	0.9	0.7	0.8	0.8	0.7	1.7	2.0
Sr	125	162	111	88	153	80	119
Ta	–	–	–	–	–	–	–
Te	–	–	–	–	–	–	–
Th	–	–	–	–	–	–	–
Tl	1.4	1.3	–	1.3	1.0	0.8	1.7
U	0.4	0.2	0.1	0.1	0.4	0.5	0.8
V	283	246	272	263	200	341	334
W	–	–	–	–	–	–	–
Y	26	22	23	23	18	48	53
Zn	109	104	99	117	91	179	164
Zr	60	54	57	54	54	164	179

NOTES: All samples are from the GINDALBIE 1:100 000 map sheet
(a) The sum of all trace elements after they are converted to oxides
(b) The oxygen equivalent value (O=S) subtracted from the subtotal
(c) The sum of all components with the exception of S
LOI loss on ignition
– below detection limit

Table 12. Whole-rock analyses of altered felsic volcanic rocks, Gordon area

GSWA sample number	*140105*	*140113*	*140125*	*140194*	*140195*
Laboratory number	*gwa277*	*gwa279*	*gwa284*	*gwa299*	*gwa300*
Locality	*----- Gordon–Sirdar gold mine -----*		*Trumpeter South*	*------ New Gordon Dam -----*	
Drillhole	*---------------- GSD-1 ---------------*		*TSD-4*	*----------- NGDD-1 -----------*	
Lithology	*-------- Aphyric crystal-lithic -------- felsic volcaniclastic rock*		*Rhyolite*	*---------- Felsic lava ----------*	
Depth (m)	*148.0 – 149.0*	*280.4 – 280.5*	*89.5 – 90.0*	*96.8 – 97.3*	*106.7 – 107.2*
Easting	*364767*	*364767*	*360137*	*359282*	*359282*
Northing	*6630407*	*6630407*	*6625487*	*6633757*	*6633757*
Specific gravity (g/cm³)	*2.73*	*2.76*	*2.71*	*2.68*	*2.68*
			Percentage		
SiO_2	79.6	75.0	70.1	74.3	75.2
TiO_2	0.53	0.51	0.25	0.06	0.06
Al_2O_3	15.5	15.3	14.7	14.4	14.0
Fe_2O_3	0.36	1.92	0.71	0.36	0.45
FeO	0.24	0.13	0.79	0.33	0.37
MnO	>0.01	>0.01	0.03	0.01	0.02
MgO	0.04	0.09	1.36	0.20	0.21
CaO	0.22	0.12	2.03	1.20	1.42
Na_2O	0.59	1.34	3.18	5.22	5.04
K_2O	1.20	2.51	3.07	1.93	1.90
P_2O_5	0.17	0.07	0.08	0.03	0.03
LOI	1.82	3.03	3.88	1.72	1.94
S	0.21	1.42	0.37	0.08	0.09
Rest[(a)]	0.13	0.16	0.13	0.10	0.10
Subtotal	100.62	101.61	100.68	99.94	100.83
O=S[(b)]	-0.10	-0.71	-0.19	-0.04	-0.04
Total[(c)]	100.52	100.90	100.49	99.90	100.79
			Parts per million		
Ag	–	0.2	0.2	0.1	0.1
As	30	42	4	13	6
Ba	468	633	603	529	529
Bi	0.6	–	–	0.2	–
Br	0.4	0.5	0.7	0.2	0.2
Cd	0.1	0.2	0.5	0.2	0.1
Co	–	11	–	–	–
Cr	30	26	11	<1	2
Cs	2	3	<1	2	1
Cu	5	8	40	8	10
Ga	21	21	19	18	16
Ge	1.7	1.9	2.1	0.9	0.9
Hf	5.1	5.6	5.0	3.5	3.6
I	0.9	1.0	0.5	1.4	0.8
In	–	–	–	–	–
Mo	1.0	0.7	1.5	0.5	0.4
Nb	4.2	4.0	3.0	2.0	2.2
Ni	10	9	5	2	1
Pb	8	19	17	12	15
Rb	28	60	84	56	53
Sb	3.1	3.5	0.3	1.1	1.0
Sc	5	6	3	<1	<1
Se	–	–	0.3	–	–
Sn	1.0	0.7	2.1	1.0	0.7
Sr	359	482	96	231	270
Ta	1.8	2.6	–	1.4	1.9
Te	–	–	–	–	–
Th	4.7	4.7	6.9	2.1	2.3
Tl	0.9	1.3	1.5	0.9	1.0
U	1.0	1.2	1.8	0.9	1.6
V	49	50	20	2	2
W	–	–	4.2	–	–
Y	3	3	3	2	3
Zn	9	14	166	8	10
Zr	156	146	134	47	46

NOTES: All samples are from the GINDALBIE 1:100 000 map sheet
- (a) The sum of all trace elements after they are converted to oxides
- (b) The oxygen equivalent value (O=S) subtracted from the subtotal
- (c) The sum of all components with the exception of S
- LOI loss on ignition
- – below detection limit

Table 13. Whole-rock analyses of sedimentary rocks, Gordon area

GSWA sample number	*140137*	*140138*	*140136*
Laboratory number	*gwa292*	*gwa293*	*gwa291*
Locality	--------------	*Trumpeter South*	---------------
Drillhole	*TSD-2*	*TSD-2*	*TSD-4*
Lithology	-----------------	*Black shale*	------------------
Depth (m)	*154–155*	*166.7 – 167.5*	*190.0*
Easting	*360717*	*360717*	*360137*
Northing	*6626157*	*6626157*	*6625487*
Specific gravity (g/cm³)	*3.17*	*2.86*	*2.95*
		Percentage	
SiO_2	43.2	59.3	63.6
TiO_2	0.42	0.32	0.16
Al_2O_3	7.12	5.84	2.98
Fe_2O_3	8.93	2.62	3.80
FeO	21.7	15.3	13.9
MnO	0.05	0.12	0.09
MgO	1.42	1.48	0.58
CaO	0.67	3.17	4.17
Na_2O	0.07	0.07	0.09
K_2O	1.78	1.63	0.63
P_2O_5	0.07	0.05	0.03
LOI	8.84	7.45	7.01
S	15.1	8.06	8.04
Rest(a)	1.26	0.45	0.40
Subtotal	110.63	105.86	105.48
O=S(b)	-7.55	-4.03	-4.02
Total(c)	103.08	101.83	101.46
		Parts per million	
Ag	3.8	3.3	1.9
As	196	497	63
Ba	196	172	115
Bi	5.2	3.6	3.8
Br	0.7	1.0	2.0
Cd	19.0	12.2	6.5
Co	104	53	51
Cr	173	37	16
Cs	–	–	<1
Cu	1252	646	1192
Ga	–	–	–
Ge	7.7	4.1	3.3
Hf	–	2.0	–
I	–	–	–
In	3.4	1.1	1.0
Mo	9.2	6.6	6.0
Nb	3.7	3.5	2.6
Ni	142	53	42
Pb	108.8	65.3	15.7
Rb	30	33	19
Sb	1.8	1.2	0.3
Sc	21	13	7
Se	18.0	7.2	8.7
Sn	34.2	14.4	6.3
Sr	10	41	11
Ta	–	–	–
Te	1.9	0.8	0.7
Th	–	2.2	–
Tl	3.3	2.6	2.2
U	0.7	0.7	0.5
V	95	63	30
W	–	–	–
Y	6	6	4
Zn	10 051	2 718	2 319
Zr	49	51	32

NOTES: All samples are from the GINDALBIE 1:100 000 map sheet
(a) The sum of all trace elements after they are converted to oxides
(b) The oxygen equivalent value (O=S) subtracted from the subtotal
(c) The sum of all components with the exception of S
LOI loss on ignition
– below detection limit

Table 14. Whole-rock analyses of lamprophyre, Gordon area

GSWA sample number	*140183*
Laboratory number	*gwa297*
Locality	*New Gordon Dam*
Drillhole	*NGDD-1*
Lithology	*Lamprophyre*
Depth (m)	*93.7 – 94.2*
Easting	*359282*
Northing	*6633757*
Specific gravity (g/cm³)	*2.77*
	Percentage
SiO_2	54.2
TiO_2	0.98
Al_2O_3	12.3
Fe_2O_3	1.35
FeO	5.03
MnO	0.09
MgO	6.32
CaO	5.30
Na_2O	3.88
K_2O	2.23
P_2O_5	0.44
LOI	7.03
S	0.08
Rest(a)	0.36
Subtotal	99.59
O=S(b)	-0.04
Total(c)	99.55
	Parts per million
Ag	0.2
As	4
Ba	1 105
Bi	1.3
Br	0.5
Cd	0.1
Co	21
Cr	381
Cs	4
Cu	30
Ga	20
Ge	1.4
Hf	7.2
I	–
In	–
Mo	1.5
Nb	10.7
Ni	204
Pb	14
Rb	137
Sb	2.3
Sc	18
Se	–
Sn	2.2
Sr	1 052
Ta	–
Te	–
Th	7.2
Tl	2.6
U	2.7
V	124
W	–
Y	20
Zn	104
Zr	212

NOTES: All samples are from the GINDALBIE 1:100 000 map sheet
(a) The sum of all trace elements after they are converted to oxides
(b) The oxygen equivalent value (O=S) subtracted from the subtotal
(c) The sum of all components with the exception of S
LOI loss on ignition
– below detection limit

Table 15. Whole-rock analyses of altered mafic–ultramafic rocks, from the Gordon–Sirdar gold mine

GSWA sample number	*140118*	*76246*
Laboratory number	*gwa282*	*gwa276*
Locality	------- *Gordon–Sirdar gold mine* -------	
Drillhole	*GSD-1*	*GSD-8*
Lithology	---- *Altered mafic–ultramafic rock* -----	
Depth (m)	*362.0 – 363.0*	*259.0*
Easting	*364767*	*365177*
Northing	*6630407*	*6630117*
Specific gravity (g/cm^3)	*2.77*	*2.84*
	Percentage	
SiO_2	51.6	44.4
TiO_2	0.69	0.59
Al_2O_3	11.6	8.25
Fe_2O_3	1.39	1.22
FeO	4.59	5.85
MnO	0.11	0.11
MgO	7.01	13.4
CaO	6.64	6.10
Na_2O	3.95	1.71
K_2O	0.25	1.85
P_2O_5	0.36	0.28
LOI	11.2	15.5
S	0.04	0.06
Rest[(a)]	0.32	0.48
Subtotal	99.75	99.80
O=S[(b)]	-0.02	-0.03
Total[(c)]	99.73	99.77
	Parts per million	
Ag	0.2	–
As	14	10
Ba	728	1 179
Bi	2.5	1.5
Br	0.7	0.5
Cd	0.4	0.2
Co	32	59
Cr	717	1 929
Cs	–	22
Cu	5	33
Ga	19	13
Ge	1.4	1.7
Hf	4.9	3.9
I	–	–
In	–	–
Mo	1.2	1.0
Nb	7.3	4.4
Ni	198	482
Pb	30	18
Rb	10	96
Sb	8.6	5.3
Sc	20	25
Se	–	–
Sn	1.4	1.1
Sr	823	499
Ta	1.9	–
Te	–	–
Th	7.7	3.4
Tl	0.7	2.0
U	1.5	1.0
V	106	111
W	–	–
Y	17	15
Zn	110	103
Zr	171	125

NOTES: All samples are from the GINDALBIE 1:100 000 map sheet
(a) The sum of all trace elements after they are converted to oxides
(b) The oxygen equivalent value (O=S) subtracted from the subtotal
(c) The sum of all components with the exception of S
LOI loss on ignition
– below detection limit

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Appendix

Sample collection and analytical techniques

Sample collection

Samples were collected from diamond drillcore at the following localities: Gordon–Sirdar gold mine (GSD-1, GSD-8, and GSD-9), Trumpeter South prospect (TSD-2 and TSD-4), New Gordon Dam prospect (NGDD-1 and NGDD-4) and East Samson Dam prospect (GIND-1 and GIND-2). Locations of drillholes are listed in Table A1 and shown on Figures 1 and 2.

Table 1.1. Locations of drillholes in the Gordon area

			MGA coordinates		
Location	*Drillhole*	*Company*	*Easting*	*Northing*	*Downhole depth (m)*
Gordon–Sirdar gold mine	GSD-1	North Exploration Ltd	364767	6630407	398.0
Gordon–Sirdar gold mine	GSD-8	North Exploration Ltd	365177	6630117	325.3
Gordon–Sirdar gold mine	GSD-9	North Exploration Ltd	365467	6629927	320.0
New Gordon Dam prospect	NGDD-1	North Exploration Ltd	359282	6633757	200.0
New Gordon Dam prospect	NGGD-4	North Exploration Ltd	360122	6630957	200.0
East Samson Dam prospect	GIND-1	Mt Kersey Mining NL	365547	6637137	315.3
East Samson Dam prospect	GIND-2	Mt Kersey Mining NL	365747	6637287	323.0
Trumpeter South prospect	TSD-2	North Exploration Ltd	360717	6626157	250.0
Trumpeter South prospect	TSD-4	North Exploration Ltd	360137	6625487	200.0

NOTES: All samples are from the GINDALBIE 1:100 000 map sheet
Drillholes GIND-1 and GIND-2 have been archived by the Geological Survey of Western Australia and are available for viewing at the Department of Mineral and Petroleum Resources' J. H. (Joe) Lord Core Library in Kalgoorlie

Analytical techniques

Major element analysis

Major element analysis was carried out by ANUTECH and the Australian National University, by X-ray fluorescence (XRF) analysis of glass fusion discs (Norrish and Hutton, 1969). Duplicate samples were prepared with a day between preparation of the duplicates.

Samples were analysed on a Philips PW2400 XRF spectrometer calibrated for silicate materials using standards made from high-purity compounds. Matrix corrections were incorporated using factors determined from fundamental parameters. The validity of this calibration was checked using international standards. All duplicates were analysed on consecutive days. International standards BHVO-1, GS-N, and SGR-1 were measured during the measurement run. Results showed a good agreement between the values obtained and the accepted values for these standards. High sulfur values were checked using synthetic standards made from sodium and calcium sulfates.

Trace element analysis

ANUTECH and the Australian National University carried out trace element analysis by XRF analysis of pressed powders (Norrish and Chappell, 1967). Duplicate samples were prepared with a day between preparation of the duplicates.

The trace elements were determined using a SPECTRO X-lab spectrometer, except for Sc, which was determined using a Philips PW1400 XRF spectrometer. In addition, measurements obtained using the PW1400 XRF spectrometer were reported in place of those obtained from the SPECTRO where better detection limits were obtained.

The SPECTRO X-lab spectrometer was calibrated using 65 standard reference materials. Values for two in-house standards were established immediately after calibration. These two standards plus 15–16 of the rock powders were analysed each day. Standard samples BHVO-1 and GS-N were also analysed during the run. Results showed a close reproducibility and an agreement between the values obtained and the accepted values for standards BHVO-1 and GS-N.

The calibration procedure for the Philips PW1400 XRF spectrometer was as described by Chappell (1991). After calibrating, five in-house standards of different rock types were measured and their concentration values compared to previously obtained data. The standards BHVO-1 and GS-N were also measured with each set of samples.

Analyses for loss on ignition (LOI), moisture (H_2O^-) and FeO were carried out as single determinations. In cases where the total was greater than 101 or less than 99.2, checks were carried out on the major element and ignition loss results.

Rare earth element analyses

Rare earth element (REE) analyses (La to Lu) were carried out by instrumental neutron-activation analysis (INAA) at Becquerel Laboratories, Sydney, using the Australian Nuclear Science and Technology Organisation's HIFAR reactor at Lucas Heights. Using the method reported by Morris (2000), samples were bombarded with low-energy (thermal) neutrons causing some isotopes to become radioactive by capture of one extra neutron. These radioisotopes are recognized by the characteristic energy of the gamma ray(s) emitted as they decay with specific half-lives, and concentrations of particular elements were determined by measuring the area of the photo peaks.

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