LIGHTS OF ISRAEL GOLD DEPOSIT, DAVYHURST, WA

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LOCATION

The Lights of Israel Au deposit is approximately 2 km NE of Davyhurst (Figure 1) at 30º02'40"S, 120º39'45"E. Kalgoorlie 1:250 000 sheet SH51-09.

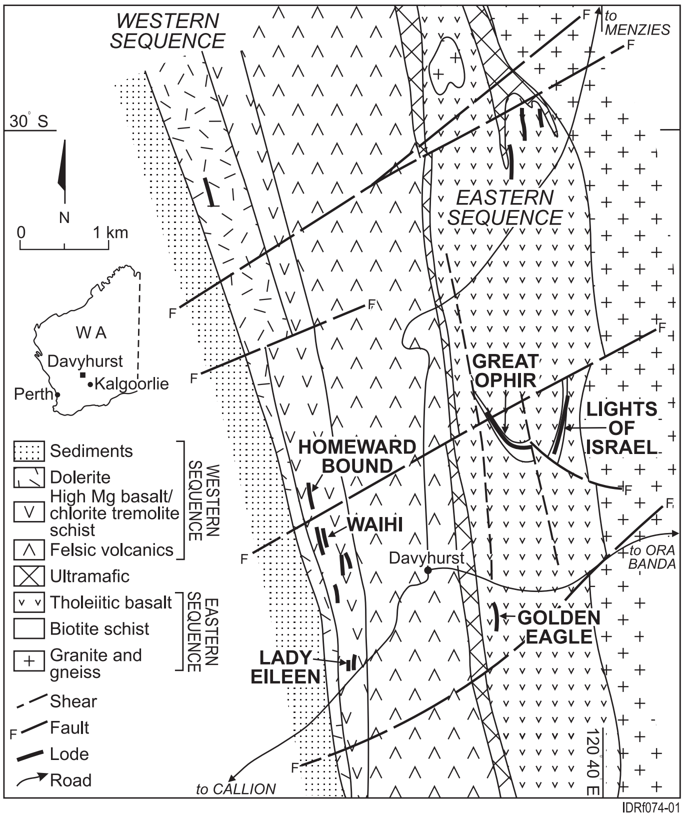

Figure 1. Location of Lights of Israel Au Deposit with surrounding geology.

DISCOVERY HISTORY

The deposit was discovered at the beginning of the last century. Historical production was 34 kg Au from 3846 t of ore between 1906 and 1913. In 1987, drilling around the old workings outlined a resource which was mined by open pit in two phases (1988-89, 1993-94) to yield 1.65 Mt at 2.79 g/t Au (Joyce et al., 1998). Underground access by decline to more than 1.6 Mt at 4.5 g/t Au is underway and mining operations are expected to continue to 2004.

PHYSICAL FEATURES AND ENVIRONMENT

The climate is semi-arid with an annual rainfall of about 250 mm. Rainfall is evenly distributed throughout the year but the summer rainfall is episodic. Maximum temperatures exceed 40°C in summer with occasional winter frosts. This site lies near to, but south of, the Menzies Line (Butt et al., 1977; Butt, 1988)

The mine is located in a very shallow valley that sloped gently (<1:100) to the north, within a very gently undulating erosional plain. Prior to mining, the site had an open eucalypt woodland with shrubs of bluebush beneath. Two, small, parallel streams were incised very slightly into this surface. The soil was a thin, brown carbonate-rich lithosol, typical of eroded areas south of the Menzies Line, and strewn with a dark brown ferruginous lag, developed on a deeply eroded saprolite.

GEOLOGICAL SETTING

The mineralised zone is a schist, some 15-20 m thick, which dips at 10-40° to the W and strikes NNE for over a kilometre (Figure 1). It thins to the north, outcrops poorly and is variably weathered to 40-50 m. The wall rocks are tholeiitic metabasalts, now metamorphosed to amphibolite, with minor interflow sediments and dolerite, which have been intruded by felsic dykes and small quartz-tourmaline veinlets. Intrusive granitoids lie 200-400 m to the east (Figure 1). This suite of rocks comprises part of the Eastern Sequence of the Coolgardie - Mount Ida segment of the Norseman - Wiluna Greenstone Belt and contains the nearby Great Ophir and Golden Eagle gold deposits.

REGOLITH

Saprolite

The weathering profile has been truncated to the saprolite. The wall rocks to the mineralization are variably weathered to 20-30 m depth. The thickness of saprock varies considerably and blocks of saprock may be seen in the side of the pit, enclosed in brownish saprolite. Weathering penetrates much deeper (40-50 m) in the mineralized zone.

Soil

The soil is a structureless, carbonate-rich brown loam, with small, ferruginous nodules and a few fibrous halite crystals. The base of the carbonate-rich soil is marked by a semi-continuous horizon of coarse, decussate gypsum crystals (5-20 mm), in a red-brown clay, overlying carbonate-free soil and saprolite. Where saprolite is close to the surface, carbonate has formed skins on saprolite blocks, with sporadic gypsum crystals at the base. Shallow channels are filled with cross-bedded, brown, fluvial gravels and sand, with a dark, ferruginous lag at the base. The channel sediments are calcareous at surface

The soil consists of quartz, kaolinite, smectite, hematite and goethite, minor maghemite, sericite and calcite, with trace anatase and K-feldspar. The soil has three contrasting size fractions (Figure 2), dominated by the silty, ferruginous <75 µm fraction. The coarse fraction (>710 µm)

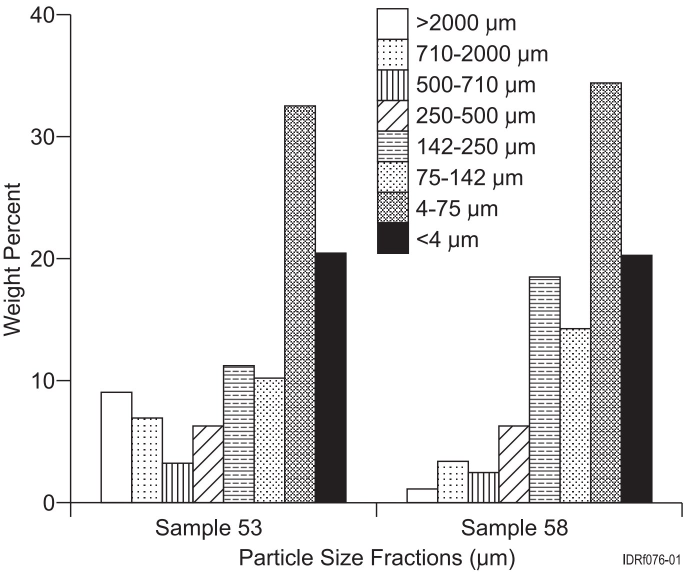

Figure 2. Typical soil size distributions.

mainly of ferruginous granules and fragments of ferruginised saprolite, with minor quartz and a trace of fresh tourmaline. The intermediate fraction (75-710 µm) consists largely of quartz. The finest fraction (<4 µm) is finely divided Fe oxides and clay.

Tourmaline (schorlite) is most abundant near mineralization and is extremely fresh and angular. Angular quartz and tourmaline indicate that the coarser fractions are residual. Minor, rounded, frosted, apparently aeolian quartz and K-feldspar grains occur only in the <150 µm fraction.

Lag

The soil is partly mantled by a lag of shiny, black, ferruginous, granules that becomes progressively scarce to absent E of the mine. Coarse lag (10-50 mm) is scarce but fine lag (0.6-10 mm) is abundant. The coarse component is angular, ferruginised saprolite with a matt, slightly porous surface and minor (5%) fragments of white vein quartz. The fine lag is also dominantly ferruginised saprolite with a few glossy black granules. Shard-like quartz fragments are a minor component of the lag. Close to the subcrop of the mineralization, the lag contains a few gossan fragments after fine-grained pyrite.

The ferruginized saprolite exhibits a wide variety of primary and secondary fabrics, including tourmaline remnants and pyrite pseudomorphs, variably preserved fingerprint and layer silicate fabrics (typical of mafic rocks (Robertson, 1989), authigenic “accordion” structures after coarse kaolinite and sericite and colloform and cuspate void-filling fabrics.

Groundwater

Drilling to the east of the pit indicated water at a depth of 48-52 m. Although no analyses are available, the ground water is probably hypersaline.

MINERALIZATION

The Lights of Israel deposit lies within a shallowly W-dipping, intensely foliated and lineated biotite-plagioclase-actinolite-calcite-quartz schist. Towards the base of the schist, a zone of intense quartz-feldspar alteration, with up to 10% pyrite and pyrrhotite, trace chalcopyrite and sphalerite, and zones of tourmaline form the lode. Feldspar porphyry bodies occur within the schist, in the hanging wall and both along and beneath the footwall. Porphyry within the mineralized zone is biotite altered, tightly folded and has a spatial relationship to high grade Au (Joyce et al., 1998). High grade Au mineralization plunges parallel to a stretch lineation.

REGOLITH EXPRESSION

Geochemical background and sampling

The soil and lag survey was limited to the mine lease, so the regional geochemical background may not have been reached in all cases. Two soil and two lag samples were collected 825 m to the north and 500 m south of the pit centre, remote from mineralization to give ‘regional’ background (Table 1). Soil from the top 250 mm (complete, >600 µm, 4-75 µm and <4 µm fractions), coarse lag (10-50 mm), fine lag (0.6-10 mm as complete, magnetic and non-magnetic fractions), and soil to 1 m were sampled by trenching (Robertson and Tenhaeff, 1992). Two sections were sampled from surface to fresh bedrock (Douglas et al., 1993).

Gold

Lag. Gold gives the best indication of the mineralization, with significant (600-700 ppb) lag anomalies in the ‘regional’ a background of 10-50 ppb. Although the coarse lag and the non-magnetic component of the fine lag both show similar peak sizes, the Au data are spiky (Figure 3A). The fine lag accurately locates the mineralization, with an anomaly of 200 ppb. Gold anomalies in the lag (80-720 ppb) are narrow (75 m), erratic, particularly in the coarse lag, and are poorly defined.

Soil. The <4 µm fraction shows the strongest Au anomaly (750 ppb), with lower but similar abundances (400 ppb) from the <75 µm fraction and the complete soil (Figure 3B). Gold is strongly correlated with Ca in the <4 µm soil fraction, indicating association with soil carbonates (Figure 3C). The least effective fraction is the >600 µm, with a 200 ppb maximum, displaced 75 m E of the mineralization.. The soil Au anomalies (peaks of 230-750 ppb) are about 125 m wide (>75 ppb) and are only slightly wider than the supergene mineralization (40-60 m) indicating the need for close-spaced sampling in this erosional area.

The soil Au anomalies were confirmed by deeper sampling (1 m) by trenching (Figure 3D), where a peak of over 1200 ppb was recorded in carbonate-rich soil and saprolite. A small Au anomaly of over 300 ppb occurs to the west of the mineralisation but this particular sample is very Ca rich. The Au/Ca relationship shows a background relationship approximating to 1% CaO to 20 ppb Au. Recalculating the Au as a residual (Figure 3D), compensating for this background relationship,

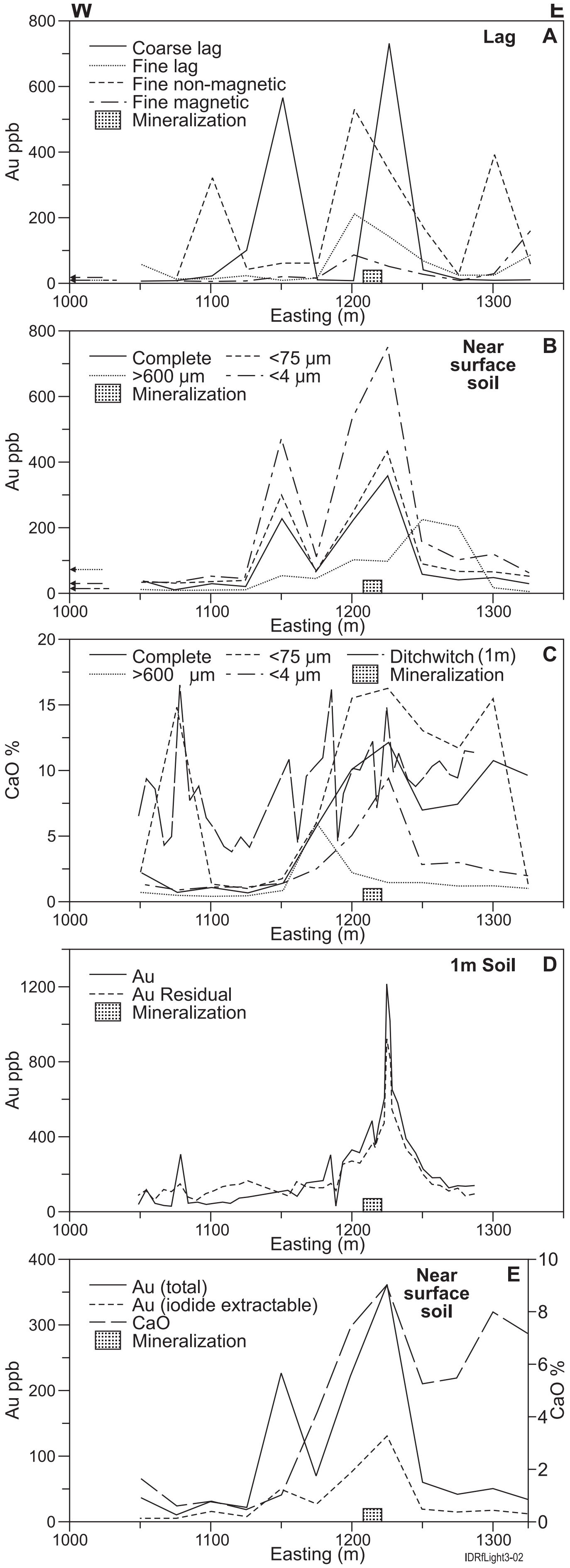

Figure 3. Gold in soil, lag and ditchwitch sampling.

removes this false Au anomaly and improves the data slightly.

Iodide-extractable Au represents about a third of the total Au (Figure

3E). Both the total Au and the easily extractable Au follow a similar correlation with Ca. This is very similar to results from soils from Mt. Hope (Gray *et al*., 1990) and elsewhere on the Yilgarn (Grey et al., 1999).

Saprolite Gold in the saprolite has a patchy distribution. There is a zone of apparent secondary Au enrichment approximately 30 m below the surface but no evidence for a corresponding zone of depletion above. The heterogeneity in Au distribution is thought to reflect that of primary mineralization, the presence of coarse, particulate Au and Au protected from weathering by quartz veins (Douglas et al., 1993).

Pathfinder elements

Primary mineralization at Lights of Israel is relatively sulphide-poor and has low abundances of chalcophile elements, e.g., As (maximum 56 ppm), W (15 ppm) and Mo (10 ppm). There is only a very weak anomaly in As and a broad, still weaker anomaly in Sb in the surficial materials. Mineralized saprolite and fresh rock are weakly anomalous in As and Sb (about 20-55 ppm and 3-4 ppm, respectively). There is also a broad but weak Sb peak over and west of the mineralisation in the ferruginous materials of both lag and soil. The Sb anomaly is largely associated with the non-magnetic component (1.7 ppm). Weakly anomalous Sb (max. 3.8 ppm) is scattered throughout the saprolite and is related to Fe (Douglas et al., 1993).

Titanium Zr , S and tourmaline

The Ti/Zr ratio in the lag and the >600 m soil fraction is >60:1 and indicates a ferruginised saprolite of basaltic composition. The >75 µm soil fraction is markedly more Zr rich, probably reflecting an increase in extraneous zircons imported by aeolian action. The whole area over the mineralization is anomalous in S relative to ‘regional’ background, due to gypsum in the soil. The isotopic composition of this S is slightly heavier (1.2‰) than that if S were derived from meteoric sources alone, thus there could be some bedrock S component (A. Andrew, pers comm., 1988; in Robertson and Tenhaeff, 1992). A comparison of tourmalines in soil with those from a veinlet at 44 m depth (1020 mN, 1060 mE and 414 R.L) show similar, tightly grouped compositions. This indicated that they probably constitute a single population and that the soil is largely residual.

DISPERSION MODEL

TBA

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TABLE 1 - SAMPLE MEDIA SUMMARY

Sample medium	Indicator elements	Analytical methods	Detection limits*	Regional Background*	Local Background*	Threshold*	Maximum*
Complete soil	Au	INAA	5 ppb	7 ppb	20 ppb	80 ppb	360 ppb
	As	INAA	2	7	10	-	11
	Sb	INAA	0.2	0.7	0.8	-	
Soil >600 µm	Au	INAA	5 ppb	48 ppb	10 ppb	50 ppb	223 ppb
	As	INAA	2	16	20	-	26
	Sb	INAA	0.2	1.6	1.7	2	2.3
Soil 4-75 µm	Au	INAA	5 ppb	10 ppb	60 ppb	90 ppb	432 ppb
	As	INAA	2	5	5	-	8
	Sb	INAA	0.2	0.5	0.5	-	1.1
Soil <4 µm	Au	INAA	5 ppb	18 ppb	70 ppb	130 ppb	748 ppb
	As	INAA	2	5	6	8	13
	Sb	INAA	0.2	0.4	05	-	-
Soil to 1 m	Au	INAA	5 ppb	-	75 ppb	200 ppb	1299 ppb
Coarse Lag (10-50 mm)	Au	INAA	5 ppb	6 ppb	6 ppb	50 ppb	726 ppb
	As	INAA	2	12	12	-	27
	Sb	INAA	0.2	0.8	1.1	1.2 ppb	-
Fine Lag (0.6-10 mm)	Au	INAA	5 ppb	6 ppb	20 ppb	70 ppb	212 ppb
	As	INAA	2	15	20	20	26
	Sb	INAA	0.2	1.5	2.5	2	-
Fine Lag Magnetic	Au	INAA	5 ppb	6 ppb	7 ppb	40 ppb	87 ppb
	As	INAA	2	19	20	-	22
	Sb	INAA	0.2	2.2	2.6	-	2.8
Fine Lag Nonmagnetic	Au	INAA	5 ppb	6 ppb	6 ppb	80 ppb	530- ppb
	As	INAA	2	15	24	25	31
	Sb	INAA	0.2	1.3	1.8	2	-
Bedrock	Au	INAA	5 ppb		10 ppb	20 ppb	25385 ppb
	As	INAA	2		3	4	56
	Sb	INAA	0.2		<1	1	3.8

*All units are in ppm unless specifically stated