

## Discovery of the Lantern deposit, the next chapter for the Pine Creek gold province

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### Introduction

Kirkland Lake Gold Ltd (KL) is a mid-tier gold producer with total gold production in 2017 of 596 405 oz from mines in Canada and Australia. The production profile of the company is anchored from two high-grade, low-cost operations: the Macassa Mine located in northeastern

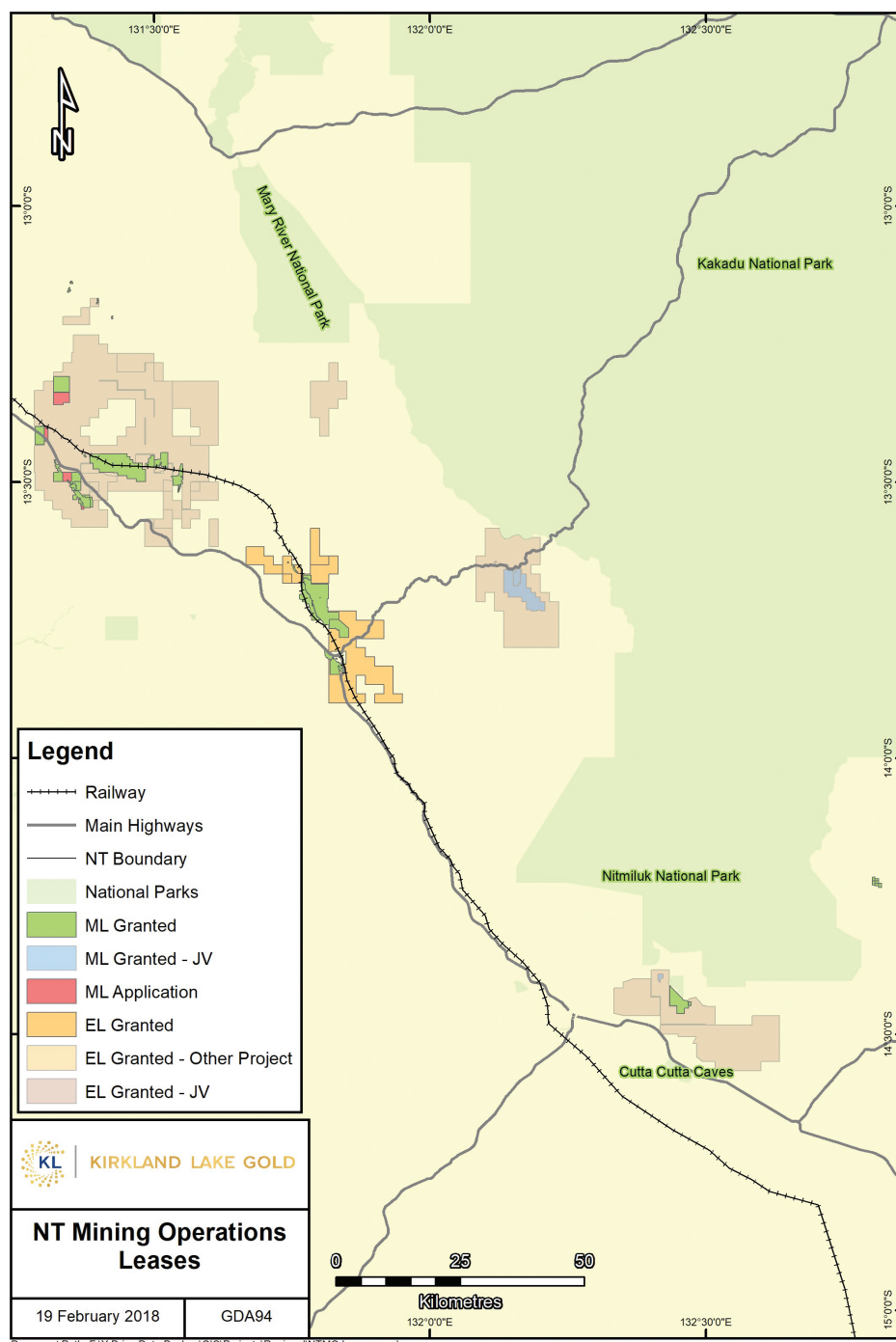
Ontario, Canada and the Fosterville Mine located near Bendigo in Victoria, Australia.

The Northern Territory operations are centred on the Cosmo Gold Mine and the Union Reefs processing plant situated approximately 60 km and 20 km respectively north of the Pine Creek Township, which is approximately 225 km south of Darwin. The Northern Territory property is comprised of 77 mineral titles (72 granted and 5 applications together covering 20 009 ha) and 25 exploration titles covering a total area of 1798 km<sup>2</sup>. The exploration titles are held under a joint venture agreement with PNX Metals Ltd (**Figure 1**).

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**Figure 1.** Tenement location map.

## Geology

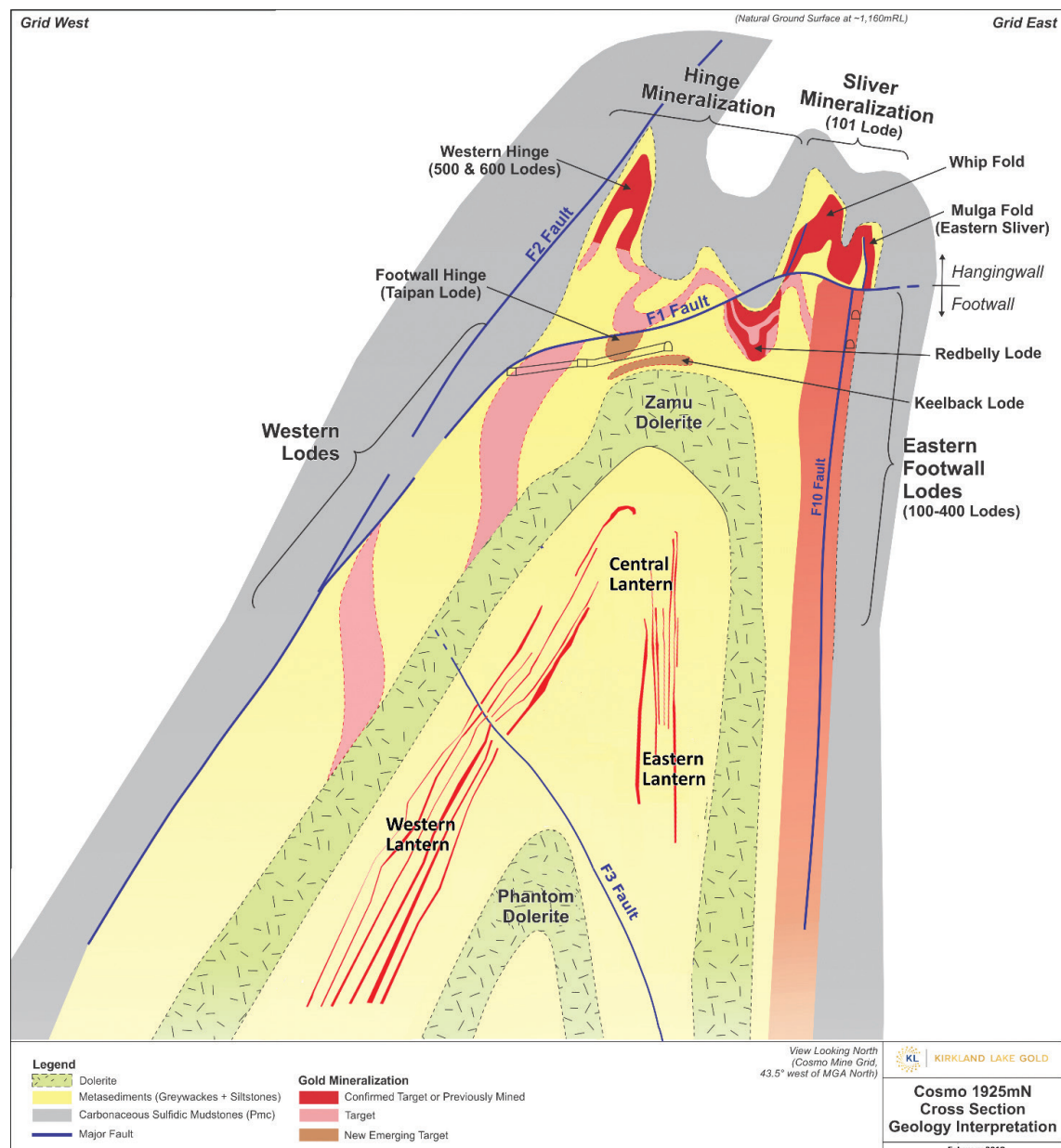
The Cosmo Gold Mine contains two main known zones of mineralisation, the Cosmo Deeps deposit and the Lantern deposit (**Figure 2**). The Cosmo Deeps gold mineralisation occurs within the folded upper Koolpin Formation between the Zamu Dolerite sill and a 30+ m thick pyritic carbonaceous mudstone unit. Siltstones located in close proximity to the carbonaceous unit generally contain stratabound nodular chert lenses. Mineralisation occurs within arsenopyrite, pyrrhotite and pyrite sulfide assemblages hosted in the strong silica-chlorite altered nodular-siltstone units.

Several major faults occur through the Cosmo system with the largest, the F1 Fault, dipping shallowly to the north with an apparent reverse movement offsetting the stratigraphy and mineralisation by approximately 150 m. The F1 fault decouples the ductile carbonaceous shale from the brittle Zamu Dolerite, allowing an increase in

structural complexity through the formation of tight, upright parasitic folding. The tightly folded nodular unit above the F1 fault remains mineralised, with this area known as the Sliver orebody. The same unit can be traced across the Howley anticline hinge, with several smaller scale parasitic folds also being mineralised, forming the Taipan and Redbelly lodes, as well as the 500 Lode on the western parasitic fold closure (**Figure 2**).

The recently discovered Lantern gold deposit is located stratigraphically deeper between the Zamu Dolerite sill and underlying Phantom Dolerite sill. Gold mineralisation occurs as visible gold in major bedding-parallel quartz-carbonate veins and in selvages surrounding tensional quartz-carbonate veins formed in close proximity major shear veins.

The competency contrast between the dolerite sills and the metasediments create zones of structural thickening, accommodated through bedding-parallel shears and low-amplitude parasitic folding. Mineralisation is hosted



**Figure 2.** Schematic cross-section.

within iron-rich, weakly carbonaceous siltstones with common, intense carbonate, sericite-pyrite-chlorite and blood-red Fe-Oxy hydroxide hypogene alteration.

Northwest-trending, sub-vertical strike-slip faulting is also present within the Cosmo and Lantern deposits with several faults showing small-scale dextral movements recorded in the order of 10s of metres. The northwest faulting appears to have a positive influence on localised grade distributions surrounding the faulting.

The Cosmo Mine mineralisation host rocks experienced metamorphism ranging between lower-amphibolite facies to upper-greenschist facies; this has pervasively re-crystallised the protolith sediments and dolerite sills, causing significant alteration/recrystallisation of former pyroxenes to fibrous actinolite and phyllosilicates to garnet, cordierite and micaceous phyllite. The metamorphism is likely related to the emplacement of an underlying granitic pluton/batholith, presumably a shoulder of the Cullen Supersuite batholith. Recent interpretation of the Lantern and Cosmo alteration zoning suggests that the western fold limb of the main anticline acted as the main conduit for gold-bearing fluids that became trapped in the fold hinge and forced down the eastern limb against the blanket of the thick carbonaceous mudstone.

## History

Gold was discovered at Brocks Creek in 1871 and at Cosmo Howley in 1873 during the construction of the Adelaide–Darwin overland telegraph line. Dominion Mining commenced modern open-pit mining within the Burnside group of tenements during 1987; underground mining at Cosmo commenced in 2010 with Crocodile Gold.

Underground mining and exploration focused on the eastern limb of the Howley Anticline, delineating and expanding the geometrically simple linear 100 Lode mineralisation found in the nodular metasiltstone sequences. The nodular package was traced above the F1 fault, where the Sliver mineralisation was discovered in 2014.

During late 2014 as gold grades within the 100 Lode exploration drilling declined, a consulting structural geologist was employed to integrate existing geological understanding in order to explain ore shoot controls and deformation history, as well as generate near-mine exploration targets. This work confirmed the site geologist's views with respect to targeting of gold; it also highlighted two further targets, the Western Lode footwall and the Inner Metasedimentary (IMS) units. Three older diamond holes had transected the IMS units in the western fold limb below the Zamu Dolerite, but the intersected mineralisation was under appreciated and the target considered un-economic and outside the mining plans.

The IMS target was subsequently tested by two drillholes in early 2015 with varying results. The first hole (CW101001A) returned 7.5 m @ 5.3 g/t Au from the eastern limb of the IMS host rocks and several narrow gold intercepts on the western limb, including 1.0 m @ 61.6 g/t Au. The second (CW101002) was more successful with intercepts of:

- 4.0 g/t Au over 4.7 m from 14.0 m
- 6.8 g/t Au over 6.1 m from 159.0 m
- 4.3 g/t Au over 22.7 m from 169.0 m
- 25.2 g/t Au over 1.7 m from 220.0 m
- 4.4 g/t Au over 13.7 m from 234.5 m
- 7.7 g/t Au over 2.3 m from 378.0 m.

After the success of the initial drilling, the consulting structural geologist returned to assess the information exposed in the drilling. The study found there was a clear control on gold mineralisation with a reactive siltstone containing a quartz lode recurring downhole due to the folded geometries observed in the core. The reactive unit was easily identifiable via its characteristic sericitic green appearance, leading to the name of the new deposit (Green Lantern).

Ten more holes were drilled by late 2015 following up on the results and interpretation of Lantern. A further 15 holes were drilled during 2016 in two stages, May and September, which led to the maiden Mineral Resource estimate completed during late 2016. This was released as part of the NT Operations NI43-101 Report on Mineral Resources and Mineral Reserves. The maiden Mineral Resource comprised 556 000 t @ 3.05 g/t Au containing 55 500 oz of gold in the Indicated category and 1 119 000 t @ 2.89 g/t Au for 104 000 oz of gold in the Inferred category.

In July 2017, KL suspended production at the Cosmo Mine to allow the Company to conduct a review of operations and obtain a better understanding of near mine exploration targets (including the newly discovered Lantern) to support future profitable organic growth.

## 2017 Results

During 2017, the Lantern deposit was targeted as part of the KL exploration programs. Several large-scale step-out drilling programs were completed; combined with further exploration and grade-control infill drilling, the program identified mineralisation extending over 1.2 km (1 km below surface) along plunge within the Lantern IMS unit (**Figure 3**).

The additional drilling has expanded the initial six mineralised lodes to more than 30, of which the Western Lantern is the most continuous and gold endowed. The 2017 drilling results were summarised in a KL news release (19 Dec 2017) with drilling highlights including:

- 1624 g/t Au over 0.91 m, including 4750 g/t Au over 0.31 m
- 198 g/t Au over 3.0 m, including 1577 g/t Au over 0.35 m
- 89.7 g/t Au over 1.0 m
- 40.8 g/t Au over 18.7 m
- 22.6 g/t Au over 8.8 m
- 14.6 g/t Au over 5.9 m

Mineralisation studies during 2017 have significantly enhanced the Company's understanding of the deposits, highlighting the importance the major shear veins and tensional vein arrays within the Lantern mineralisation system. Ongoing drilling is highlighting mineralisation variation within the deposit. For example, coarse visible

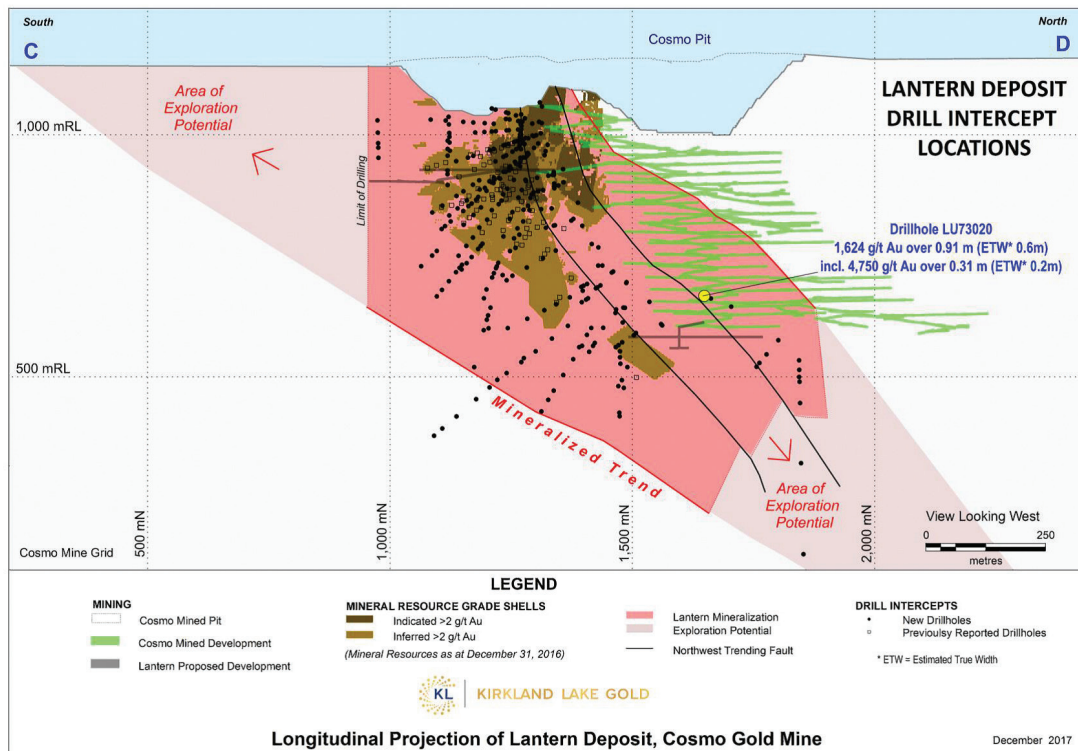


Figure 3. Lantern mineralisation long projection.

gold is more prevalent in the Lantern deposit as compared to Cosmo Deep. Visible gold is often associated with the major shear veins, with arsenopyrite-rich sediments surrounding the tensional veins arrays.

Drilling continues to intersect mineralisation down-plunge, with ongoing geological interpretation and further project work showing encouraging results and building an improved understanding of the geological controls involved in the formation of the Cosmo mineralised system.

### Future

KL's exploration expenditure in 2018 is expected to reach US\$75–US\$90 million, with approximately US\$60–US\$75 million to be targeted at the

Australian operations. The planned exploration programs at the NT Operations involve underground development and drilling to improve the understanding of the Lantern deposit and support resource definition and expansion, and to further test the prospectivity of the Union Reefs mineralised system. Exploration expenditures in 2018 for the Northern Territory are largely focused on supporting the establishment of a five-year production plan for the Cosmo Mine and Union Reefs mill that is sufficiently attractive to support a resumption of operations.

The Lantern deposit remains open in multiple directions; drilling of the Lantern mineralisation is continuing from existing underground drilling platforms. Underground development to establish new drilling platforms is expected to commence during the first quarter of 2018.