



# SIKA AT WORK

## MOUNT ISA MINES, AUSTRALIA

SIKA CONCRETE ADMIXTURES

BUILDING TRUST



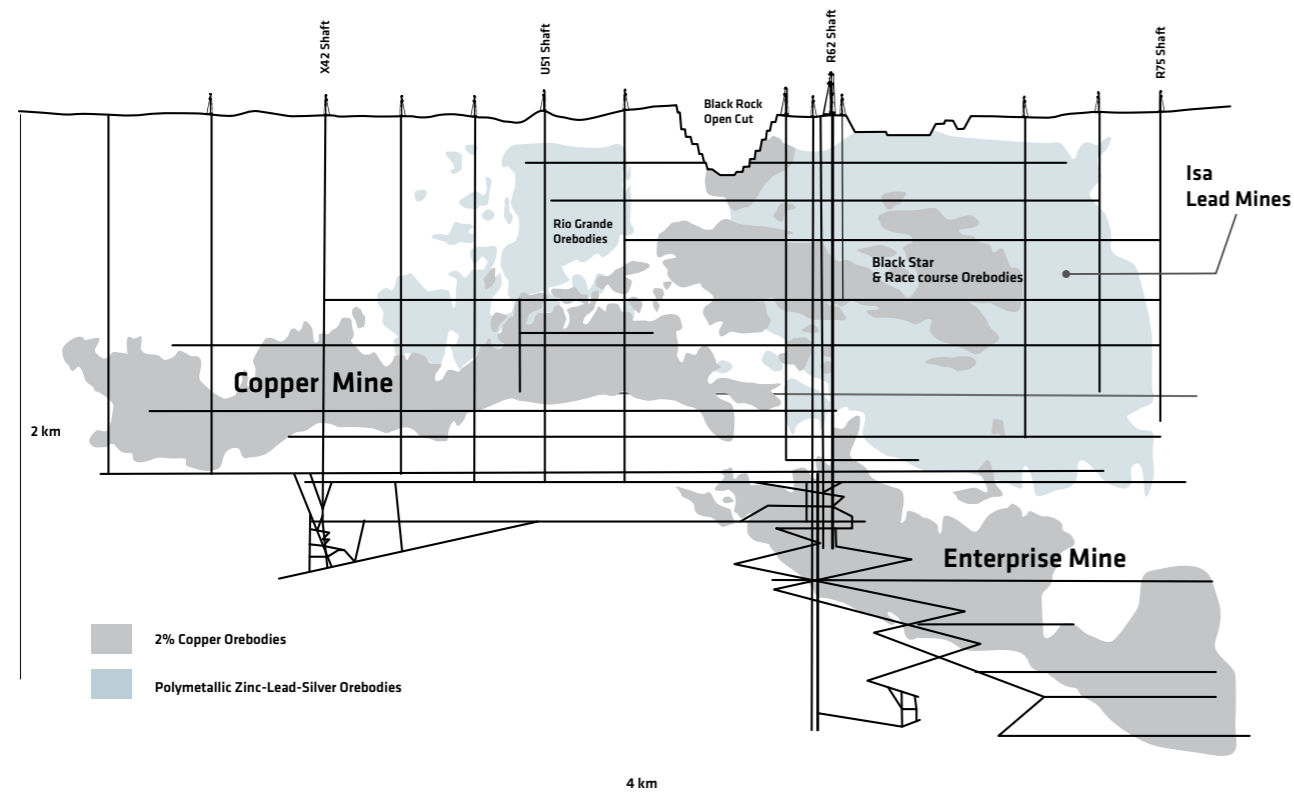
# SIKA AT THE DEEPEST AUSTRALIAN MINE

## PROJECT DESCRIPTION

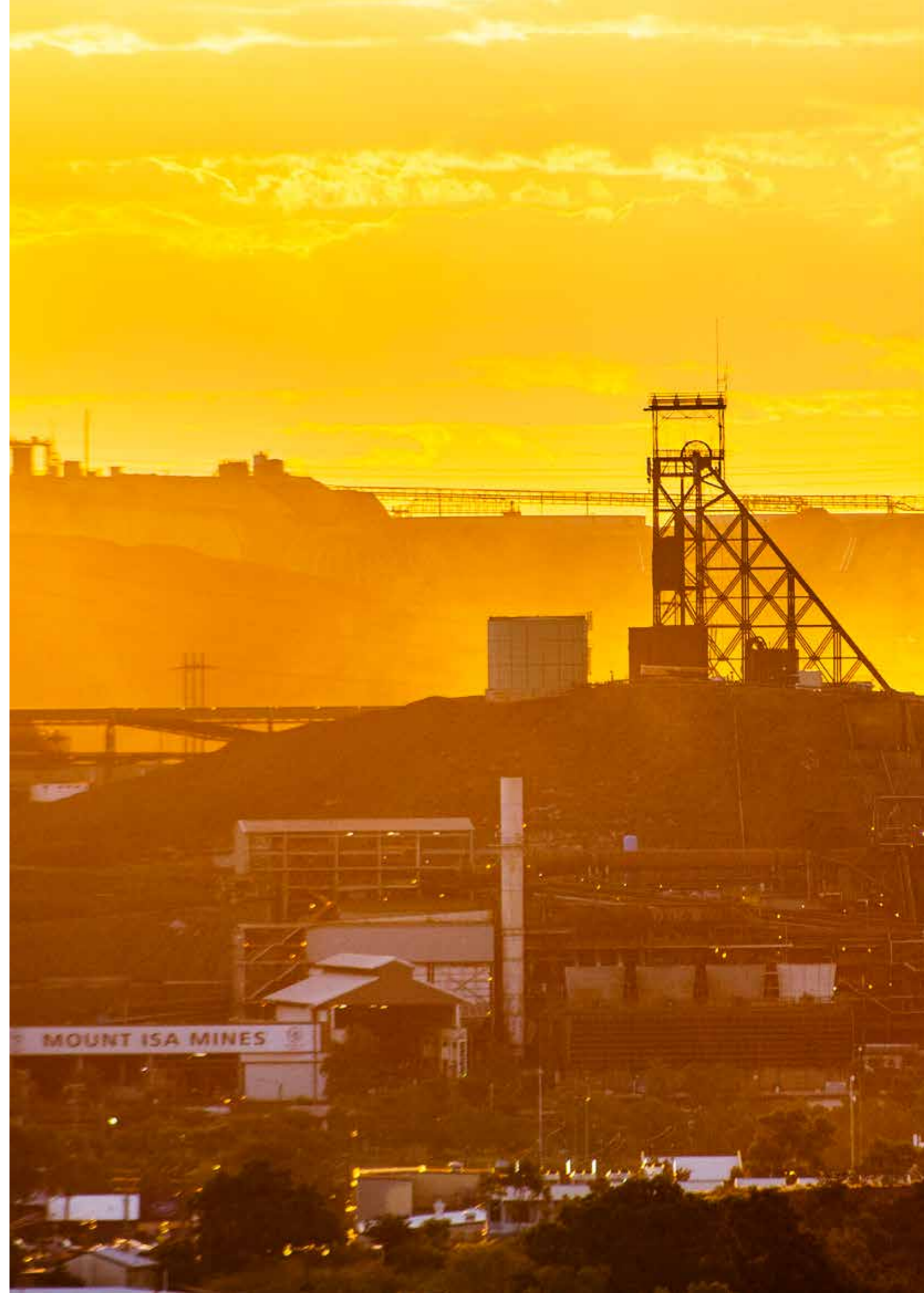
Mount Isa Copper Operations is an underground sublevel open stope copper mine situated in North West Queensland. The mine is one of the oldest and deepest mines in Australia, comprising one of the largest underground networks of mine development in the world. From the 95-year-old operation containing over 500 km of accessible development, 6.7 Mtpa of copper ore is concentrated and smelted at onsite processing facilities before it is transported to the Townsville copper refinery for final treatment to saleable copper cathode. During the early operational years, ground support, particularly surface support, was not routinely installed. Large rehabilitation efforts undertaken in recent years has drastically increased underground support and today, in cycle shotcrete for fast mine cycle times is applied on a daily basis. As the Mt Isa mines have progressively reached deeper levels, good yielding shotcrete liners with rapid curing times and good early strength development have become a critical, integral part of the underground support layout. As transportation distances are increasing rapidly, shotcrete mixes are today delivered through a slick line system that requires a stable concrete mix without segregation and minimal remixing efforts underground. Sika is a long standing partner of Glencore at Mt Isa and is actively supporting the Mt Isa teams when it comes to concrete and shotcrete solutions.

## GOING DEEPER AND DEEPER

As the different ore bodies of the Mt Isa system are exploited towards greater depths, several challenges need to be tackled when it comes to the underground shotcrete application of large volumes. Increasing Transportation times require an extended slump life and workability time of the concrete. This is achieved by adding a special Sika® ViscoCrete® high range water reducing admixtures that extend the hydration time at the same time. For further extension of the workability time, SikaTard®-990 IP, a specially developed hydration retarder is added. Workability time of around 5 hours is provided through this system. The market leading Sika® Sigunit® technology is added at the shotcrete nozzle that provides early strength development for the sprayed shotcrete liner in order to shorten the time before the bolts can be installed through the liner without damaging the freshly sprayed concrete. In addition, SikaFiber® technology in the form of 65mm macrosynthetic fibers in the range of 5Kg per m<sup>3</sup> of concrete are added at the batch plant on surface.



Mt Isa mines, long section showing the various ore bodies and underground infrastructure



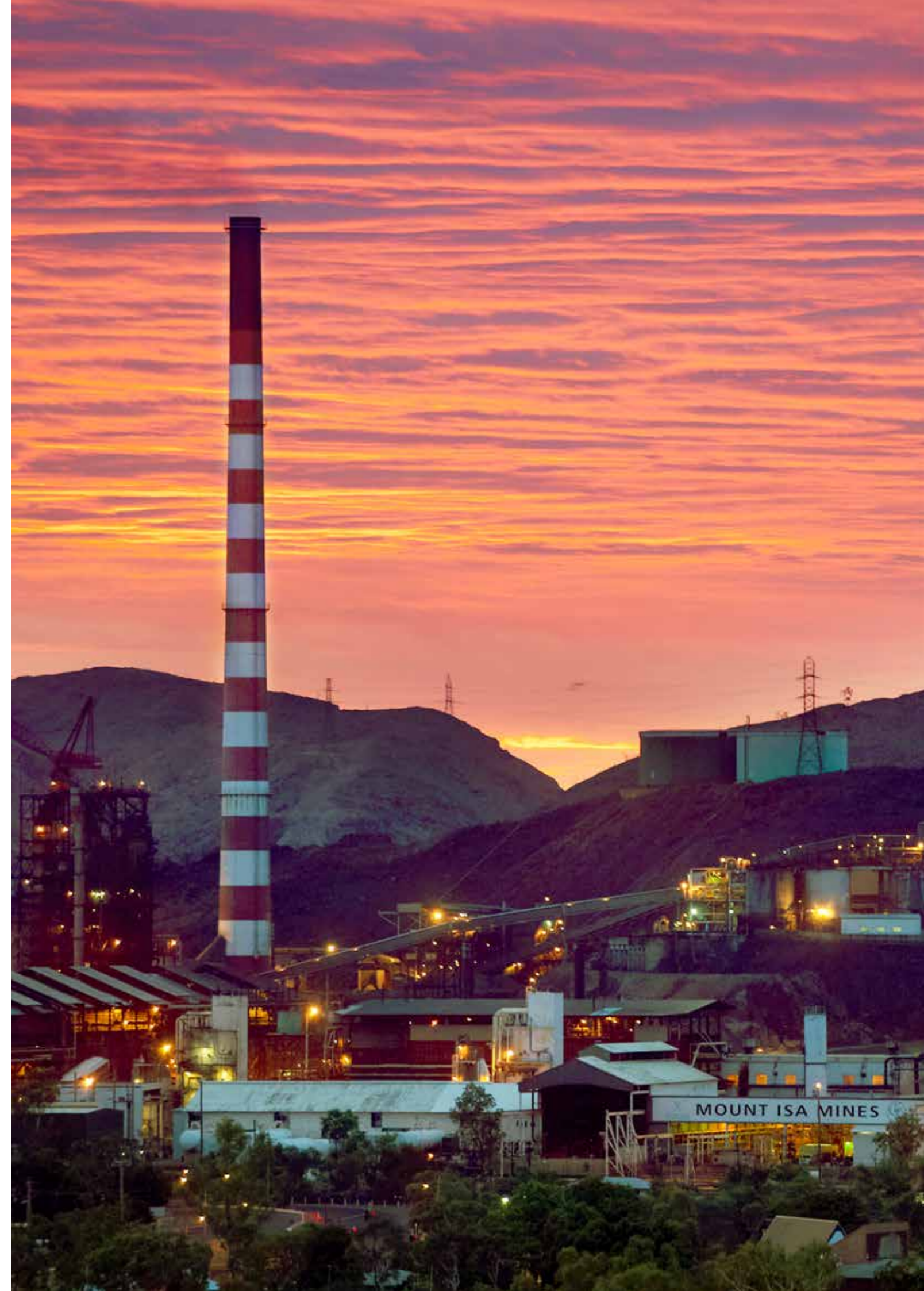
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## EFFICIENT MINE DEVELOPMENT

Sika has been actively involved, upgrading the shotcrete and concrete production process at the mines site. Efforts to reduce the clinker content in the shotcrete and to reduce the water to binder ratio in the mix has been of particular focus by looking at the batched sieve composition of the mix and observing the workability behaviour in detail. Introducing high performing water reducing admixture key for the upgrade of the shotcrete design always having the challenging concrete transport in mind. Gravity fed concrete slick line systems can create several issues and impact the fresh state of the concrete dramatically. Reducing the risk of line blockages during the concrete feeding process is critical. Sika has developed detailed slick line operational protocols which are used today at many mines sites and by following a few key concepts, operational risks can be greatly reduced.



1. Portal of one of several adits to the Mt Isa underground infrastructure
2. Wet batch plant at the mine site with different aggregate bunkers and cement silo. Ventilation shaft in the background.



# SIKA AT THE DEEPEST AUSTRALIAN MINE



## SIKA SOLUTION

Sika admixtures and fibers are supplied through the Brisbane based Sika factory located at the eastern Australian Seaboard. Special haulage road trains are loaded and deployed to the mine site where the admixtures are transferred into a state of the art tank farm at the mines batch plant that includes five 30.000 litre, self bund tanks with a 150.000 litre total capacity. This is largely eliminating manual handling of IBC's and hence, chemical waste and landfill. Glencore Mt Isa is among the largest clients where the Bulk Telemetry System of Sika Australia was implemented. Using Telstra 4G network telemetry sensors, everything is run electronically: Stock level control and ordering, refilling requirements, delivery document handling through to invoicing. Concrete volumes vary on an annual basis but can reach up to 100.000m<sup>3</sup> a year. Providing consistent quality for such large amounts of concrete require diligent production procedure, a good QAQC procedure that is easy to follow and very experienced production personnel. The shotcrete is applied through mobile wet shotcrete rigs. SikaFiber® Force PP-65 is supplied in 4 kg card boxes to the site where the fibers are added to the concrete mixer manually. Extensive qualification trials have been performed at the site to elaborate the ideal fiber dosage for the required energy absorption of the sprayed shotcrete liner. The Sika Minishot equipment, a scaled down shotcrete equipment based on an ultrasonic receiver, was used to fine tune the admixture chemistry for Mt Isa and to develop a custom made shotcrete technology based on the mines raw materials and requirements. This equipment is used for every mining project Sika is active and one of these is based at the Sydney R&D centre in Australia.



## REQUIREMENTS

- Efficient production of concrete mixes for concrete and shotcrete application for both, above ground and underground applications.
- Safe and trouble free transportation of concrete mixes through the extensive slick line system
- In cycle application of wet, dense flow shotcrete with rapid early strength development to optimise mine cycle times
- Good energy absorption of the shotcrete liner at early age in order to cope with the increase seismic activity within the deeper mine levels
- Consistency that allows above head grouting application (thixotropic behaviour)
- Ongoing technical site support
- Full compliance with the mines logistical and storage requirements

## SELECTION OF SIKA PRODUCTS

- Sika® ViscoCrete® High range water reducer with hydration controlling properties
- SikaTard®-990 IP Hydration retarder developed especially for shotcrete application with extended transportation requirements
- Sika® Sigunit® L-530 AF Shotcrete accelerator for high early strength development to allow short mine cycles and rapid re-entry time
- Sika® Sigunit® L-5401 AF
- SikaFiber® Force PP-65 Polypropylene macrofiber for high energy absorption at a minimum fiber dosage

1. Sika admixture farm at the Mt Isa batch plant
2. Sika® ViscoCrete® technology as a key component for the good workability and open time of the Mt Isa concrete and shotcrete
3. Sika® MiniShot shotcrete testing equipment



# MOUNT ISA MINES, AUSTRALIA



Mt Isa underground

Our most current General Sales Conditions shall apply. Please consult the most current local Product Data Sheet prior to any use.



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