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Northparkes

A highly automated block caving leader - John Chadwick reports

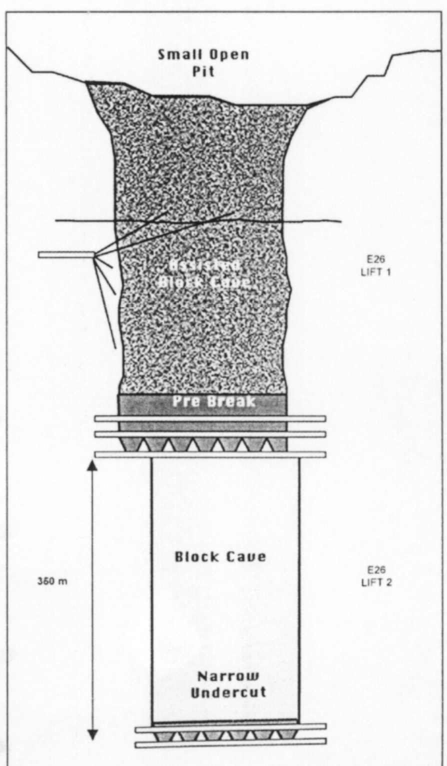
Rio Tinto has significant interest in block caving. It purchased North Ltd. and gained 80% of Northparkes, one of the foremost block cave mines in the world, with joint venture partners, Sumitomo Metal Mining and Sumitomo Corp. It has gone underground at Palabora in South Africa, where caving has started, and it is in advanced planning for Bingham Canyon in Utah, US, to become a block cave mine.

The Northparkes copper-gold mine, believed to be the most productive underground mine in the world, lies 26 km north-northwest of Parkes in central New South Wales, Australia. It was developed on proven and probable reserves of 80.8 Mt assaying 1.14% Cu and 0.48 g/t Au. The porphyry-type mineralisation (Endeavour 22, Endeavour 26 North, Endeavour 27, and Endeavour 48 deposits) is contained within units of the Late Ordovician Goonumbla Volcanic Group. The mineralisation is hosted by a series of sub-vertical pipe-like intrusions of quartz monzonite with the mineralisation occurring as disseminations and within fractures and veins within both the intrusion and the surrounding volcanic rocks. The strongest mineralisation is associated with quartz stockwork veining within a central, potassic alteration zone while pervasive sericitic alteration and widespread propylitic alteration have also been identified.

Production comes from open pit mining at E22 and E27 and block caving at Endeavour 26 (E26). Endeavour 48 will provide a second underground operation. The E26 underground mine was Australia's first block cave mine. Construction for the first block cave, known as Lift 1, commenced in October 1993 and was fully commissioned by November 1997. It was designed as a low-maintenance working environment, and has allowed minimal operating costs and high productivities. For example, in 1999/2000, E26 produced 50, 340 t of copper/gold ore per underground employee, including contractors. Northparkes currently produces approximately 50,000 t/y of copper and 40,000 oz/y of gold.

E26 is a pipe-like orebody 200-300 m in diameter and extends to over 800 m in depth. Bornite and lesser chalcocite, enveloped by a chalcopyrite dominant zone and then a pyrite-magnetite zone dominate the higher grade central core. The Lift 1 rock mass is moderately to well jointed and characterised by gypsum veining, the intensity of which decreases with depth. The top 480 m of the orebody is Lift 1 and its undercut dimensions measure 196 m long by 180 m wide. Continuous caving was never achieved after the completion of the undercut so cave inducement was required to maintain caving and sustain production. The use of hydraulic fracturing as a cave inducement tool was successfully tested in December 1997 using existing exploration boreholes located midway up the lift. Subsequent fracturing campaigns have enjoyed various degrees of success and have yielded in excess of 7 Mt of ore at a significantly lower cost than conventional cave inducement techniques. Monitoring of both the hydraulic fracture system and the rock mass response has provided considerable insight into the geometry, growth and influence of hydraulic fracture networks above the block cave, and has initiated additional research into the use of hydraulic fracturing in other mining methods.

Schematic section through E26



The rock mass strength, and ultimately the geotechnical zoning, of the Lift 1 rock mass is a function of the fracture frequency and the intensity of both the gypsum and quartz veining. In general the competence of the Lift 1 rock mass increases with depth and inwards toward the centre of the orebody.

The E26 deposit has been divided into two mining blocks, Lift 1 which extends to 480 m below surface and comprises 27 Mt of ore, and Lift 2 which consists of the lower 350 m of the deposit. Block caving was chosen for Lift 1 because of the deposit's geomechanical and geometrical characteristics. The Laubscher Mining Rock Mass Rating (MRMR) system was used to classify the rock mass and assess its cavability. The MRMR's for the various geotechnical zones in Lift 1 ranged from 33 to 54, hence continuous caving was predicted to occur at a hydraulic radius of approximately 20 to 25.

Planning of Lift 1 made extensive use of Gemcom's PC-BC, a programme developed for design and evaluation of block caves. Detailed design was done between 1994 and 1997. Some of the (then unique) characteristics of this deposit from a caving perspective were the high column heights of 450 m or more as well as the large undercut height. PC-BC was used to assess overall mineable reserves.

Initial caving commenced once the undercut had attained a hydraulic radius of approximately 23. On completion of the undercut, the cave back had propagated to a maximum height of 95 m above the top of the undercut, yielding approximately 3 Mt of caved ore. Caving appeared to stall as the cave back reached zones of lower stress.

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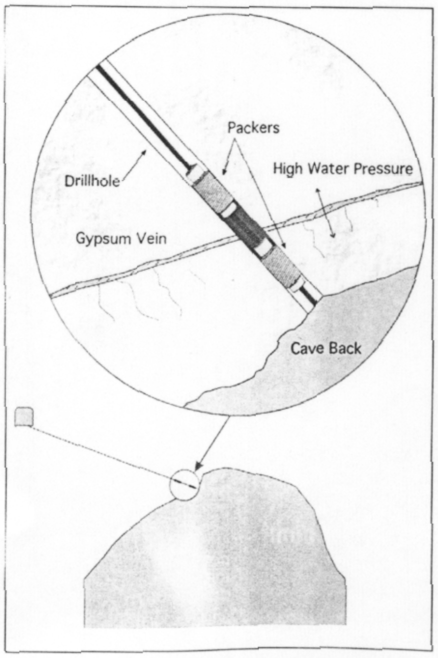
Hydraulic fracturing

An inflatable straddle packer system and diesel powered triple pump were used to induce hydraulic fracturing. The straddle packers were connected to AQ drill rods and lowered down a selected borehole using a diamond drill rig. Once in position the packers were inflated with water, usually to around 5 MPa above the anticipated injection pressure. The triplex pump then pumped water under high pressure along an injection line and into the straddle section between the packers. Pressurisation of the rock between the straddle section induces tensile stresses along the walls of the hole and eventually fractures the rock or opens existing fractures. Further injection forces water into these fractures causing them to extend into the surrounding rock mass.

Following the initial trial to prove the technique, a second trial of three separate one-week fracturing campaigns was conducted. A total of 127 hydraulic fracture treatments were conducted in ten boreholes inducing 2.5-3 Mt of ore to cave. The maximum cave height was increased from 130 m to 165 m resulting in a considerable increase in the average ore column height. For most treatments the flow rate was kept constant at approximately 400 litres/min, with a gradual reduction in pressure over time attributed to the propagation of the fracture.

Most hydraulic fracture treatments were characterised by increased seismicity both during and after injection. In several cases this increase in seismicity was followed by significant caving events. Measurements of fracture growth and geometry suggest that there are both single planar fractures (extending over 40 m from the injection point) and more diffuse pressurisation and opening of existing fracture systems (extending up to 135 m from the injection point).

Schematic illustrating hydraulic fracturing above the cave



Surface fracturing

Hydraulic fracturing from 1 Level produced substantial failures along much of the cave back, but was not successful in the southern side of the cave. Thus, the southern cave face lagged behind the rest of the cave forming a steep overhang. The southern half of the orebody contained high grades so the mine did not want to risk diluting or losing this ore. Subsequent fracturing treatments focused on propagating the southern cave back, but this was difficult from underground. Consequently, hydraulic fracturing from surface was attempted, but did not achieve the desired results and was abandoned.

Next, Northparkes resorted to the more conventional inducement of boundary weakening. This, essentially, required the development of a subvertical north-south striking slot located along the southwestern boundary of the cave. In addition to the boundary slot, several large diameter 'strip' holes were drilled across the southern cave face. The entire blasting operation was a challenge with several holes in excess of 120 m in length. Although costing an estimated $A1.4 million, the blasting programme was highly successful, inducing 2.7 Mt from the southern half of the cave, and achieved all of its objectives with the exception of inducing continuous caving.

Experience gained up to the time the slot was formed, demonstrated that the most successful hydraulic fracturing occurred in holes which covered a large area of the cave within 20 m of the back, that is, the zone of discontinuous deformation. It is believed that hydraulic fractures propagate roughly parallel to the cave boundary.

Northparkes attributes its success with hydraulic fracturing to a number of factors. Propagation of multiple fractures reduced the overall strength of the rock mass by creating and opening new fractures or opening and producing shear displacement on existing fractures. In addition, water under pressure in these fractures reduces the effective stress across them allowing them to slip and promote instability. Shear movement in the rock mass was more often associated with treatments near the cave back. The fracturing fluids partially dissolved and eroded the gypsum joint fill. The fine gypsum was then partially flushed out by the water injected into the fracture system. This mechanical degradation of the gypsum reduced the tensile and shear strengths along the joints.

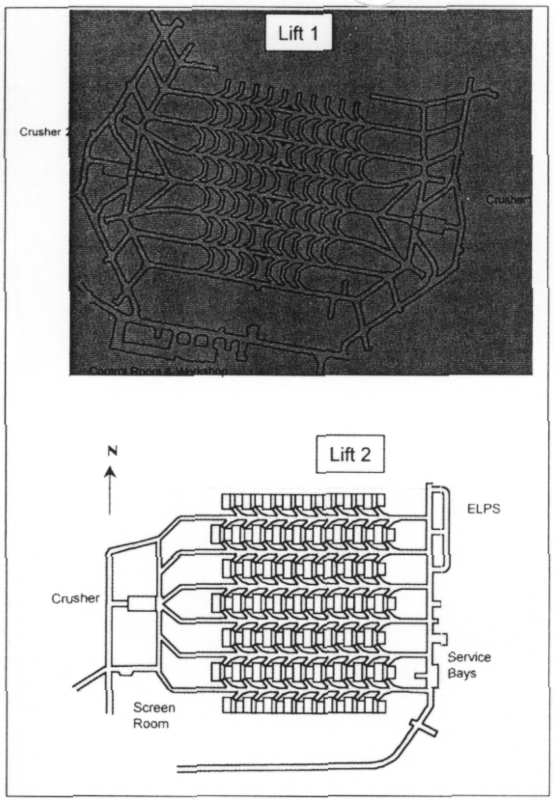
Once localised failures occur, the change in the affected cave back geometry produces larger zones of low stress or tensile zones, which in turn encourage further instability and caving. The fracturing response and monitoring data show that both conventional hydraulic fracture and shear mode fracture growth occurred. For the future, Messrs van As and Jeffrey1 note that "not only does hydraulic fracturing offer an extremely cost effective method of cave induction but it has the potential to improve both the cavability and fragmentation size of an orebody through pre-conditioning. In essence, mass fracturing of a mining block could reduce the rock mass strength and primary fragmentation size through the creation of new fractures or the opening of existing discontinuities."

Hydraulic fracturing has been highly successful at Northparkes with over 7 Mt of ore attributed to the method at a cost of around A$1.1 million. Monitoring has confirmed that hydraulic fractures propagated in excess of 40 m from the packed off hole. Pressurisation of the joints around the main fracture was measured to extend to over 130 m. This vast fracture growth has the ability to soften and weaken the rock mass whilst also altering the local stress environment. The data suggests that most of the treatments conducted within 20 m of the cave back produced shear mode failures and displayed a greater incidence of microseismic activity. Conversely the treatments performed further away from the cave back were characterised by opening mode fractures and served to pre-condition the rock for caving by the introduction of new fractures.

The Lift 2 project

In January 2001 Rio Tinto approved the implementation of the Lift 2 Project at E26 for development over 2001 to 2003, with Lift 1 production forecast to be depleted by 2004. Lift 2 has an ore reserve of 25 Mt grading 1.2% Cu and 0.48 g/t Au. Development of this lower portion of the orebody will ensure a smooth transition and maintain production through until 2010. The total cost of development and construction is estimated at A$139 million. E26 Lift 2 is planned to produce at rate of 5 Mt/y over a period of about six years.

The design for the second lift aimed for continuous improvement. The emphasis was to minimise capital expenditure while still main-



Comparison between Lift 1 and Lift 2 extraction levels

taining the excellent low operating costs of Lift 1. Although Lift 1 established a benchmark for productivity from block caving, there is further potential for improvement. In order to maintain the low operating costs for the second block cave mine located 350 m below Lift 1, it was essential that the low maintenance philosophy be continued. The mine, however, realised that high capital investment would impact unfavourably on production costs and was aware of large low-cost copper operations either coming on-stream or expanding capacity around the time Lift 2 is planned to be commissioned in 2003/2004.

Lift 2 geotechnical

The E26 Lift 2 rock mass comprises generally strong rocks, showing mean intact rock strengths of 80 to 150 MPa for all rock types. The rock mass is generally well jointed with some narrow northwest trending faults and shear zones evident in the northeastern corner of the Lift 2 block. Lift 1's fracture system was dominated by steeply dipping joint sets and the gypsum veining. The jointing and the gypsum veining reduced the rock mass strength.

Design of Lift 2

Lift 1 mine layout proved to be efficient and flexible at generating high productivity with low operating costs. However, some valuable lessons were learnt that are being incorporated in the design of Lift 2. For instance, the drawpoint brow is the most important part of the construction. By installing the right lining system first time, maintenance was minimised. The Toro 450E LHDs exceeded the design productivity in Lift 1, due in part to the custom design of the extraction level. All these points were incorporated into the design philosophy for Lift 2.

Cavability

Using empirical methods and numerical stress modelling it was judged that Lift 2 would cave more readily than Lift 1 due to higher in-situ stresses, favourable joint orientation, and changes made to improve the cav-

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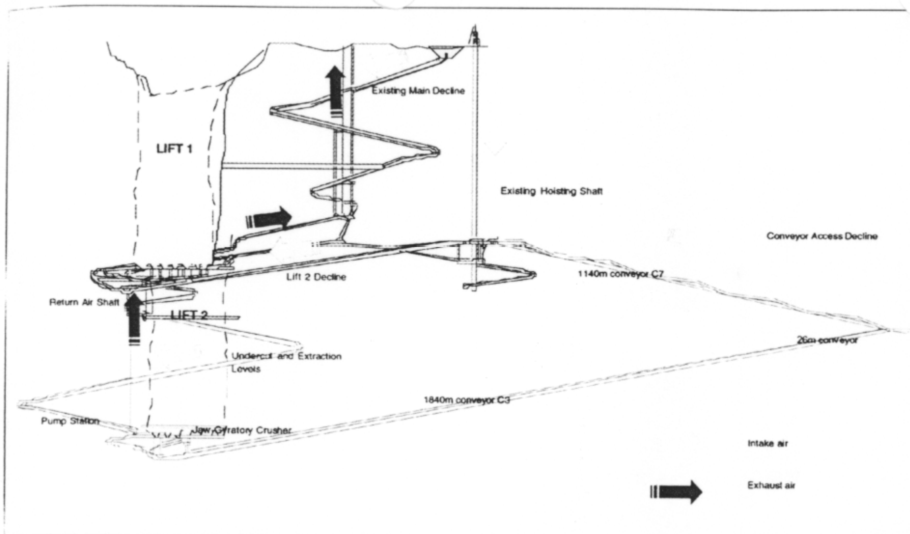

Access and ventilation network at Northparkes

ing response. The latter were the undercut shape and the use of the inclined undercut. It is predicted that continuous caving will occur at 80-95% of the planned undercut dimensions. In addition, the layout of the Lift 1 extraction level and exploration development will allow extensive coverage of the Lift 2 orebody for cave monitoring. Should caving problems arise, existing Lift 1 openings can be used for fracture inducement programmes.

Options for Lift 2

The pre-feasibility study showed that both hoisting from a deepened shaft and conveying up to the Lift 1 loading station offered advantages worth investigating further. Two block cave options were evaluated; a single 350 m high lift and a double block cave of two 200 m lifts. In parallel with the mining method assessment, different ore handling systems were considered which gave rise to the three main options for further evaluation:

- A single lift block cave with deepening of the hoisting shaft
- A single lift block cave with inclined conveyors to the existing loading station
- A dual lift block cave with inclined conveyors and trucking

Each combination offered advantages and disadvantages. The two different ore handling systems for the single lift block cave showed no significant difference on an economic assessment at the cost estimate accuracy level. The double lift option would allow earlier production to be sourced from the higher grade reserve at an initially lower capital cost.

For the double lift option, with the decreased lead-time, expenditure could be deferred until necessary for the production changeover from Lift 1. The capital commitment for the Lift 3 part of the reserve would also be deferred. However, the smaller cave height would result in coarser average fragmentation. The profitability of Lift 3 was questionable given that ore would be trucked up to the base of Lift 2 at a rate of 1.5 Mt/y, with a further 3 Mt/y to be sourced concurrently from E48. This would bring forward the E48 construction and capital; and lower the life-of-mine value.

By mining two lifts it was also identified that there was a greater risk of waste mixing into the ore columns. The single 350-m high lift option offered greater scope for the beneficial impact of secondary fragmentation. It was decided that the single 350-m high lift offered technical, capital and operational advantages over the double lift alternative. This is despite the better grade profile achieved by the double lift. Hence, the single lift option with inclined conveyors was selected. Mine design was executed using Datamine with detailed construction drawings later drafted in AutoCAD. Project scheduling utilised MS Project and ventilation network design was carried out on VentSim software.

Lift 2 ore handling

A single Krupp BK jaw-gyratory crusher will be installed to allow a reduction in size from 3 m^3 down to a minus-150 mm lump size. Crushed ore is fed by a vibrating feeder directly onto a 1,840-m long inclined conveyor, known as CV012, rising at a gradient of 1 in 6 to the transfer point. A 26-m long transfer conveyor takes the ore through 90° onto the second main belt, which is at a gradient of one in 5.4. The second conveyor, CV010, transports ore over a distance of 1,140 m up to the existing orebins above the loading station. Ore is automatically fed into weigh flasks and then into the 16-t capacity skips. The skips are hoisted through 505 m vertically to the surface by a ground mounted friction winder. The higher production rate of 5 Mt/y significantly improved the base project value over the original pre-feasibility study plan of 4.5 Mt/y.

Lift 2 undercut

Undercutting is the critical component of cave initiation. As such, design work was very much driven by technical confidence and risk assessment rather than costs. In terms of sequence, blast design and temporary support requirements, all effort was made to ensure success at the first attempt as the consequences of failure to cave initiation and production security can be high.

The narrow inclined advanced undercut proposed for Lift 2 has advantages over the 42 m high undercut used on Lift 1:

- Reduced ratio of 'height to extent of the undercut excavation' concentrates stresses into the cave back
- Abutment loading on the extraction level is reduced
- Sawtooth shape enhances instability
- Reduces opportunity for pillar loading
- Narrow undercut contains fewer tonnes, thus speeding up undercutting.

Against this is the disadvantage of the immediate impact of coarse primary fragmentation.

The regular rectangular shape of the undercut footprint is inherently unstable and maintains a minimum span dimension across the entire length of the footprint. Flexibility for extending the undercut was designed into the Lift 2 undercut level to allow further expansion to the east if required.

Undercut sequence

A narrow undercut results in a slower production ramp up than Lift 1, as only limited broken ore is generated during undercutting. This is exacerbated by the use of the advanced undercut proposed to limit the effect of abutment stress. However, the ramp-up scheduled for Lift 2 is under reduced pressure since production will be coming from Northparkes' two open pits. An advanced undercut must be developed, drilled and blasted to provide the stress cover for the drawpoint development below. The narrow, inclined advanced undercut designed for Lift 2 provides complete stress cover for the drawpoint development and results in full breakage of the undercut. Drawbell excavation and subsequent production of caving material then follows.

As fewer tonnes are extracted from the undercut level compared to Lift 1, the narrow undercut will be retreated rapidly, allowing quicker access to bring drawbells on stream. The twin drift option allows confirmation of full breakage and ease of recovery if remnant pillars are left. The inclined section of the undercut rings is self-cleaning with blasted material falling straight to the drill drive. Any narrow undercut requires extensive development and drilling which provides little return on a tonnes per developed metre or drilled metre basis. However the prime role of the undercut is to guarantee initiation of the cave, which this method will achieve.

The undercut design has twin 4.2 m by 4.5 m drill drives placed on 12 m centres on the corners of the future drawbell, 14 m above the extraction level floor. The undercut consists of horizontal sidewall stripping holes and inclined holes overlapping adjacent rings over the major apex. This design has a 55° angle on the major apex, assisting cleaning of undercut swell and subsequent movement of initial cave material into the drawbell. Holes are 89 mm in diameter and 8.5 m long through the sidewall and up to 18 m long over the apex. Rings are drilled on a 2-m burden and a nominal toe spacing of 2 m has been imposed by the undercut geometry. Uphole rings will be inclined forward to facilitate uphole charging and mucking of the horizontal face.

Rings will be charged with emulsion explosive of a relative density to ANFO of 1.0. Rings will be fired initially one at a time and approximately 60% of the fired tonnage will be mucked from the undercut level over a period of about 12 months. Undercut initiation will be against an inclined slot fired against the western edge of the footprint.

Extraction level

The design of Lift 1 RL 9800 extraction level proved to be efficient and flexible at generating high productivity with low operating costs. The design however incorporated much peripheral development in order to allow two electric LHDs in the same quadrant to tip into one crusher. In order to reduce capital costs, the amount of development on the proposed extraction level has been minimised by designing alternative operating practices. RL 9450 extraction level offered the most significant savings in terms of capital expenditure. The main differences from Lift 1 are:

- Perimeter drives were eliminated
- Turning bays were eliminated
- No link drives between extraction drives
- Drawpoint spacing increased from 14 m x 14 m to 18 m x 15 m
- Six extraction drives instead of 14 extraction areas
- Single LHD tip point
- Maintenance facilities and operations support infrastructure reduced

The benefits of the layout include LHDs only interacting at the run-of-mine bin tip point, negating the need for perimeter drives. The LHD trailing cables are extended in a straight line resulting in less damage at the gate end panel section. As the airflow passes all the way through the orebody, ventilation requirements are reduced and can be easily regulated. Average tramming distances are reduced and the long straight extraction drives will allow high speed tramming (the Toro 450Es are capable of travelling at up to 20 km/h loaded) and enable automation to be easily applied.

As a result of the fragmentation predictions for Lift 2, the drawbell spacing was increased to 18 m with 30 m between extraction drives, centre-to-centre. This spacing meets Laubscher's guidelines for the predicted fragmentation and incorporates a robust major apex design. As was the case in Lift 1, the extraction level dimensions were designed around the tramming parameters of the Toro 450E LHDs, including turning radius, unit length and speed. Automation can be easily applied to this layout.

The extraction drives are 247 m in length, on average, with average tramming distances of 150 m. Drawpoints were spaced at 18 m centres along the extraction drive in an offset herringbone pattern. The angle of entry from the drive is 45° with a chamfer of 22° to allow for the LHD turning radius. The LHD will load on the same line in a horizontal layout so there is no need for a drawpoint much wider than the unit, as rocks can move behind the front tyres during loading and cause damage. The pillars between drawpoints are 14.2 m wide. Drawpoint length has been maintained at 10 m along centreline to the brow. Drawbell crosscut length is planned at 10.3 m.

However, the one-way layout means only six effective areas from which ore can be sourced and was therefore a potential restriction on productivity. If one extraction drive is out of use for any reason, 17% of the production area is lost. An essential part of the design process was the use of simulation modelling to alleviate these concerns. This modelling, carried out by consultants, input the operating parameters of the LHDs and secondary breaking rigs, along with predictions of oversize rocks and high hang-ups (derived from the fragmentation predictions). The result showed that the extraction level layout would not restrict Lift 2's planned productivity.

The six extraction drives will be fully developed prior to completion of undercutting. The undercut front will follow extraction drive development, with drawpoint development, drawbelling and construction activity following by no closer than 14 m (45° shadow). The advantages of this are:

- Abutment stresses are shouldered by 25-m wide regular inter-drive pillars
- The completed drives allow for through ventilation and two sided access to production level construction activity
- Drawpoint development, drawbelling and construction activity can be undertaken and accessed from one side while initial production can be accessed from the other
- Earlier production from completed drawbells will permit relief of the cave, preventing compaction of narrow undercut and enabling a controlled caving front to be established
- Earlier production ramp-up than a complete pre-undercut approach.

'Skull' shaped drawbells, to be excavated after completion of the undercut overhead, have been designed similar to Lift 1 except that the initiation raise is planned to be excavated with a 660 mm diameter blind-bored vertical raise instead of a conventionally mined inclined ladder raise. This raise will be bored to within 0.5 to 0.75 m of the undercut and stripped open to provide a 1.5 to 2.0 m relief opening for slotting across. Drawbell rings will be fired sequentially into the slot, retreating back to the drawpoint brow. This design produces drawbell shoulders 10 m above the drawpoint brow.

The drives will require good quality road surfaces to maintain high speed tramming and high LHD productivity. Concrete roadways will be laid to the same extent as Lift 1. The roadways will be graded for drainage towards the eastern access drive and to the extraction level sump.

Dewatering

Average water inflows to E26 are predicted at 17 litres/s. Peak water flows can be expected to be around 65 litres for a one in ten year event. Lift 1's main underground pump station, screen room and suction sump were designed, built and commissioned by Weir Engineering, using Geho pumps.

The fully automatic, PLC-controlled pump station is located 500 m below surface. Its main units are three Geho ZPM800 duplex (double-acting) positive displacement, piston-diaphragm pumps. Driven by nominal 350 kW fixed-speed motors with fluid coupling and V-belt drive systems, each is capable of pumping 25 litre/s (90,000 litre/h) for a combined capacity of 270,000 litre/h.

Lift 2's production level will be the primary water collection level. Regular production water sources, such as drawpoint sprays, will be collected here as well as all water inflows from the cave. The extraction level will drain to the eastern perimeter drive. Formed drains may be installed in the concrete roadways on the level directing collected water to the Extraction Level Pump Station (ELPS) located in the northeast corner, which will be fitted with submersible pumps. It is assumed that some settling will occur in the sump and provision will be made for sump agitation or cleaning. Water will be pumped horizontally through one of the extraction drives to the screens located in the Lift 2 Main Pump Station (MPS2).

Infrastructure

The main workshop and control room remain on Lift 1, as the facilities are located outside the subsidence region. The Lift 1 workshop will provide major servicing of electric LHDs. Communications and SCADA infrastructure can be extended from the RL 9800 control room down to Lift 2. However certain operations support activities will occur on Lift 2's extraction level and facilities will be provided for tyre storage and changing, minor vehicle servicing including lubrication and daily pre-start checks, miscellaneous storage capacity and first aid and emergency refuge.

The improvements in the mine layout will result in a simple ventilation network. The one-way tramming layout of the extraction level simplifies the directing of air.

450E workhorses

The current Lift 1 fleet is six Toro 450E electric LHDS, each with a nominal capacity of 6 m^3 (about 10 t). Any oversize material is left in the drawpoint for secondary breaking. Electric drives provide clean, quiet operation (reducing ventilation requirements) and provides maximum power all the time, helping the loaders to give better productivity. Each 450E has a tare weight of 33 t and maximum all-up weights of 45 t. They are powered by 1,000 V Siemens motors with installed power of 160 kW. Each machine is equipped with a 260 m-long trailing cable and features a PLC-controlled cable reel.

Careful monitoring, with Sandvik Tamrock's CECAM on-board monitoring system, ensures that each 450E is performing to its best ability. Leaky-feeder telemetry transmits operating data from each unit in turn to a central monitoring station. The fully enclosed 450E cabs have a touch-screen monitor for machine diagnostics. These screens also provide data recorded and transmitted by the CECAM system, including bucket-by-bucket load information.

These LHDs, operating for about 5,000 hours each year, are currently forecast to last until 2005 (the first having started operating in March 1997), two years into the production phase of Lift 2. Hence extraction level design and operations for Lift 2 are based around these units. However, the outer extraction drives (1 and 6) are too long for the current trailing cables. New longer cables will be required. Simulation modelling has shown that three LHDs can supply the crusher at the target production rate.

Dynamic Automation Systems (DAS) is equipping one of Northparkes six Toro 450E LHDs with its Smart Loader automation system. The hardware includes two cameras and scanning lasers at the front and rear of the machine. CSIRO was contracted by DAS to interface the computer hardware to the LHD's systems. It is intended that this machine will autonomously navigate itself over its tramming route. If this first unit proves successful, the other five units in the 450E fleet will probably be retrofitted.

Besides raising productivity, one of the reasons for automation is the requirement to load remotely from any drawpoint in which the material could possibly flow uncontrollably.

There will be no production personnel engaged in rockbolting, shotcreting or scaling in Lift 2. Hence, the high standards of excavation and ground support installation that were set on Lift 1 will again be employed to ensure that there is no requirement to revisit excavated ground over Lift 2's operating life.

The design for construction of the second lift will require decline and level development of 15,000 m, vertical development of 450 m, uphole raising of 900 m, 125,000 rockbolts, longhole drilling of 140,000 m, and the loading and hauling of 770,000 t of waste and 780,000 t of ore. It is scheduled to take 35 months from start of development to reaching production from all 59 drawbells. ❑

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Mineral Development Office

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COMMENTS: Re: Red-Chris
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Cheers,
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