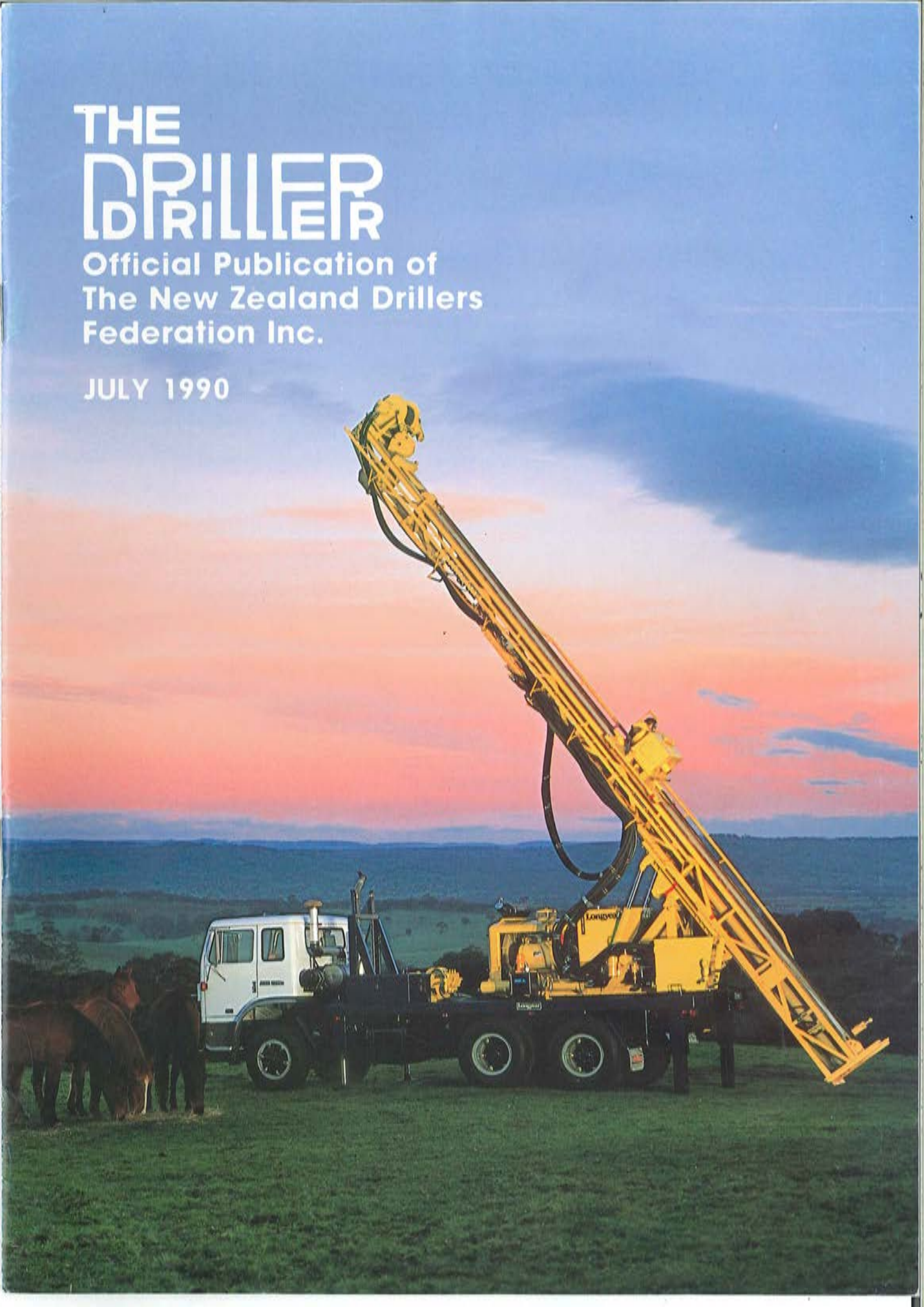
THE DRILLER

Official Publication of
The New Zealand Drillers
Federation Inc.

JULY 1990



CONFERENCE PROGRAMME
QUALITY INN, 355 WILLIS ST, WELLINGTON
JULY 25, 26 & 27, 1990

WEDNESDAY, 25 JULY, 1990

4.30 p.m.	Registration.
6.00 p.m.	Cocktails (Sponsored by Grundfoss Pumps Ltd).

THURSDAY, 26 JULY, 1990

9.00 a.m.	Opening Address. Rt Hon David Butcher — Minister of Energy.
9.30 a.m.	Ministry of Commerce — New Corporate Structure. Mr Mike Lear — Energy and Resources Division, Ministry of Commerce.
10.00 a.m.	Resource Management Law Reform. Mr Geoff Feasey — Ministry of Commerce.
10.30 a.m.	Morning tea.
11.00 a.m.	The Impact of the Resource Management Bill on the Mining Industry. Ms Robyn Ross — NZ Mining and Exploration Association.
11.30 a.m.	Ground Water Resources of Wellington Region. Mr Bert de Jong — Wellington Regional Council.
12.00 noon	Recovery of Fuels from Groundwater. Mr Bert Kroon — BLM Consultants.
12.30 p.m.	Lunch.
1.30 p.m.	Earthquake Geology of Wellington. Dr Kelvin Berryman — Geological Survey.
2.00 p.m.	Foundation Design in Wellington. Mr Ted Malan — Tonkin and Taylor Ltd.
2.30 p.m.	Dynamics of Structures under Earthquake Conditions. Mr Win Clark — Morrison & Cooper Ltd.
3.00 p.m.	Afternoon tea.
3.30 p.m.	Strategy for Management Safety. Mr Gordon Reynolds — Shell BP and Todd Oil Services Ltd.
4.30 p.m.	Product Quality in the 90's. Mr Chris Cole — Mobil Oil NZ Ltd.
5.00 p.m.	End of conference day.
6.00 p.m.	Cocktails (Sponsored by Longyear NZ Ltd).
8.00 p.m.	New Products session.

FRIDAY, 27 JULY, 1990

9.00 a.m.	Offshore Contracting — Prospects. Mr Terry Bates — Mineral Resources Ltd.
9.30 a.m.	Offshore Contracting — Hazards and Difficulties. Mr Bruce Morris — Consultant Geologist.
10.00 a.m.	Offshore Contracting — Taxation Aspects. Mr Chris Abbiss — KPMG Peat Marwick.
10.30 a.m.	Morning Tea.
11.00 a.m.	Antarctic Drilling — NZ Involvement. Mr Carey Mills — New Zealand Oil & Gas.
11.30 a.m.	Computer Applications for Small Drilling Businesses. Dr Jeff Ashby — Ashby Consultants.
12.00 noon	Lunch.
1.00 p.m.	Bus Departs — Field Trip.
4.30 p.m.	NZDF ANNUAL GENERAL MEETING.
7.30 p.m.	Closing Dinner (Wine sponsored by Grundfoss Pumps Ltd).

All enquiries please contact the Conference Convenor.

Bain Webster, P.O. Box 50-354, Wellington. Phone/Fax (04) 358-599.

RESEARCH AND THE PUBLIC GOOD: FINDING THE RIGHT DEFINITION

IPENZ believes that more money should go into research and development activity which will be of commercial benefit to the nation, and that government must take a leading role in encouraging this to happen.

Speaking to the Southland branch of the Institution on May 12, the President of the Institution, Mr Barry Butcher, said that the definition of 'public good' research being used by the Ministry of Research, Science and Technology was giving rise to concern.

The establishment of the Ministry, and its associated Foundation for the disbursement of funds, held out hope for the increasing use of technology to add value to our primary products, and to create innovative new manufactured products for export so that we could pay our way in the world.

To date, our manufacturing sector has not been successful in creating jobs in new high-technology and export-orientated manufacturing businesses to replace the jobs lost over the last few years as import protection has been removed. The two tables — reproduced on this page — show only too clearly where we are missing out with regard to productivity gains and the number of people employed.

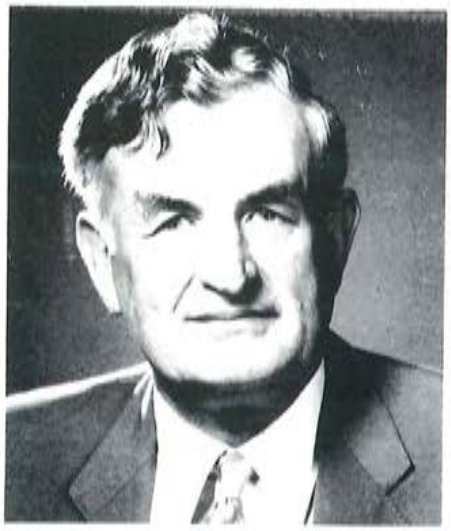
"We need new technological developments," Mr Butcher said. "But they won't happen overnight and they need support from the community — that is, from government — to make them happen at all.

"Unfortunately, government thinking is tending towards funding only so-called 'public good' research — apparently defined as research from which no definable person will make any money, at least, in the short term.

"But what we need now is research for new, successful commercial ideas from which people **will** make money. The entrepreneurs will make it; those employed by them will make it; those who handle the goods will make it; and, don't forget, the government will make it through the collection of taxes on all the incomes of all those people."

Mr Butcher acknowledged that there were channels for distributing government money directly into new commercial ideas. There was the emerging technologies programme ($6.5m to be spent over three years); the New Technologies for Industrial Growth Programme ($15m to be spent over three years, and bids totalling more than six times that had been received for the programme recently). These ideas were good. But the pool for 'public good' research was around $50m for the 1990/91 year. Within a few years it would be increasing to $125m annually, or more.

"The discrepancy between the amounts available for commercial ideas and those for so-called 'public good' research is too great," Mr Butcher said. "IPENZ believes that government should take a leading role in encouraging the flow of money into research and development that will be of direct commercial benefit to the nation."



Mr Barry Butcher, IPENZ President.

TABLE ONE
Productivity increases over the 30-year period 1957-87

New Zealand	*49%*
West Germany	*135%*
Japan	*424%*

TABLE TWO

	*Unemployed people in New Zealand**	*Number employed in the manufacturing sector***
March 1987	*65,000*	*310,000*
March 1989	*116,000*	*260,000*
Change	*+51,000*	*—50,000****

Notes: * *from Household Labour Survey*
** *from records of the NZ Manufacturers*
*** *ignores secondary employment from 'flow-on' jobs also lost.*

GIANT EXCAVATOR PREPARED IN CHRISTCHURCH

When it goes for gold it really shifts the earth — that's the new Caterpillar excavator just delivered by Gough, Gough and Hamer to Macraes Flat in Otago.

The Cat 245BME, one of only three such mass excavators in New Zealand, has been bought by Doug Hood Ltd, prime earthmoving contractor to Macraes Mining Company.

Weighing in at more than 65,000kg, the $900,000 machine is specially designed for high productivity loading of 50-tonne dump trucks.

Its huge bucket was fabricated and fitted to the big Cat at Gough, Gough and Hamer's branch in Christchurch, where the excavator was commissioned before being freighted south by road.

"The excavator is the first of a fleet of Caterpillar machines we will be supplying to Doug Hood Ltd for Macraes — there are dozers and dump trucks still to come," said Gough, Gough and Hamer's Manager of Caterpillar Sales, Mr Steve Templer.

"The development at Macraes Flat is a great boost, providing jobs and revenue for Otago, the South Island and the whole of New Zealand."

Macraes is expected to produce 85,000 ounces of gold a year by 1992, from two open pits which comprise one of the largest gold mines in New Zealand.

Doug Hood Ltd, a longtime Caterpillar operator, has a three-year contract to extract the gold-bearing ore from the ground.

The 245BME, the largest excavator made by Caterpillar, will provide plenty of digging power. It is driven by Caterpillar's proven 3406 engine, noted for its dependable, powerful performance. The engine is an in-line 6-cylinder turbo diesel of 14.6 litres, producing 268.5kW (360 HP) flywheel power.

Longyear

One Million Miles Old

If the age of a drilling equipment manufacturer were measured by the miles its products have drilled or the miles its staff have travelled to drill sites around the world then Longyear would be very old indeed.

We've lost count of the miles we've put into this industry — but not the years. We can proudly say that Longyear is 99 years old.

The experience we've gained providing equipment, service and support to the exploration and mining industry since 1890 has made Longyear a world leader in its field.

Commitment to product development, quality control and field support have made Longyear products the cost effective choice world wide.

To ensure your exploration drilling dollar lasts that extra mile contact Longyear.

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DRURY/BOMBAY GROUNDWATER

BACKGROUND — DRURY/BOMBAY STUDY

A study into the groundwater resources of the Drury/Bombay area (see Figure 1) is currently being undertaken by the Auckland Regional Water Board. This was initiated in 1988 for the following reasons:

— An increased level of horticultural development in the area, combined with low availability of water from local streams focussed attention on the groundwater resource. Reports of unauthorised groundwater use were being received regularly.

— A lack of knowledge of the groundwater systems in the area, and reports of falling water levels and water availability problems.

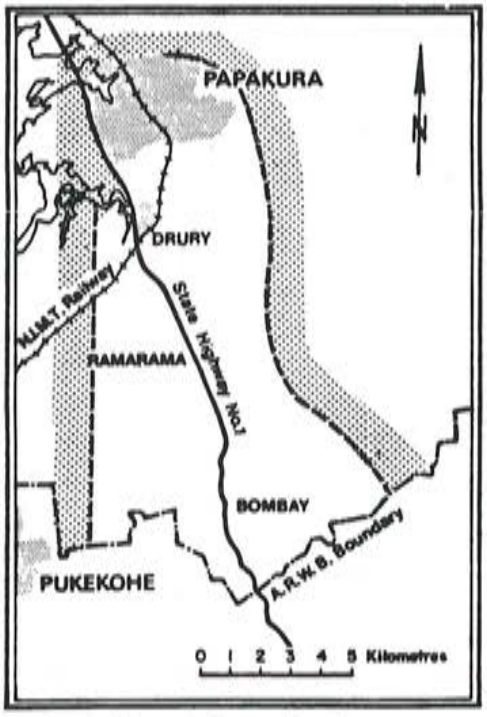

Figure 1. Drury/Bombay Study Area.

The study, undertaken to identify and understand the groundwater aquifer systems, will also determine how much water is available. A Land and Water Use Survey of all properties was carried out during the 1988/89 summer to determine the current level of groundwater abstraction, and ensure that all appropriate water use in the study area was covered by a water right.

Two investigation and monitoring bores have been drilled, one in Fielding Road, Drury and the other in Coopers Road, Ramarama. These bores provide important geological information from their bore logs and the results of the pumping tests carried out. They also monitor the long term water level changes in the aquifer. Water chemistry and water level data is collected from private bores.

The management plan for the entire area should be completed by early 1991.

Work to date has shown the largest concentration of groundwater use is in an area boundered by Fitzgerald, Drury Hills, Appleby and Waihoehoe Rds (see Figure 2).

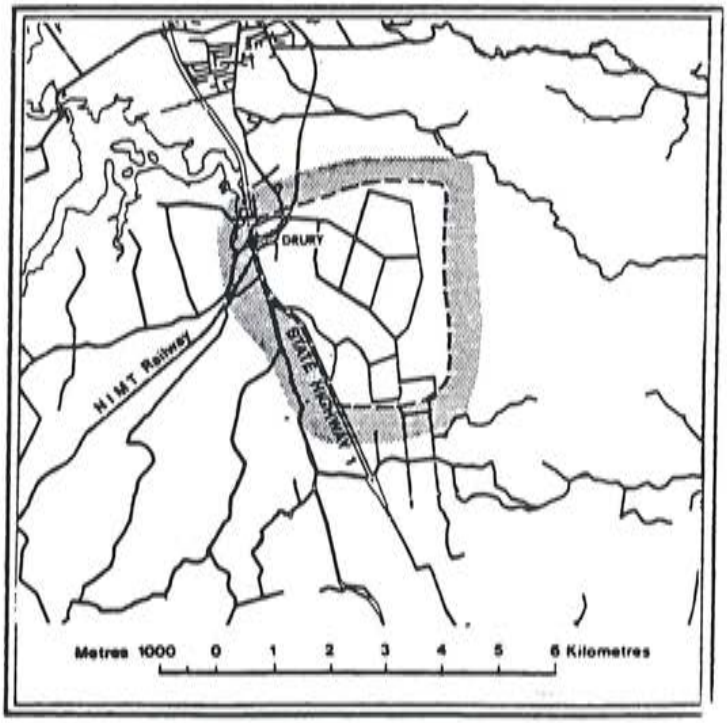

Figure 2. Area of Groundwater Restriction, Drury East Area.

This, together with the apparent poor performance of the aquifer, has prompted closer scrutiny of water availability in the area.

Water availability calculations are still provisional, but they identify a potential over allocation situation. Over allocation of the groundwater leads to a situation where more water is taken out of the aquifer than is naturally replaced annually by recharge. This can lead to severe water availability problems to growers as water levels in the aquifer drop, and bore yields are reduced.

Additionally the majority of landowners in this area are engaged in practices, such as glasshouses and plastic-houses, which require year round irrigation. The water requirement is therefore less seasonal, maintaining demand on the aquifer all year round, and leaving less time for water levels to recover during the winter months.

Finally, water levels in the monitoring bore have dropped significantly during this summer (Figure 3). Monitoring these levels over the winter period will determine whether recovery is taking place.

GENERALISED HYDROLOGY OF THE STUDY AREA

Groundwater resources of the Drury-Bombay Study area are made up by a multi-aquifer system comprising basaltic lava flows, consolidated sands, and sandstones.

In the south, Bombay is serviced by low producing lava flows overlying sandstones which have been up-faulted and lie close to the surface. West of the motorway there is a small zone of higher producing basalt.

Moving north towards Ramarama the lava flows form shallow discrete aquifers, often isolated by the clays and peats which surround them. This volcanic material has issued from a fault which is marked by the rise of the Hunua foothills. Elsewhere consolidated sands make up the predominant aquifer, overlying the Kaawa Formation and the Sandstone basement.

Nearer Drury, the basalts are generally low yielding and often non-porous. East of Drury the Water Board monitoring bore in Fielding Road found the basalts to be overyling 18 metres of fine-grained silty sands. Below these sands, silts, clays and peats continued to 115 metres. The sand aquifer was pumped for three days at 150 cubic metres per day, which produced a drawdown of 34 metres in the pumped bore and five metres in a bore 100 metres distant. There was 47 metres of available head in the pumped bore. The testing showed the aquifer to be low yielding when compared to others in the Manukau lowlands. The aquifer is characterised by excessive drawdowns following high extraction but relatively small effects at distance. This therefore lends itself to short duration, low volume takes, such as would be required by glasshouse operations, thus allowing time for recovery. Ultimate yield in

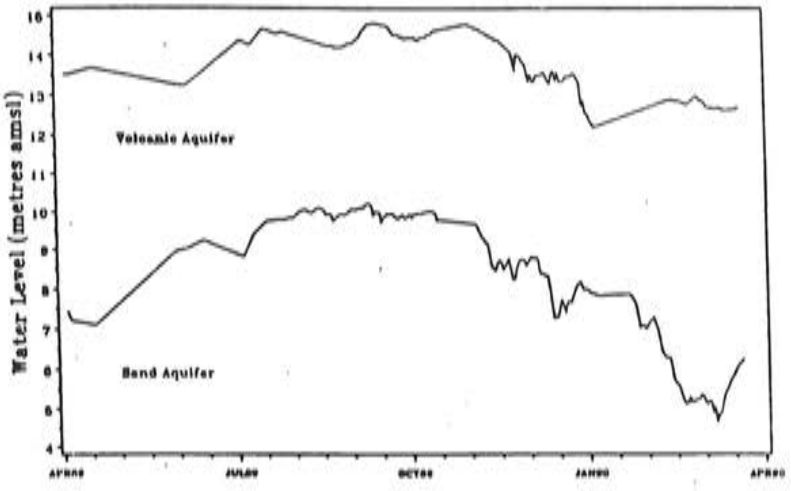

Figure 3. Water levels in the Fielding Rd Monitoring Bore.

the pumped bores tapping this aquifer will be limited by the drawdown. The water level in the Water Board bore is now monitored continuously and its record appears in this newsletter.

Though often existing as discrete units, these aquifers can be considered as one system since vertical infiltration of rainfall occurs from the basalt to the sands. There is also a general groundwater flow horizontally from Bombay to Drury following topography.

INTERIM POLICIES

1. RESTRICTION ON FURTHER GROUNDWATER ABSTRACTION ALLOCATION.

The potential for over allocation of groundwater in the Drury area is considered sufficient to require that a policy restricting further allocation of groundwater from the area south/east of Drury be adopted until further information is available from the completion of the Drury-Bombay area groundwater study.

The Water Board is not allowing any further abstractions from the basalt/sand aquifer, at least until the mechanisms of recharge are better understood, and a better estimate of actual availability is defined. This policy will be reviewed with the completion of the Drury-Bombay study in early 1991.

Please note that this restriction does not apply to groundwater required for stock or domestic use.

Thus the Auckland Regional Water Board, at its meeting on 29 March, 1990, resolved that:

1. Any established unauthorised water user be given 3 months to apply for a water right.

2 All new water right applications (not covered by 1 above) which apply to take groundwater from the basalt/sand aquifer in the area defined in Figure 1 be deferred until March 1991, or the adoption of a management plan for the Bombay Drury area.

This means that no new bores can be drilled into the Basalt/Sand Aquifer to take water for irrigation or water supply to piggeries or poultry farms. Similarly no water can be taken for these purposes from existing bores if that use is not already covered by a water right.

A MESSAGE FROM THE PRESIDENT

Dear Members,

We have all, at some time noticed a friend start to do strange, out of character things.

Recently, Rodney (not his real name as some members would recognise him) has begun to exhibit some real way-out actions.

This man has always advocated buying new machinery and vehicles etc. What does he do?

Buys a Japanese import. Well I can tell you, I kept a close eye on him from then on.

His hearing hasn't been the best for sometime and I believe his eyes may be troubling him also, as he has taken to eating enormous amounts of raw carrots. Another more worrying diet habit is that he can not get enough passionfruit. I have yet to diplomatically ask his wife about this. Only this week another most disturbing aspect of his behaviour has become apparent, he has taken to carrying in a small container, Redex upper cylinder lubricant, whether for sniffing or drinking we have not yet ascertained. Redex sniffing or drinking does you no good at all.

In Rodney's case it seems to have caused an unco-ordination of his physical actions as he frequently manages to spill Redex all over the office carpet which he proceeds to clean up with super octane petrol, thus subjecting the rest of us to passive petrol sniffing.

I have just spotted Rodney going upstairs to the lunchroom with a large raw cauliflower clutched under his arm. Could this be an attempt to improve his ears?

NEWS RELEASE FROM THE DSIR

DSIR GEOLOGY AND GEOPHYSICS

Analysis of earthquakes and the earth processes that lead to them will be a major focus of a new DSIR division formed from the amalgamation of Geophysics Division and New Zealand Geological Survey.

The Director General of the DSIR, Mike Collins, said the new division will be called DSIR Geology and Geophysics.

It is part of the DSIR's restructuring which involves reducing the number of divisions from 23 to 10 by July 1, 1990. Director of the new division will be Dr Ian Speden, previously Director of the New Zealand Geological Survey.

Mr Collins said the recent earthquakes near Dannevirke and the more damaging Edgecumbe quake in 1987 illustrated the need for excellent scientific study of these major natural hazards.

Another important role of the new division is the evaluation of economically valuable resources such as petroleum, gold and other minerals, geothermal energy, coal and groundwater. Both arms of the division have also been involved in research into the Cromwell Gorge slips.

The headquarters of DSIR Geology and Geophysics will be at Lower Hutt with a major research centre remaining at Kelburn and with substations at Auckland, Rotorua, Wairakei, Gracefield, Christchurch, Dunedin and Cromwell. Mr Collins said this was the last of the 10 new divisions to be announced under the DSIR's current restructuring.

For further details contact: Dr Fred Davey, Director, or Fleur Templeton, Geophysics Division, DSIR, WELLINGTON. Telephone: (04) 738-208. Facsimile: (04) 710-977.

ENVIROFLOC — LIQUID WASTE DISPOSAL ON DRILLING SITES

Increased awareness of the environmental impact from the discharge of liquid waste from both oil and mineral exploration drilling, has resulted in the development of various alternative waste treatment methods.

Traditionally liquid waste has been either carted to a disposal site for disposal or deep well injecting, allowed to evaporate (when local climatic conditions are suitable), spray irrigated onto surrounding farmland, or simply buried on the existing site. As there are no "toxic" fluids used in drilling today, all these methods are still considered acceptable in New Zealand.

Regardless of this, there is increased concern worldwide as to whether these practices will have a long term affect on ground water quality. Exploration companies and associated service companies, are involved in continuous research and development of various environmentally acceptable methods of waste disposal.

This paper describes one method developed by Baroid Corporation's Environmental Services Division, and in particular an experimental process trialled jointly between Petrocorp Exploration and Baroid New Zealand. It also summarises a report compiled by the Taranaki Regional Council on the effects of this process on the aquatic life of the discharge stream.

ENVIROFLOC

The "Envirofloc" (tm) process is a combination of chemical and mechanical separation of suspended solids from the water or brine used in the drilling process. Chemically, the process uses acids, coagulants and flocculants to enable the ultrafine colloidal particles to be more effectively separated using a decanting centrifuge.

ACIDS

Acids are used to neutralise the typically alkaline (pH 8 to 10) waste from the sump to just below neutral (pH 6 to 7). This hydrolyses the polymers and reduces the viscosity of the fluid.

COAGULANTS

Coagulants are then injected into a turbulent manifold stream to reduce the repelling forces between the colloidal particles. As most of the solids in suspension, such as clays, organic polymers etc. possess a negative (anionic) surface charge, coagulants are typically inorganic chemicals, such as alum, although the use of cationic polymers is becoming more cost effective in some instances.

FLOCCULANTS

Flocculants are then injected into the system to entrap or wrap up the now neutralised particles into larger sized "flocs" which enables separation to occur more effectively. Flocculants are generally long chain non-ionic or slightly anionic polymers. Although some chemical reaction occurs, the flocculation process is largely a mechanical process by using the molecular bridging effect of the polymer to entrap the suspended particles.

CENTRIFUGE

Final separation then can be achieved by introducing the treated waste to an artifical gravitational force, such as a decanting centrifuge. This method of separation is preferred over traditional techniques such as settling ponds, which require an unacceptably large area to be effective, or belt filter presses, which have difficulty handling viscous or oily sludge.

The use of a decanting centrifuge allows continuous waste handling to be achieved. It must be noted that the effectiveness of the chemical process described above will determine the quality of the results obtained from the centrifuge. An "unstable" floc will be easily broken by the centrifugal force resulting in an unacceptable effluent for discharge to a water course, or re-use as drill water.

TEST RESULTS

During the drilling of a recent Petrocorp Exploration operated well in South Taranaki, Baroid's Envirofloc process was monitored by the Taranaki Regional Council. Samples were taken from an area down stream from the drilling site discharge. Biological analysis of these samples were compared to samples taken prior to drilling.

The following is an excerpt from this report. "In summary, our results indicated that the Envirofloc system: (a) removed almost all suspended solids from the drilling fluid, (b) removed 99% of the oil and grease from the drilling fluid, (c) removed 78% of the chromium from the drilling fluid, (d) produced a 70% reduction in the chemical oxygen demand from the drilling fluid, (e) produced only small reductions in the lead and zinc levels of the drilling fluid, (f) produced an effluent containing high chloride levels (which would at times be insufficiently diluted by such a small stream as this)."

Some problems were encountered initially with the process, due mainly to bacterial degradation of the flocculated effluent, resulting in a discoloration of the discharge. However the Regional Council detected no impact on the aquatic life of the stream, and no detrimental effects were noted on the algal flora of the stream, or either the algal or macroinvertebrate communities in the stream.

In conclusion, the reported results indicate there are other environmentally acceptable methods to traditional forms of waste disposal. What has yet to be proved is the economic viability of these alternatives. Both companies involved in this project believe future research and development on this type of system will have long term benefits, both environmentally and financially.

ABOUT BAROID/MINTECH

The Baroid Corporation is a worldwide supplier of specialised drilling chemicals, technical services and equipment to meet the specific needs of oil and mineral exploration and development.

Mintech NZ Ltd is the owner/operator of extensive mineral quarries and is a major supplier of minerals and chemicals used in the drilling, construction, foundry and paint industries in New Zealand and the South Pacific basin. The combining of these two companies enables the Joint Venture to offer specialised services throughout New Zealand.

THE AUTHOR

Brian Campbell is Baroid's equipment supervisor in this region. He has had extensive involvement in designing and implementing specialised solids handling and environmental equipment in Australia, New Zealand, South East Asia and North America. He is currently based in New Plymouth, New Zealand.

PETROCORP DRILL HORIZONTAL WELL

The first horizontal well to be drilled in New Zealand has been drilled by Petrocorp Exploration in the McKee field.

McKee-12 was spudded in on 21 November 1989 and completed on 26 December. It was drilled in the central part of the field. It is estimated that it will increase the field's ultimate recovery by some 0.25 MMstb and will raise the daily field production rate.

The well, drilled by Parker Rig 188, planned to reach a total depth of 2659m AHBKB (2130m TVSS) and the length of horizontal section was estimated to be between 300 and 450 metres depending upon drilling performance. The well was designed as a medium radius horizontal well with a kick point at 1959m TVSS with a build up rate at 12^0 every 30m. Total depth reached was 2728m.

The McKee Formation reservoir ranges from 60 to 100 metres thick and the drilling of McKee-12 will increase Petrocorp's understanding of the production potential of the reservoir.

With the completion of McKee 12 Petrocorp has commenced drilling a second medium radius horizontal well in the northern part of the field, Tuhua 4.

Longyear.

We've Married Quality

Committing a manufacturing plant to a 'Total Quality Control' system is a lot like getting married. Success requires total involvement from everyone concerned.

Longyear and Quality are not strangers. We've been supplying high performance products to the exploration and mining industry for nearly 100 years. But now we're making it formal.

Total Quality Control is a team approach to ensuring product quality. It involves everyone, from the shop floor to the company's management.

Corporate policies and procedures have been developed and documented to meet the needs of the mining industry. Participation by Production personnel is ensuring that these quality procedures are adopted and implemented at all levels. Quality is everyone's business, it's not inspected in.

Total Quality Control also demands the latest in manufacturing technology. Longyear have installed sophisticated CAD systems to improve product design and coupled them to CAM controlled machinery. We've invested in advanced electronic test equipment and incorporated new process inspection and analysis procedures.

We've been going steady for a long time but now you'll really see sparks. The wedding presents are the best mining products that technology can produce, and they're all for you. Give us a ring!

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Longyear Australia Pty. Ltd. 919 Marion Road, Mitchell Park, Adelaide, South Australia 5043.
Telephone +618 296 6022, Telex AA 82421, Fax +618 296 6761.

Dominion Construction staff look forward to meeting all their customers and colleagues at the July Conference. Over the years this company has supported NZDF Conferences regularly, most often promoting our representation of Surescreen wellscreens and EDECO drill rigs. This year, in this respect, it will be no different, and we will have these products on display, particularly emphasising Surescreens recent licensing as a Quality Endorsed Company to AS3901/ISO9001; the only screen manufacturer to be so licensed to date.

The main differences you will notice are the additional products we will have on hand to show you, that will be of interest to every driller attending the Conference.

Since the 1940's, in fact shortly after this company was formed, we have represented the largest single manufacturer of safety equipment in the world, namely MSA Co., Pittsburgh and its subsidiaries throughout the world. Our main interest had been gas detection and respiratory protection, however recent developments have given us the opportunity to represent MSA across their complete product range exclusively, and we can now offer the drilling industry this range of good quality personal safety equipment at competitive pricing.

In particular we will be featuring the MSA Glove Programme, designed to promote hand safety awareness throughout industry. The drilling industry is particularly prone to hand injury, we all tend to take hands for granted because a hand with its fingers is the most constantly used part of the body. A hand contains pulleys, levers, hinges, gears, slings, pipes, tunnels and valves — all held within a delicate structure — the skin. Yet a hand is more exposed to potential danger and can cause more accidents than any other part of the body. Just remember that these tools are as important to drilling a hole successfully as the bits you use.

So, stop by our display at the Conference and we'd be pleased to give you a helping hand to 'Save Fingers and Thumbs'.

RECORD WATER-WELL CONTRACT AWARDED

What is probably the largest single contract for water-well construction was awarded recently to the Sydnor Pump and Well Co. of Richmond, Virginia. The work involves drilling some 11 unusually deep water wells for the city of Orlando, Florida. The value of the contract is approximately $574,000. Alternate bids were taken on the basis of dividing the work between two contractors but the Utilities Commission selected the Sydnor bid for the entire drilling project as being the lowest and best.

Both heavy cable-tool and rotary drilling equipment will be used on the work.

The wells are to be drilled to a depth of about 1,350 feet. The inside liner in each well will be 16-inch diameter pipe 1,100 feet long. This string of pipe will weigh 28 tons. In all, a large carload of pipe (50 to 60 tons) is required for each well.

Four sizes of pipe will be used in casing each well. The pipe will be pressure-grouted from the bottom to the ground surface.

SHATTERING A 13.68 MPH SPEED RECORD

A world speed record may soon be threatened by a device that uses a human as an engine, looks like a bicycle, and moves on water. It is a human-powered propeller-driven, hydrofoil-supported watercraft that, according to its designers, will approach the world record of 13.68mph over a standard men's rowing distance of 200 metres on non-tidal water. The record was set by an 8-man racing shell on the Rootsee River in Lucerne, Switzerland, in June 1984. In describing the vehicle, Dr Arthur G. Erdman says, "On top, it looks like a bicycle. It has two floats on each side to keep it up. The idea is to peddle to turn the propeller, which was computer-designed. The vehicle speeds forward through the water." The big snag so far is that there's too much lift in the system. When that is worked out, as Dr Erdman thinks it can be, the next barrier will be to find a qualified driver. The project is being carried out at the University of Minnesota to help students develop principles of engineering design and manufacturing processes. Ben Hoffmann, president of Wings on Water Inc., assisted in the project and hopes to market the human-powered hydrofoil as a recreational vehicle.

SPECIALISED DRILLING APPLICATIONS

Klemm hydraulic drill package systems are being introduced to North America this year. They are designed for specialised ground and civil engineering drilling applications. For example, they can be used for permanent and temporary tiebacks and anchors, earth support, foundations, and dam stabilisation projects. Klemm drills have a double-head drilling system to penetrate overburden quickly and easily. A variety of high-torque rotary heads and drifters can be combined on the same mast to provide optimum drilling performance, reports Ingersoll-Rand Company. The drills are also designed to meet a wide range of geology. For example, one drill measures only 36 inches wide. This can be reduced to 28 inches to move through tight quarters. Yet, the unit can be fitted with high-torque heads that permit drilling most standard-diameter, mini piles at depths to 300 feet. More information about Ingersoll-Rand's Klemm drilling products is available. *Ingersoll-Rand Company*, Ground Engineering Products, Department NR-346, 253 E. Washington Avenue, Washington, NJ 07882.

THE REGIONAL DEVELOPMENT INVESTIGATION GRANT

▸ What is the Regional Development Investigation Grant?

The Regional Development Investigation Grant (RDIG) helps people or businesses throughout New Zealand investigate new business ideas.

It assists new and existing businesses and people wanting to go into business develop innovative and economically sound ideas which use the region's resources and development opportunities to best advantage.

▸ What help is available?

RDIG helps with the cost of investigating the technical and commercial aspects of a new project. It will pay 50 percent of approved investigation costs, up to a maximum of $50,000 per project.

▸ Who can apply?

Individuals, businesses, groups and organisations, including local authorities, can apply.

▸ What are the basic criteria for a project?

To be eligible the project:

- must be an activity new to the region
- must be a legal activity
- must have a reasonable chance of developing into a successful business.

New businesses are eligible, but so too are existing businesses which want to look at a new technology or process to increase their productivity.

▸ How to apply?

You can get application forms from Business Development Centres, Business Development Boards and offices of the Ministry of Commerce.

IRRIGATION HOSE — MATERIALS

D.R. Sheard, B.Sc., Ph.D., C.Chem., M.R.I.C., Angus Irrigation, Bentham, N. Yorks., England.

We are living in an Age of Plastics, but who can honestly say that some plastic widget hasn't let them down at some time or other? Not that there is anything wrong with plastics — the failures only happen if plastics aren't the right material for the job, or if the design is wrong for the application.

Most important where irrigation hoses are concerned — they're not exactly a cheap replaceable widget. But how do you judge whether plastic hoses are a brilliant technical advance or just a gimmicky substitute? You need to know something about the experience of the designers and manufacturers and how much they know about how you use the product, and what you expect from it.

Angus Irrigation is part of the Angus Company, which, like Australia, has passed it's 200th year of operation.

Among its many inventions and innovations, it pioneered the extrusion processes which make rubber irrigation hoses. Angus was also the first to make and market thermoplastic polyurethane hoses, such as Wellmaster, which finds wide usage in Australia, and also lay-flat fuel and potable water hoses for civilian, offshore and military uses.

Using polyurethane in irrigation hose was an obvious option, and we made and tested them in France over 10 years ago.

Why then, did we choose to stay with the rubber option? It all boils down to fitness for purpose and the right design and materials for the job.

The pliability and drape of rubber hoses gives them good handling, coiling and flaking properties, compared with the stiffer thermoplastic types. In particular, it doesn't form into sharp folds which invite point abrasion, permanent damage and leaks. Simple repair kits are available if damage or leaks do occur.

In the same way, we can design anti-kinking properties into rubber hoses, either for medium pressure traveller irrigators or for low pressure lateral machines to an extent that simply cannot be achieved in polyurethane hoses. Kinking and the ensuing kink point abrasion are key features in both operational use and in determining the working life of the hoses.

Another advantage of rubber hoses is their improved swelling property under pressure, which results in lower friction and pressure drops, higher water delivery rates and reduced energy costs.

Years of PVC nitrile rubber compounding experience in Angus, together with a rigorous Quality Control System, applied to rubber compounding and all stages of hose manufacture ensure high resistance to ozone cracking, U.V. and heat degradation, and microbiological attack. Indeed, Angus have opted for PVC nitrile rubber hoses for long-term application in desert conditions in preference to the polyurethane option.

Angus have chosen PVC nitrile rubber as the ideal material for irrigation hoses on the basis of experience of the performance of these materials, and we pass this on free of charge. In the end, the customer's experience will finally count, but it may cost him to gain it!

STAN'S FANTASTIC FIND: A HUGE MOUNTAIN OF IRON ORE

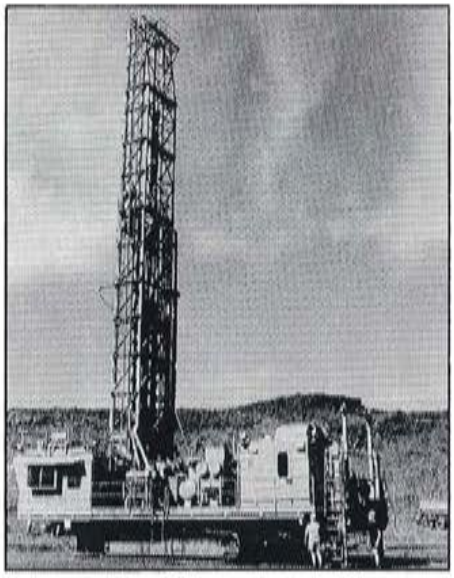
In 1957, Stan Hilditch, prospector and master of many trades, climbed the mountain in Western Australia that was later to be named Mount Whaleback. He realised immediately that he stood on top of one of the world's biggest deposits of iron ore.

By courtesy of BHP-Utah Minerals International

Stan said nothing about the discovering to anyone – apart from his wife, Ella. The reason was the export embargo, which the Australian government had placed on iron ore. Exploitation at that time was out of the question.

The couple kept the secret between themselves for four years, until the embargo was lifted in 1961. Then the hunt started for developers willing to exploit the enormous deposit, estimated at 1.5 billion tonnes.

Those who thought that the world's mining companies would queue to take part in the exploitation of Mount Whaleback were quite wrong. The location of the deposit (about 400 km from the coast and nearest port), the huge investment needed, and uncertainty about future development in the iron-ore market made many potential investors sceptical.



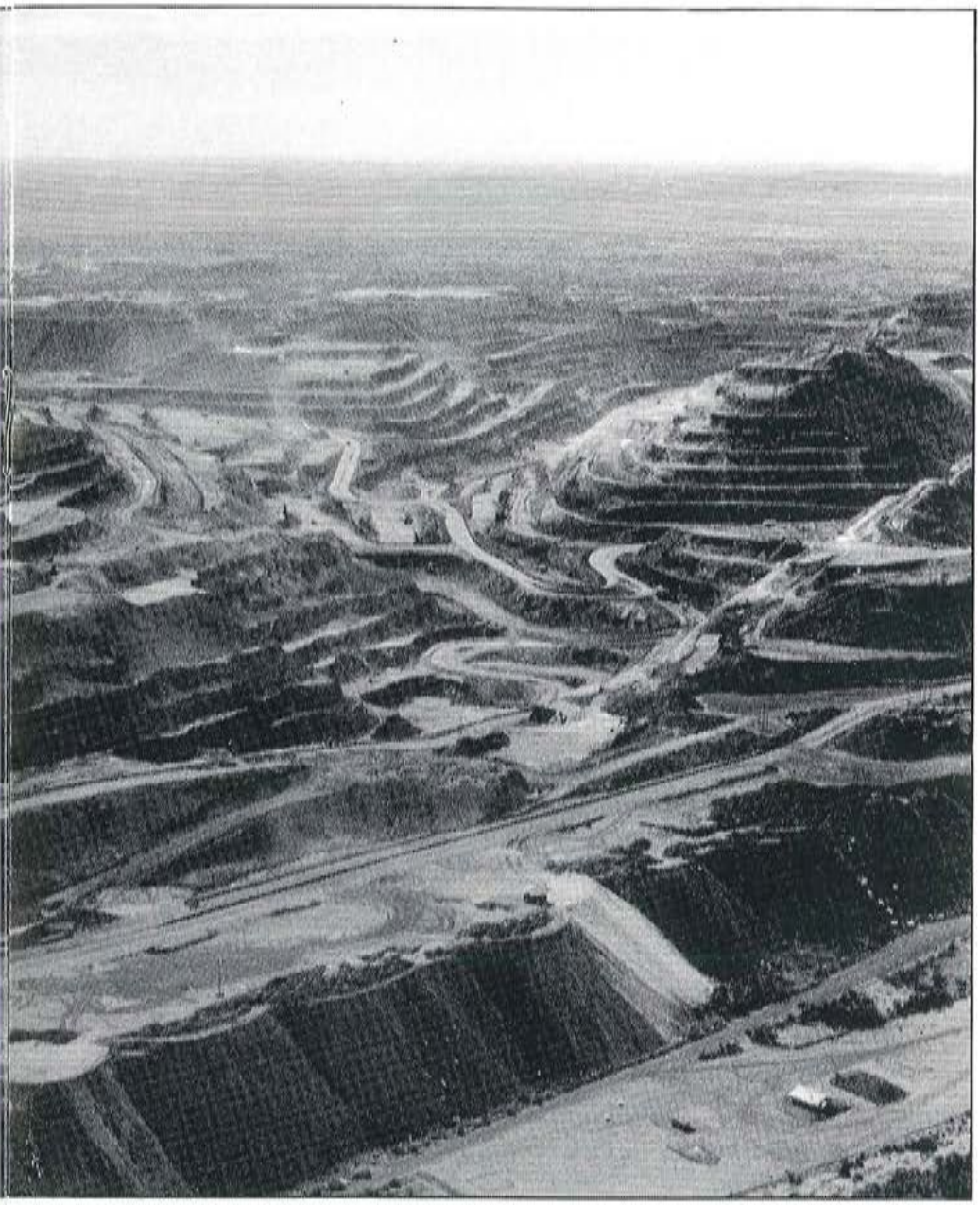
Bucyrus-Erie 60R, equipped with 15" (381 mm) Sandvik Coromant CS2 roller bit.

THREE WHO DARED

The size of the deposit, together with its unusually high iron content (64–70 %), finally convinced the American company, AMAX, to take the plunge. AMAX found two Australian companies, CSR and BHP, to join them in the project. Contracts for future deliveries were signed with large Japanese steelworks, and in 1967 Mount Newman Mining was established to exploit the deposit.

This signalled the start of intensive construction work in the mining town of Newman, at Mount Whaleback, and in the coastal town of Port Hedland. Development included a 425 km rail link between Newman and Port Hedland.

Many curious tales emerged about the project, with perhaps the most spectacular concerning the construction of the railroad. A peak of 1300 men worked as railroad labourers. A total of 870 000 sleepers were laid, which is equivalent



The world's largest open-pit, and one of the richest iron-ore deposits: Mount Whaleback in Western Australia.

The mine manager Paul Schipke.

to the amount of wood needed to build 10 000 standard houses. Beer consumption in the 45°C heat was enormous, at about 1000 litres per kilometre of track laid. Beer was as essential a commodity as were rails, sleepers and track bearings!

Mining operations began in 1969. The goal was to produce 5 million tonnes of ore a year.

LARGEST OPEN-PIT

It was soon to be proved that the target had been set too low. The works were expanded successively, and in 1976 the annual capacity reached about 40 million tonnes of rock. By 1989, this had risen to 110 million tonnes, making Mount Newman one of the largest iron-ore mines, and one of the largest open-pit mines in the world.

This enormous investment, in what is described as total desert, hundreds of kilometres from the nearest settlement, and where few people, with the exception of the aboriginals, had so much as set foot by the end of the nineteenth century, was not without problems.

There was a long list of obstacles in the path of the project: poor transportation, aggressive climate, natural disasters (cyclones), a high turnover of personnel, crippling strikes etc.

Yet nothing has been able to stop the pioneers who turned one of the most daring investments in mining history into a successful project – a project with an exiting future.

Since 1986, 85 % of Mount Newman Mining has been owned by one of the original investors, the large Australian mining concern, BHP-Utah Minerals International.

A SATISFIED COROMANT CUSTOMER

Sandvik Rock Tools is involved in the development work at Mount Newman Mining, which is aimed at increasing iron-ore production still further.

The Bucyrus-Erie 60R drill rigs used in production are all equipped with 15" (381 mm) Sandvik Coromant CS2 roller bits.

"We are very satisfied, both with the performance of Coromant roller bits and with the service given by Sandvik Rock Tools", says the mine manager, Paul Schipke. "This year we have been able to increase the average service life of the drill bits to about 2800 metres, with a net penetration rate of 22.1 metres per hour. This kind of performance is very important to us, now that we are going all-out for increased production".

Harry McArthur, product manager at Sandvik Australia in Perth, reports: "The increased service life is a result of the investments we have made in product development. We hope to be able to make further improvements during 1990, to win increased customer confidence. Similarly, we will continue with technical service recommending and improving bit handling, drilling parameters and air flushing requirements, all with the objective lower cost/drilled meter.

Iron-curtain – rows of Tubex casings in a 50 m² top-heading.

THE IRON CURTAIN IN TUNNELLING

Trevi SpA, Italy's foremost foundation and piling specialist, has found a remarkable new use for Sandvik's simultaneous drilling and casing system, Tubex. The new application was pioneered in difficult tunnelling conditions through glacial moraine in the Italian alps, where conventional drill-and-blast is impossible. The company has used Tubex to create a new means of roof support which permits faster, safer and more economical tunnel advance through dangerously unstable ground conditions.

Trevi was awarded contracts for pre-consolidation work, in connection with the excavation of a series of 95 m^2 tunnels. The work was originally performed using the conventional jet-grouting technique ("micro-piling"), which involved the drilling of a series of 12.0 m holes around the profile of a 50 m^2 top-heading. As the drill string is withdrawn upon completion of each hole, it is rotated, while large volumes of grout are pumped into the surrounding moraine through a nozzle at the end of the drill string. Grouting pressures of up to 400 bar are used.

As the liquid cement binds with the moraine and hardens, a series of interlinked, horizontal concrete pillars are formed, which creates a stable roof (fig. 1). The main contractor then comes in to excavate beneath the grout curtain, and so produce the tunnel in relative safety. During the excavation work of the roof is further supported through the insertion of pre-fabricated arcs of steel. Any large boulders suspended in the moraine, and which project into the tunnel profile, are trimmed as necessary by means of drill-and-blast. Boulders up to 75 tonnes in weight have occasionally been encountered.

Trevi has used the jet-grouting technique with great success on many projects. However, the particular ground conditions at two current projects render the method problematic. Very large boulders make drilling difficult, while frequent water intrusion causes excessive grout dilution. A further drawback is the long time (up to 50 hours) the grout needs for hardening. It was for this reason that the company's engineers decided to explore the possibilities of Tubex.

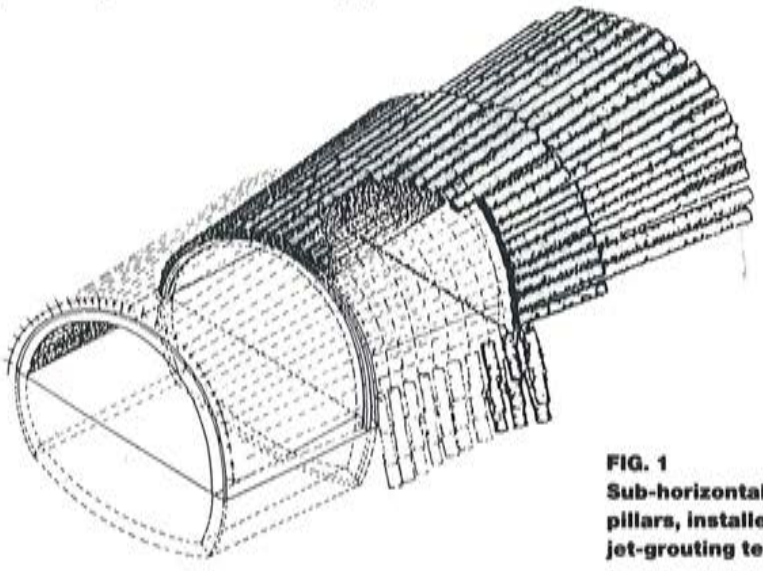
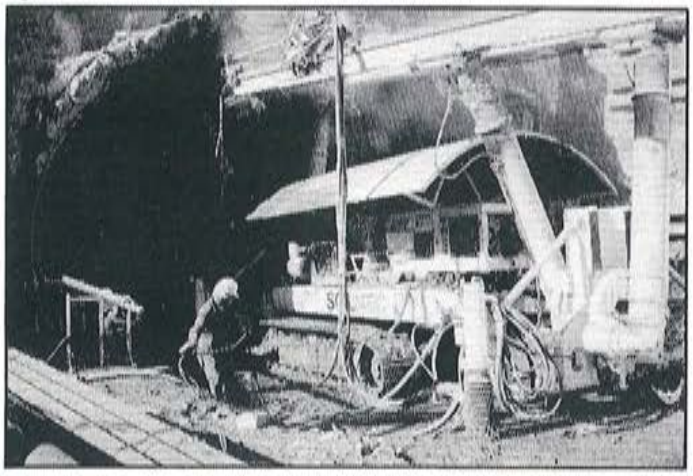


FIG. 1
Sub-horizontal concrete pillars, installed using the jet-grouting technique.

Twin 50 m² top-headings for 95 m² motorway tunnels in Aosta Valley, northern Italy.



The twin-boom SM 505 TD, developed by Soilmec to install 12.0 m Tubex casings, in one pass.

EXPERIMENTATION WITH TUBEX

Experimentation with Tubex 90 and 115 began in 1986, using a modified crawler drill rig to install 12.0 m tubes around the profile of the top-heading (fig. 2). Spacings between the tubes were varied between virtual zero and 30 cm, depending on ground conditions. In the 50 m² top-heading, this involved the installation of between 35 and 70 tubes.

To give the tubes added strength, and provide an interlinking concrete medium between each tube, a unique solution was found. A number of perforations are drilled into each tube, and fitted with very simple "valve" mechanisms, designed to "burst" when the grout pressure reaches 30 bar. Grouting starts with the filling of the casing tube itself. All air in the tube is allowed to escape via a separate outlet in the grouting cap. When the casing tube is full, this outlet is closed, which causes the grout pressure to rise. At about 30 bar, the "valves" in the walls of the tube burst, whereupon pressurized grout escapes through the perforations and into the surrounding moraine. In this way, a certain interlinking is obtained between individual tubes in the system. The result is a steel and concrete curtain, with superior bearing capacity.

Further roof security is obtained by installing the tubes so that one series (or "round" of tubes) overlaps the next by up to 3.0 m (fig. 2). Trevi engineers refer to this as the "balcony effect", which gives greater safety and long-term stability.

Tubex is also used to install 6.0 m micropiles along the base of the top-heading, at 1.0 m intervals.

ADVANTAGES OF THE TUBEX METHOD

When asked about the advantages and cost-effectiveness of the Tubex system, Sr Gino Zanchini, Technical Director at Trevi's Susa site on the Turin to Bardonecchia motorway project, replied:

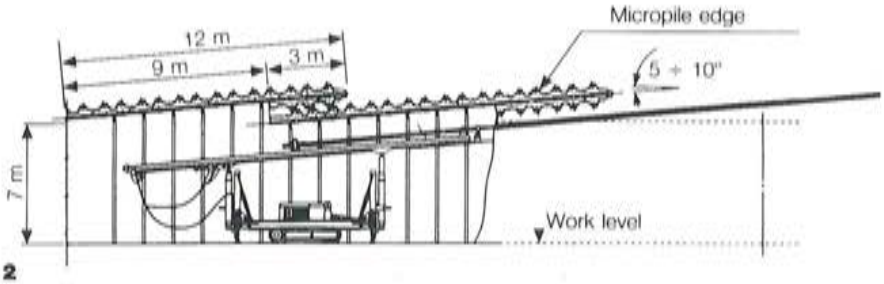


FIG. 2
Installing 12.0 m "perforated" casings, using Tubex. Concrete interlinking by means of grouting. Note the "balcony" effect.

"There are no cheap ways of tunnelling through glacial moraine, but the cost of Tubex compares favourably with the jet-grouting method. However, there are other factors besides the cost of materials, which influence overall economy. The most important of these is the time factor. In jet-grouting, we have to wait up to 50 hours for the grout curtain to harden, before excavation of the tunnel can begin. If there are large boulders crossing the tunnel profile, there is more delay, since they cannot be trimmed until the grout curtain has hardened further".

"Using the Tubex system, excavation can usually begin 12 hours after the casings have been installed and grouted. As you can imagine, this speeds up the rate of tunnel advance tremendously".

"Also, the Tubex method is much less sensitive to water intrusion, and gives a stronger framework to support boulder trimming operations".

STEEL RIBCAGE

Sr Zanchini continued: "Another major consideration is safety – the Tubex method gives the contractor a steel ribcage under which to excavate the tunnel. The safety of personnel is of paramount importance to us".

So far, around 35 000 m of casing has been installed at the Susa site using the Tubex method. This corresponds to about 1000 m of tunnel advance. About the same amount has yet to be installed at the same worksite.

At another of Trevi's worksites, this time on the Aosta to Monte Bianco motorway project, it has been decided that 100% of pre-consolidation work will be done using the Tubex method. It is estimated that 150 000 m of casing will be installed, corresponding to around 3000 m of tunnel advance.

SUPPORT FROM SANDVIK

Sr Ezio Fogliata, General Manager of Sandvik Rock Tools Division, had this to say about Trevi's pioneering application of the Tubex method:

"It quite often happens that a customer finds a new use for a given product, and this is exactly what Trevi has done. Trevi engineers conceived an idea, experimented with it, and pursued it to perfection. We admire their ingenuity, and give as much support as we can."

Trevi has been quick to refine its new tunnel pre-consolidation method. A series of drill rigs, specially designed to handle Tubex in sub-horizontal applications, has been developed by the group's manufacturing associate, Soilmec. This has culminated in the SM 505 TD, a substantial two-boom, crawler-mounted rig capable of covering a face with a radius of 6.80 m, from one parking position.

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WELDING PIPE ON CABLE-TOOL JOBS

Tough enough to stand severe driving and the resulting vibration, and strong enough to keep from being pulled in two — these are the well driller's basic requirements for a pipe joint. In addition, he wants straight alignment at each joint and a smooth inside surface.

Threaded and coupled pipe pretty well meets these stringent demands, when the proper size and length of threads are cut accurately on both the pipe and the coupling, when the threads are carefully protected from damage in handling and when pipe of sufficient wall thickness is used. Screwing pipe together is a simple operation requiring only standard tools. Admittedly; it is hard work and does require the best wrenches and pipe tongs that money can buy.

Why then, should joining pipe by electric arc-welding attract water-well drillers' attention when threaded joints seem to be satisfactory? Job experience shows several practical reasons.

- Plain-end pipe costs less than threaded and coupled pipe.
- Properly welded joints have proven to be stronger than screwed joints.
- Smooth joints make pipe easier to drive through earth materials.
- Absence of couplings is helpful when one pipe must be telescoped through another.
- One man can weld 4", 5" or 6"; screwed joints usually require two men on the tongs.

Obviously, welded joints require good welding equipment on the job and a driller-welder with sufficient skill to make dependable welds every time.

To get first-hand information on the important steps in welding pipe for well casing, we visited the jobs of three Minesota drilling contractors who weld pipe on much of their work. The photographs shown here were all taken on those jobs and illustrate methods that these contractors have adopted.

WELDED JOINTS STRONGER

All the contractors have found that welded pipe joints stand hard driving better than threaded and coupled pipe. Before changing to the use of welded joints, E.H. Renner & Sons of St. Louis Park experienced eight to ten failures per year, where threads were stripped or couplings split. Thus far, they have had no failures of welded joints.

When using threaded and coupled pipe in southern Minnesota, Al Miller of Spring Valley used to find it necessary to put fillet welds on the couplings for added strength after screwing up the joints. In his territory, it often takes a lot of hard driving to penetrate certain formations. Butt-welded joints have proven highly satisfactory and are obviously considerably more economical than the screwed joints reinforced by welding.

The Keys Well Drilling Company of St. Paul welds all joints on 16-inch OD pipe and larger. This firm uses both threaded and welded connections for eight-inch, 10-inch and 12-inch pipe. But when hard driving is expected, welded joints are preferred on these sizes too, because they have proven stronger.

Both the quality and the speed of welding are considerably influenced by the care with which the joint is prepared and set up before the arc is struck. The pipe ends must be cut off at right angles to the axis of the pipe. The end that is to form the upper half of the welded joint should be chamfered on the outside to an angle of 40° to 50°. The other pipe-end is often left square, with no chamfer, so that it will not be mushroomed when struck repeatedly while being driven. The two pipe ends, when brought together, form a bevel groove rather than a full vee groove.

The practice of the Keys Well Drilling Company is to chamfer both ends to form a full vee groove for welded joints on eight-inch and larger pipe. Drive heads are all machined to fit the chamfer closely so that the end of the pipe is not damaged when being driven.

A full vee groove formed by 35° chamfers on both sides of the joint assures that the weld will extend through the full wall thickness of the pipe. The strength of a welded joint varies with the degree of weld penetration. Since drillers want maximum strength, complete penetration is essential. To ensure better penetration in a bevel groove, the chamfer on the pipe that forms the sloping side of the joint must be at a liberal angle as compared to the chamfer for the full vee.

Besides taking pains to get full penetration, the operator must also develop skill to avoid entrapping slag when welding in a bevel groove. Bits of slag do tend to drop on the flat side of the groove in the path of the advancing bead.

Each pass or bead is cleaned before starting the next pass. Slag is carefully removed from the surface by vigorous wire brushing. Any spots of slag inclusion within the weld metal are completely chipped out with a chisel or chipping hammer.

SET-UP FIXTURES

Good welding practice demands the use of a good setting-up fixture two to four feet long with heavy clamping devices near each end. Renner and Miller both use a heavy angle with large C-clamps welded on. This fixture works nicely for holding pipe up to six-inch diameter. For aligning larger pipe, Keys uses two steel channels that are snugged against the pipe by bolts passing through chain links welded to the channels. While applying the holding fixtures and setting up a joint, all the contractors use a level or straight-edge to carefully check the alignment.

Two or three eight-penny nails seem to be the favourite guage for the gap between the pipe ends. In welding language, this gap is called the root opening which should be 1/16" to ⅛" to ensure full penetration of the weld in a bevel groove. No gap or root opening is needed if a full vee groove is provided.

If pipe is slightly out of round, the length suspended in the derrick is rotated until the best fit at the joint is obtained. Use of an internal line-up device would be difficult and impractical when welding well casing so the best possible matching of the outer circumference of the pipe should be achieved in setting up each joint. Badly deformed ends must be re-shaped or cut off.

The operation of driving pipe in cable tool drilling is usually the factor that has the greatest effect on the cost and speed of the job as a whole. Pipe with welded joints drives more easily, according to the contractors, and thus reduces the cost of drilling operations in most cases. Couplings on threaded pipe set up extra resistance to driving and also increase the difficulty of pulling pipe back, such as may be necessary when setting a well screen.

Another disadvantage to threaded couplings is their necessarily large outside diameter. Extra clearance for the couplings must be allowed when telescoping one size of pipe through a larger one. In cable tool drilling, it is necessary to "reduce" the size of the hole being drilled whenever excess friction stops one string of casing before the desired depth is reached. The next smaller size of pipe is set inside and driven out through the bottom of the casing which has already been driven to refusal. If the well is started with five-inch pipe, the size must be reduced to three-inch to allow threaded and coupled joints to pass through the five-inch. However, if welded joints are used no allowance for couplings is needed and so four-inch pipe can be put down through the five-inch. The well can then be completed as a four-inch hole in the water-bearing formation which, in effect, gives the owner a larger well.

E.H. Renner & Sons and Al Miller both use 200 ampere welding machines made by the Lincoln Electric Company of Cleveland. Keys Well Drilling Company uses a 300-ampere Hobart welder. Coated electrodes to produce a shielded arc while welding are used without exception. The electrode coating is consumed in the arc to form a protective shield around the molten metal. The coating also produces a removable slag which covers and protects the bead during cooling. The shielded arc largely prevents the formation of oxides and nitrides in the weld metal and produces a sounder joints.

The normal procedure in welding a pipe joint is to first tack the joint in the root of the groove at two or three points about evenly spaced on the circumference. This serves to prevent distortion as welding heat builds up. The root pass is then made around the entire

joint. It is best to use ⅛" electrode for the root pass to ensure full penetration of the weld in the root of the groove. This is followed by one or more passes, often with heavier rod, to fill the groove and join the rest of the wall thickness of the pipe. For four-inch pipe, two passes with ⅛" electrode are generally adequate. Three pases with ⅛" electrode are required for five and six-inch pipe. For larger pipe, Keys Well Drilling Company uses 3/16-inch electrode with three or four complete passes depending upon the wall thickness of the pipe.

One of the accompanying pictures shows an interesting idea used by Al Miller. When ready to add a joint of pipe, he slips the pipe over the drilling bit and stem with the tools lying on the ground. A bolt, used as a pin, is put through a hole in the bit to retain the length of pipe on the tools as they are picked up. The pipe is set up in place and the joint is welded with the drilling tools hanging inside. Driving the pipe is then resumed. If the pipe can be driven far enough so that the tools can be lifted out and swung free, drilling and bailing are then done in preparation for the next drive. In case the pipe will not drive far enough, it is cut off with an oxy-acetylene torch at a level that will permit using the tools for drilling and bailing.

The pipe is cut carefully so that it can be readily welded at this point when the next length is added. Obviously, Miller increases the average length of the pipe joints used and decreases the number of welded connections by this scheme.

The contractors whose methods have been described here would probably be the first to say that these welding practices can and will be improved, if such a question were raised. Anyone who has experience-tested procedures that produce high-quality welded joints rapidly and economically is invited to submit his ideas for publication in the *Journal*.

ACKNOWLEDGEMENTS

We acknowledge gratefully the assistance and information supplied by Tom Renner, Ed Renner, Jr., Al Miller and Jack Keys of the respective drilling firms whose jobs were visited and photographed. We are also grateful to Roy Williams, district manager of the Lincoln Electric Company, who arranged for several of the photos and furnished certain technical information on arc welding practices developed by Lincoln Electric.

METRICATION MUDDLE

"Metrics, don't talk to me about metrics, mate!" said the farmer.

"When they changed from pounds, shillings and pence to dollars, it made my place twice as valuable, so my rates doubled.

"When they changed from acres to hectares, I lost half of my land, rates doubled again.

"When they changed from miles to kilometres, it put my place twice as far out of town and doubled my petrol bill. And I get booked twice as much for speeding.

"Since they changed from gallons to litres, it takes four times as much petrol to fill the ute's tank.

"I used to have a dam that held 100,000 gallons. When this became 454,600 litres, the dam overflowed and flooded what land I had left.

"When they changed from pounds to kilograms, it halved the weight of my cows and doubled the amount I had to feed them.

"My sons have doubled in size since they changed from inches to centimetres, so I had to buy them all new clothes.

"The old lady's figure has filled out from 40-50-30 to 100-127-76, so I had to buy a bigger bed.

"And the weather! Everytime it rains, we get flooded in millimetres. Since they changed to celsius, the place has got too damned cold to live in.

"And daylight saving! The extra hour of sunlight curdled the cow's milk, faded the curtains, makes the hens lay hard-boiled eggs and turned me roosters funny."

GROUND-WATER PURIFICATION

Vyredox is a natural method to remove iron and manganese from groundwater to purify it for drinking before the water is pumped to the surface. Water, enriched with oxygen, is forced down the well for 20-hour periods every second or third week. This enriches a zone around the well with oxygen. Bacteria multiply, and with their aid, the dissolved oxygen oxidises iron and manganese and renders them insoluble. The precipitated compounds are retained in the soil. Thus potable water is obtained, without chemicals and at a relatively low cost.

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CLAUDE 13024

Lodes of experience – McConnell Dowell mining

Mine development and commissioning work is a growth area for McConnell Dowell Australia Civil Division.

In keeping with the group's reputation for undertaking relatively complex projects, two mine developments contracts in Queensland are underway involving both vast scale and a high degree of difficulty.

The A$7 million Thalanga project is the first stage of a three stage development. Until now, the client has used open pit mining, and gold has been the major product. The current McConnell Dowell contract will create an underground operation with sufficient ventilation and haulage to increase mining capacity for copper, lead, zinc and silver ore.

For a contract of this size it is complex, encompassing many aspects of mining. Existing haulage routes have been rehabilitated with substantial additional support and 3000 metres of cable bolting.

The aim is to create a 'spiral decline' tunnel into the ore body, a zig zag haulage route with side routes at various intervals. The 1 in 8 spiral decline is 1.3 kilometres in length and the side developments 1.2 kilometres in total.

The equipment used on the project is described as state-of-the-art, and in the same breath 'distinctly spacelike'.

The Tamrock Jumbos, the 'Rolls Royces' of electric-hydraulic jumbos, drill 60-70 holes 3.5 metres deep into the face. Once the holes are drilled, they are filled with explosives and blasted. The material is scooped onto the apron of a Schaeff Electric Tunnel loader and conveyed up to Volvo A20 dumpers. Because of limited ventilation, electricity powers the majority of underground equipment.

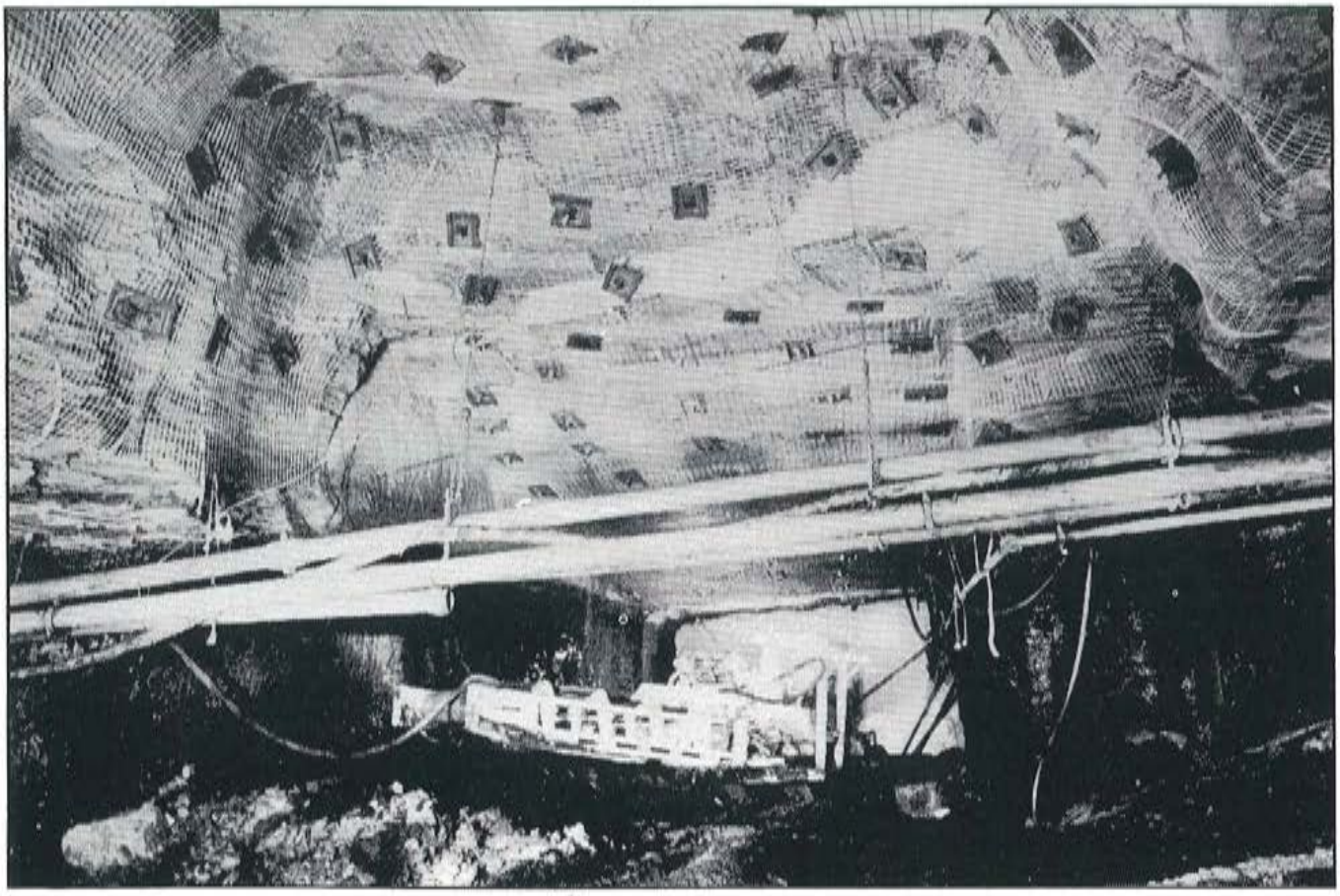
As a result of the nature of the development, the mining operation has a greater capacity than similar mines, because three and sometimes four faces can be worked simultaneously, thus streamlining proceedings.

For Thalanga's Project Manager Gary Parkinson the major difficulty is quantifying what lies ahead.

"When you build a building you can see what is in front of you. With mining you are pushing a tunnel into territory you really cannot quantify. Perhaps there are fault planes or underground streams ahead which can make things very difficult, so you have to achieve the best advance possible whatever the ground."

To achieve their November 1990 completion target the 40 man crew at Thalanga work six days a week, two shifts per day, ten hours per shift.

It is an extremely isolated existence. Townsville, the closest city, is 220 kilometres away but it has become well worth the thirsty journey to travel there on the occasional day off.



Oaky Creek coalmining operations. A rear view of the scorpion tailed Jeffrey 120H2 continuous miner performing in its own amphi-theatre. This machine has been specially modified with a 5.2 metre cutting head to enable roadway excavation in a single pass.

Like Thalanga, economics have dictated the underground development of the Oaky Creek Coal Mine. The A$6.5 million McConnell Dowell contract involves the construction of the initial underground roadway development within the coal seam, 5.2 metres wide, 3 metres high and totalling 3.5 kms in length. Two reinforced concrete portals and a concrete line ventilation shaft, 4.5 metres in diameter and 75 metres deep, are also being built.

The primary difference between Oaky Creek and Thalanga is the nature of the material to be excavated. Thalanga, like previous McConnell Dowell mining contracts, is in 'hard rock'. However the softer nature of Oaky Creek's coal necessitates different mining equipment. The acquisition of suitable mechanical and electrical plant and equipment has therefore been of supreme importance. All coal mining equipment must be flame proof and intrinsically safe due to the inherent volatility associated with coal seams, especially methane gas and high percentages of combustible particles.

The most significant item of equipment is a continuous miner, a Jeffrey 120H2, overhauled and modified with a 5.2 metre wide cutting head to enable roadway excavation in a single pass.

The complexity of the Oaky project, like Thalanga, is compounded by long hours and the isolation of the site. Oaky Creek is truly a Central Queensland location, 17 kilometres from the township of Tieri which is in turn three hours from the coastal towns of MacKay and Rockhampton.

The 24 hour working day is divided into three shifts, seven days a week and to ensure maximum productivity the shift change occurs "at the face" meaning that each shift excavates coal for the full eight hours.

Home for most of the 72 people on site is a portable building camp provided by McConnell Dowell Building Products subsidiary, Pacesetter. A 'mess' subcontractor is kept busy 24 hours a day, seven days a week, supplying food to hungry gangs. And as with Thalanga, it's still a long way to the nearest pub.

Contractor:
McConnell Dowell Constructors (Aust) Pty Limited
Jobs:
Thalanga Mining Project Oaky Creek Coal Mine
Location:
Queensland, Australia
Contract:
A$7 million (Thalanga)
Values:
A$6.5 million (Oaky Creek)

MONITORING WELL CONSTRUCTION HANDBOOK NOW AVAILABLE

The Handbook of Suggested Practices for the Design and Installation of Ground Water Monitoring Wells is now available from the National Water Well Association (NWWA-USA).

The handbook addresses field-orientated practices to solve problems, rather than conceptual or idealised practices. It focuses on state-of-the-art technology that may be applied in diverse hydrogeologic situations.

Sections found in the 298 page monitoring well handbook include: Factors influencing design and installation; well planning considerations; selection of drilling methods; design components; well completion; well development; well network management; and well abandonment.

Forty-three tables and 20 figures are used to clarify concepts discussed throughout the book. In addition, 40 pages of matrices for selecting appropriate drilling equipment for monitoring well construction are featured.

Prepared by NWWA under sponsorship of the U.S. EPA's Environmental Monitoring Systems Laboratory, Las Vegas, Nevada, the book (Catalogue Number T479) is available from NWWA for $43.75 ($35 to NWWA members), plus $3 for handling and shipping. To order, send complete payment to: NWWA Bookstore, P.O. Box 182039, Dept. 017 Columbus, Ohio 43218.

DRILL '90 CONFERENCE & EXHIBITION "FUTURE DIRECTIONS"

Launceston Federal Country Club/Casino. Tasmania.
Saturday 6th — Tuesday, 9th October, 1990.

PRELIMINARY PROGRAMME

Sat. 6th Oct.

12.00 m/d - 6.00 p.m.	Delegate Registration. Golf &/or Tennis Tournament from 2.00 p.m.
7.00 p.m. - 9.30 p.m.	Welcoming Cocktail Party/Carvery Dinner.

Sun. 7th Oct.

9.00 a.m. - 10.30 a.m.	First Session — "History Of Mining In Tasmania".
10.30 a.m. - 11.00 a.m.	Morning Tea/Coffee — Viewing Exhibits.
11.00 a.m. - 12.30 p.m.	Second Session — "Raise Boring".
12.30 p.m. - 2.00 p.m.	Lunch — Viewing Exhibits.
2.00 p.m. - 3.30 p.m.	Annual General Meeting.
3.30 - 4.00 p.m.	Afternoon Tea/Coffee — Viewing Exhibits.
4.00 p.m. - 5.00 p.m.	Annual General Meeting.
7.00 - 9.30 p.m.	Welcoming Dinner — Opening Address.

Mon. 8th Oct.

9.00 a.m. - 10.30 a.m.	Third Session — "Drilling & Blasting".
10.30 a.m. - 11.00 a.m.	Morning Tea/Coffee — Viewing Exhibits.
11.00 a.m. - 12.00 m/d	Fourth Session — "Diamond Drilling".
12.00 m/d - 1.00 p.m.	Lunch.
1.00 p.m. - 5.30 p.m.	Coach Tour (Delegates & Partners).
	EVENING FREE

Mon. 9th Oct.

9.00 a.m. - 10.30 a.m.	Fifth Session — "Environmental Drilling & Monitoring" (Inc. Cable Tool).
10.30 a.m. - 11.00 a.m.	Morning Tea/Coffee — Viewing Exhibits.
11.00 a.m. - 12.30 p.m.	Sixth Session — "New Products".
12.30 p.m. - 5.00 p.m.	Barbecue Lunch — Castrol Drill Skill '90 Competition.
7.00 p.m.	Closing Dinner/Dance.

PARTNERS PROGRAMME

Coach Tours to local scenic attractions have been arranged for partners accompanying delegates to Drill '90 on:

Sunday, 7th October.

Monday, 8th October (with conference delegates).

Tuesday, 9th October, 1990.

DRILL '90 EXHIBITION

Indoor Exhibition Booth Space (approximately 3x3 metres) is available.

For those not wishing to freight heavy items across Bass Strait, why not consider a Poster or Audio Visual Display?

Morning & Afternoon Tea will be served within the Exhibition area.

DRILL '90 SPONSORSHIP

Sponsors are being sought for provision of the conference satchels and printing/binding of conference papers.

Recognition of sponsor support will be via the sponsor company "logo" appearing on either or both of these items, plus publicity circulated to all potential delegates.

For details of anticipated costs, contact:

John McLean
Drill 90 Vic. Branch Committee.
Tel: (03) 873-1144.
Fax: (03) 874-3312.

RUDCOPRINT

Longyear New Zealand Ltd

Canning Crescent, Mangere, Auckland.
P.O. Box 43-030, Mangere, Auckland.

Telephone:	(09) 275-4049.
Toll Free Phone:	0800 80 5961
Fax:	(09) 275-3182