NUMBER 2

THE SYDNEY HARBOUR TUNNEL

MARCH 1988

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Sydney Work Taking Shape

The major Tunnel construction site in Sydney is rapidly taking shape in Bradfield Park, Milsons Point.

Work has already begun on the excavation, which will reach a depth of 26 metres.
Also under way are major facilities such as the load-out jetty (from where spoil will be taken for disposal at sea) and the coffer dam, being built west of Jeffreys Street Wharf.
A $7 million contract for the first stage of work at Milsons Point was awarded to Thiess Contractors Pty Ltd on 17 February.
Work on site began on 29 February, and progress has been rapid.
To help residents keep up with what is happening and where, the Sydney Harbour Tunnel Joint Venture is distributing brief Construction Bulletins, in addition to this newsletter.
Construction Bulletins will be prepared at least fortnightly, and more frequently if required, in the early stages of construction.
They will be distributed in the immediate area of the construction site.
If you live outside that area and would like copies, please contact the Community Relations Officer, Ms Denise Eisenhuth.
Phone 959 3028 or write to PO Box 296, North Sydney 2059.
This newsletter will continue to be published quarterly and distributed in Kirribilli, Milsons Point and Lavender Bay, as well as areas near the Tunnel construction site at Port Kembla.
Construction Bulletins will be distributed while rapid development of the site continues.

Work in progress in Bradfield Park, Milsons Point for the Tunnel

A map showing major Tunnel works at Milsons Point was printed in the previous issue of this newsletter, and is reprinted in this issue (see inside).

What's Involved

The excavation now under way will be the site of three major operations.

1) Construction of the Tunnel ventilation station, which includes the interface between the immersed tube section of the tunnel, to be positioned in a trench on the harbour floor, and the land section of the Tunnel.
2) Excavation of a pilot tunnel.
3) Driving the main land tunnels north to the Warringah Freeway.

Excavation will continue into the second half of 1988.
The next contract to be awarded will be for the pilot tunnel, running north along the path of one of the main tunnels, which will be driven next year.
Work on the pilot tunnel is expected to start early in the second half of 1988.
Surplus spoil excavated from Milsons Point will be loaded onto barges and dumped at sea.
There is no access to the Tunnel construction site from Broughton Street, and Tunnel construction traffic is prohibited from the Kirribilli side of the bridge and approaches.
Bradfield Park will be restored as work on the Tunnel is finished, with completion scheduled for 31 August 1992.

Port Kembla

Major Marine Project Starts

Work is well under way at Port Kembla to prepare for what will become one of Australia's largest marine civil engineering projects.

The $10 million contract for excavation of the casting basin, next to the Inner Harbour, was awarded to Leighton Contractors Pty Ltd in January.
Major work began in February, and is on schedule for completion at the end of August 1988.
The casting basin is the site for constructing the eight 22,000 tonne reinforced concrete units to be placed in a trench to be dredged on the floor of Sydney Harbour for the Tunnel.
The units will be built in two batches of four, starting late this year, under a separate contract.
Each unit will be 120 metres long, 26 metres wide and 7.5 metres high.
The casting basin itself is 320 metres long and 100 metres wide, and will be about 12 metres deep.
About 50 jobs will be provided by the excavation,

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Heavy construction machinery at work at the Tunnel casting basin at Port Kembla

Tunnel Ventilation

Designers Aim To Cut Pollution Impact

A key aim of the Tunnel designers is to minimise the environmental impact of the $408m project.

That applies to all aspects of the Tunnel – and especially the ventilation system.
In all the debate about the Tunnel, a number of claims have been made about this system.
The fact is, however, that the Tunnel actually reduces the potential impact on Kirribilli and Milsons Point residents of pollution from harbour crossing traffic in years to come.
With the tunnel, local pollution from harbour crossing traffic will be no worse than it is now, and better in many conditions.
Local pollution will certainly be better in future years than it would have been if the tunnel had not gone ahead.
To understand this, three issues need to be considered:

- the way the Tunnel ventilation system operates
- future conditions without the Tunnel
- how the Tunnel will operate to reduce pollution potential.

How It Works

The system will work as follows:

- air will be drawn in through a muffled intake on the slope at the southern end of Bradfield Park to an underground ventilation station roughly midway along the tunnel;
- it will be circulated through vents in the tunnel wall, then drawn along the column of cars and back via the ventilation station to the outlet in the northern pylon of the bridge;
- powerful fans will push the stream of air and vehicle exhaust gases out of the top of the pylon and into the atmosphere.

The major part of vehicle exhausts is carbon monoxide (CO), a colourless, odourless gas.
The World Health Organisation (WHO) limit for CO exposure is 35 ppm for a one-hour exposure and 13 ppm for a one to eight-hour exposure.
Studies in 1986 showed one-hour exposure levels of 10-16 ppm CO in North Sydney (Warringah Expressway, Mount and Arthur Streets), 1.8-5.2 ppm CO in Kirribilli (Broughton Street, Parkes and Upper Pitt Streets) and 2.8-12 ppm CO in Blues Point.

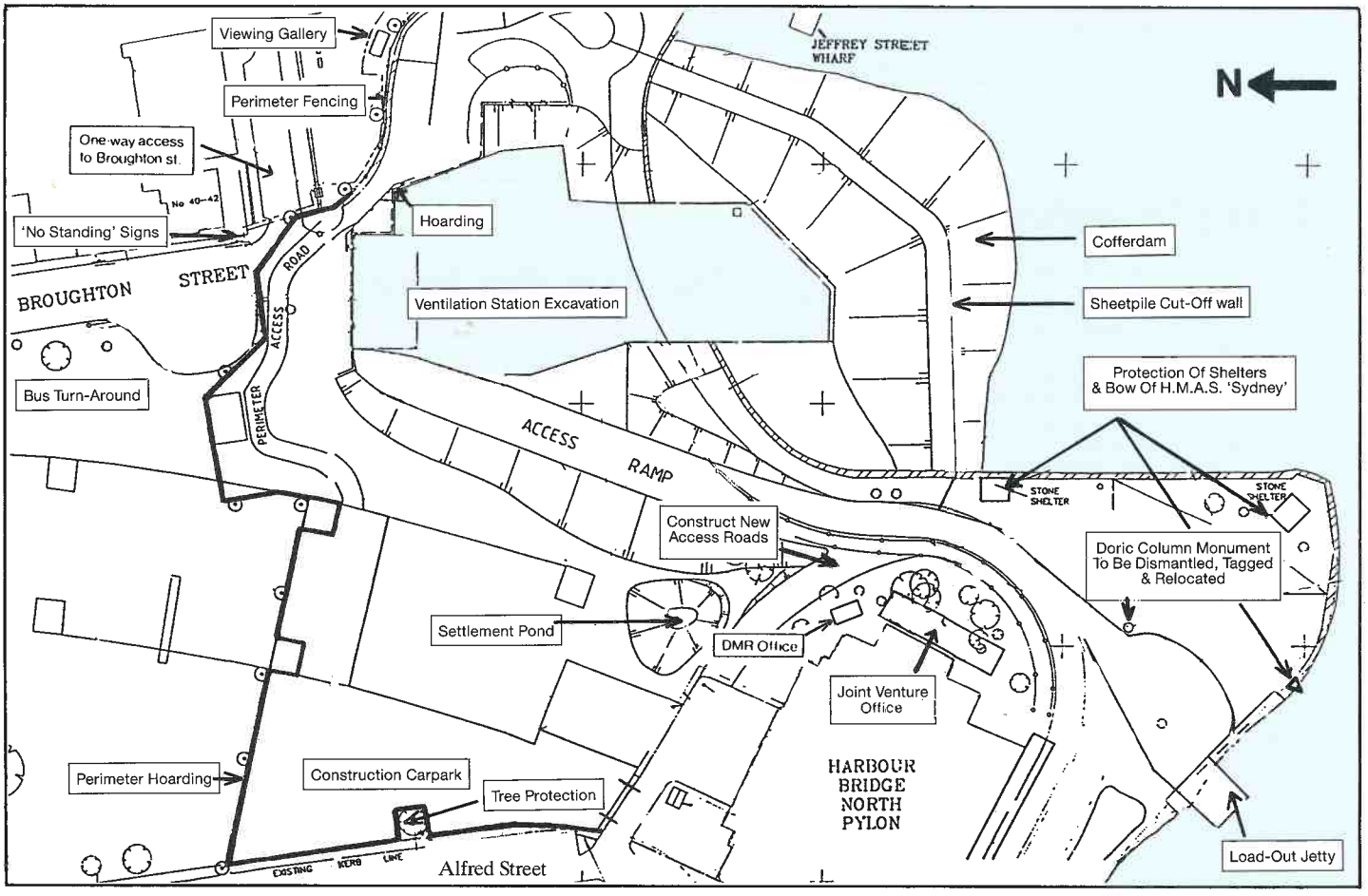
Jams Equal Pollution

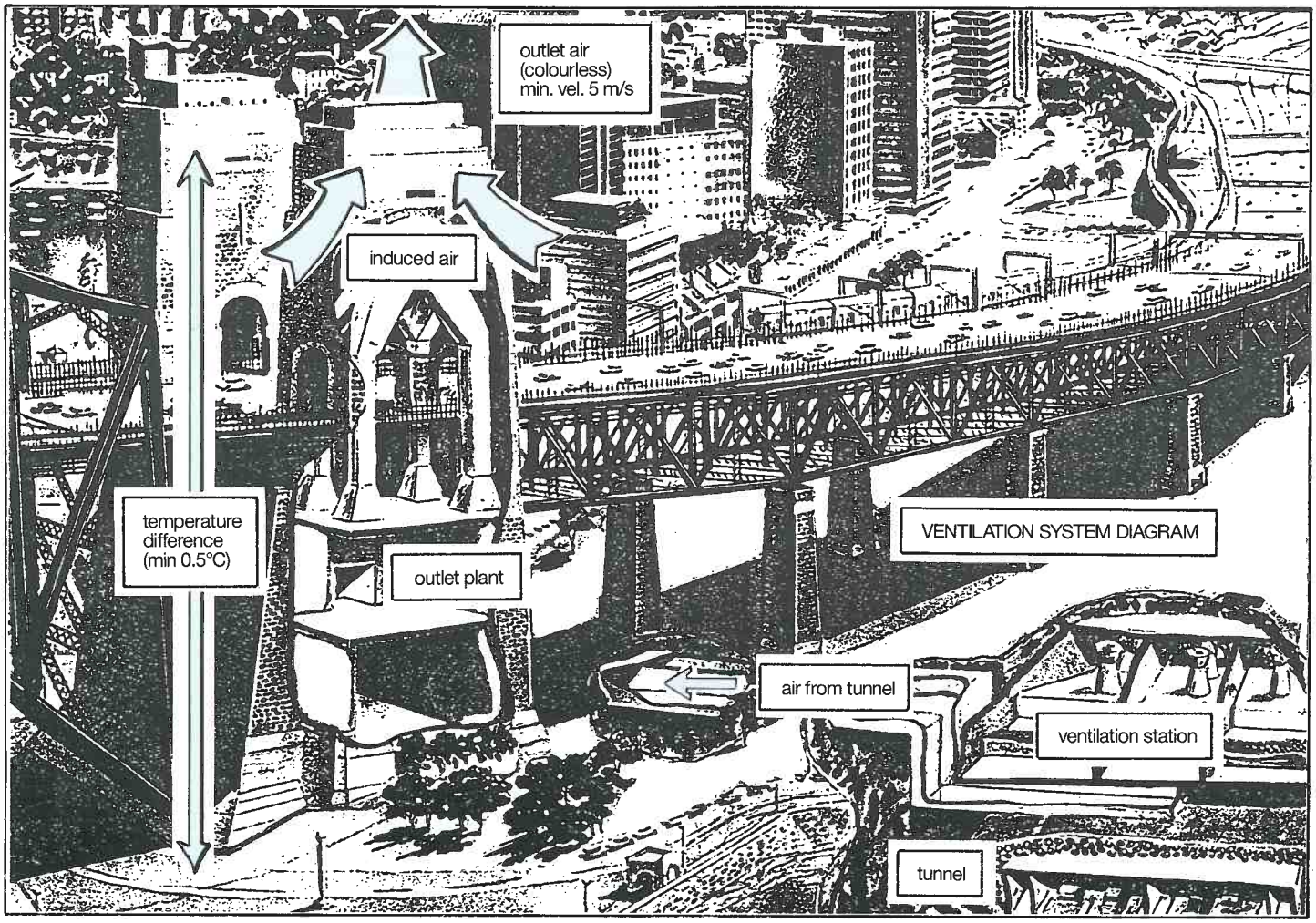
Levels are highest when bridge traffic is stalled in peak periods and vehicles are stopped with engines idling.
Without the tunnel, these levels would increase as vehicles using the bridge increased and the length of the peaks increased (to a forecast 12 hours by 2000).
When the tunnel is built, congestion on the bridge and bridge approaches will be reduced, and so will queueing on local feeder roads.
Accentuating this, southbound tunnel traffic won't be able to enter the expressway south of Falcon Street, so ensuring it bypasses North Sydney back streets.
When the tunnel is operating after 1992, and traffic flows more freely, total fuel usage on the bridge and approaches should be cut by 30% – and 30% less fuel means 30% less pollution and a saving of 13 million litres of fuel a year.
At the northern approaches to the bridge, existing one-hour CO levels are 10-16ppm, largely because of the stop-start traffic, which will be substantially reduced by the tunnel.
Without the tunnel there would be cause for concern about future CO levels in residential areas near northern bridge approaches.
As an additional safeguard, the ventilation system will draw small amounts of air into the tunnel from the northern entrance and exit.
This will not only dilute air from the ventilation outlet, but also help ensure that pollution does not escape from the tunnel entrance and exit.
In operation, the ventilation system is designed to handle a 'worst case' condition involving both tunnels full of stalled traffic and all engines idling.

Detectors Cut In

Before that worst case was reached, however, vehicle detectors built into the road and CO detectors in the tunnel would alert tunnel controllers to the traffic jam and exhaust build-up.
The developing situation would be viewed on closed circuit television within the tunnel control building.
Increased stages of fans would be triggered, bringing more fans into operation and more fresh air into the tunnel.
Traffic entering the tunnels would be diverted.
Drivers already inside would be told to switch off engines, by illuminated signs on the tunnel ceiling and through radio re-broadcast transmitters.

TUNNEL CONSTRUCTION AT MILSONS POINT





Outlet Air Dispersed

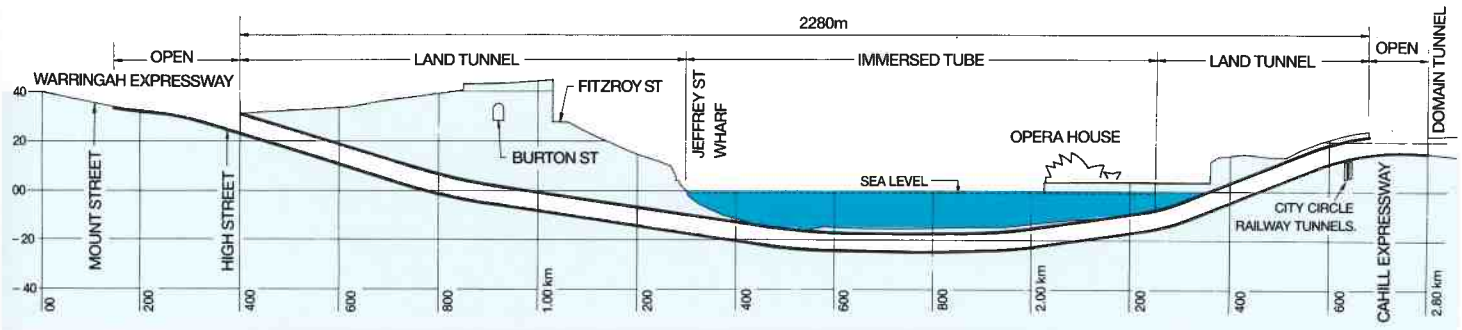
As outlet air is expelled from the top of the pylon, a number of factors operate to disperse it away from Kirribilli, Milson's Point and other nearby areas.
The first is the buoyancy effect.
Air temperature decreases with altitude, falling by about 2 degrees centigrade for each rise of 300 metres.
Air from the tunnel is drawn in from ground level and will be about 0.5 degrees C warmer than surrounding air at the top of the pylon
When released it is lifted by its relative buoyancy, and it can rise for more than one thousand metres – further, in fact, when there is little or no wind.

Jet Velocity Effect

The second factor is the jet velocity effect.
Air won't just drift out from the top of the pylon – it will be forced up, adding to the buoyancy effect and pushing the air up, even in a temperature inversion.
The minimum velocity of outlet air will be about five metres a second – even in strong cross winds providing a "throw" of an additional 150 metres from the top of the Pylon, already 90 metres above sea level.
In peak periods, more fans will be operating and the "throw" will be greater.
The third factor is the induction effect.
Ventilation air blown upward from the pylon will exert a drag force on the surrounding air, inducing it to move toward the discharge airstream, mix with it, and be pulled upward as well.
The result is rapid and thorough diffusion of air discharged from the tunnel.

Finally, there's the issue of visual impact.
Other tunnels around the world have large, ugly ventilation stations above ground at both ends.
That was not acceptable for Sydney
So the Tunnel designers looked for and found a clever alternative.
It utilises the northern bridge pylon as an outlet for the ventilation system, and places all other equipment underground.
When the tunnel is complete, the only sign of its existence apart from the entrances and exits will be the ventilation air intake.
This is at ground level in Bradfield Park, and will be muffled to below background noise levels day and night.
This design puts Sydney streets ahead of the rest of the world.

Tunnel Route



Elevation drawing of the Tunnel route, showing its location in relation to major landmarks (the scale is compressed horizontally, accentuating gradients).

Port Kembla

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with a total of 150 jobs involved in construction of the concrete units.
In conjunction with the tunnel works, the Department of Main Roads is building a new port access road from Springhill Road, and this is scheduled for completion at Easter.
As part of preparation for the work the western coal dumps have been removed.
Spoil from the casting basin is being taken to adjoining sites on both sides of the rail loop serving the coal loader, and is expected to help further development of this area.
After use for the Tunnel, the casting basin will form part of the proposed harbour extension.

The Tunnel casting basin at Port Kembla

Conditions Set For Hours, Noise

Work at the Tunnel construction site at Milsons Point is not permitted on Sundays or public holidays, and must stop at 3pm on Saturdays.

These are some of the tunnel construction conditions set by the State Pollution Control Commission.
SPCC conditions cover the first stage of Tunnel construction at Milsons Point, which began in February.
For noise control, the SPCC defines three categories of noise level activities.
The first is short-term activities.
In this category, noise levels of up to 70 decibels (measured at nearby residences) are acceptable, for activities lasting for up to one month.
Permitted working hours in this category are 7am to 6pm weekdays and 7am to 1pm Saturdays.
The second SPCC category is medium-term activities.
In this category, noise levels of up to 60 decibels are acceptable for activities lasting from one to six months.
The third SPCC category is long-term activities, where noise levels of up to 50 decibels are permitted for activities lasting more than six months.
Permitted working hours for medium and long-term noise level activities are 7am to 10pm weekdays and 7am to 3pm Saturdays.
Work can be allowed outside these hours if noise levels are within the SPCC long-term night limit of 40 decibels, which is significantly under background noise levels in the area.
Major work likely to involve extended hours is tunnelling, which will be deep underground.
Other conditions require the Sydney Harbour Tunnel Joint Venture to monitor noise and vibration.
All contractors' equipment on site must meet SPCC noise standards.

Noise from the site is being minimised using several techniques, and a three-metre acoustic barrier has been erected on the eastern and northern sides of the excavation.
The Joint Venture is spending about $250,000 on measures and techniques to reduce noise during construction.
In addition, measures required to be used by the various contractors involved will result in significantly increased costs to the Joint Venture.

Trial Blasting Scheduled

Trials are taking place at Milsons Point of techniques for use if blasting is required for Tunnel construction.

They are being organised in conjunction with the State Pollution Control Commission, which would set standards for any blasting which took place.
Blasting is being studied both to remove particularly hard rock, and to reduce the need for particularly noisy mechanical excavation equipment, such as hydraulic rockbreakers.
Controlled blasting techniques developed by the Joint Venture's own construction experts and one of Australia's leading explosives experts will be tested in the trials.
Residents will be informed of times for trial blasts and are encouraged to monitor the effects and discuss any concerns with the Joint Venture.

Hoarding Vote

Kirribilli residents have voted strongly for a plain "environmental green" finish to the hoarding around the Tunnel construction site at Milsons Point.
In the first issue of this newsletter, in December last year, residents were asked to give their views on this issue.
There were two major options for painting the hoarding:

- a plain dark green
- a special design symbolising Sydney landmarks and pastimes.

Local opinion, in letters and calls and contact with Tunnel staff, was strongly in favour of the plain green option.
As a result, the environmental green finish was chosen by the Joint Venture.

Tunnel Appointment

A Community Relations Officer has been appointed by the Sydney Harbour Tunnel Joint Venture to help communication between local residents and the project.

She is Ms Denise Eisenhuth, of Kirribilli.
Ms Eisenhuth was formerly Personal Assistant to the Tunnel Project Manager.
She has considerable experience with the construction industry and community activities.
Ms Eisenhuth can be contacted by phoning (02) 959 3028, or writing to PO Box 296, North Sydney 2059.