

## Sydney's M5 Tunnel Closed Again by Computer Glitch

November 2005

The M5 Motorway is a major link connecting Sydney, Australia, in the state of New South Wales, with points southwest. Completed in 2002, the 22-kilometer motorway is partly free and partly tolled. It currently carries over 100,000 motorists per day.

A 4.5-kilometer tunnel near Sydney airport has proven to be the Achilles heel of the motorway. Costing AU\$800 million, it has been closed six times in the six years since the tunnel opened, causing major backups and creating political outrage.

### The September Outage

The latest affront to Sydney motorists came on the morning of Monday, September 22, 2008. The morning rush-hour traffic on the M5 came to a sudden halt at 9 AM on that day. One of the twenty or so computers that monitors the safety systems in the tunnel suffered a circuit-board failure. No problem, right? The system has a backup just for this purpose. Unfortunately, the backup failed to take over.

The tunnel was not reopened for almost three hours. The closure of the tunnel shut down the M5 in both directions from the Sydney airport to King Georges Road.



Normally, the tunnel handles 6,000 cars per hour during the morning rush hour. The closure stranded hundreds of cars for hours with no way to get off of the M5. 20,000 other motorists turned side streets into gridlock as they tried to bypass the tunnel. Eight were injured in the pileup.

To add insult to injury, a car fire shut down all east-bound lanes on the M5 the next day around 10 AM, just after the morning rush hour.

### A Miserable History

This was the second time in three months that the tunnel had closed. On June 25<sup>th</sup>, a computer glitch shut down the tunnel for five hours, again during the morning rush hour. And again, the backup system did not kick in. An estimated 27,000 motorists were stuck in the traffic backup. Many of them gave up and returned home, giving up a day of work.

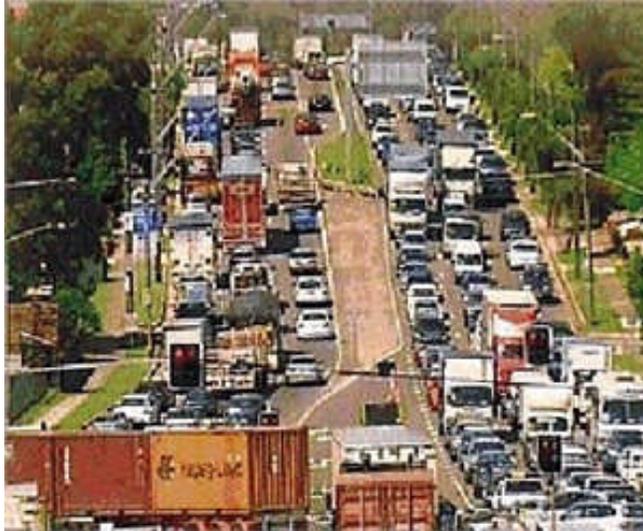
A third closure occurred on February 1, 2002, just after the tunnel opened. Again, this closure was caused by a computer failure.

In all, there have been at least six closures since the tunnel opened in early 2002. The other three outages were caused by failures in other systems. The tunnel lights failed in January, 2002. In March, 2004, the tunnel closed due to a power failure (where were the diesel backups?). In December, 2004, the closed-circuit TV systems failed.

Sydney motorists are undoubtedly bracing for the next failure.

## The Aftermath

The problems facing the operators of the tunnel are manifold. The tunnel operation contractor is Baulderstone, Hornibrook, Bilfinger, & Berger. Expiring in 2011, its contract with New South Wales calls for BHBB to manage traffic averaging about 75,000 vehicles per day. Rather, the tunnel is carrying over 100,000 vehicles per day. As a result, the New South Wales government may have to pay as much as AU\$13 million in additional operational fees over the life of the contract due to the overwhelming increase in traffic.



Part of the traffic increase is attributed to the Cashback program, which was introduced after the traffic modeling was done for the operations contract. Cashback reimburses motorists for the cost of the M5 toll.

However, notwithstanding these factors, after the second major tunnel closing in three months and the sixth in as many years, the NSW government is cracking down on the tunnel operators. NSW Premier Nathan Rees, in typical Aussie terms, said that he was “filthy” over the latest computer glitch.

After a tense meeting between NSW representatives and BHBB, in which threats were made to cancel BHBB’s contract and turn operations over to the Roads and Traffic Authority, it was agreed that the company would have a software engineer on site 24 hours per day, seven days per week. The government also commissioned an independent audit of the motorway’s aging systems and the associated safety problems. It is felt that upwards of AU\$5 million dollars will need to be invested to update these systems. The audit will look at tunnel systems around the world to make sure that the best available technology will be used.

## Lessons Learned

There is no reason why the safety-monitoring systems such as those used in the M5 tunnel should be so susceptible to failure. Imagine the outcry if the Chunnel connecting England to the European continent was as unreliable? As it happens, the 58-kilometer Chunnel has been closed three times since its opening in 1994, but all three closures were caused by truck fires on the HGV (Heavy Goods Vehicle) shuttle that carries large trucks through the Chunnel.

It seems that there are three problems facing the operators of the M5 tunnel:

- It appears that the NSW government (and perhaps the operators as well) are trying to get too much life out of an old, creaky system (though six years doesn’t seem to be that old).

It is clear that the system is probably inadequate, but the strategy seems to be to try to get just a little more life out of it. When will it fail next? How does the cost of the lost productivity of tens of thousands of Sydneians compare to the cost of a new and improved system?

- Apparently, the backup system has consistently failed to take over the safety-monitoring functions of the primary system following a primary system failure. This smacks of a failure to periodically test the backup system and its failover capabilities. Certainly, during the wee hours of the morning, tunnel traffic is light enough so that the risk of a failover fault is mitigated. There is no reason why failover to the backup cannot be tested frequently.
- On the other hand, we don't know how often the backup system did perform properly. If failover worked properly 90% of the time, 30 primary system failures in six years doesn't bode well for the tunnel's safety systems.

There are disasters over which we have no control. There are also the disasters that we just let happen.<sup>1</sup> The M5 experience seems to be a good example of the latter.

## **Acknowledgements**

Material for this article was taken from the following sources:

Sydney Morning Herald  
The Daily Telegraph  
Yahoo News  
ABC News

IEEE Spectrum Online  
LiveNews  
Campbelltown Local Paper  
Jamii Forums

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<sup>1</sup> Thanks to Richard Buckle for this observation.