



Sustainable water practices in road construction

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The duplication of the Hume Highway in southwest NSW, from Woomargama to Table Top, shows how sustainable water use can be incorporated into a major road infrastructure project.

The Hume Highway links Sydney and Melbourne and forms a key component of one of Australia's busiest inter capital road corridors. As most freight is moved by road, particularly overnight, concern was raised that approximately 67km of the 807km highway still consists of single lanes in each direction.

Upgrading the highway involves significant earthworks and associated engineering activities in a predominantly rural area that also has areas of significant remnant vegetation, habitat and heritage. Another important aspect is that this part of Australia is in the grip of longterm drought conditions, so the availability

of water is scarce.

However, water is an essential component during construction of road works. It is used in compaction of earthworks, dust suppression activities and revegetation of the construction site. Due to the project's large scale, significant volumes of water have been required.

In 2006, funds were committed by the federal government to complete the duplication of the highway so there will be a high grade dual carriageway suitable for current and predicted freight and other traffic. Completing the duplication of the highway has major benefits in improved safety and freight efficiency.



A workshop early in the project identified ways to improve the sustainability of delivery methods for the project.

To deliver the project, the RTA decided to use an alliance framework, with the work being awarded to two alliances; the Northern Hume Alliance and the Hume Highway Southern Alliance.

The Hume Highway Southern Alliance, comprising the RTA, Abigroup and Sinclair Knight Merz (SKM), is delivering the Woomargama to Table Top section of the duplication.

The Hume Highway Southern Alliance management team comprises individuals with specific accountability for design, quality, construction, engineering, occupational health and safety (OHS), environment and sustainability. Each area has overall and equal commitment to the project's outcomes.

A sustainability workshop early in the project identified outcomes and objectives that would leave a legacy to the community, improve the sustainability of delivery methods for the project, involved RTA personnel outside the alliance in the development of the project, and also involved other key stakeholders.

Water savings and rehabilitation of landfill waste are among key innovations achieved by the Hume Highway Southern Alliance, resulting in successful environmental management and sustainability.

Preliminary hydrological investigations that were undertaken as part of the environmental assessment indicated there was a

Surface water management

The Hume Highway Southern Alliance project largely traverses essentially rural precincts, cleared lands and lands modified by grazing and agriculture.

The average annual rainfall representative of the region is 720.6mm over an average of 118 rainy days. The wettest months are July and August with an average rainfall of 84.8mm and 85.7mm, respectively over 15 to 16 days.

The alignment of the road passes over or beside several creeks and drainage lines and these extend along the length of the project. These generally feed into Lake Hume which, in turn, feeds into the River Murray.

The detailed design of the project focussed on the 100 year average recurrence interval (ARI) flood event and noted some “localised flooding could occur upstream of bridges and culverts but the effect will be transient and will have limited impacts on property, agriculture or soil waterlogging”.

Construction activities that potentially create changes to flooding and drainage include topsoil removal, drainage works, bulk excavation, fill placement, spoil stockpiling, and bridge and culvert works.

A surface water management plan was drawn up to cover impacts caused by the constructed highway.

One of these management actions was the construction of sedimentation basins prior to substantial construction activities commencing.

The transverse drainage along the route was designed to limit impact on flow distributions for all events up to the 100 year

ARI. Culverts and bridges are designed to convey the design flow for the 100 year ARI event with events greater than this discharged over the road. Use of diversion channels was limited to small catchments that can't be conveyed across the proposed road, such as in cuts.

Drainage design for both cross drainage and pavement drainage aimed to minimise changes to overland flow into downstream properties by maintaining cross drainage in the location of existing structures and collecting runoff from the highway and discharging regularly into adjacent properties.

Transverse drainage was generally separated from the carriageway drainage with the 100 year ARI design criteria applied to all hydraulic structures.

An appropriate level of stormwater treatment and spill containment was incorporated into the drainage works. In addition, appropriate erosion control such as rock protection and energy dissipaters have been constructed where required.

Significant drainage changes are going to occur at a number of locations along the route. For example, a culvert, including provision for a fish passage, and channel realignment has been provided downstream at an area of Ryan's Creek and Four Mile Creek. Another creek, Mullengandra Creek has also been realigned where its route conflicted with the carriageway.

It has been substantially reconstructed to “mimic” a natural ecosystem with embedded tree stumps and root balls, rock riffles and significant revegetation of creek banks and aquatic habitat zones. ●



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Surface water works on the road construction project. Clockwise from top left: A sedimentation basin, a drainage blanket performing its function, drainage for a temporary crossing at Bowna Creek, and a full sedimentation basin awaiting deflocculation.

severe shortage of reliable water available in close proximity to the project. Lake Hume was identified as the main source, though the weir levels were low due to the prolonged drought and hence represented a scarce resource.

While looking for potential solutions to this problem, Norske Skog Paper Mill, approximately 10km southwest of the project, was identified as having a significant surplus of treated effluent and cooling water from its paper milling process. A solution to pipe this surplus water to the construction site was then investigated.

Working in conjunction with Norske Skog, the Hume Highway Southern Alliance connected a pipeline from Norske Skog to the project alignment, transferring water to a series of inter-linked storage dams. By using Norske Skog's existing pumps and pressure within the irrigation system it controlled, it was found that minimal energy was required to transfer the water to the construction site.

The recycled water from the Norske Skog facility is now providing approximately 50% of construction water, significantly reducing the reliance on Lake Hume.

When considering other water uses in the project, the design and construction of the project site compound also incorporated sustainability principles and practices. Recycled water and rain-water harvesting in the compound significantly reduces the need

to import potable water to the remote site.

In other water-related aspects, value engineering sessions have identified drainage modifications to shorten the length of culverts that lowered cost and also reduced the length of underpass for fauna to cross through the corridor. The project has also made a significant contribution to the Murray River Re-snagging Project, by donating felled trees and root balls.

In considering other sustainable initiatives, the new road alignment passed over an old tip at Mullengandra. To deal with the waste, material that could be recovered and recycled was sorted, excavating and sieving the waste material to separate ash and soil for reuse in earthworks, with any remaining putrescible material then removed to the Albury landfill tip. The outcome delivered an overall water benefit in the reduction of potential contamination risks to the local surface and groundwater reserves.

The entire road project is expected to be completed by 2012. ●

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