

Category 1 (Projects over A\$1 million)

Tunks Park Aqueduct by Metropolitan Restorations

The Tunks Park Aqueduct presented a different and unusual challenge for the live sewer refurbishment approach adopted for most refurbishment projects. The Tunks Park Aqueduct located in the Sydney suburb of Cammeray is a heritage listed structure of approximately 100 m in length and supported approximately 8 m above the ground. It was designed to carry sewer across the public park area and is located in a very sensitive residential environment close to the Sydney Harbour foreshore. The internal surface of the aqueduct were severely gas affected and repairs to these surfaces as well as external concrete cancer were urgently required.

In 2001 Sydney Water Corporation, the owner of the asset, appointed Metropolitan Restorations Pty Ltd as the head contractor for refurbishment.

The small internal size of the aqueduct, approximately 1 m by 1 m, precluded entry into the aqueduct in a live flow condition. It was necessary to provide a bypass system that could cope with the flows across the length of the aqueduct. A bypass system was designed that incorporated two steel pipes 900 mm in diameter and erected on temporary steel supports running along the length of the aqueduct. Temporary concrete footings were installed to support the structure. The flow was directed into and out of the bypass system via the underside of the aqueduct so as to minimise the damage and disruption to the existing heritage structure.

In addition to the bypass construction, two large noise insulated enclosures were fabricated, one at each end of the aqueduct, to allow the work teams to carry out operations at night without disturbance of the surrounding neighbourhoods.

The repair procedure included some complications.

The thin shell of the aqueduct dictated that excavation work carried out to expose corroded reinforcing needed to be carefully controlled to avoid puncturing the aqueduct shell. It was also not possible in the confined environment to spray apply micro concrete to repair the substrate so hand repairs were affected prior to epoxy application.

The refurbishment work within the aqueduct, being carried out in this type of confined and difficult environment was labour intensive and time consuming. Externally the concrete surface of the aqueduct required a concrete repair solution that would satisfy the strict heritage conservation requirements whilst repairing the structure to good order and protecting its surface for years to come.

Areas of damaged concrete were removed from the structure using small demolition hammers to minimise impact upon the surrounding surfaces. Corroded reinforcing was either cut out and replaced by splice welding or grit blasted and protective coated dependent upon condition.

The removed areas were patched with cementitious mortars and finished using tools de-



A diversion pipeline was built and installed to maintain the systems' continued use during repair works.



Application of 3 pack epoxy mortar to all internal surfaces with areas sectioned off.

signed specifically for the job to reproduce the boarded formwork appearance of the original surface.

Once all repairs were completed, the aqueduct was carefully cleaned and a protective clear coating was applied to all external surfaces.

The final result was that the external repairs matched perfectly and the exterior of the aqueduct appears to be in original undamaged condition.

Sydney Water was impressed with the success of the internal and external repair systems, as well as Metropolitan Restorations' ability to complete such a complex and demanding project in a highly sensitive residential area without the generation of any noise, odour or visual amenity complaints.

Category 2 - High Commendation (Projects of A\$ 500,000 to A\$ 1 million)

South Hurstville NGRS by Metropolitan Restorations



Application of 20 mm thick protective layer of hand applied 3 pack epoxy system under extreme work conditions.

The South Hurstville NGRS project involved the repair of a section approximately 230 m in length of the North Georges River Submain (NGRS) located beneath the southern Sydney suburb of Hurstville.

This 50 year old large box culvert sewer had suffered gas attack above the water line. In particular the reinforced concrete roof had become dangerously degraded and there was a great deal of damage to exposed and corroded reinforcing in this area.

The submain could not be bypassed or removed from service, therefore a live sewer repair system was required. Sydney Water awarded the contract to refurbish this section of sewer tunnel to Metropolitan Restorations Pty Ltd for a sum of approximately A\$ 1 million.

The refurbishment process utilised for this work has been developed over a 15 year period by Sydney Water and specialist companies such as Metropolitan Restorations. To start with, the entire section of tunnel to be rehabilitated was cleaned with high pressure water to remove the soft and decayed concrete and to expose corroded reinforcing.

Once corroded sections of reinforcing are exposed, it is ready for augmentation. This involves cleaning of lightly corroded reinforcing, replacement of severely corroded reinforcing by weld splicing of new rebar and in some cases fixing of new mesh reinforcing with stainless steel anchors.

The entire area to be refurbished is then grit blasted using an inert blast medium such as garnet. This is for the final preparation of all steel reinforcing and the removal of any remaining gas affected concrete back to a sound substrate.

The indicator chemical phenolphthalein is used to test the prepared concrete to ensure that the surfaces are alkaline and gas attack free. At this point in the process the removed concrete is reinstated using wet mix process sprayed concrete.

Finally in order to protect the repaired surfaces from future gas attack a 20 mm thick epoxy coating is applied throughout the entire refurbished length above the low water or flow line. In the case of the Hurstville NGRS epoxy for the entire 230 m was trowel applied.

The Hurstville NGRS project was completed on time and on budget, without any incident or accident of any kind and the sewer has been returned to good structural condition.