REID HIGHWAY

MAIN CONSTRUCTION COMPANY : Macmahon
CLIENT : Main Roads WA
PROJECT END VALUE : $78 Million
SIZE : 4-lane. 2.6km dual carriageway. 220m bridge
COMPLETION : March 2010

SILT, SNAKES AND SURPRISES

Macmahon's Reid Highway undertaking belongs in the annals of daring construction deeds. Things were done that had never been tried in WA before, with a successful outcome produced to budget and with no LTIs despite a myriad of challenges.

Working in partnership with MRWA, Macmahon had a design and construct contract to build a 2.6 kilometre, four-lane, controlled access dual carriageway between West Swan Road and Great Northern Highway, a 220 metre bridge, an underpass for a local road to maintain community access and several smaller bridges and a major intersection - without impacting upon the traffic flow.

A crew of 50 Macmahon staff made up of Engineers , Construction Supervisors and Surveyors, as well as Safety, Environmental and Community Relations personnel worked from August 2008 up until April 2010 on the project. The new road was formally opened at the end of February 2010, with subsequent works including salvage demolition of the old timber bridge, with the timbers going to City of Swan for local community projects, and erection of a noise wall.

"In terms of the main bridge, most of the challenges stemmed from the relatively unpredictable ground conditions on the Swan River flood plain," said Macmahon Project Manager, Phil Barker.

"Firstly Deep Soil/Cement Mixing works were undertaken to stiffen the ground that the abutments sit on. This is a relatively new method of construction and after it was chosen it had to get underway as quickly as possible to meet program. This meant trying to refine the methodology while also accelerating ahead with production. After completing the works, huge mounds of earth were loaded on top and the settlements measured. This settlement measurements confirmed beyond any doubt that the method was a spectacular success.

Because of the long lead times to procure piles, decisions had to be made early, without the luxury of a full design analysis. We chose 24m long octagonal prestressed concrete piles. The unpredictable refusal depths of individual piles created many challenges for the design and construction team. Modifications were required to many of the piles to ensure correct finish levels, due to the variable bearing depths. Piling in the river was even more challenging than on land. Apart from the obvious difficulty of the location, decisions had to be made far in advance because once the piles are driven below water level options become very limited. It seemed that some of the variability we had on the land had evened out, because fortunately the river piles all reached refusal at the precise depth that was predicted, so that no extensions or reworks were required at all.

To save on transport, 42 bridge beams 33m long weighing 100 tonne each were manufactured on site in two purpose built casting bays. To lift them into position, hardstand taxiways had to first be constructed for the cranes due to boggy ground conditions.
"A massive challenge for the Roadworks team was to completely rebuild all of the pavements and install new traffic signals at the extremely busy

Great Northern Highway Intersection. To make things more interesting this area is a minefield of new, old, redundant and unknown services. A temporary roundabout was devised as a way of gaining access to the most difficult part of the works without having any impact on traffic flow," said Phil.

"The use of Full Depth Asphalt Pavement is a revolutionary change for Perth road construction. As this project is a Design and Construct contract, there were many design issues that had to be worked through while production continued."

Other aspects to the site which required special attention were acid sulphate soils and silt posing a risk to the Swan River. An acid sulphate mitigation plan, dewatering plan which incorporated treatment of effluent and use of a silt curtain for river works solved these problems and protected the environment. Likewise, the community required protecting from the risk posed by open excavations, so hard barriers were used instead of orange fencing.

Protecting the 150 or so Macmahon, MRWA and subcontractor staff present on any given day included additional measures: a snake awareness program and training of on-site snake handlers; induction information on the large number of underground services cables, these necessitated the training of a dedicated cable location crew; an exclusion zone for stressing of bridge cables and installation of end covers in event of cable failure; and installation of crane mats for the 250 T crane lifting and carrying loads up to 109 T. Throughout the project, the community were kept both informed and involved. Macmahon's drive to benefit to the community was exemplified during clearing, with selected timbers gifted to the local Woodturners Association.

Macmahon are entering the project's environmental aspects in the Case Earth Awards run by the Civil Contractors Federation, and are also entering it for the WA Engineering Excellence Awards in the areas of Management of Engineering, and Infrastructure and Building. Previously they have been Winner – Engineers Australia - Management of Engineering category in 2008; Winner – IAP2 Australasia 2007 Core Values Award –public participation enhanced decision making; and Highly Commended - Public Relations Institute of Australia – Community Relations.
The Macmahon team is responsible for other major WA civil projects for Main Roads WA: the Port Access Road project at Bunbury undertaken simultaneously with work on the Reid Highway project and the Mitchell Freeway Extension. With a company CV stretching back to 1963, and over 3,000 staff across offices in Perth, New South Wales, Queensland, Northern Territory and South East Asia, Macmahon can tackle anything in the transport, water, rail and mining sectors.

MACMAHON CONTRACTORS PTY LTD
PO Box 198
Cannington, WA, 6987
Level 3, 27-31 Troode Street,
West Perth, WA, 6005
t. (08) 9232 1000
f. (08) 9232 1001
www.macmahon.com.au

BRIDGE OVER TREATED WATERS

Before work commenced on the Reid Highway project, intelligent solutions had to be found for a number of environmental challenges on site. Aurecon provided environmental science and water engineering expertise during the planning stage, providing the project team with Environmental Management Plans for Stormwater, Acid Sulphate Soils and Dewatering in order to protect the project area's significant environment values.

"The primary challenge for this project was due to the high risk Acid Sulphate Soils area where the bridge was installed. As pylons were required to be installed as part of the bridge support system, the resulting excavations required the excavation of ASS and extraction of acidic groundwater. Both these required extensive treatment by innovative methods to meet the requirements of the regulatory guidelines," explained Aurecon Executive, Jeff Barham.

"Treating the soil involved mixing it with lime on a prepared limestone pad until neutral acidity levels were achieved. Similarly the dewatering effluent was treated in a lime dosing machine and then allowed to aerate.

"Stormwater management measures aimed to maximise sustainability initiatives. Where possible, vegetated swales were incorporated into the design in order to maximise infiltration and remove pollutants prior to runoff entering stormwater basins. Conveyance of stormwater through existing vegetated surfaces was also favoured above conveyance in newly constructed drains."

Aurecon undertook preliminary site investigations to establish the — possibility of contaminants on site. Their brief further extended to developing the Approval Documents to satisfy approval conditions set out by various statutory bodies prior to construction works commencing. This involved consultations with the relevant bodies, resulting in preparation of permits for Geotechnical Works by the Swan River, Construction of the bridge over the Swan River and demolition of the existing bridge, Geotechnical Works by Jane Brook and Bridge Widening over Jane Brook.

"Aurecon's Community Development and Infrastructure group has extensive experience in the environmental assessment of major infrastructure projects across the power, transport, mining and industrial sectors. A significant transport group exists in the company's Western Australian operations, supported by substantial global resources," said Jeff Barham.

Aurecon is a leading, vibrant, global group created by the recent coming together of three world-class companies: Africon, Connell Wagner and Ninham Shand. They are able to bring over two centuries of combined experience, and the expertise of thousands of engineers, scientists, project managers, development experts, urban planners and policy advisors across 28 countries, to projects across all sectors.

AURECON AUSTRALIA
Jeff Barham
Executive - Community Development & Infrastructure
t. 08 9223 1500
e. barhamj@ap.aurecongroup.com
www.aurecon.com.au

TEAM WORK

New road and bridges for the Reid Highway Extension also meant new electrical work, a job carried out jointly by Thiess Services and JKA Excavations on behalf of Western Power.Thiess Services did all the associated electrical work related to the extension. This included both Underground and Overhead construction on behalf of Western Power, and involved four main stages, tackled over four months.

Overall, the works encompassed removing existing overhead power lines within the project area and installation of underground cable, along with installation of cables inside the new Reid Highway Bridge. One of the challenges involved the logistics of needing to cut power in order to safely perform works.

"There were large outages that had to be completed during the night to lessen impact on Western Power customers and traffic flow on the Great Northern Highway," said Thiess Services Project Co-Ordinator, Roy (Roedolf) Shipman" We used existing techniques on this job, but this involves well trained and experienced operators and crews. The work went through some Aboriginal Heritage areas, so special care had to be taken when working in these areas."

Thiess Services have a couple of hundred highly competent staff working on projects around Western Australia which range from Underground network construction and upgrades to overhead construction and maintenance. They are undertaking further contributions to WA's civil works, with electrical works on the Great Northern Highway, Wanneroo Road extensions.The company's 'Can Do' attitude is coupled with excellent tools for the job, in the form of well maintained and up to date machinery.

For the cable laying and other electrical infrastructure, JKA Excavation supplied their experience and technology. JKA laid the project's underground cable by directional drilling and trenching, and did the installation of RMU and Transformers, a three month task involving a dozen JKA staff.

This part of the works also needed to carefully avoid impacts on the Aboriginal heritage site, in addition to working amidst high traffic volumes and digging into ground already host to old and often uncharted existing services. JKA's high focus on safety, and commitment to doing the job right, first time, overcame these challenges.To achieve the best possible environmental standards on the project, all drilling fluids that were used were bio degradable. In addition, using directional drills saves on trenching and has a smaller environmental footprint.

Experience, reliability and quality of workmanship are company hallmarks. Their working capital includes four directional drills, eight excavators, sixteen trucks and bobcats, utilized effectively for multiple concurrent projects, including LV/HV linework, street light connections, feeder cables, and pit and pipe installs. JKA were a part of the Tenix Power Alliance venture, completing hundreds of pole to pillar, and the Henry ST substation took their drills through the center of Fremantle.

THIESS SERVICES PTY LTD
14 Aitken Way
Kewdale WA 6105
t. 61 8 9441 3015
f. 61 8 9353 2145
e. sjose@thiess-services.com.au
www.thiess-services.com.au

JKA EXCAVATIONS 2000 PTY LTD
42 Lancaster Drive
Wangara WA
t. 08 9409 1288
f. 08 9409 1990
e. reception@jkaexcavations.com.au
www.jkaexcvations.com.au