BERRINBA WETLANDS - INTEGRATING BUILT, LANDSCAPE AND INFRASTRUCTURAL ELEMENTS WITH TIMBER AS A UNIFYING THEME TO SUPPORT NATURE-BASED RECREATION

Ted Stubbersfield B.A., M. Th.

SW1 (Berrinba Wetlands) was the winner of the 2008 National Awards for National Development Excellence, Category 4, Environmental Economic Innovation Award. It is a project where civil engineering becomes social engineering.

SUMMARY

The Berrinba Wetlands project demonstrates how a local government can aggressively steer a community in the direction it wants it to go and bridges were a major part of this process. Bridges are not stand alone structures without any social impact. The SW1 project showed how they can be used in conjunction with good planning to bring around major social change in a community.

PART 1 – THE OVERALL PROJECT

The Birth of the Project

Logan City Council, (between Brisbane and the Gold Coast) with a population of about 260,000 has the sixth largest Local Government area in Australia. Under the SE Queensland Regional Plan, Logan was earmarked as a regional growth centre and was experiencing extraordinarily high population growth but probably not as a direct result of this Plan. Logan's employment was centred on a strong retail and wholesale sector. Frustratingly, commercial and industrial growth, critical for a sustainable future, had eluded the city. This was despite being highly accessible through the road network. This lack of success was probably contributed to by the perception of Logan as a troubled, low socio-economic region.

In the 1990's the economic development and planning officers became proactive in measures to provide sustainable growth through attracting new industries. This would not be possible without changing the image of Logan. A 120 ha portion of bushland in the south west of the shire was gazetted with a view to establishing a Mixed Industry Business Area (MIBA). The Council defined this as:

> "high quality, low impact mixed industry use which has a commercial office character set in a park-like environment with low environmental impact and minimal economic or social concerns. A MIBA is expected to enhance the existing and planned

amenity and character of adjacent localities and communities".[1]

The MIBA was seen as embodying the ideals of the "smart state" and the "knowledge based economy" promoted by the Queensland Government and supported by the Logan Council. The gazetted land was logistically central to the shire and near to the well established, but facility poor, Queensland Government's Crestmead Industrial Estate.

For ten years, developers showed little interest in the Council's vision of a profitable development with the true elements of an MIBA. Logan Council believed the "so called" MIBA's in the adjoining Brisbane City Council were less than adequate in achieving their goals of "social. environmental and economic development in the City".[2]

In 2003 the Council purchased 80 ha of the area which, by this time, was now also adjacent to growing residential communities as well. By this action the "Council assumed the role of the land owner, development application processor, developer, and marketer of the MIBA development; managing and controlling every stage of the development right through to the approval of tenants".[3] This is believed to be the first time in Australia that a local government has been involved in a development of this scale and became one of the largest commercial and industrial developments by an LGA in the southern hemisphere.[4]

The project itself

In Queensland, normally 10% of a development is given over for green space. SW1 gave an unprecedented 80 ha of its 120 Ha site over for recreation and environmental space! These 80 hectares now provide an unprecedented level of recreation and educational access for residents with an 8.5 km network of cycleways (all with disabled access) and interpretive signage throughout the site. Five steel bridges and a number of timber bridges were incorporated into the path. The main public area, with full facilities was constructed adjacent to the lagoons and so providing a safe peaceful outlook. Much of the infrastructure is so spread out that it was decided to use timber as a unifying theme throughout the public facilities.

To control the type and impact of businesses that could be established in the MIBA a Community Title Scheme was adapted which gave legal, ongoing force to the covenants. This controls building layout, design parameters, architectural guidelines, landscaping, and encourages energy efficiency and waste recycling.

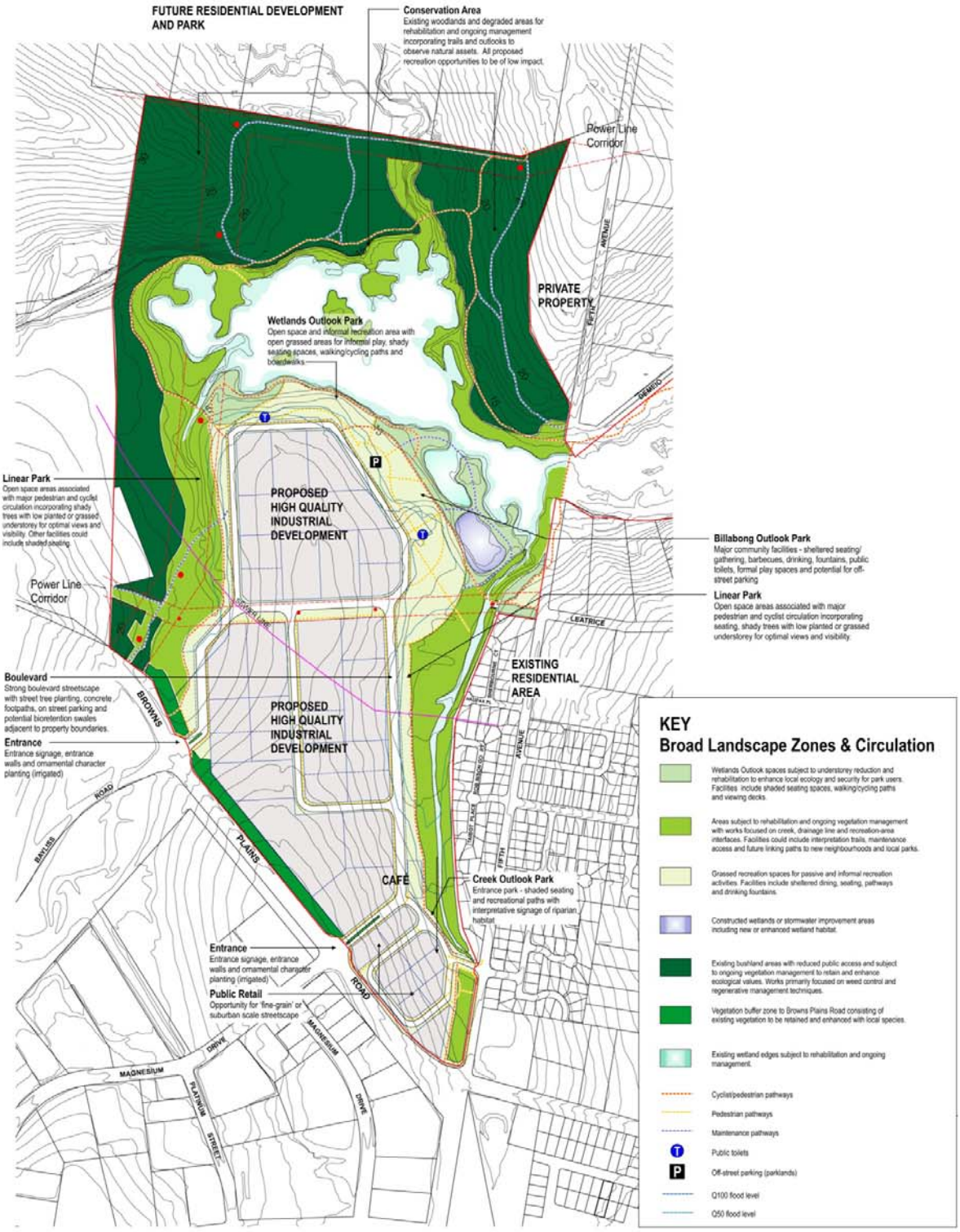
From the start SW1 was conceived as being a hi-tech estate. This involved optic fibre cabling, separate piping for gray water recycling, advanced storm water quality improvement devices and vandal proof public spaces.

The Master Planning was undertaken by Verge Landscape Architecture led by their Principal Peter Boyle. They in turn worked with PMM (which changed names to Conics and is now RPS) and Natural Solutions (who were bought out by Conics). Peter reported that it was a credit to all these companies that they were able to arrive at such a focused vision for the entire SW1 site. During the design, documentation and construction process, GHD – (with special recognition to Kevin Killilea) - was very proactive in helping to achieve the vision

[1] Logan City Council. *EDA2008 2008 National Awards for National Development Excellence, Category 4, Environmantal Economic Innovation Award*. (Logan:2008) 6.
[2] Logan, *EDA2008...,* 5.
[3] Logan, *EDA2008...*, 5.
[4] Logan*, EDA2008*..., 4.

along with Steve Barnes of the Logan Council[5]. Because the Council was so pleased with the Master Planning work done by Verge they became the natural choice to lead the design team as the project became a reality. Verge recommended OSA to GHD.

[5] Boyle, Peter. *Personal Communication* (Email) Jan 7, 2011.


FUTURE RESIDENTIAL DEVELOPMENT AND PARK
Conservation Area
Existing woodlands and degraded areas for rehabilitation and ongoing management incorporating trails and outlooks to observe natural assets. All proposed recreation opportunities to be of low impact.
Power Line Corridor
PRIVATE PROPERTY
Wetlands Outlook Park
Open space and informal recreation area with open grassed areas for informal play, shady seating spaces, walking/cycling paths and boardwalks
Linear Park
Open space areas associated with major pedestrian and cyclist circulation incorporating shady trees with low planted or grassed understorey for optimal views and visibility. Other facilities could include shaded seating
PROPOSED HIGH QUALITY INDUSTRIAL DEVELOPMENT
Billabong Outlook Park
Major community facilities - sheltered seating/ gathering, barbecues, drinking, fountains, public toilets, formal play spaces and potential for off-street parking
Linear Park
Open space areas associated with major pedestrian and cyclist circulation incorporating seating, shady trees with low planted or grassed understorey for optimal views and visibility.
Power Line Corridor
EXISTING RESIDENTIAL AREA
Boulevard
Strong boulevard streetscape with street tree planting, concrete footpaths, on street parking and potential bioretention swales adjacent to property boundaries.
Entrance
Entrance signage, entrance walls and ornamental character planting (irrigated)
PROPOSED HIGH QUALITY INDUSTRIAL DEVELOPMENT
CAFE
Creek Outlook Park
Entrance park - shaded seating and recreational paths with interpretative signage of riparian habitat
Entrance
Entrance signage, entrance walls and ornamental character planting (irrigated)
Public Retail
Opportunity for 'fine-grain' or suburban scale streetscape
KEY
Broad Landscape Zones & Circulation
Wetlands Outlook spaces subject to understorey reduction and rehabilitation to enhance local ecology and security for park users. Facilities include shaded seating spaces, walking/cycling paths and viewing decks.
Areas subject to rehabilitation and ongoing vegetation management with works focused on creek, drainage line and recreation-area interfaces. Facilities could include interpretation trails, maintenance access and future linking paths to new neighbourhoods and local parks.
Grassed recreation spaces for passive and informal recreation activities. Facilities include sheltered dining, seating, pathways and drinking fountains.
Constructed wetlands or stormwater improvement areas including new or enhanced wetland habitat.
Existing bushland areas with reduced public access and subject to ongoing vegetation management to retain and enhance ecological values. Works primarily focused on weed control and regenerative management techniques.
Vegetation buffer zone to Browns Plains Road consisting of existing vegetation to be retained and enhanced with local species.
Existing wetland edges subject to rehabilitation and ongoing management.
Cyclist/pedestrian pathways
Pedestrian pathways
Maintenance pathways
Public toilets
Off-street parking (parklands)
Q100 flood level
Q50 flood level
BROWNS PLAINS ROAD
MAGNESIUM DRIVE
PLATINUM STREET
LEATRICE AVENUE
GEMERO
FIFTH AVENUE
BERRINBA WETLANDS - PARKLANDS MASTER PLAN
March 2005
0 50 100 150 200 250 500M
verge
URBAN LANDSCAPE ARCHITECTURE

Environmental Considerations

Bushland Issues

The land was formerly owned by The Royal Order of the Aquarians (an Order of the Rosicrucians) who did not want to sell to mainstream developers as they feared the heritage value of the area would be lost. This was in keeping with Council's vision and, after agreeing to honour their requests, the property changed hands[6].

The former owners and the council believed the ecological values of the old sand mine needed to be maintained

The area that constituted SW1 is part of the wider Scrubby Creek catchment which has "significant sensitive environmental and recreational value"[7]. The area developed had a series of small lagoons that had developed through sand mining but had since become a haven for native animals and birds. A budget of $15M was allocated to protecting the bushland and establishing cycle ways, signage and bridges

At the beginning, the project received strong criticism from environmental groups. Their representatives would inevitably turn up at the site every time the media arrived and on occasion caused "quite a bit of disturbance"[8]. The reality was that while some revegetation had taken place the landscape was degraded. It had become a haven for feral animals and weeds and was used as a dump for old vehicles and rubbish.

[6] Barnes, Steven. Get Title, Logan City Council. *Personal Communication* (Email), Dec 23, 2010.
[7] Cole, Therese. Executive Services Officer, Strategy & Outcomes Directorate, Logan City Council. *Personal Communication* (Email), Dec 22, 2010.
[8] Cole. *Pers. Com*. ... 2010.

Degraded bushland near "Bridge 3"

This opposition dropped off as the project progressed and the extent of the precautions taken to protect wildlife[9] and plants and the extent of the cleanup was obvious. As well a massive replanting of native vegetation was undertaken. Now many groups come to photograph and make recordings. The local bird watching group were provided with a hide and this group has just received a government grant to build a second hide.

The Council reported that there are no ongoing environmental issues. The family representing the group that sold the land to the Council have written saying that the outcome exceeded their expectation.

Developed Areas

Each lot contains its own bio-retention basin which filters water before release into the catchment, a first for Queensland. This water can also be used on the individual block for its landscaping needs. The communal areas are likewise filtered. The design allows for "Sewer Mining" to be adopted. Parallel to the potable water mains are gray water pipes which allows the development access to up to 1 mega litre per day of recycled water to SW1, and with the potential for extension of mains on to Crestmead Industrial Estate and local playing fields.

Key Dates

A key feature of SW1 was the adoption of a realistic timetable and budget. The timing was as follows

2003:		The Council purchased 80 ha comprising the former sand mine Adding to the existing 40 hectares they already owned.
2006	October	Construction commenced
2007	January	Possession of site (target date achieved)
	April	Operational Works Approval received
	May	First release of lots (target date achieved). All Stage 1 lots sold During the expression of interest stage
	July	Final budget approved to accommodate additional items
	August	Planned practical completion of MIBA – delayed 2 months
	October	planned practical completion of recreational buildings – delayed three months to accommodate design changes and extra facilities.
2008 (January)		Practical Completion – on time, on budget

Financial Impact

SW1 has been an unqualified financial success and it needed to be as the Council took all the financial risk on their investment which was in excess of $32M. Costs were cleared with the sale of Stage 1 and there were two more stages to go! It is forecast that there will be a surplus which equates to 50% of one year's general rates income. These surplus funds will be equally divided between retiring Council debt, providing additional community services

[9] Animals in the MIBA area were relocated – 220 were found. Logan, *EDA2008*..., 8-9.

and further economic development projects.[10] Projected annual sales of the companies who locate there is anticipated to be $220m[11]

When fully developed the investment is expected to be in excess of $100M when planning, infrastructure, buildings and fit-out are included[12]. A higher amount is expected to be spent annually on wages for the 2000 people who will eventually be employed ad SW1. This represents a 5% boost to the economy of Logan City Council area. Businesses already established include DHL, Tyco and Helix which is a development for smaller entrepreneurial operators.

Community Acceptance

There are many entrances to the park making it difficult to accurately record the numbers visiting the facilities. Council's own estimates are that 200-400 people a day visit the park facilities on a week day and 1000 or more on the weekend. The cycleways within the park are also well used on a daily basis. The hire venue is booked out almost every weekend for weddings, birthdays, seminars etc.

Graffiti and vandalism was expected to be a major problem and initially there was resistance in some quarters to providing high quality infrastructure. These fears have proved unfounded. Care was taken in choosing graffiti resistant surfaces and permanent camera monitoring was installed. Initially there was a caretaker Monday to Friday with security patrols at nights and weekends. While the investment in surface coatings and cameras was a wise investment there proved to be few reports of graffiti damage even though there are now few night patrols. Logan Council intended to provide a facility that the community would have "ownership of" and the pride that this engenders goes a long way to explaining the low level of graffiti and other vandalism.

[10] Logan, *EDA2008...*, 7.
[11] This official figure seems light considering the wages figure.
[12] While this is the official figure, it seems light considering the future development proposed.

Future Developments

Marketing is soon to commence on the "village" which will make up the entry precinct that was always intended to be an integral part of SW1. It is intended to attract essential services such as a doctor's surgery, newsagent, small supermarket, coffee shop, offices and child care facilities. These services are lacking in the adjoining Crestmead Industrial Estate. There are also plans for an international hotel. The Council's Economic Development Team will work closely with the developers to instil the Councils vision.

Timber theme is continued in the existing steel framed shelters

The existing facilities for seating, shelters and barbecues were found to be inadequate and more are planned to be added in 2011. Extensions in the park area are likely also to include an amphitheatre and more car parking

Lessons to be learnt by planners

For Logan Council, one of the key outcomes of SW1 was the way it "act[ed] as a new reference for Local Government authorities willing to explore the boundaries of public enterprise thinking in a modern world requiring rigid triple bottom line outcomes"[13]. This triple outcome was beneficial decisions for the environment, the society and economic development. SW1 has proven that Local Government can be proactive in engendering pride in a community (and itself) through delivering a strategic vision and unwaveringly maintaining it. This can be a hard decision when there are strong pressures from one side to abandon the vision and not to develop at all and on the other side to compromise that vision and maximise profits and speed up the return. This vision was only achieved by strong decisions and managed risk.

The level of master planning and the transparency of the process have set a benchmark for future council and private development in the shire. Satisfactory outcomes can be achieved despite having to deal with sensitive political, financial, environmental and public awareness issues.

A strong message has been sent about what is acceptable from developers in the city from the planning stage through to the supply of facilities. Council planners intend to guide the developers in what is good planning through encouraging a deeper understanding of what is required. This should lead to more innovative solutions and the full potential of a site should then be realised. This requires closer working with economic, town, environmental, social

[13] Logan, *EDA2008...*, 10.

planners not just the normal design professionals. This level of planning can have effects that are sustainable, substantial and long term and benefit the wider region.

Logan, like all of SE Queensland, is experiencing a down turn in development so we will have to wait till the economy ramps up to determine the ultimate success of this policy.

PART 2 – THE BRIDGES

The Berrinba Wetlands was a challenging site. The bikeway presented us with difficult access for many of the bridges, some of the spans were larger than normally experienced and, despite that, had to withstand regular (Q2) and significant flood events. There was already substantial erosion in the sandy waterway. This meant that the bridges required extensive foundations to control erosion of the steep sides. The demands of this site required our consultant to develop two new bridge types. One has gone into our standard repertoire and is sold as the “Berrinba”. The pedestrian walkway and bridges located near the park facilities were straight forward and used our normal range of full timber construction bridges and boardwalks.

Our consultant for the project was James Pierce of James Pierce and Associates. We have been using this firm since 1985 for virtually all our bridges. Over the last 17 years he has designed 121 bridges, most for OSA (This does not count standards built by OSA from generic plans). Mr. Pierce had been a senior Queensland Main Roads engineer before leaving the Department to specialise in timber design. He is regarded by many as being the country’s foremost authority in that very difficult media. Our structured research into various bridge and landscaping areas was also undertaken by Mr. Pierce.

Other structures/services supplied by Outdoor Structures Australia included a viewing platform, decking to the interpretative shelter and other structures and handrails. The costs were

Bridge No.	Item	Span (overall + 0.5m)	Flood speed	Cost installed W/O GST
Steel bridges with Deckwood Decks				
1	"Berrinba" bikeway 2.7m clear	18m	2.35m/s	$150,983
2	"Berrinba" bikeway 2.7m clear	24m	2.2 m/s	$157,308
3	"Berrinba" bikeway 2.7m clear	18m	2.35 m/s	$156,559
4	Cable stayed bridge 2.7m clear	71m overall 27m centre span	Above Q100	$714,645
5	"Berrinba" bikeway 2.7m clear	12m	1.5 m/s	$119,119
Full Timber Bridges				
Bridge No.	Item	Span (overall + 0.5m)	Flood speed	Cost delivered + geotech & certification

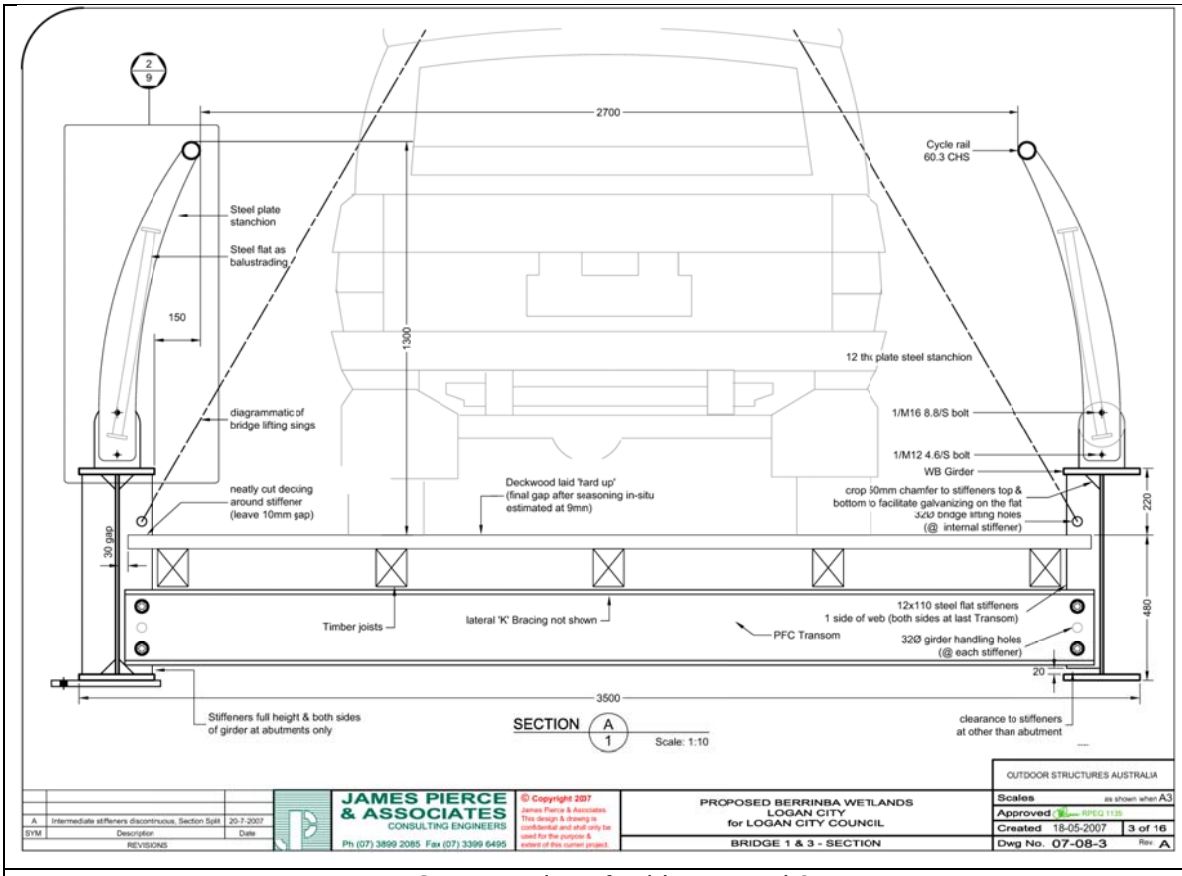
				W/O GST
n/a	Swale drain 2.5m wide (2 of)	6m	n/a	$8,224 ea
n/a	Log bridge 2.5m wide	9m	n/a	$16,158
n/a	Observation Deck 8x4m	(installed)	n/a	$54,531
n/a	Bedlog boardwalk	21m	nominal	
n/a	Decks on various building	(installed)	n/a	$44,550
n/a	Handrails	(installed)	n/a	$64,255

All the bridges on the cycleway were 2.7m clear between the 1300mm high rails which were offset 150mm. This allowed sufficient clearance for vehicles. All these bridges were designed to carry an emergency vehicle load of 2.5 tonne. The joists on all the cycleway bridges were 125x100 Joistwood and the decking was 120x45 Deckwood. We have the screws made especially for our Deckwood. They are 14#x85mm in 304 stainless steel, with a smaller head and wax dipped for easier driving. The decking was laid without gaps which gave a typical gap of 7-9 mm after timber moisture stabilised after a few seasons. All treatment was to H3 with Tanalith E (Copper Azole).

Bridges 1, 2. 3. and 5. The "Berrinba" bridges were designed for a debris mat height of 1.2m, no log impact, a live load of 5 kPa and a 2.5 tonne light maintenance vehicle. A load factor of 1.5 was chosen based on risk considerations in that the facility was purely recreational. The girders were large and longer than available galvanizing tanks. They required double dipping (first one end, then the other). The telltale immersion mark can still be seen on a number of girder webs, The transoms and K bracing were all bolted steel, Because the bridges will be submerged so often, a walk through girder allowed maximum clearance under the bridge. This arrangement also provided good impact protection against errant vehicles and reduced the flood loading on the handrail as they were shorter. All bridges were fitted with arrestment devices to prevent shear movement at the abutments caused by these large flood forces.

Because all the fall heights were under four metres, we designed a handrail which met the BCA and the Walking Track Infrastructure Code while still being able to withstand the load required by the Bridge Code. Being a walk through girder we could keep footholds out of the first 760mm and provided upper rails at 1000mm and 1300mm. These handrails were as open as possible which gave good visibility, lower cost and very importantly, reduced flood load. The barriers were designed to flop over by shearing some bolts once the flood forces on them become substantial. In that even the barriers remain attached by the 'hinge' bolt and can simply be rotated back up and new frangible bolts installed.

The abutments were concrete on driven timber piles. The high water table precluded the use of bored piers cast in situ. They all included substantial wing walls to prevent erosion at the approaches.



Cross section of Bridges 1 and 3

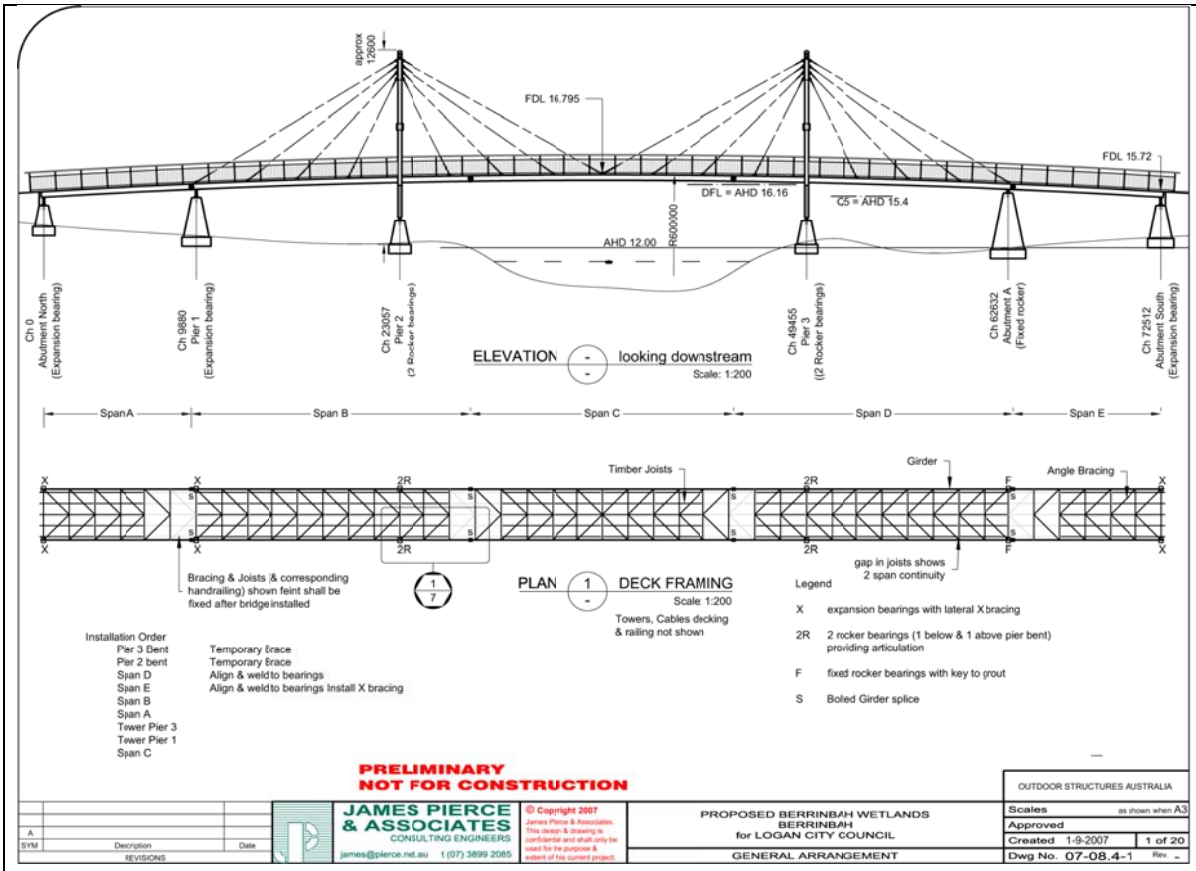
Bridge 2

Cable Stayed Bridge. Bridge 4, The “iconic” cable stayed bridge, had a further requirement that it not impact upstream and downstream flood levels and so affect the natural flow rates in Scrubby Creek. (The other bridges were expected to be submerged every two years approx.). This required large open spans above the Q100. While this could have been achieved with the “Berrinba” bridge in multiple spans, it was decided that this should be an “iconic” bridge. A cable stayed bridge was decided as best meeting the needs for striking appearance and longer spans.

The cables were Ronstan Galfan 28.3 mm dia spiral strand – 1x37 open spiral fitted with Ronstan type 3 fork/swage turnbuckle at one end and a swage fork at the other. These were chosen as they should give a longer life than normal galvanised cables. The fittings also had an architectural appeal. The ropes were especially imported for the project. The configuration allows one set of cables to be removed for maintenance and the bridge still remain in service. The masts extend about 12.5 metres above the bank

The bearings were a challenge and our consultant designed a system of swinging links to control expansion. These had to be immobilised during construction.

The handrails were a modification of OSA’s C3 bikeway barrier with our Cruiserline timber rail oiled with our Tanacoat tinted Jarrah. We only use F22 Spotted Gum or F27 Ironbark for our rails. The barriers were not designed for maintenance vehicle impact.



Bridge 4, 71m overall cable stayed bridge with 27m centre span

Boardwalk

The walkway near the park facilities included a 27 metre boardwalk. The product chosen was our standard bedlog boardwalk. This is an extremely simple structure. Durability 1 (In-Ground) hardwood logs are slabbed to 300 between two parallel faces and dropped on the ground every 2.4m. They are packed as necessary to give a level surface. Joists (150x75 Joistwood) are laid on their flats, covered with a bitumen felt and CN Emulsiion and 120x35 Deckwood screwed to the joists. All timber was oiled with CN Oil, docked, and drilled prior to dispatch. The boardwalk took two days to build on site.

The standard bedlog system was designed for areas where the soil is above 50 kPa and only a nominal stream flow. Bouyancy of these heavy hardwood structures is not a problem as their density is greater than water. Never-the-less they can be tied down using soil anchors.

Log Bridges and Swale Drain bridges

Log bridge 8m c/c

Swale bridge 6.0m c/c

Three of these simple structures were used, being two swale drain bridges at 6.0m c/c and a log bridge at 8.0m c/c. These are standard bridges we have been making since 1985 and very well proven. The joists for the swale drain were 250x100 Joistwood and the girders for the log bridge were 300mm slabbed spotted gum. The decking was 120x35 Deckwood. Dampcourses were used throughout.

All the bridges were designed for foot traffic only with a 5 kPa distributed load and a concentrated load of 4.5kn. When we saw a concrete truck on a swale drain bridge without any damage to it, we were reminded of the enormous reserve of strength in these

structures (definitely not to be a recommended practice).

Viewing deck

The viewing deck uses the standard OSA decking system. The substructure is 200 mm dia. H5 CCA driven pine piles. Bearers are 200x75 Joistwood, Joists are 150x75 Joistwood, decking is 120x35 Deckwood. All the timber was pre-oiled and a dampcourse was used between the decking and the joists. As in all structures, liberal quantities of CN Emulsion were also applied to end grain and timber to timber interfaces. When we were designing this deck we were also finalising our *Commercial Barrier Guide* and took the opportunity to hone the design of our C7 barrier system. (This was further refined after we simplified the corner posts).

A problem encountered with this structure proved to have a beneficial outcome for ourselves and designers who wish to benefit from it. The hole positions in the posts were designed around a brand of lower cost imported stainless fittings. When the rigger came to site nothing fitted!! When he took this matter up with the importer he was told “Our catalogue was right once.” We decided then that our Barrier Guide had to be extended to cover design with stainless wires. In conjunction with Ronstan we adopted two of their systems and offered in our Guide OSA1 a high quality domestic system (with some commercial application) and OSA2, a commercial system which has tamper resistant fittings. OSA2 was first used on the deck and then later adopted throughout SW1. We have observed that wire rope designs always nominate the wire size, type and spacing but frequently ignore the fittings and method of terminating. The guide and associated DWG blocks on our website simplified the full specification of wires which can now be detailed in a matter of minutes.

Decking in and around buildings

The look of the decking used in the bridges was carried through into the public structures. The decking around the toilets and hire facility was straight forward with 120x35 Deckwood on 75mm wide Joistwood joists with the standard dampcourses and oiling.

The challenging area was the deck at the approach to the interpretive shelter where there was little more than 100 mm recess in concrete slab to lay a deck and joist system over. This is not an ideal arrangement but

can be made to work satisfactorily. While our hardwoods do not particularly mind getting wet they need to dry quickly and this does not happen if joists are screwed directly to the concrete. Clearance under the joists and a self draining fall on the slab to the outside are essential.

Layout of a low clearance deck at the interpretative centre

The way OSA dealt with this was as follows: The 100x50 Durability 1 In Ground joists (which were laid on their flat) were sized to 45mm. They were pre-drilled and countersunk at our site prior to delivery. They were laid out and the positions of the supporting studs marked, the builder then drilled into the slab and epoxied in short lengths of 12mm stainless threaded rod and nuts were then run down the stud. The shrinkage was then calculated (45 joist +35 decking =80mm shrinking 6% = approx 5mm) and the nuts set to a level where the deck would be about 2.5mm (1/2 of the shrinkage) above the existing deck. We were able to achieve a gap of about 20-25mm under the joist. Protruding studs were cut off and then dampcourse and CN emulsion were added to the top of the joists. Decking was then laid without a gap.

Differential movement between the approach path and some of the decks proved to be an issue after time. The paths were not integrated with the decks. (We have observed this on a number of boardwalks also) and we believe that consideration should always be given as to how to integrate the two. In this case It was probably a matter of choosing between cracked concrete and a trip hazard and of these the former is preferable. Fortunately it was easily rectified with an aluminium plate..

Handrails on Buildings

Close to the end of the project we were asked to also supply handrails and cabling to the buildings. These handrails were not designed by us but the fittings used on the observation deck, OSA2, were adopted. The steel rails were welded on site and then a separate contractor painted them by brush. As a consequence, many of the holes for the cables filled with paint and then had to be drilled out to fit the insulating bush. This caused some minor rust issues and caused us to rethink how we process the rails used on our standard painted bridges. Our practice now is to prime the post, fit the insulating bush and then paint the post. If paint has to be drilled out to fit the wire, we are only removing a little plastic, not the corrosion protection.

These fitting (OSA2) are now the preferred fitting on our bridges that incorporate stainless wires. Their advantage is that if someone cuts the wires the expensive fitting is not lost, just the stud that screws into it. Apparently Ronstan developed these in conjunction with Brisbane City Council to minimise their vandalism repair costs.

The use of Timber

Outdoor Structures Australia has received a number of grants to undertake research into boardwalks, decking, light bridges and bollards. Our practices are often very different to common practice. This has been recognized as such under the joint Federal and State Government initiative, the *Advanced Technology Showcase*. We believe that our technical guides represent current world's best practice in the use of timber externally. It is our firm convictions that in timber related matters, reliance of the Australian Standards can give a designer a false sense of security that something meaningful has actually been specified. For this reason OSA developed two proprietary products Deckwood and Joistwood. These products allow designers unfamiliar with timber to receive the correct strength, stiffness, durability, stability, weathering ability and shrinkage. The Deckwood product was developed through formalising the grade of timber we previously hand selected to go into our bridges when we first started making them in 1985. They have a well proven track record. The properties of our Deckwood and Joistwood were determined through testing at the DPI Forestry Laboratory in Brisbane. They are higher than those given under Australian Standards.

Because the joists are protected by dampcourses, the life expectancy in Logan for the joists is 85 years[14] and from experience a minimum of 20 years for the decking if no pre-oiling and maintenance is done at all[15]. The decking was coated all round with CN Oil. There is an enormous reserve of strength in our decking and joist system.

[14] As determined by the Timberlife Software
[15] As opposed to the totally unrealistic 40 years as indicated by AS5604-2005

OSA's Heavy duty bollard and signage range used extensively throughout SW1

The timber bollards and signage were prepared to our own grades. AS2082-2000 did not allow any heart at all in structural timber. This made the 200x100 hardwood we use cost prohibitive if purchased as a true F14 or F17 grade. (It is my observation that large timber sizes to this grade seldom existed due to the exclusion of even the faintest trace of heart). The 2007 revision of AS2082 allows virtually unlimited included heart which would make F rated timber unsuitable for landscaping use[16]. By careful placement of natural feature in the ground and allowing a touch of heart, an economical but very serviceable and attractive piece of timber that ages gracefully is achieved.

Council advised that they had only received good reports on all the materials used in the parkland but in particular the timber areas and especially the handrails on the cable stayed bridge. When the Council was asked if the timber had proved to be a maintenance headache (and it was designed not to be) they replied:

> "When we went through the formal handover from GHD (property managers) we reviewed the maintenance information for the timber. Around that time we were approached by Boys Town to see if we would be interested in groups of young people undertaking work experience on site, with their own supervisors training and organising the work. Two groups went through their work experience training, with each one taking 16 weeks to complete. One of their main projects was to oil and maintain all timber surfaces, and another project was the building of extra timber box type seating in the playground area. Last time I was out there it all looked fantastic."[17]

There were three issues with the timber. We had a problem with mould growth under the Tanacoat on the "Cruiserline" rails on Bridge 4. We believe this was caused by spores from the surrounding bushland settling on the unseasoned rails and then a delay in oiling. Future practice in bushland would be to clean the rails with a product such as Cabots Deck Clean prior to oiling. We can control the grading and species of our decking and deliver material that is to grade at the time of manufacture. What we cannot control is "shelling out" where some pieces raise grain some time after installation. Our own inspections identified 2-3% of the decking which had this problem and was replaced. Of the 1300 bollards supplied, six were replaced.

[16] I have written on this in detail at http://www.outdoorstructures.com.au/pdf/etdn_5.pdf
[17] Cole. *Pers. Com*. ... 2010.

OTHER MATTERS

In this project, timber is used very well, in conjunction with other materials, but it is my observation that often it is not used well. Despite high quality technical material now being available on how to design well with timber it is my further observation that the standard of timber design is deteriorating, not improving. Caution and a lot of research and consultation with Timber Industry leaders needs to be undertaken before using large amounts of timber in public works. If this research is well done, the use of timber will be rewarding.

Credits

Asset Owner

LOGAN CITY COUNCIL
P.O. Box 3226
Logan City Qld 4114
Contact Mr Steve Barnes
T: 07 3412 5140

Project Managers

GHD CLIENTS PEOPLE PERFORMANCE

GHD
G.P.O. Box 668
Brisbane Q 4001
Contact Mr Kevin Killalea
T: 07 3316 3000

Landscape Architects

verge
URBAN LANDSCAPE ARCHITECTURE

Verge Urban Landscape Architects
P.O. Box 450 Stones Corner Qld 4120
Contact Mr Peter Boyle
T: 07 3847 8755

Architects

AR:2 architecture

129 Margaret Street Brisbane 4000
P.O. Box 15363 City East 4002
Contact Mr Ben Parker
T: 07 3012 7314

Principal Contractors

NEUMANN CONTRACTORS

Neumann Contractors
54/28 Burnside Rd
Yatala Qld 4207
Contact Mr Amith Jayaweera
T: 07 3826 1600

Consulting Engineer to OSA

James Pierce and Associates
24 Waldo Street
Norman Park Qld 4170
Contact Mr James Pierce
T: 07 3899 2085

Wire Ropes and Cables to OSA

RONSTAN
Architectural Rigging Systems

Ronstan International P/L
Unit 1, 1029 Manly Road
Tingalpa 4173 Qld
Contact Mr Luke Seaborn
T: 07 3890 5844

Major Steel Fabricator for OSA

DWW

DWW Engineering P/L
P.O. Box 47
Richlands 4077 Qld
Contact Mr Pius Studer
T: 07 3375 5841

Bibliography

Logan City Council. *EDA2008 2008 National Awards for National Development Excellence, Category 4, Environmantal Economic Innovation Award*. (Logan:2008).