Executive summary

Introduction and background

In October 2006, the Queensland Government commenced a study to determine the best location for a future public transport corridor between Ipswich and Springfield. The need to address public transport requirements between Ipswich and Springfield was identified in the South East Queensland Regional Plan (SEQRP) and the South East Queensland Infrastructure Plan and Program 2007-2026 (SEQIPP). These plans predict a significant population increase in the greater Ipswich area over the next 20 years. This population increase will require new and enhanced infrastructure and services to provide residents with fast and accessible transport options, and at the same time support employment and industry growth in the region.

The Ipswich to Springfield Public Transport Corridor (Ipswich to Springfield PTC) will provide a link between the Ipswich City Centre and Springfield Town Centre via Redbank Plains South and the future Ripley Valley Town Centre. The corridor is approximately 25 km in length and is proposed to include the construction of nine stations. Each station, which will service its specific surrounding catchment are proposed for:

- The University of Queensland, Ipswich campus
- Berry Street
- Yamanto
- Deebing South
- Ripley North
- Ripley Valley Town Centre
- Swanbank
- School Road
- Keidges Road.

The Minister launched the Ipswich to Springfield PTC study on 24 October 2006 at the Ipswich campus of the University of Queensland. Queensland Transport commissioned Parsons Brinckerhoff Australia (PB) to undertake the study. The first phase of works to secure a transport corridor was to prepare a Review of Environmental Factors (REF) that evaluated different corridor options by assessing the existing environment and potential impacts of four corridor options. A preferred corridor was recommended based on these investigations.

The second phase of works (this Environmental Impact Study) focussed on evaluation of the preferred corridor with the primary intention of highlighting any potential significant environmental impacts and mitigation measures to enable Queensland Transport to preserve the corridor for future public transport purposes.

It should be emphasised that this Environmental Impact Study has been prepared to a level of detail required to preserve a corridor for a future transport route. It is not a formal Environmental Impact Statement undertaken pursuant to legislation (for example *Integrated Planning Act 1997* or *State Development and Public Works Organisation Act 1971*). Further environmental works will be required at the detailed design stage prior to construction.

Study process

In order to address the future demand and growth predicted for the greater Ipswich area, which includes the future Ripley Valley Town Centre, the need for the identification and protection of a high quality public transport corridor has arisen and has been assessed in two phases. This current document represents the output from the second phase of works.

The objectives of this impact study are to:

- determine potential environmental impacts that may be encountered on the preferred corridor. The identified impacts are then considered in terms of their significance and possible mitigation strategies suggested
- identify information gaps and establish a base line for further detailed study that may be required closer to the time of construction
- contribute to the knowledge base for the eventual choice of the preferred mode of transport
- indicate to the relevant authorities the level of mitigation possible to any identified impact and comment on the likelihood of encountering impacts that are so significant that they may be regarded as “show stoppers”.

This Environmental Impact study encompasses a process of reviewing various literature sources and known data base sets and refining available information to the preferred corridor; involving more detailed impact assessment work and further public consultation. Ground truthing was undertaken in areas where data obtained from literature searches was regarded as inadequate or by issues raised during consultation. Understanding that the construction dates are not yet set, environmental factors were assessed, where applicable, in terms of their existing status and a statement made as to the anticipated impacts of the transport corridor on these factors. Comment is also made as to potential mitigation strategies.

Project need

The need for a public transport corridor linking Ipswich to Ripley to Springfield is being studied due to the projected growth in population in south-east Queensland. To help cater for this growth, Ipswich City Council is planning new communities in the Springfield, Redbank Plains South and Ripley Valley area to ultimately accommodate over 200,000 residents. A number of Ipswich City Council land use planning activities and strategies support the development of a high quality public transport corridor between Ipswich and Springfield.

SEQRP identifies that the current Ipswich City population is around 135,000 and provides strategies to manage future growth. It estimates that Ipswich City will grow to around 318,000 residents by 2026. SEQRP identifies the Ipswich/Ripley area as being suitable for future medium to longer-term urban development. It also identifies the need for a study into a new public transport corridor from Springfield to Ipswich via Ripley.

Project description

The proposed public transport corridor is approximately 25 km in length and will link the Ipswich City Centre and Springfield Town Centre via the future Ripley Valley Town Centre. The preferred corridor is described in detail below from the start at 0.00 km in West Ipswich up to its termination point in Springfield, chainage 24.62 km.

Although no preferred mode has been decided upon, heavy rail has been assumed for planning purposes. Rail construction is more restrictive than road and if a bus mode is decided on, it would easily be accommodated within the planning.

The typical corridor width(s) adopted provides for two rail tracks and a maintenance track. Two tracks are considered to be sufficient to meet the long term passenger demand between Ipswich and Springfield.

For legibility, the corridor is divided into sections separated by the proposed stations.

Start of corridor – University station

At its start, the preferred corridor joins up with the existing rail corridor in West Ipswich. This area is very constrained and the first 250 m is 20 m wide – the narrowest part of the entire corridor. It then follows a 290 m radius curve, before crossing Brisbane Street perpendicularly, and then running parallel to Keogh Street towards the Sandy Gallop Golf Club and the proposed station, at chainages 1.70 km – 1.90 km.

Vertically, the preferred corridor starts off on shallow fill in the constrained 20 m wide area, moves onto structure around the large radius curve and crosses over Brisbane Street. It then varies between fill, cut and structure along Keogh Street right up to University station. The width varies along this section between 20 m, 50 m, 30 m (on structure) and 40 m. The maximum height of the structure in this section is approximately 17 m.

University station – Berry Street

From University station the preferred corridor initially travels in a south-westerly direction before turning south as it crosses Deebing Creek and Lobb Street, and then running adjacent to the Bremer River towards Berry Street station (between chainages 4.15 km and 4.35 km). This station is situated to the west of the existing residential development in this area.

The corridor runs on embankment from the southern end of University station up to approximately chainage 2.32 km where it transfers onto structure for approximately 1.7 km as it crosses over Deebing Creek and Lobb Street. It then changes back to an embankment just before the station at Berry Street. The corridor is 40 m wide at the start of University station, 30 m on structure and 50 m at Berry Street station.

Berry Street – Yamanto

The preferred corridor continues south from Berry Street to Yamanto running parallel to Hall Street up to the proposed Yamanto station located between chainages 5.90 km and 6.10 km.

For most part the corridor is located on embankment in this section. There are however short sections of cut/fill and constrained cut, as well as structures over Berry Street, Belar Street and Warwick Road.

Corridor widths along this section are typically 50 m, apart from the sections on structure which are 30 m wide. The preferred corridor width at Yamanto station is restricted to 30 m.

Yamanto – Deebing South

From Yamanto station the corridor continues in a southerly direction as it crosses the Cunningham Highway towards the SWTC. Between the Cunningham Highway and Deebing South station (which is located between chainages 8.90 km and 9.10 km), no allowance was made in the SWTC for a public transport corridor. As a result, there are land requirements outside the SWTC in this area.

The preferred corridor runs deeper into cut from Yamanto station to cross beneath the Cunningham Highway. It stays mostly in cut from hereon and resurfaces around chainage 7.80 km to run on embankment for approximately 700 m before passing into the cut again. The corridor then crosses underneath the proposed South Deebing Creek interchange and resurfaces at Deebing south station. The station itself is also located on the cut-fill line.

Immediately after the Yamanto station, the preferred corridor starts off at a width of 40 m and it widens to 85 m just south of the Cunningham Highway. This then drops down to 60 m for a short section before changing back to the standard corridor width of 50 m for most of the remainder. Deebing South station is located within a 40 m corridor.

Deebing South – Ripley North

The preferred corridor continues further eastwards within the boundaries of the SWTC before diverging to Ripley North station (11.20 km to 11.40 km), which is situated to the south of the SWTC.

From Deebing South station, the corridor transitions into structure for approximately 800 m. This is followed by a short stretch of embankment, before another section of structure enables the corridor to cross over Deebing Creek. From here on the corridor varies between cut and embankment. It finally dips below the natural ground all the way up to Ripley North station. The corridor is depressed through Ripley in accordance with the Ripley Valley Master Plan.

The corridor widths vary between 40 m, 50 m and 60 m apart from the sections located on structure where the width is 30 m. Ripley North station is located within a 40 m corridor.

Ripley North – Ripley Town Centre

From Ripley North, the preferred corridor starts to make its way back towards the SWTC as it slowly turns in a south-easterly direction before turning east as it enters the station that will service the future Ripley Town Centre. This station is located between chainages 13.10 km and 13.30 km.

The entire section along here is located in cut, except for a short stretch on shallow fill between chainages 12.33 km and 12.45 km.

The corridor is 40 m wide for the entire length between the stations at Ripley North and Ripley Town Centre.

Ripley Town Centre – Swanbank

The preferred corridor continues on an easterly path as it enters back into the SWTC at approximately chainage 13.95 km on its way to Swanbank station which is located between 14.95 km and 15.15 km.

The corridor continues in cut until it surfaces near Bundamba Creek. From here, it runs along a short section on embankment and then crosses over Bundamba Creek on structure. Shortly after this structure, the corridor dips into cut all the way up to Swanbank station, which is also located in cut for the majority of its length.

Swanbank – School Road

From Swanbank, the corridor starts off adjacent to the SWTC and then diverges in a slight north-easterly direction on the way to the station at School Road, at chainages 19.45 km to 19.65 km.

The preferred corridor starts off on a shallow embankment at Swanbank which quickly becomes higher. After a short section of structure the corridor moves onto another short section of shallow fill again, before a section of constrained cut at the Steel Mill interchange. The remainder of this section of the preferred corridor then varies between cut and fill, it also passes beneath Cumner Road and the Swanbank interchange in deep cuttings. The corridor crosses School Road on a short section of structure just before the station.

Corridor widths between Swanbank and School road vary greatly. It starts off at 40 m wide, some parts then conform to the standard 50 m width for cut/fill, however widths of 120 m (deep cut at the Cumner Road crossing), 80 m, 100 m (deep cut at Swanbank interchange) and 70 m are also to be found along here. A corridor width of 30 m applies for the two sections on structure.

School Road – Keidges Road

The preferred corridor changes back to a general easterly direction as it continues on to Keidges Road station which lies between chainages 21.10 km and 21.30 km.

This section varies between cut and fill, however the most part of it runs through a deep cutting. Keidges Road station is located partly on fill and partly on structure.

The 70 m wide corridor is carried through from School Road station for another 400 m before it widens out to 95 m for the deep cutting. This then drops down to 60 m approximately 200 m before Keidges Road station.

Keidges Road – End

Continuing from Keidges Road, the preferred corridor passes in a south-easterly direction as it enters the SWTC again on its way to the Springfield Town Centre. The corridor is consistent with the rail alignment proposed by the Horizon Alliance around the Springfield Town Centre station.

The preferred corridor starts off on fill at Keidges Road station and moves onto structure as it crosses over Keidges Road and Woogaroo Creek. This is followed by varying sections of cut and fill as well as two more sections of structure, before the preferred corridor dips below the natural ground and crosses of the SWTC in a cut-and-cover tunnel.

Corridor widths are 30 m on structure along here and vary between 50 m and 80 m for other sections.

Property resumptions

A number of unavoidable impacts occur where the preferred corridor either partially or wholly traverses properties. Where major impacts occur, properties will be wholly or partially acquired by QT. On properties that are not totally acquired, remedial works to the remainder of the property would be addressed through negotiations with the property owner. The total number of properties affected include 80 local businesses and industry; 10 low density residential; 2 rural residential; 35 future urban and 6 other (including major centres etc), with a total of 143 properties.

Engineering and environmental issues

Infrastructure design

Design criteria for heavy rail have been adopted for the purposes of this study. Busway design requirements can be accommodated within the heavy rail corridor widths. Typically, in both cut and fill, the corridor width is 50 m to allow for the two tracks, a maintenance track and a buffer on either side. However, the width varies from as little as 20 m at the northern end of the alignment in West Ipswich to a width of 120 m at the Cumner Road area in Redbank Plains South. Standard corridor widths in other situations are as follows:

- 30 m for structure
- 40 to 50 m for cut-and-cover tunnel
- 30 m for a station in cut.

Horizontal alignment

Where possible, north of the Cunningham Highway the horizontal alignment has been designed to a 90 km/h design speed. Where this was not achievable due to constraints the design speed was reduced to 60 km/h. While this represents a reduction in the rail design standard, these locations are typically at station approaches and departures, where generally reduced travel speeds would be expected.

Between the Cunningham Highway and Springfield, a design speed of 120 km/h has been adopted. The exception to this is through the Ripley Valley Town Centre, where a reduced design speed of 90 km/h has been used to better fit the proposed built form.

Stations have been designed to be on a 215 m long straight, consisting of a station length of 175 m and a 20 m length of straight at each approach. The length of a busway station is approximately 70 m.

Vertical alignment

A dedicated right of way with grade separation at road crossings has been adopted for both rail and busway options. The surface level of the alignment has been designed to be a minimum of 1.2 m above the 100 Year ARI flood line. In some places because of the need for a gradient of 2% or less and the topography the corridor is cutting as high as 21 m.

Construction issues and staging

Various construction techniques would be required for the construction of the Ipswich to Springfield PTC. Significant lengths of structure, tunnels and/or retaining walls will be required along the length of the corridor.

For parts of the corridor, more specialised construction methods would be required for the constrained work areas, for example within narrow corridors and along existing road infrastructure.

Night works may be required through some built-up areas, (i.e. West Ipswich). This would require temporary road closures. The type and extent of night works through the particular areas would also need to be restricted due to the proximity of sensitive noise receivers. Night works may also be required for the placement of structural spans over Brisbane Road, Moffatt Street and Lobb Street.

Dependant upon the timing of construction and extent of future development, sufficient space would be required for both construction site compounds and construction site access. Compound areas would be restricted between Saleyards Road and the Cunningham Highway and at the Springfield end of the project.

Significant noise and construction impacts that would require mitigation are envisaged through certain sections. These include Redbank Plains South, the West Ipswich area and along Hall Street.

The staging and implementation for the preferred corridor will be investigated in detail at a time closer to construction during the business case study.

Early works through certain areas would be beneficial to the overall delivery of the project. Notable areas where early works would provide significant benefits include:

- Kerners Road/Warwick Road/proposed Yamanto Shopping Centre, where the area surrounding the corridor is currently non-developed
- the eastern extents of the Ipswich to Springfield PTC where it crosses the Centenary Highway to tie into the Springfield end.

The full implications of any staging option require careful consideration, especially the year of introduction into an emerging or developing area. In many cases, the early introduction of a high quality public transportation service will likely encourage more sustainable developments and communities.

Infrastructure cost estimates

The estimated infrastructure cost for the construction of the Ipswich to Springfield PTC is $1.415 billion for heavy rail and $1.038 billion for busway (excl. GST and including a 50% contingency). Rail is approximately 1.4 times busway costs.

Consideration of alternatives

Alternatives to a priority public transport corridor between Ipswich and Springfield include line-haul buses between centres and/or continued reliance on the private motor vehicle. Line-haul buses sharing road space with private vehicles would experience delays in congestion and a resultant lack of reliable running times. Continued trend use of private vehicles is not sustainable and is inconsistent with the desired outcomes of SEQRP. Neither of these service options would provide a high quality and attractive public transport service that can help

shape a sustainable city or result in an improvement in public transport mode share in the region.

Consultation and communication

As part of the Environmental Impact Study, Queensland Transport and PB conducted a community consultation process which flowed on from the extensive consultation process undertaken during the corridor selection process. This facilitated an open and transparent two-way communication process between potentially affected property owners, the community, stakeholders and Queensland Transport before the release of the Environmental Impact Study.

A key focus of the consultation process was to gather community and stakeholder issues and concerns while providing detailed information about the study.

143 property owners within the preferred corridor were identified. These owners were contacted by PB during the REF phase and the development of the draft Environmental Impact Study.

The consultation process included potentially directly affected property, key stakeholders and the broader community. Key methods of consultation included:

- contacting and meeting with potentially affected property owners
- conducting public displays
- developing project specific communication materials such as advertisements, newsletters and a website
- maintaining community contact points.

Potentially affected property owners were contacted by letter and were invited to participate in face-to-face meetings.

The study team met with sixteen property owners. The most common issues raised during these meetings were potential property impacts, study timings, impact on lifestyles, compensation and environmental impacts. These issues were raised at all sixteen meetings. Other general community concerns included:

- potential construction timings
- noise impacts
- visual impacts
- economic impacts
- safety concerns
- cultural heritage.

The community consultation program was an ongoing process throughout the Environmental Impact Study.

Land characteristics

The impact study undertook a desktop assessment of geotechnical and land resources and found:

- There are no active mining leases covering the corridor options.
- The corridor does not pass through Good Quality Agricultural Land (GQAL) class A or B. The project therefore will not impact on the availability of GQAL.
- The study area has low to very high susceptibility to erosion and control measures will be required during construction. Erosion susceptibility is especially high within the Ripley and Deebing creek valleys.
- There is a possibility that acid sulfate soils (ASS) may be encountered if deep cut earthworks are required along the Bremer River and additional investigations will be required to confirm the presence of ASS in this area.
- The Environmental Management Register (EMR) and the Contaminated Land Register (CLR) search as well as a review of historical aerial photos indicated that 21 lots were identified as having potentially contaminating activities. The potentially contaminating activities included livestock dip or spray race operations; petroleum product or oil storage; foundry operations; landfill and scrap yards.
- The Department of Defence highlighted 15 lots in or close to land that may have been used for military purposes that they assessed as 'having a slight potential for residual unexploded ordnance (UXO)'. These sites were not listed on the CLR. Other activities not included on the EMR and CLR may include cropping and the use of broad acre herbicides and pesticides.
- Potential regional subsidence impacts and ground tilt due to propagation of collapses to the surface is relatively low, some maintenance in the long-term should however be expected as a result of ground movement.

All impacts associated with the Land Characteristics of the preferred corridor can adequately be mitigated by means of the recommendations stated in Section 18.2.

Water

Surface water

It was identified that the flooding of the area associated with the preferred corridor poses a considerable constraint. In relation to the flooding, the following corridor sections are identified as being of particular concern:

- chainage 2.5 to 4.5 km running parallel to the Bremer River
- chainage 9.5 km Deebing Creek crossing.

The Deebing Creek crossing is linked to the Bremer River floodplain, and it is directly impacted by any increase in flood levels associated with Bremer River at that location.

The proposed route and associated cross drainage require that the potential impact on flood levels in the Bremer River are mitigated, whilst adequate cross drainage from adjacent catchments on the right bank are maintained.

Through adequate vertical design and drainage infrastructure, this significant impact can be mitigated.

Groundwater

Six privately registered bores were identified in the immediate influence area of the preferred corridor. Another 36 registered bores were identified in the area surrounding the preferred corridor. Impacts on existing groundwater users are not expected to be significant. NRW bore data suggests that water quality ranges from 'fresh' to 'brackish'. Other bore data indicates that groundwater levels range from 3 m to 8 m below ground surface with seasonal fluctuations by up to 2 m. A steady decline in groundwater availability was also identified, which negatively affects wetland habitats that are dependant on shallow water tables.

Potential construction impacts identified include:

- possible salinisation from surrounding rocks into alluvial sediments
- works cutting into shallow water tables
- contamination of groundwater in the event of inadequate drainage design.

Declining groundwater levels may also affect the corridor by causing the cracking of transport surfaces.

Air quality

Local air quality and wind data currently collected by the Bureau of Meteorology at Amberley and the Environmental Protection Agency at Flinders View was used for this study. Key existing activities affecting ambient air quality include the Swanbank Power Station, coal and clay mining and a solid waste disposal facility. The pollutants relevant to this study are nitrogen dioxide, sulphur dioxide, PM_{10} and total suspended particulates and ozone.

The study found that nitrogen dioxide is the most important pollutant for bus emissions, and for sensitive receptors a separation distance of 20 m is recommended from a bus station with 150 buses per hour and 20 m for a railway station. During construction there is the potential for elevated levels of dust. A range of mitigation strategies can be adopted to minimise construction and operational air quality impacts. No significant air quality impacts were identified.

Noise and vibration

During construction it is likely the chosen noise criteria will be exceeded for up to 150 m from the construction site. A total of 252 properties are located within the zone of potential impact. A range of mitigation strategies can be adopted to minimise construction noise impacts on adjoining communities including keeping the community well informed of scheduled activities of significant noise impact such as bridge/viaduct construction and haulage of spoil.

Based on a 60 m zone of potential impact, the operational phase will potentially affect 61 properties. Sleep disturbance has been considered for busway but it is not applicable for heavy rail noise as the rail noise criteria are explicitly provided for in the *Environmental Protection Policy 1997* (EPP Noise).

No noise modelling was undertaken but will need to be included in the eventual Environmental Impact Assessments at a time closer to the corridor being needed. As a result of the continuing changing environment, in respect of residential expansion, any results obtained from noise modelling carried out at this stage would be inaccurate in respect of future development. Vibration predictions will also need to be undertaken at this stage.

A range of mitigation strategies can be adopted to minimise construction and operational noise impacts and no significant vibration impacts were identified.

Biological environment

The results of a review of available fauna and flora desktop and databases indicate that the preferred corridor has the potential to impact on habitat for a number of fauna and flora species. The preferred corridor impacts in different degrees on:

- significant remnant vegetation listed as 'endangered' and 'of concern' vegetation
- EPA Essential Habitat for rare and threatened species
- wildlife corridors under EPA Biodiversity Mapping Assessment including riparian crossings
- protected areas under EPA mapped koala habitat and conservation reserves.

The biological assessment has identified the potential for six rare and threatened flora and 16 rare and threatened fauna species listed under the *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act) and/or *Nature Conservation Act 1992* (NC Act) to potentially occur along the Ipswich to Springfield PTC. In addition, six migratory species protected under the EPBC Act are also considered to potentially breed or occur along the Ipswich to Springfield PTC.

Referral of the Ipswich to Springfield PTC to Federal Government under the EPBC Act was not undertaken since no approval for the project is currently sought. Once a decision is made to commence with the project, it will be necessary to seek approval. The information gathered during this Environmental Impact Study will be used in any such referral at an appropriate time in the future, taking into account any possible changes to legislation and standards applicable at that time.

While further targeted studies are required prior to construction to access the exact impact of the project on listed species of flora and fauna, it is likely that any identified impacts can be mitigated or minimised through the implementation of measures such as:

- minimising vegetation clearing
- providing fauna underpasses/overpasses to maintain connectivity between vegetation patches
- fencing of the corridor to prevent interactions between fauna and the transport network
- having a spotter-catcher present during vegetation clearing works
- monitoring
- translocating individual species of flora
- providing offsets.

Providing such mitigation measures are implemented, any impacts to flora and fauna expected to be encountered are unlikely to be regarded as a fatal flaw to the realisation of the project. Due to this corridor's coexistence with part of the SWTC, the majority of key impacts such as vegetation and habitat loss, fragmentation and mortality are considered to be cumulative. This highlights the importance for a strategic approach to mitigation strategies by the various state and local government stakeholders in order to produce the best biological outcomes for the region.

Land use planning

The impact study reviewed relevant local and state planning documents and identified that the land uses in the study area include residential, rural, industrial, recreation and conservation, and community and special uses, and that the need for effective land use and public transport integration is a recurring theme in all documents reviewed.

The proposed Ipswich to Springfield PTC is largely in response to the predicted future growth of area such as Ripley Valley, Springfield and southern Redbank Plains which have been identified both in the Ipswich Planning Scheme 2006 and SEQRP. The preferred corridor does not conflict with the relevant statutory legislation as it provides a wide-spread public benefit. The proposed Ipswich to Springfield PTC is also in-line with the Ripley Valley Master Plan and the Redbank Plains Master Plan.

Planning approval process

The decision on a preferred approvals process will be influenced by a number of issues including timing of construction, preferred mode, level of environmental assessment, level of support from local government, and extent of administrative cost for Queensland Transport to protect the corridor. As a result of these undecided influences, no preferred process (or combination of processes) has been recommended at this stage for the protection of the preferred public transport corridor.

Urban design, landscape and visual

A three-dimensional representation of the preferred corridor was undertaken and integrated with a Digital Terrain Model. The preferred corridor passes through a range of rural and residential areas with significant industry midway along the overall alignment. In the long-term, the landscape character of significant parts of the corridor will change due to planned and proposed urban development.

The combination of land uses creates the situation of potential significant views of the preferred corridor but also interesting and stimulating views for users of the public transport facility. Residents and visitors are likely to be highly sensitive to visual changes to a landscape dominated setting. The alignment of the corridor has a moderate to high scenic quality based on the landscape features, a range in elevation of view points and relative level of the corridor alignment, these all combine to provide a range of viewing distances.

Visual sensitivity is the extent to which a landscape can change without unacceptable adverse effects on its visual character or scenic quality. The viewing distance was calculated to be 6 km for the purposes of the study. Visual sensitivity impacts are highest in areas west of the preferred corridor and north of the Cunningham Highway.

Visual and landscape impacts are deemed to be “moderate” for the area between Ipswich to Ripley. For the area from Ripley to Springfield, the visual impacts in an overall context are deemed ‘low’ while the landscape impacts are regarded as ‘moderate’. The overall impact for the preferred corridor is deemed to be “moderate”.

Mitigation measures may potentially involve modifications to the design of features of the public transport facility or other measures including consultation with stakeholders to change off-site developments to reduce negative visual impacts of the public transport facility.

Socio-economic

Economic and financial evaluation

SEQRP mentions that transport services and infrastructure are fundamental for supporting future economic prosperity in the western corridor. Transport infrastructure is highly supportive of economic development and employment creation in south-east Queensland.

The expected population growth rate is expected to be higher than south-east Queensland for the entire study area over the next 20 years with the Ripley to Springfield area growing at a faster rate than the Ipswich to Ripley area. The Ripley to Springfield area has a higher proportion of individuals in higher income brackets and a higher level of younger families than the Ipswich to Ripley area or south-east Queensland.

Ipswich is characterised by high employment in manufacturing (18.7% compared to 10.7% in Queensland), slightly higher employment in health, and comparatively lower employment in education, property and business. Occupations in Ipswich reflect this employment profile.

Increased public transport use reduces travel costs and supports higher density development. This reduces energy consumption and allows more efficient use of available infrastructure and resources. High quality transport also supports major urban trends such as clustered retail and mixed-use centres, knowledge based industries, services sector (i.e. tourism, recreation), cultural and creative industries, education centres and home-based business.

The overall economic impact of the Ipswich to Springfield PTC on the community is regarded as positive.

Economic feasibility

Total project costs for a rail corridor option is $1.415 billion and a busway corridor option is estimated to be $1.038 billion.

The benefit cost ratio for the rail corridor option is estimated at 0.29 whereas the bus corridor option has a BCR value of 0.26.

Social environment

Social indicators developed for Queensland Transport to monitor constraints and opportunities for the public transport corridor include population; access to health; education; employment; personal security; social interaction and quality of life. There is an above average rate of unemployment in Ipswich City (8.4% compared with 8.2% in Queensland). The level of mobility of the Ipswich City population is stable indicating people are less likely to move away from the area and the housing is characterised by a high proportion of separate houses (85.3%).

A total of 50 state schools and 18 private schools currently operate in Ipswich City with 28,931 students plus another 40 kindergarten and preschools. About 5,400 students currently attend schools in close proximity to the proposed public transport corridors. Ipswich currently has in the order of six community centres; 21 community groups; 14 community services and 26 recreational and sporting facilities. The number of community services will increase with the expected population growth in the area.

Development of the Ipswich to Springfield PTC is not expected to change the population characteristics of the area. It is generally accepted that the public transport system would

improve accessibility and enhance access to community and other social services thereby improving the quality of life of current and future residents.

Cultural heritage and native title

Aboriginal Cultural heritage: Searches of NRW's Aboriginal Cultural heritage database and register indicate that seven known Aboriginal cultural heritage sites are in the proximity of the preferred corridor. Five of the recorded sites were artefact sites, one a land feature associated with a story place of cultural significance. Another site, located within the area of access easement to the Debbing Creek Aboriginal Mission and Cemetery, is described as a burial site, with earth arrangements potentially associated with ceremonial activities and evidence of contact between Aboriginal and European people. Previous cultural heritage studies in the area indicate that more is unknown in regard to cultural heritage within the area than is on current desktop records.

A Cultural Heritage Management Plan (CHMP) is to be prepared in accordance with the processes outlined in Part 7 of the *Aboriginal Cultural Heritage Act 2003*. This process is to include investigating locations and significance to the project of the recorded sites, through consultation with the relevant Aboriginal party, undertaking review results of previous cultural heritage studies, as well as a survey of the corridor in association with the relevant Aboriginal party.

Historic heritage: Searches of the Register of the National Estate and the Queensland Heritage Register were conducted to identify places and sites of cultural heritage significance that may be impacted upon by the proposed transport corridor. It was found that no sites listed with the Register of National Estate are in close proximity to preferred corridor. The Queensland Heritage Register however listed two sites that will be directly impacted.

These are the Challinor Centre (now the University of Queensland Ipswich Campus) and the Deebing Creek Aboriginal Mission and Cemetery. The preferred corridor passes to the west of the main node of the Challinor Centre across a narrow band of the land parcel which links the campus to Deebing Creek. No buildings are located within the preferred corridor. Although the golf club house is directly impacted upon by the preferred corridor, it is located outside the registered heritage site.

The preferred corridor passes through a 50 m wide area of the Deebing Creek Aboriginal Mission and Cemetery site which is the easement linking the original mission lot to the cemetery reserve. The transport corridor is proposed to be elevated on structures over the site and will be located adjacent to the SWTC structure. This will potentially minimise the level of permanent surface disturbance, and allow pedestrian and local traffic access under the structures along Deebing Creek, and is not considered to significantly impact on the statement of heritage significance of the site.

A heritage impact assessment and conservation management plan will need to be undertaken by an experienced and qualified heritage consultant. The intention of this study will be to assess the heritage impacts in line with the site's Statement of Significance and outline, and in accordance with the *Heritage Act 1993*, outline all responsibilities and requirements for works to proceed on the site. This may include documenting the heritage values of the areas of the Challinor Centre and the Deebing Creek Aboriginal Mission and Cemetery proposed to be disturbed by the corridor. This information should aim to provide detail design teams with specific recommendations to manage the proposed project around

the historic sites with minimal impact. Consultation with the EPA's heritage unit and the Ipswich City Council's heritage staff will also be required.

The Ipswich Planning Scheme provides for the protection of character, historic and heritage places by identifying zone sub-areas for Character Housing (low density and mixed density). Individual sites of character, historic and heritage significance outside of the Character Housing areas are identified in Schedule 2 Character Places (Historic and Miscellaneous Places) or Schedule 3 Character Places (Identified Places of interest).

The preferred corridor passes through an area zoned as a Character Area, and three other Character Places listed in the Ipswich City Council Planning Scheme. The three existing dwellings in the area zoned Character Area are directly impacted by the preferred corridor and will need to be either demolished, or depending on the heritage significance, relocated. One dwelling at 341 Brisbane Street West Ipswich which is listed as a Character Place will need to be either demolished, or depending on the heritage significance, relocated. There will be no significant impact to the character or heritage values of the other two Character Places. The one at 345 Brisbane Street appears to be vacant, with no dwelling present. The other is the is H.T. Hooper & Co, Soap Works at 97 Lobb Street, Churchill, and as the preferred corridor crosses site approximately 100 m from the heritage building it is not considered that the preferred corridor will have a significant adverse impact on the heritage values of the site.

While sites of heritage significance occur along the preferred corridor, potential impacts to these sites can be minimised or mitigated through sensitive design of the transport corridor and through adherence to the recommendations outlined in Section 15.4. This includes consultation with the relevant Aboriginal party to introduce the project and outline the future intentions to develop a CHMP and discuss potential impacts and management strategies on the known Aboriginal cultural heritage sites within the vicinity of the preferred corridor. This consultation will be undertaken prior to finalisation of the Environmental Impact Study. If these items are addressed then the presence of heritage sites is not regarded as a fatal flaw to the realisation of the project.

Traffic and transport

The stations along the preferred corridor differ not only in size, but also in the function each performs within the public transport network. Each station is defined as a type in accordance with the TransLink Network Plans' hierarchy of stations and stops, which also provide guidelines on minimum standards for facilities located at each type of station. Those located in major hubs for example will act as transport interchanges, while others located in (existing and future) residential areas will function as standard stations.

Safety at stations will promote the use of public transport along the preferred corridor and Crime Prevention through Environmental Design (CPTED) principles should also be incorporated into the design of station facilities along the preferred corridor.

Bicycle use and walking add greater flexibility and efficiency to a public transport network and further reduce reliance on the car. Accessibility for cyclists and pedestrians is therefore critical to the effective use of stations along the corridor. Due consideration should be given to the ease and convenience of accessibility at each station in relation to the surrounding area it serves. Research indicate that most commuters will walk up to 400 m (a five minute walk) to a minor public transport stop, like a small bus stop and up to 800 m (approximately 10 minutes) to a major public transport node – for example a railway or busway station. Safe, direct routes that are well marked should be provided in the vicinity of each station and

should cover at least the extent of the walk catchments. Bicycles travel three to four times faster than a person on foot and as such, the bicycle catchment for a five minute ride is around 1.5 km. As with walking, safe and direct routes that are well marked should be provided within this catchment. These routes (paths) should also connect to existing networks, for example the Integrated Regional Cycle Network where they run in close proximity to the station. Appropriate end of trip facilities like secure bicycle parking will further enhance the attractiveness of cycling to/from a station. Furthermore, in some cases a residential area may be cut off from a station by a creek for instance and in such a case, the provision of cycle/pedestrian bridge over the creek will further enhance the cycling/walking route and further promote the use of public transport along the preferred corridor. The above is especially true for stations located in major urban centres that will have a strong focus on walking and cycling, for example, University, Yamanto, Ripley North, Ripley Town Centre and School Road stations.

By combining car use and public transport through means of park-and-ride facilities, an efficient and effective system is created which transfers parking demand from the inner city to suburban/urban fringe locations. Some stations along the preferred corridor that are located within lower density residential areas for instance are proposed to have provision for parking. Park-and-ride facilities will enable the corridor to serve a substantial catchment of public transport users that can access the station from beyond the cycling and walking catchments by private vehicle. Stations identified for significant park-and-ride are:

- Berry Street (400 spaces)
- Deebing South (1,000 spaces)
- Swanbank (1,000 spaces)
- Keidges Road (1,500 spaces).

Mode integration occurs at points where modes of transport interface. This may take the form of a bus to rail transfer (or interchange) or a bus to busway transfer. Several stations along the preferred corridor are anticipated to be serviced by feeder buses and would each thus serve as a transport interchange. Mode integration should be as seamless as possible – for example, different services should have compatible timetables, run frequently to eliminate waiting times or the need for a timetable.

An international trend in support of a sustainable future includes the use of transit oriented development (TOD) in both new and existing public transport networks. TODs promote the integration of public transport and land use. The trend is a move away from reliance on the private vehicle as the primary mode. Three stations along the preferred corridor – Yamanto, Ripley Town Centre and School Road – have been identified as potential TODs. These stations have been identified because they are planned to be the hub for major new and rejuvenated existing urban areas.

The mode for the preferred corridor will depend on a number of factors including:

- transport function
- cost
- social.

Ipswich is currently served by a rail line between Ipswich and Brisbane. The proposed rail line from Darra to Springfield is currently under consideration by the State Government. The presence of a second passenger rail line to the south, complemented by a network of local feeder bus routes will substantially enhance the functionality of public transport for the area.

Both capital and operating costs are relevant in a short term as well as a long term context. Capital costs and operating costs for the rail mode may be relatively higher than for a busway, however the carrying capacity of the rail mode compared with the bus mode is substantially higher and similarly returns from farebox revenue is higher for rail.

As for social benefits, from the investigations in the REF phase of the Ipswich to Springfield PTC study, a rail mode appears to influence sustainable community generation to a greater level than bus in greenfield sites.

This impact study was not however intended to recommend a particular mode, as detailed studies for both modes will be undertaken as part of a business case closer to the time of construction.

Apart from the differences highlighted above during the evaluation, there are a number of other influencing factors associated with each mode. In general, a rail mode will make for easier integration with the existing public transport networks in the area, for example existing rail stations at Ipswich and Springfield (part of the Darra-Springfield extension), whereas a bus mode would have to allow for a busway to rail station transfer at either end.