26.1.1.2 To provide for other use or development that does not constrain or conflict with resource development uses.
26.1.1.3 To provide for economic development that is compatible with primary industry, environmental and landscape values.
26.1.1.4 To provide for tourism-related use and development where the sustainable development of rural resources will not be compromised.

The Local Area Objectives relevantly provides for:

a) Primary Industries:
Resources for primary industries make a significant contribution to the rural economy and primary industry uses are to be protected for long-term sustainability. The prime and non-prime agricultural land resource provides for variable and diverse agricultural and primary industry production which will be protected through individual consideration of the local context...

The Desired Future Character Statement is:

The visual impacts of use and development within the rural landscape are to be minimised such that the effect is not obtrusive.

Consistent

The proposed highway alignment requires acquisition of land outside the current highway alignment, within the Rural Resource zone (as described in Section 7.11 above). This land is currently used for rural purposes.

Agricultural
In accordance with the LIST mapping, the land affected is Class 4 and 5 land and therefore does not fall within the definition of prime agricultural land. It is also noted that the development site will not impact on any existing dams. Only the southernmost portion of the site is within an Irrigation District (Lower South Esk Irrigation District extending from Perth / Evandale to Campbelltown). The affected land is situated between the proposed southern link and Drummond Street and is identified as the South Perth Outline Development Plan (ODP) in Council's recently adopted Perth Structure Plan. The South Perth ODP 'is designated as an emerging residential area and represents a prime opportunity for redevelopment to accommodate the town's future growth' (GHD and Northern Midlands Council, *Perth Structure Plan – A Strategy for the Future*, 2017, p. 12). It is understood that Council are currently drafting amendments to the planning scheme to rezone this land and guide the development of the ODP. As such, future access to the irrigation scheme in this area, will not be required.

Visual Impacts
The existing landscape character comprises predominantly agricultural land, with vegetated hillsides to the west. Vegetation removal has been minimised to that required for the construction of the link roads. The design of any landscaping for replacement plantings along the proposed link roads will be a collaborative process between State Growth, the Council and landowners. It will continue to be developed as an integrated landscaping scheme, providing visual interest with the established character of Perth and the surrounding area, while ensuring safe sight lines and being cost effective for ongoing maintenance. A concept landscaping plan forms part of this Development Application.

26.2 Use Table

Under the Use Table at Clause 26.2, Utilities are classified as Discretionary if:

a) *For existing uses on prime agricultural land;*
b) *Not for existing uses; or*
c) *The curtilage increases by more than 30% as at the effective date.*

The proposed link roads are a new use through the rural resource land and, as such, the use is discretionary in the zone.

26.3 Use Standards

The proposal meets the Rural Resources Use Standards objectives by providing for an overriding benefit to the region through a safer and more efficient highway network. The impacts through conversion of the existing agricultural land to road use and the associated visual impacts on the rural landscape are minimised to that necessary to accommodate the proposed road works.

The proposal also complies with the specific performance criteria 26.3.1, Discretionary Uses if not a single dwelling, which requires:

Acceptable Solution/Performance Criteria	**Compliance Statement**
P1.1 It must be demonstrated that the use is consistent with local area objectives for the provision of non-primary industry uses in the zone, if applicable;	Complies. See assessment at the top of this Section (10.4.2).
P3 The conversion of non-prime agricultural land to non-agricultural use must demonstrate that: a) The amount of land converted is minimised having regard to: i. Existing use and development on the land; and ii. Surrounding use and development; and iii. Topographical constraints; or b) The site is practically incapable of supporting agricultural use or being included with other land for agricultural or other primary industry use, due to factors such as: i. limitations created by any existing use and/or ii. development surrounding the site; and iii. topographical features; and iv. poor capability of the land for primary industry; or c) The location of the use on the site is reasonably for operational efficiency.	Complies. The amount of acquisition required has been minimised to that necessary to accommodate the required road design and the road is required to provide for operational efficiency and safety of the highway network consistent with subclause a) and c).
P4 It must demonstrated that: a) emissions are not likely to cause an environmental nuisance; and b) primary industry uses will not be unreasonably confined or restrained from conducting normal operations; and c) the capacity of the local road network can accommodate the traffic generated by the use.	Complies. A Traffic Noise Assessments has been undertaken for the Perth Link Roads in accordance with the Department's *Tasmanian State Road Traffic Noise Management Guidelines*. Only two dwellings are eligible for consideration of noise mitigation, under the Department's Guidelines. Mitigation measures will be undertaken in accordance with the EPA endorsed *Tasmanian State Road Traffic Noise Management Guidelines* and in consultation with the affected landowner. Lighting is only proposed at the roundabout and on and off ramps, as required to ensure a sufficient level of safety. The lighting design will be developed in a manner that ensures that light spill is minimised and will not cause an environmental nuisance.

Acceptable Solution/Performance Criteria	Compliance Statement
	As such, the proposal accords with subclause a). The Department has been working with local landowners impacted by the works, to ensure that impacts on existing primary industry activities are minimised. Where existing property accesses to the State road network are required to be closed, new property access points to the State road network are proposed to ensure that primary industry uses will not be unreasonably confined or restrained from conducting normal operations, consistent with subclause b). The design includes new property access arrangements for existing agricultural land, including internal accesses and stock underpasses. The proposal is a road project, and is designed to improve the existing road safety and efficiency outcomes at existing road junctions between the highway and local road network consistent with subclause c). As described under 7.5, through traffic using Drummond Street, Youl Road and Midland Highway (Main Road) will be diverted onto the new Link roads. The proposal will reduce traffic on local roads within Perth. As such, the proposal accords with subclause c).
A5 It must be demonstrated that the visual appearance of the use is consistent with the local area having regard to: a) the impacts on skylines and ridgelines; and b) visibility from public roads; and c) the visual impacts of storage of materials or equipment; and d) the visual impacts of vegetation clearance or retention; and e) the desired future character statements.	Complies. The key impacts relate to the associated earthworks with the proposed alignment requiring construction of fill embankments for the new highway and ramps around Illawarra Main Road, along with new road cuttings on some sections. These earthworks have been minimised as far as practicable, and are required due to the nature of existing terrain and the requirement for under/over passes at the northern and western junctions (see section dwgs A0087.038 Sheets 0060-0097 and photo montages). The road has been designed to minimise the visual impact on the adjoining rural landscape by: • Minimising extent of vegetation clearance and avoiding areas of natural value; • Minimising land acquisition and impact on surrounding properties; • Restricting storage of materials and equipment to the construction phase and managing the storage in accordance with a CEMP so as to minimise impacts during

Acceptable Solution/Performance Criteria	Compliance Statement
	construction; • Continuing the development of an integrated landscaping scheme in conjunction with Council.

The proposal also complies with specific performance criteria 26.3.3, Irrigation Districts, which requires:

Acceptable Solution/Performance Criteria	Compliance Statement
P1 Non-agricultural uses within an irrigation district proclaimed under Part 9 of the *Water Management Act 1999* must demonstrate that the current and future irrigation potential of the land is not unreasonably reduced having regard to: a) The location and amount of land to be used; and b) The operational practicalities of irrigation systems as they relate to the land; and c) Any management or conservation plans for the land.	Complies. As discussed above, only the southernmost portion of the site is within an Irrigation District (Lower South Esk Irrigation District). The land is situated at the northern edge of the district immediately adjacent to Perth (Drummond Street) and at 53 hectares, constitutes only 0.078% of the 66,600 hectare district. The proposal has been designed to avoid impact on existing irrigation infrastructure and irrigated land in the area. The affected land is identified as the South Perth Outline Development Plan (ODP) in Council's recently adopted Perth Structure Plan. The South Perth ODP is designated as an emerging residential area and it is understood that Council are currently drafting amendments to the planning scheme to rezone this land and guide the development of the ODP. As such, any potential reduction in irrigation potential of the land between the proposed southern link road and Drummond Street was foreshadowed by Council, and is considered to be consistent with strategic land use planning for the Perth area.

26.4 Development Standards

Acceptable Solution/Performance Criteria	Compliance Statement
26.4.1 Building Location and Appearance	Not applicable.
26.4.2 Subdivision	Not applicable. Land acquisition occurs under the *Land Acquisition Act 1993.*

10.4.3 28.0 Utilities Zone

28.1 Zone Purposes, Local Area Objective and Desired Future Character Statement

The Utilities Zone Purpose is:

28.1.1.1 To provide land for major utilities installations and corridors.

28.1.1.2 To provide for other compatible uses where they do not adversely impact on the utility.

There are no desired local area objectives or Desired Future Character Statements.

The proposed works within the Utilities zone directly furthers Zone Purpose 28.1.1.1.

28.2 Use Table

Under the Use Table at Clause 28.2, Utilities are classified as Permitted.

28.3 Use Standards

The utilities use within the zone is compliant with the acceptable solution at 28.3.1, Capacity for existing utilities, as the use is permitted.

28.4 Development Standards

Acceptable Solution/Performance Criteria	Compliance Statement
28.4.1 Building Design and Siting	Not applicable.
28.4.2 Subdivision	Not applicable.

10.5 Part D Codes

10.5.1 E1 Bushfire Hazard Code

This Code does not apply to the proposed development.

10.5.2 E2 Potentially Contaminated Land Code

This Code does not apply to the proposed development.

10.5.3 E3 Landslip Code

This Code does not apply to the proposed development.

10.5.4 E4 Road & Rail Assets Code

The purpose of this Code is to protect the safety and efficiency of road and railway networks, maintain opportunities for future development, and reduce amenity conflicts between roads and railways and other use or development.

E4.2 Application of the Code

The Code is applicable as the proposal includes relocated accesses and new junctions.

A Traffic Impact Assessment (TIA), written by a suitably qualified traffic engineer, is submitted with the application in accordance with the requirements of the Code. The TIA demonstrates compliance with the use standards under Clause E4.6.1 and all relevant development standards. Please see the accompanying TIA for the full assessment and compliance statements under the Code.

10.5.5 E5 Flood Prone Areas Code

The purpose of this code is to ensure that use or development subject to risk from flooding is appropriately located and that adequate measures are taken to protect human life and property and to prevent adverse effects on the environment, and determine the potential impacts of flooding through the assessment of risk in accordance with the Australian Standard.

E5.2 Application of the Code

The Code is applicable as the proposal involves the development of land potentially subject to flooding at a 1% annual exceedance probability.

Acceptable Solution/Performance Criteria	Compliance Statement
5.6.1 Flooding and Coastal Inundation	
P1.1 It must be demonstrated that development: a) where direct access to the water is not necessary to the function of the use, is located where it is subject to a low risk, in accordance with the risk assessment in E5.7 a); b) where direct access to the water is necessary to the function of the use, that the risk to life, property and the environment is mitigated to a medium risk level in accordance with the risk assessment in E5.7.	Complies. Direct access to the water is necessary to the function of the use, and the Drainage Report outlines how the preliminary design has mitigated risk to life, property and the environment. The proposed development does not change the existing likelihood and consequence of flood, and its design can effectively drain the site up to and including the 1 in 100 year ARI event, without worsening the existing flooding in Perth (i.e. consequence of flooding).
P1.2 Development subject to medium risk in accordance with the risk assessment in E5.7 must demonstrate that the risk to life, property and the environment is mitigated through structural methods or site works to a low risk level in accordance with the risk assessment in E5.7.	The flood risk to the development has been mitigated by providing drainage for the project has been designed to convey existing flows up to the 1 in 100 year ARI event. The current downstream flood risk is assessed as being medium, and the proposed works do not change the future flood risk, consistent with the Drainage Report.
P1.3 Where mitigation of flood impacts is proposed or required, the application must demonstrate that: a) the works will not unduly interfere with natural coastal or water course processes through restriction or changes to flow; and b) the works will not result in an increase in the extent of flooding on other land or increase the risk to other structures; c) inundation will not result in pollution of the watercourse or coast through appropriate location of effluent disposal or the storage of materials; and d) where mitigation works are proposed to be carried out outside the boundaries of the site, such works are part of an	Mitigation of flood impacts proposed as part of the works are summarised below. a) the works have been designed to minimise the restriction or changes in existing flow of Sheepwash Creek, by following existing drainage lines, and modelling to determine appropriate sizes for culverts; b) the works will not result in an increase in the extent of flooding on other land or increase the risk to structures, as the drainage has been designed to drain the site up to and including 1 in 100 year ARI event; c) the proposal includes vegetated table drains and discharge to grassed buffer

approved hazard reduction plan covering the area in which the works are proposed.	zones, to treat sedimentation and pollution from stormwater runoff from the road. d) The detailed design phase will consider any further work done by Council and Hydrodynamica on hazard reduction plans in nearby areas along Sheepwash Creek.

10.5.6 E6 Car Parking and Sustainable Transport Code

The purpose of this Code is to:

a) ensure that an appropriate level of car parking facilities are provided to service new land use and development having regard to the operations on the land and the nature of the locality; and
b) ensure that cycling, walking and public transport are encouraged as a means of transport in urban areas; and
c) ensure access for cars and cyclists and delivery of people and goods is safe and adequate; and
d) ensure that parking does not adversely impact on the amenity of a locality and achieves high standards of urban design; and
e) ensure that the design of car and bicycle parking space and access meet appropriate design standards; and
f) Provide for the implementation of parking precinct plans.

E6.2 Application of the Code

The Code is applicable it applies to all use and development.

A TIA, written by a suitably qualified traffic engineer, is submitted with the application. The TIA provides the following assessment against the provisions of the Code:

This code applies to all use and development, with no exemptions. However not all of the purposes of the Code are relevant to this current proposal, with the exception of "(b) ensure that cycling, walking and public transport are encouraged as a means of transport in urban areas."

Pedestrian and cyclist movements to or from Illawarra Main Road will be encouraged to remain on the existing road network, even though general traffic will need to use the new Perth Links. A pedestrian/cyclist underpass will be provided to connect Illawarra Main Road with Drummond Street and Youl Road. The lower traffic volumes within Perth will make walking and cycling these areas safer and more attractive than at present.

No car or bicycle parking is required for this development, and is not proposed to be provided. The proposal does not therefore require assessment against any of the standards.

For further information, please see the attached TIA.

10.5.7 E7 Scenic Management Code

The Code seeks to control development adjacent to and viewed from the road so as to maintain the visual amenity.

E7.2 Application of the Code

This Code applies as the development site includes land within the scenic management - tourist road corridor, where the proposed link roads connect with the existing Midland Highway alignment to the north and where the proposed link roads connect with Illawarra Road to the west (see Figure below). The scenic management corridor extends 200 m from each frontage of the Midland Highway and Illawarra Road.

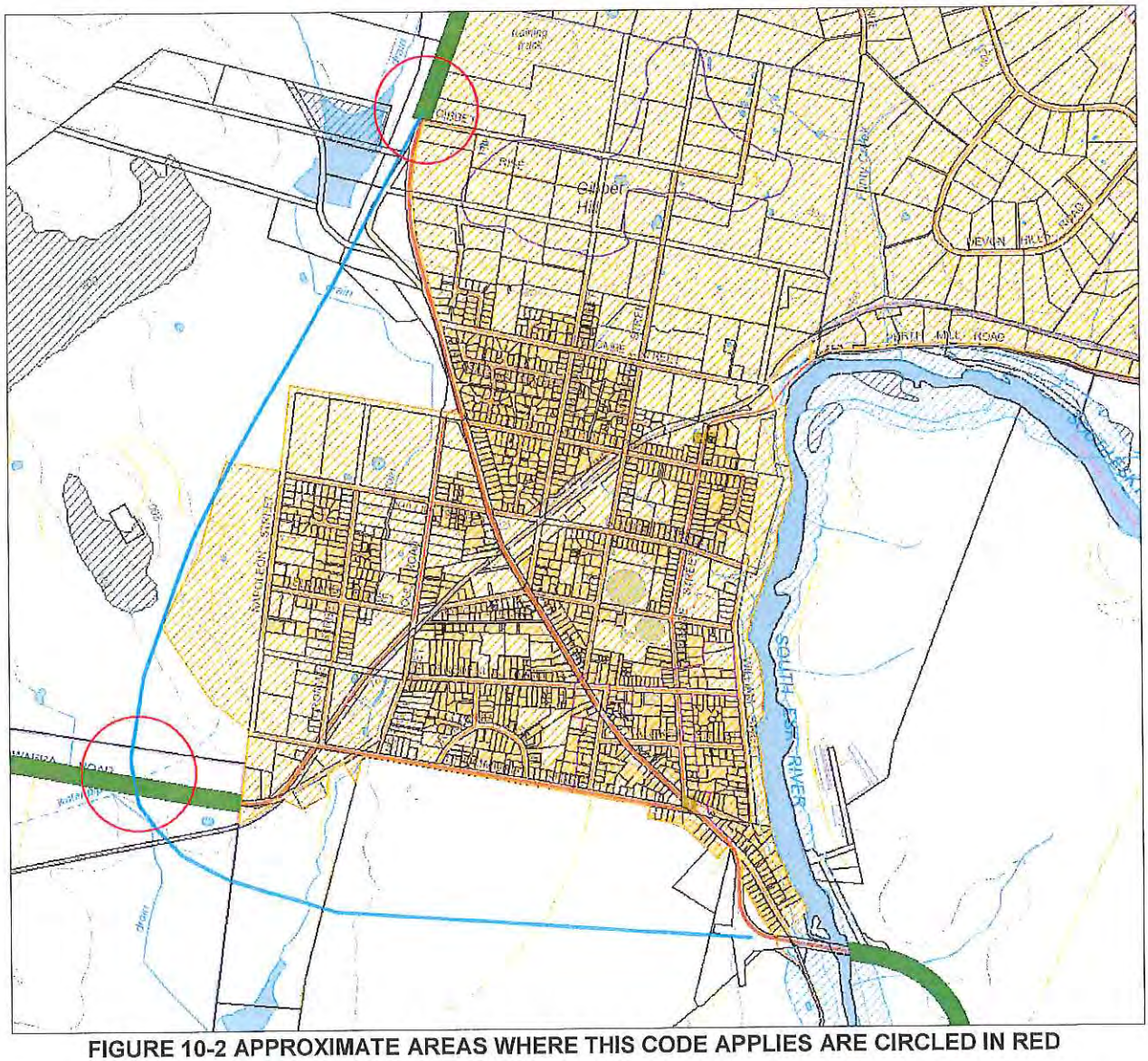


FIGURE 10-2 APPROXIMATE AREAS WHERE THIS CODE APPLIES ARE CIRCLED IN RED

Source: the LIST

The Code objectives relevantly state:

a) To enhance the visual amenity of the identified tourist road corridors through appropriate:
   i) setbacks of development to the road to provide for views that are significant to the traveller experience and to mitigate the bulk of development; and
   ii) location of development to avoid obtrusive visual impacts on skylines, ridgelines and prominent locations within the corridor; and

iii) design and/or treatment of the form of buildings and earthworks to minimise the visual impact of development in its surroundings; and
iv) retention or establishment of vegetation (native or exotic) that mitigates the bulk or form of use or development; and
v) retention of vegetation (native or exotic) that provides amenity value to the road corridor due to being in a natural condition, such as native forest, or of cultural interest such as hedgerows and significant, exotic feature trees;

The Code applies to those works outside of the road reserve, on land being acquired. Once constructed this road will form the new Midland Highway road frontage. The Code will then no longer apply as the scenic management – tourist road corridor starts from the Highway frontage. Accordingly it is considered that the proposed objectives and development standards are not applicable to the proposal.

Notwithstanding, the proposal is consistent with the objectives (outlined above) as the alignment has been informed by the flora and fauna assessment, the existing layout of Perth and strategic work informing the future development of Perth, and the proposal has sought to minimise the impact on identified values and clearance to that necessary to accommodate the proposed works.

The Department will be considering the visual impacts of the proposal through a landscaping scheme that will be developed in consultation with Council and adjacent landowners.

A concept landscaping plan has been developed, with the aim to avoid obtrusive visual impacts along the new road corridor. Similarly, the concept landscaping plan includes retention and establishment of vegetation (both native and exotic) that acts as screening for the new road, and provides views that are significant for the travellers using the new road.

This plan will be developed in consultation with Northern Midland Council and landholders.

10.5.8 E8 Biodiversity Code

The purpose of this provision is to:
a) Protect, conserve and enhance the region's biodiversity in consideration of the extent, condition and connectivity of critical habitats and priority vegetation communities, and the number and status of vulnerable and threatened species; and
b) ensure that development is carried out in a manner that assists the protection of biodiversity by:
    i) minimising vegetation and habitat loss or degradation; and
    ii) appropriately locating buildings and works; and
    iii) offsetting the loss of vegetation through protection of other areas where appropriate.

E8.2 Application of the Code

The Code is applicable to use or development of land within an area identified as priority habitat on the planning scheme maps or for the removal of native vegetation.

State Growth engaged an environmental consultant to undertake an assessment of the proposal against the provisions of the Code. The assessment finds the works to accord with the intent of the Code through minimal clearing of "native vegetation" and the works occurring in an already highly modified landscape. The assessment also states that while there may be some limited clearing of "native vegetation", none of this will be within an area identified as priority habitat, such that the Acceptable Solution under E8.6.1 'Habitat and Vegetation Management' is met.

For further details please see attached Biodiversity Compliance Analysis and attachments compiled by Mark Wapstra of Environmental Consulting Options Tasmania and David James.

10.5.9 E9 Water Quality Code

The purpose of this Code is to:

a) consider the impacts of development to limit adverse effects on the following:
   i) wetland and watercourse ecosystems; and
   ii) flow regimes, water levels, biological activity and physical characteristics; and
   iii) the variety of flora and fauna; and
   iv) the role of wetlands and watercourses for water supply, flood mitigation, environmental protection, water regulation and nutrient filtering, as resources for recreational activities and as attractive features in the landscape; and
b) improve the sustainable management of surface water through development.

E9.2 Application of the Code

The Code is applicable as parts of the site are located within 50 m of a watercourse, including the South Esk River and Sheepwash Creek. The works do not intersect any wetlands designated under the Conservation of Freshwater Ecological Values database.

The proposal will result in some riparian vegetation clearance within 40 m of these watercourses.

E9.6 Development Standards

Acceptable Solution/Performance Criteria	Compliance Statement
E9.6.1 Development and Construction Practices and Riparian Vegetation	
P1 Native vegetation removal must submit a soil and water management plan to demonstrate: (a) revegetation and weed control of areas of bare soil; (b) the management of runoff so that impacts from storm events up to at least the 1 in 5 year storm are not increased; and (c) that disturbance to vegetation and the ecological values of riparian vegetation will not detrimentally affect hydrological features and functions.	Complies. The successful contractor will be required to implement the approved Construction Environmental Management Plan (CEMP) in accordance with State Growth's Specification 176 Environmental Management, which includes requirements for soil, water and weed management consistent with subclause a). The CEMP will include sedimentation and erosion control measures to ensure that adequate controls such as sediment traps are incorporated to minimise disturbance to the existing watercourses. The drainage design was informed by the Council commissioned flood study for the area conducted by Hydrodynamica. New culverts and table drains have been sized to adequately cope with the runoff from the road and adjacent verges and earthworks and will discharge into suitable discharge locations for rainfall events up to and including a 1 in 100 year flood event consistent with subclause b), therefore impact from storm events are not increased. The main culverts along Sheepwash Creek have been designed to convey flood flows and maintain the existing flow of water. The two proposed frog passage culverts are adjacent to two stock underpasses. In addition to their function as underpasses, they will also provide

	additional drainage capacity in high flow events. The waterways have been maintained in the current locations and where relocation is required, localised diversion of the waterway has been minimised, so to be consistent with subclauses b) and c). Environmental drainage assessments have been undertaken that demonstrate that hydrological features and functions will not be detrimentally affected (c).
A2 A wetland must not be filled, drained, piped or channelled.	Complies. There are no existing wetlands in the development site.
P3 A watercourse may be filled, piped or channelled: (a) within an urban environment for the extension of an existing reticulated stormwater network; or (b) for the construction of a new road where the retention of the watercourse is not feasible.	Complies. The affected tributaries will be channeled via culverts for the construction of the new link road. The culverts at Sheepwash Creek are 1.5 m x 1.2 m box culverts for frog connectivity as per State Growth's Green and Gold Frog Guidelines.
E9.6.2 Water Quality Management	
A1 All stormwater must be: (a) connected to a reticulated stormwater system; or (b) where ground surface runoff is collected, diverted through a sediment and grease trap or artificial wetlands prior to being discharged into a natural wetland or watercourse; or (c) diverted to an on-site system that contains stormwater within the site.	Complies. Stormwater runoff will be controlled using a system of vegetated table drains and concrete culverts. These will discharge to grassed buffer zones and existing drainage lines, outside Perth's existing reticulated stormwater system.
P2.1 New and existing point source discharges to wetlands or watercourses must implement appropriate methods of treatment or management to ensure point sources of discharge: a) do not give rise to pollution as defined under the *Environmental Management and Pollution Control Act 1994*; and b) are reduced to the maximum extent that is reasonable and practical having regard to: i) best practice environmental management; and ii) accepted modern technology; and c) meet emission limit guidelines from the Board of Environmental Management and Pollution Control in accordance with the State Policy for Water Quality Management 1997. P2.2 Where it is proposed to discharge pollutants into a wetland or watercourse, the application must demonstrate that it is not practicable to recycle or reuse the material.	Complies Management of sedimentation and pollution of stormwater runoff from the road is to be managed using vegetated table drains and concrete culverts, discharging to grassed buffer zones where possible.

E9.6.3 Construction of Roads	
P1 Road and private tracks constructed within 50m of a wetland or watercourse must comply with the requirements of the Wetlands and Waterways Works Manual, particularly the guidelines for siting and designing stream crossings.	Complies. The guidelines require for the 'siting and design of stream crossings: bridges, culverts, fords, causeways & stock-crossings': • Explore alternatives to the construction of a new crossing. Use existing crossings wherever possible. • When selecting structure type, use the following order of preference to minimise environmental impacts – bridge, arch culvert, open-bottom box culvert, closed bottom box culvert, pipe culvert. • Maintain the natural flow regime by avoiding or minimising changes to channel form and flow volume. • Avoid 'perched culverts' which have an outlet more than 10 cm above the level of downstream waters. • Minimise disturbance to stream bank soil and vegetation. • Ensure adequate erosion control on approach roads. • Regulate stock access to waterways. The culvert structure type has been designed to have regard to the fauna values in the area and in particular State Growth's Green and Gold Frog Management Guidelines 2015. The construction works will be undertaken in accordance with a CEMP which will include sedimentation and erosion control measures to ensure that adequate controls such as sediment traps are incorporated to minimise the disturbance to the existing water courses.

10.5.10 E10 Recreation and Open Space Code

This Code does not apply to the proposed development.

10.5.11 E11 Environmental Impacts and Attenuation Code

This Code does not apply to the proposed development.

10.5.12 E12 Airport Impact Management Code

This Code does not apply to the proposed development.

10.5.13 E13 Local Historic Heritage Code

This Code does not apply to the proposed development.

10.5.14 E15 Signs Code

Any regulatory signs required do not require a permit under this Code under Clause 15.4.1 of the Scheme.

11. State Policies

11.1 State Policy on the Protection of Agricultural Land 2009

The State Policy on the Protection of Agricultural Land provides a framework for planning decisions involving agricultural land. Its purpose is to conserve and protect agricultural land so that it remains available for the sustainable development of agriculture, recognising the particular importance of prime agricultural land. Its provisions are reflected in the Scheme; however they are also addressed below.

In terms of agricultural use on the development site, it is identified that:

- The development site does not comprise prime agricultural land.
- The existing adjacent agricultural land uses predominantly comprise grazing and cropping.

Principle 3 of the Policy relevantly states in relation to the development of utilities, such as roads, that:

> "The development of utilities, extractive industries and controlled environment agriculture on prime agricultural land may be allowed, having regard to criteria, including the following:
>
> (a) minimising the amount of land alienated;
>
> (b) minimising negative impacts on the surrounding environment; and
>
> (c) ensuring the particular location is reasonably required for operational efficiency."

The proposal is assessed to be consistent with the above requirements in that the proposed works are designed to minimise the amount of the land acquired to that necessary to accommodate the necessary road design. The impacts on the surrounding environmental are also minimised by limiting vegetation clearance to that required for the proposed link roads.

Further, the proposed works are required to ensure the operational efficiency including safety of this section of the Highway as part of the National Highway network.

11.2 State Policy on Water Quality Management 1997

The State Policy on Water Quality Management provides a framework for the development of ambient water quality objectives and the management and regulation of sources of emissions to surface waters (including coastal waters) and groundwater. In terms of water quality, investigations have identified that:

- Stormwater will be directed to table drains, and works will accord with the Department of State Growth's Standard Specifications for road construction, including implementation of appropriate measures to control erosion and manage stormwater.
- Construction of the road will be carried out in accordance with an environmental management plan consistent with the relevant State Growth specifications to prevent erosion and the pollution of streams and waterways by runoff from sites of road construction and maintenance.
- The cross drainage of the Class 1 waterways, has also been specifically designed to provide passage corridors for fauna, including the Green and Gold Frog (*Litoria raniformis*) which are known to occur within the local area. 1.5 x 1.2 m 'frog friendly' box culverts will be installed with attractant ponds at the opening of each culvert end to encourage frogs (and other fauna) to use the underpass culverts rather than cross the highway. This approach has been successfully adopted by other jurisdictions around the country as 'best practice' to minimise road kill of threatened species and facilitate fauna movement across the landscape.

The proposal is therefore assessed to be consistent with the State Policy.

11.3 State Coastal Policy 1996

Not applicable as the site not within the coastal zone.

12. Conclusion

This report supports a development application by the Department of State Growth to Northern Midlands Council for the new Perth Link Roads dual carriageway.

The report has identified the proposed road works are a permitted use within the Utilities Zone. Discretion is required in relation to the development in the General Residential Zone, Rural Resources Zone and under the Road and Railway Assets Code (development on and adjacent to existing and future arterial roads and railways and new accesses), Flooding and Water Quality Code (development and construction practices and riparian vegetation and construction of roads).

The proposal is assessed to be consistent with the relevant performance criteria under the Zone standards and Codes. The proposal is therefore assessed to comply with the requirements of the Northern Midlands Interim Planning Scheme and should be approved.

The proposed works are also considered to comply with the applicable State Policies subject to implementation of a Construction Environmental Management Plan to minimise potential water quality impacts. Preparation of a satisfactory CEMP will be a State Growth requirement for the successful contractor responsible for the construction works.

Department of State Growth

GPO Box 536
Hobart TAS 7001 Australia

Phone: 1800 030 688
Email: info@stategrowth.tas.gov.au
Web: www.stategrowth.tas.gov.au

Dept of State Growth

Perth Link Roads - Preliminary Design

Drainage

June 2017

Table of contents

Table index

Figure index

1. Introduction

1.1 Purpose of this report

This report provides the assumptions and general description of the preliminary drainage design for the proposed Perth Links Roads project. It supports a Development Application by the Department of State Growth (State Growth) to the Northern Midlands Council (the Council) for the proposed Perth Link Roads project to the west of Perth. The site constitutes a total length of approximately 5 km.

1.2 Background

The proposed Perth Link Roads will link with the Perth-Breadalbane duplication project and will re-align the Midland Highway to the west and south of the existing Perth township, with interchanges linking to the major access routes into Perth and through to Devonport.

Northern Midlands Council has commissioned flood studies for Sheepwash Creek under existing conditions. GHD has used the resulting report (Hydrodynamica, July 2016) to review the existing conditions influenced by Sheepwash Creek.

2. Existing Conditions

The site is largely open paddocks with minor drainage paths crossing the proposed road corridor. Sheepwash Creek is the major drainage path and crosses the corridor twice – once at the north and once at the south. There are existing drainage structures including culverts at roads and rail, and table/swale drains within the corridor.

Northern Midlands Council has commissioned flood studies for Sheepwash Creek under the existing conditions. The resulting report (Hydrodynamica, July 2016) has been used to review the existing conditions influenced by Sheepwash Creek. It should be noted that the Hydrodynamica Report does not address flooding from sources other than Sheepwash Creek.

We understand that there is flooding experienced to the west of Perth in the region of Napoleon Street. This was out of the scope of the Hydrodynamica Report but has been noted in the following design and assumptions.

Figure 1 Site Overview

2.1 Flood Prone Areas Risk Assessment

An indicative Risk Assessment has been undertaken for Perth associated with the flooding in Sheepwash Creek. The indicative Consequence for a 1 in 100 ARI event appears to be 'Medium' based on the Hydrodynamica Flood Mapping (June 2016). The Likelihood is approximately 1% ('Rare'). Therefore, in accordance wth AS/NZS 4360:2004, the Risk is 'Medium' under current conditions.

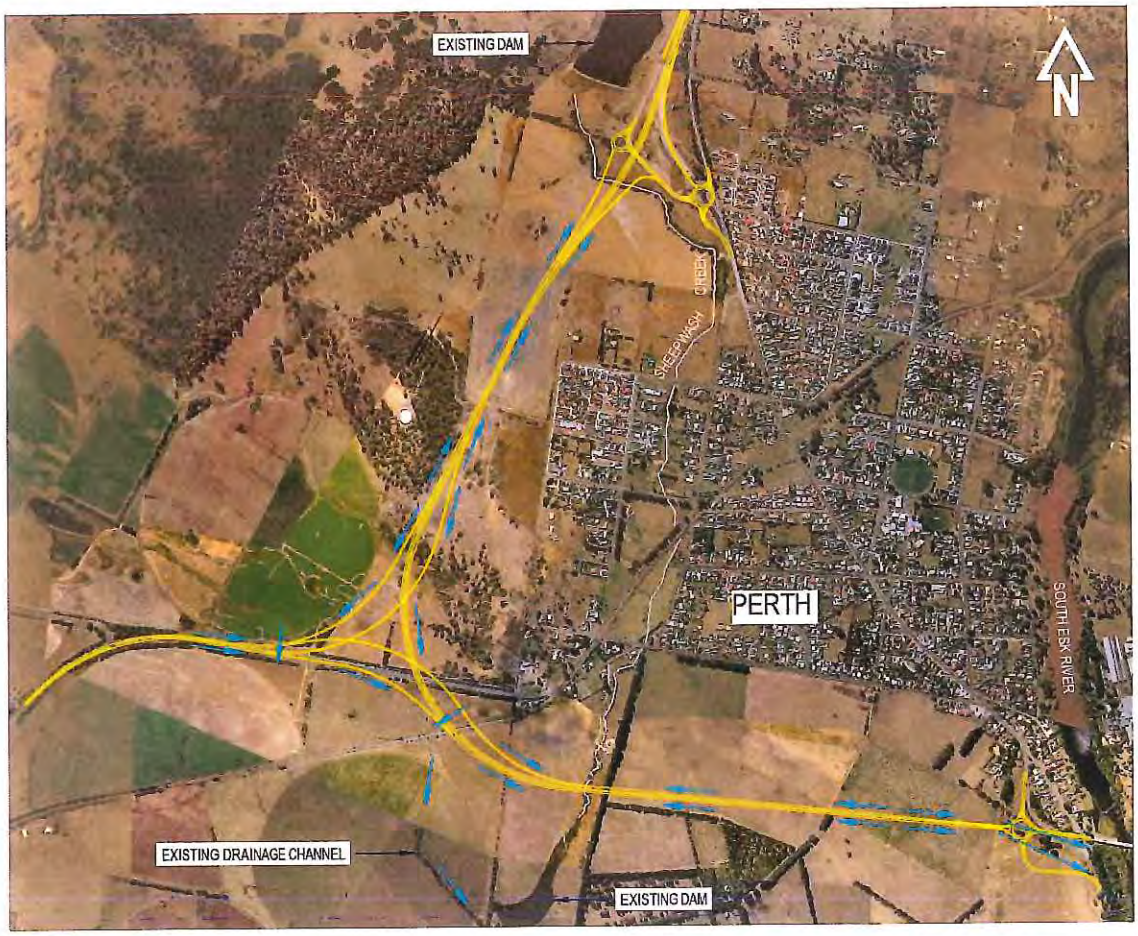
3. Proposed Conditions

3.1 Road Drainage

The drainage system shall convey runoff from all pavement areas (194 000 m^2) and adjacent verges and earthworks, and all runoff affected by the Project Works to suitable discharge locations for rainfall events up to and including the 1 in 100 ARI event.

Drainage easements are to be acquired for any new drainage outfalls on private property (excludes discharge directly to existing creeks). A drainage plan for the project area is shown at Figure xx.

Figure 2 Drainage paths – Perth Link Roads



3.2 Cross Drainage

3.2.1 Sheepwash Creek (North & South)

Hydrodynamica has undertaken flood modelling for Sheepwash Creek (refer section 3.3). A summary of the peak flows is included below.

Table 1 Peak Flows at Highway (from Hydrodynamica, 2016)

ARI (1 in Y year)	Peak Flow (m^3/s)
100	10.9

100 + Climate Change	22.9

Based on these flows, indicative culvert sizes are as follows.

ARI (1 in Y year)	Span (m)	Height (m)	Gradient	Max Water level above invert (m)
100	3.6	1.5	1%	1.52
100 + Climate Change	3.6	1.5	1%	3.24
100 + Climate Change	3.6	1.8	1%	2.78
100 + Climate Change	3.6	2.1	1%	2.58
100 + Climate Change	3.6	2.4	1%	2.51

The culverts are to have multiple functions:

- To convey flood flows (as above);
- To provide access under the highway for frogs; and
- To provide access between land each side of the highway for light vehicles and stock.

As such, a minimum single 3.6m x 2.4m is required at each location together with a low flow path to prevent wetting of the access during low flow events (i.e. probability of 50% AEP or greater). It is understood that the minimum required access for frogs is a 1.5m x 1.2m (hydraulic capacity approximately 1.5m x 0.9m due to shaping of base).

3.3 MacKinnon Dam Flood

The MacKinnon Dam is located upstream of the Highway and the township of Perth. There is a culvert proposed underneath the highway conveying flows from the dam catchment through to Sheepwash Creek. As for other cross drainage (refer 3.2), the culvert is to be designed for a 1:100 AEP event without dam overtopping (minimum road level Q100 + 0.5m) based on State Growth's T8 – Drainage Design Standards.

Northern Midlands Council has commissioned flood modelling by Hydrodynamica for the 1:100 AEP flood from McKinnon's Dam through Perth as well as dam break, 1: 1,000 AEP, 1: 10,000 AEP and 1: 50,000 AEP events. According to the hydrology report, the dam's current Hazard Category is 'Significant' and the design flood for the spillway is the 1: 1,000 AEP event. Hydrodynamica's report has suggested that the Dam may need to be re-categorised as 'High C' which would increase the required flood flow conveyed by the spillway to 1:10,000 to 1: 50,000 AEP.

The road batter will consider erosion control (only) to the upstream and downstream batter of the road around the area affected by dam 'sunny day failure' flood event and the 1:1,000 AEP flood event with maintenance expected following these floods.

3.4 Water Quality

Sedimentation and pollution treatment of stormwater runoff from the road shall be included in the works to satisfy the requirements of the Northern Midlands Interim Planning Scheme 2013 via vegetated table drains, and discharge to grassed buffer zones where possible. Water quality in existing drainage lines from runoff upstream will not be treated specifically.

In terms of managing water quality during construction works, the successful contractor will be required to implement the approved Construction Environmental Management Plan (CEMP) in accordance with State Growth's Specification 176 Environmental Management, which includes requirements for soil, water and weed management. The CEMP will include sedimentation and erosion control measures to ensure that adequate controls such as sediment traps are incorporated to minimise disturbance to the existing watercourses.

3.5 Frog Passage

As noted under section 3.2.1, a frog culvert will be provided for low flow flood events at both crossings of Sheepwash Creek. Frog passage has not been provided for on any other culverts.

3.6 West Perth Drainage

During the stakeholder engagement process, flooding issues were particularly noted in the vicinity of Napoleon Street under existing conditions. Two culverts are proposed under the proposed highway draining to this area. Based on the survey and aerial photography, there does not appear to be any formal drainage path in these areas. Therefore, the discharge from the culverts was initially designed to dissipate over the paddocks rather than be concentrated and discharged at a single location.

The preliminary design has been amended to divert the run off from both the upstream catchments and the proposed highway via a table drain to Sheepwash Creek. This will provide an improvement to the drainage around the properties along Napoleon Street.

Directing the additional catchment directly to Sheepwash Creek is likely to provide a peak flow from the western catchment prior to the peak occurring due to the larger Sheepwash Creek catchment. While the early peak may be increased, the latter larger peak will likely remain the same or be slightly reduced due to the quicker passing of the western catchment flows.

4. Conclusion

The site can be effectively drained up to and including the 1 in 100 year ARI event without worsening the existing flooding in Perth.

The Risk Category of Sheepwash Creek through Perth is 'Medium' before the proposed works (refer section 2.1). As described in section 3, the flooding will not be worsened. The proposed works will not increase the Risk through Perth.

5. Scope and Limitations

This report has been prepared by GHD for Dept of State Growth and may only be used and relied on by Dept of State Growth for the purpose agreed between GHD and the Dept of State Growth as set out in this report.

GHD otherwise disclaims responsibility to any person other than Dept of State Growth arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Dept of State Growth and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

GHD

2 Salamanca Square
T: 61 3 6210 0600 F: 61 3 6210 0601 E: hbamail@ghd.com

3218285-63510/https://projects.ghd.com/oc/Tasmania/perthlinkroadsprelim/Delivery/Documents/Drainage Report.docx

Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	Fiona Haynes	Mike Graver	Per email	Mike Graver	Per email	19 May 2017
1	Fiona Haynes	Greg McGuire	Per email	Greg McGuire	Per email	21 June 2017

www.ghd.com

Department of State Growth

Midland Hwy - Perth Link Roads Prelim Design

Traffic Impact Assessment

June 2017

This report has been prepared by GHD for Department of State Growth and may only be used and relied on by Department of State Growth for the purpose agreed between GHD and the Department of State Growth as set out in section 1.3 of this report.

GHD otherwise disclaims responsibility to any person other than Department of State Growth arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Department of State Growth and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

Table of contents

Table index

Figure index

1. Introduction

1.1 Background

This report supports a development application by the Department of State Growth (State Growth) to the Northern Midlands Council (the Council) for the proposed Perth Link Roads project to the west of Perth. The site constitutes a total length of approximately 5 km.

The upgrade of the Midland Highway at Perth is a component of the staged upgrade of the highway from the South Esk River Bridge (south of Perth) to Breadalbane. The first stage, which commenced in 2016 and is due for completion in 2018, duplicates the highway between Perth and Breadalbane.

The remaining portion of the overall project is the subject of this development application and comprises the construction of the Southern and Western Links, which will realign the Midland Highway around Perth and provide a new connection to Illawarra Main Road.

The purpose of this report is to address the Northern Midlands Interim Planning Scheme 2013 and to consider issues of traffic flow and safety, accesses, natural and cultural values, water quality, land capability, amenity, cycling routes, and accommodation works for any impacted properties.

The proposed Perth Link Roads will link with the Perth-Breadalbane duplication project and will re-align the Midland Highway to the west and south of the existing Perth township, with interchanges linking to the major access routes into Perth and through to Devonport.

Completion of these projects will improve road safety by installing central median barriers on the Midland Highway and removing through traffic from the main thoroughfare of Perth; improve transport efficiency (including freight movement between the northern ports and Hobart); and ease traffic congestion within Perth.

The existing highway does not meet contemporary safety and design standards and has sections that significantly impact on the suitability of the National Land Transport Network for safe and efficient transport of freight and passengers across Tasmania.

In conjunction with the current upgrade between Perth and Breadalbane, completion of Perth Link Roads will provide a dual carriageway between Perth and Launceston, addressing current and future capacity constraints.

1.2 Basis of assessment

GHD previously provided traffic advice to the Department of State Growth during the concept development for the Perth Links project in 2014. An AIMSUN mesoscopic traffic model was developed for Perth and immediate surrounds, and used to evaluate various alignment and interchange concepts.

The same model has been used for this current assessment, with a base (calibrated) year of 2014, and future forecast for the year 2043.

1.3 Purpose of this report

The purpose of this report is to describe the proposed changes to the existing road network and outline the predicted impacts on traffic and transport in and around the study area.

2. Existing Conditions

2.1 Study Area

The study area is shown in Figure 2.1, and includes the Perth town area, as well as the Midland Highway and Illawarra Main Road on approach to Perth.

Figure 2.1 Study Area

Source: LISTMap

2.2 Transport Network

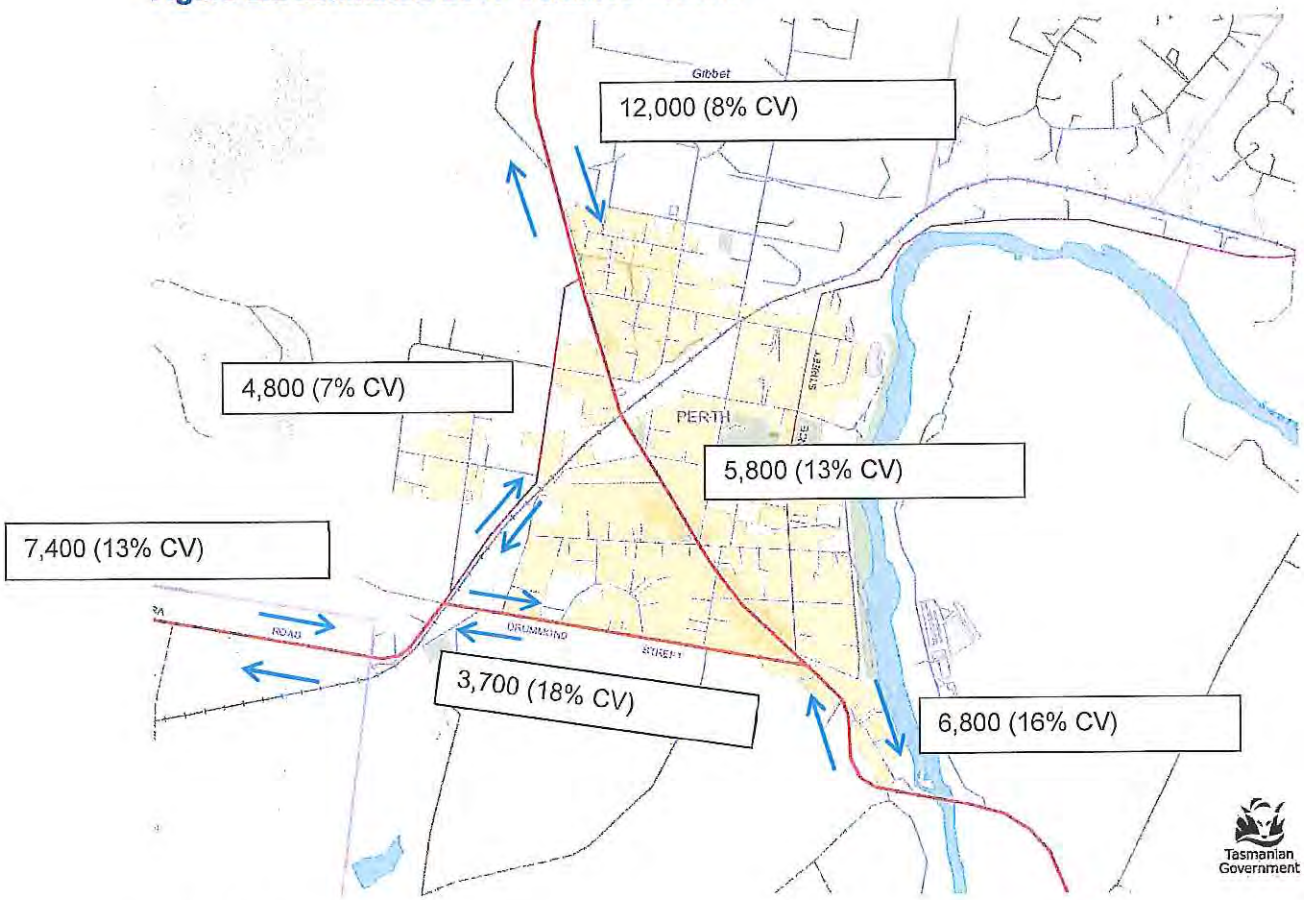
For the purpose of this assessment, the transport network consists of the following roads:

- Midland Highway
- Illawarra Main Road
- Youl Road

Each of these is discussed in detail in the following sections.

Estimates of current daily traffic volumes for Illawarra Road, Midlands Highway and the Youl Road are shown in Figure 2.2.

Figure 2.2 Estimated 2017 Volumes – AADT



Source: LISTMap

2.2.1 Midland Highway (Main Road)

The Midland Highway is Tasmania's major north-south transport corridor and is a key link in Tasmania's National Network. The Highway facilitates freight transport from the Southern region to the State's northern ports and is also the major transport link for passengers travelling between the northern and southern regions; It fulfills an important role as a passenger transport link, including for commuters between Perth and Launceston.

The Midland Highway is also known as Main Road through Perth. The Midland Highway is classified as a Category 1 – Major Highway in the Tasmanian State Road Hierarchy (Department of State Growth). The function of Category 1 roads is as follows:

Category 1 Roads are Tasmania's major highways and are crucial to the effective functioning of industry, commerce and the community in Tasmania. They carry large numbers of heavy freight and passenger vehicles and are the key links supporting future economic development in Tasmania.

Category 1 Roads facilitate:

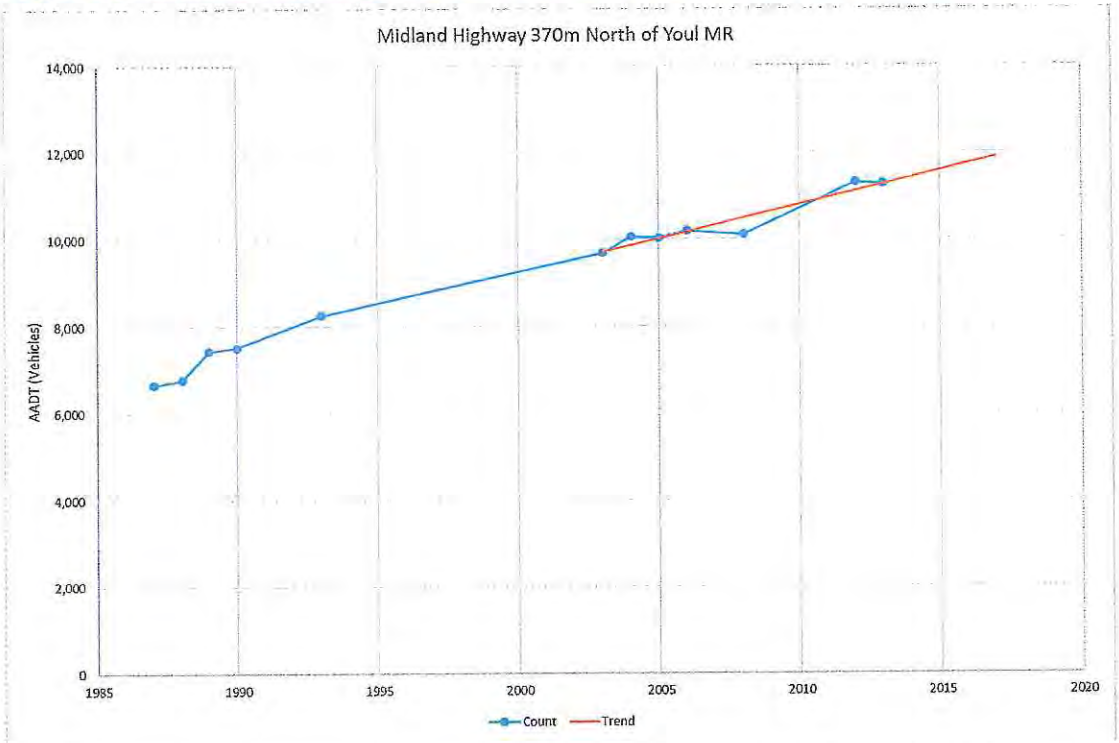
- *inter-regional freight movement*
- *inter-regional passenger vehicle movement*
- *business interaction.*

The Category 1 Roads connect the largest population centres, major sea and air ports, and key industrial locations.

The highway services traffic travelling between Hobart and Launceston. Within the study area the highway consists of a single lane in each direction, with major intersections at Illawarra Main Road (Drummond Street) and Youl Road.

Figure 2.3 shows historical traffic counts for the Midland Highway north of Youl Road. Based on the historic trend since 2003 current AADT volumes are expected to be in the order of 12,000 vehicles per day, with a growth rate of approximately 1.3% per annum. The proportion of heavy vehicles across the day is approximately 8%.

Figure 2.3 Midland Highway Historic Traffic Growth – north of Youl Road



The speed limit north of Perth, where the adjacent land use is predominantly rural, is 100km/hr. Duplication of the highway between Perth and Breadalbane is currently under construction.

Figure 2.4 shows historical traffic counts for the Midland Highway through Perth (north of Drummond Street). Based on the historic trend since 2003 current AADT volumes are in the order of 5,800 vehicles per day, with 13% commercial vehicles and a growth rate of approximately 1.3% per annum. The speed limit through the urban area is 50 km/h, with on-street parking on either side of the road.

Figure 2.4 Midland Highway Historic Traffic Growth – through Perth

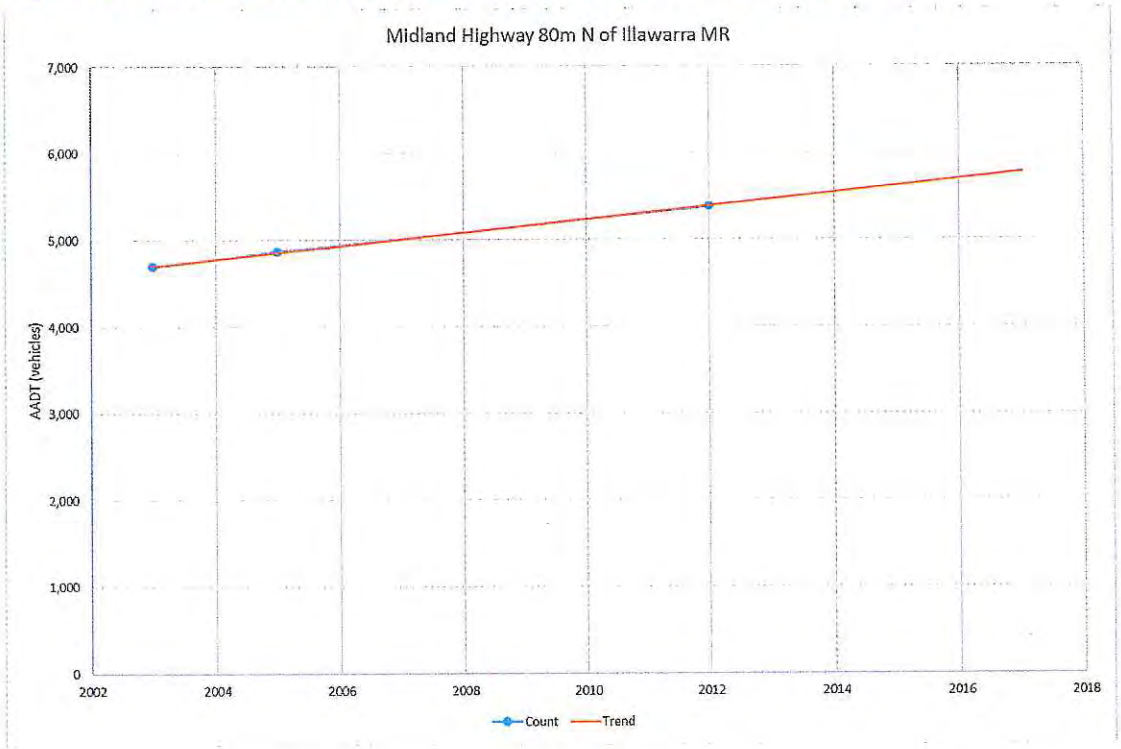
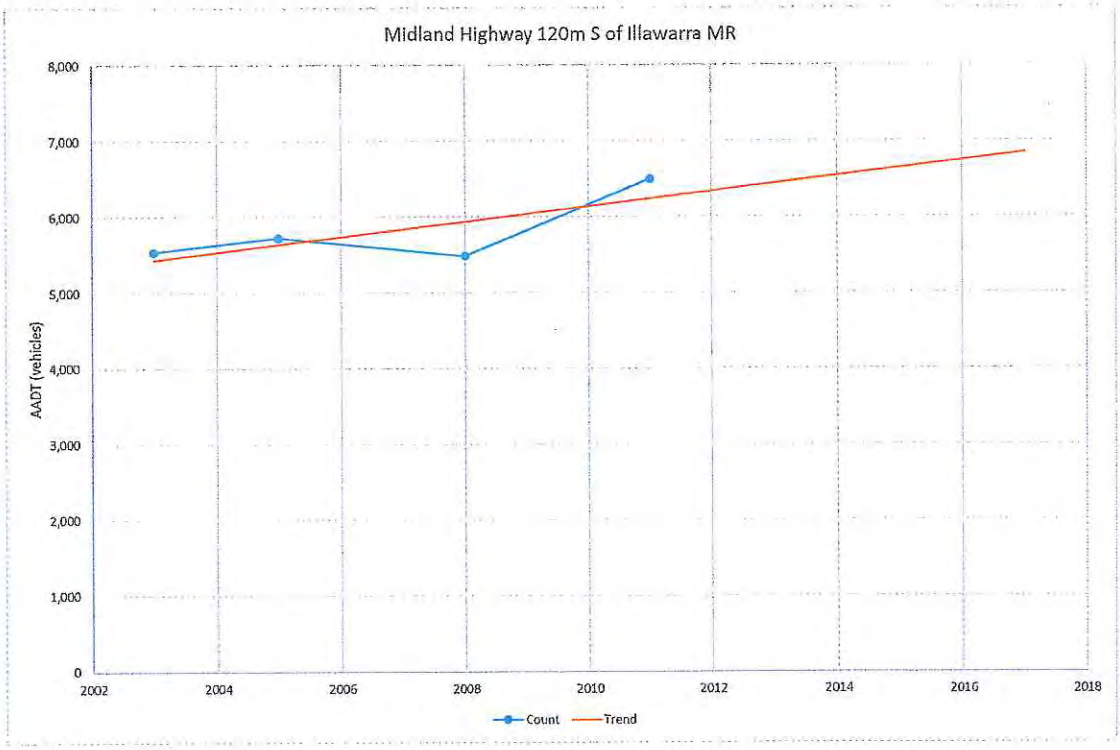


Figure 2.5 shows historical traffic counts for the Midland Highway south of Perth. Based on the historic trend since current AADT volumes are in the order of 6,800 vehicles per day, with a growth rate of approximately 1.5% per annum. The proportion of heavy vehicles across the day is approximately 16%. The speed limit south of Perth is 100km/hr, with rural adjacent land use.

Figure 2.5 Midland Highway Historic Traffic Growth – south of Perth



2.2.2 Illawarra Main Road

Illawarra Main Road is the key connection between the Bass and Midland Highways, providing a shorter, more attractive route for freight and passenger vehicles travelling between the north-west and south.

Illawarra Main Road is classified as a Category 1 – Major Highway in the Tasmanian State Road Hierarchy (Department of State Growth). The function of Category 1 roads is as follows:

Category 1 Roads are Tasmania's major highways and are crucial to the effective functioning of industry, commerce and the community in Tasmania. They carry large numbers of heavy freight and passenger vehicles and are the key links supporting future economic development in Tasmania.

Category 1 Roads facilitate:

- *inter-regional freight movement*
- *inter-regional passenger vehicle movement*
- *business interaction.*

The Category 1 Roads connect the largest population centres, major sea and air ports, and key industrial locations.

Illawarra Main Road is also known as Drummond Street through the urban area of Perth. Drummond Street is a single carriageway road with a speed limit of 70km/hr.

Figure 2.6 shows historical traffic counts for the Illawarra Main Road (Drummond Street) east of Norfolk Street. Based on the historic trend since 2003, current AADT volumes are in the order of 3,700 vehicles per day, with a growth rate of approximately 1.6% per annum. The proportion of heavy vehicles across the day is approximately 18%.

Figure 2.6 Illawarra Main Road Historic Traffic Growth – through Perth

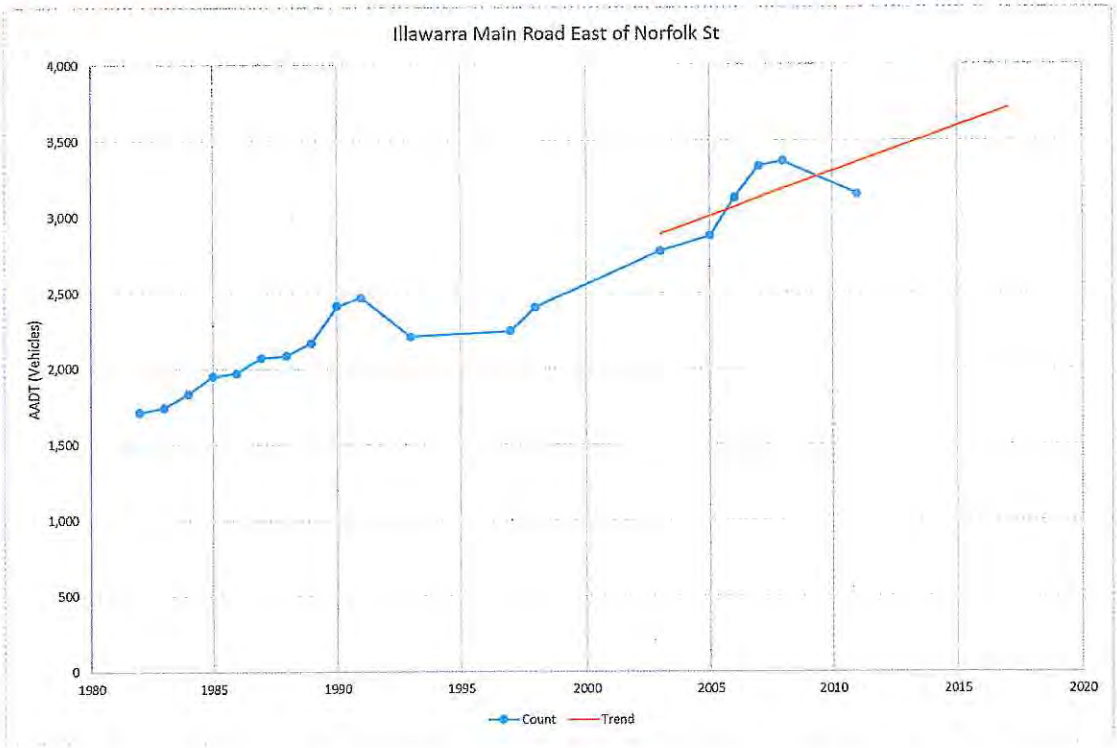
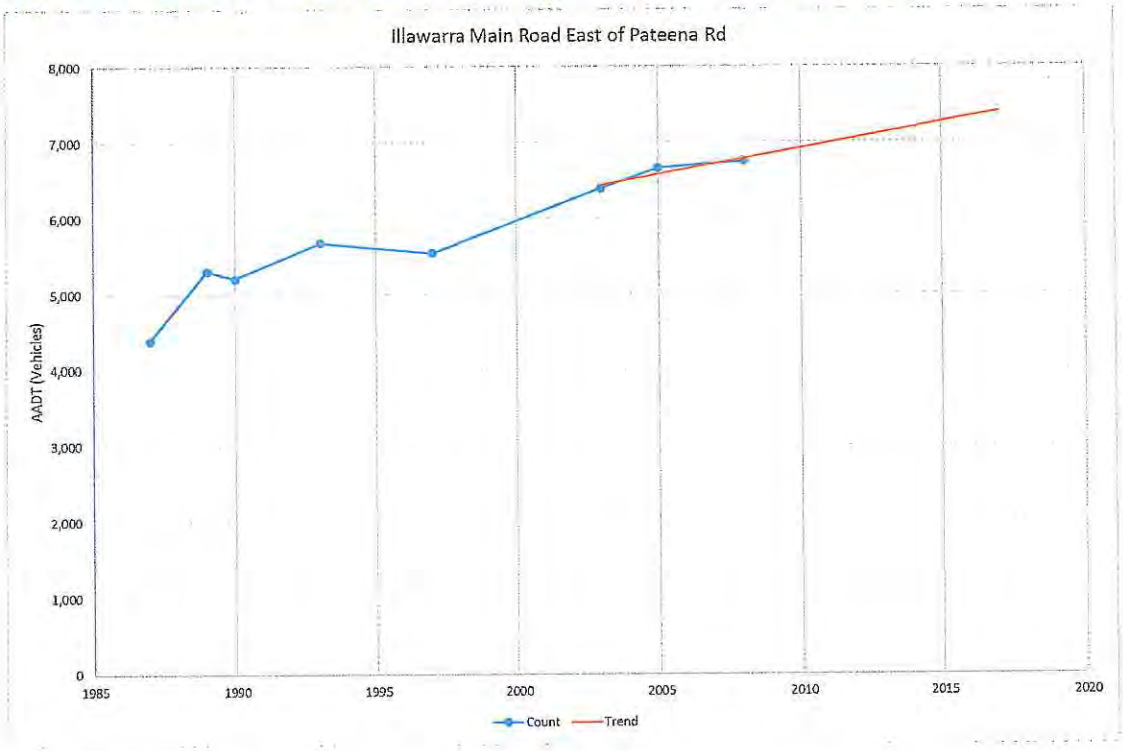


Figure 2.7 shows historical traffic counts for the Illawarra Main Road west of Perth. Based on the historic trend since 2003. Current AADT volumes are in the order of 7,400 vehicles per day, with a growth rate of approximately 0.9 % per annum. The proportion of heavy vehicles across the day is approximately 13%. The speed limit west of Perth is 100km/hr, with rural adjacent land use.

Figure 2.7 Illawarra Main Road Historic Traffic Growth - West of Perth



2.2.3 Youl Road

Youl Road is classified as a Category 5 road in the Tasmanian State Road Hierarchy (Department of State Growth). The function of Category 5 roads is as follows:

Category 5 Roads are primarily access roads for private properties.

Some may be used for comparatively low frequency heavy freight vehicle transport, for example:

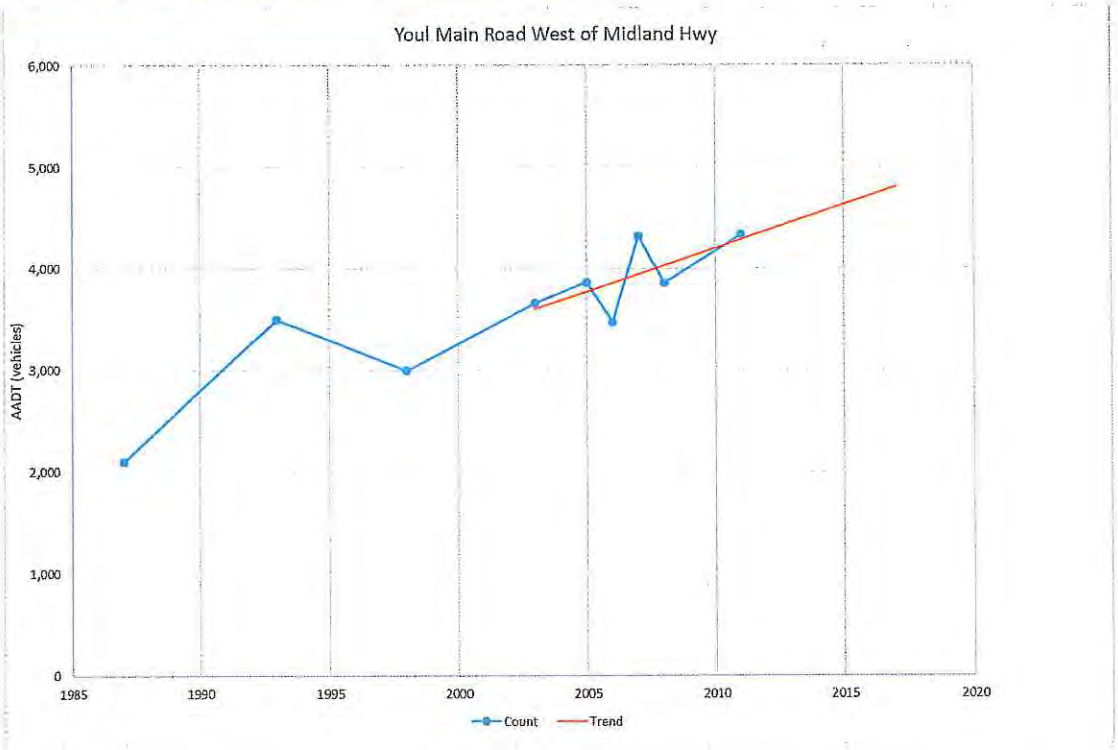
- *log transport – but they are not the most important log transport roads, and experience fluctuation in use*
- *farm property access – for purposes including delivery of fuel and supplies, stock transport, crop delivery and milk pick-up.*

While a few of these roads may currently carry larger numbers of heavy freight vehicles, they may duplicate existing Category 1, Category 2 or Category 3 Roads and are not the Department of State Growth's strategically preferred heavy freight vehicle routes.

Youl Road provides a cross-connection between the Midland Highway just north of Perth and Illawarra Road. It is a single lane rural road with speed limits of 60km/hr.

Figure 2.8 shows historical traffic counts for Youl Road. Based on the historic trend since 2003 current AADT volumes are in the order of 4800 vehicles per day, with a growth rate of approximately 1.8% per annum. The proportion of heavy vehicles across the day is approximately 11%.

Figure 2.8 Youl Road Historic Traffic Growth



2.3 Population

Perth is a relatively small town, within commuting distance (approximately 20km) of Launceston. At the 2011 census it had a population of 2,567. Land use is generally residential or rural residential with a few small retail and commercial enterprises.

A 2013 Land Use Planning Study by GHD, used to inform the Launceston Traffic Study for the Department of State Growth, indicated potential for an additional 1,700 dwellings to be constructed in Perth up to 2043. Future residential development is expected to be concentrated in the areas immediately to the west and south of the existing Perth urban area, within the proposed Perth Link roads.

2.4 Pedestrians and Cyclists

Along the Midland Highway, Youl Road and Illawarra Main Road (Drummond Street) no specific provisions currently exist for cyclists, however the roads within and surrounding Perth are relatively well used by cyclists due to the flat terrain. Within Perth, footpaths are provided on most roads to encourage pedestrians.

The Perth Link Roads project includes a 1.4 km long pedestrian and cycle path (2.5m wide) between Drummond Street and Illawarra Main Road, to provide a connection between Perth and areas to the west, and eliminate the need for cyclists/pedestrians to use the Perth Link Roads.

2.5 Public Transport

Within Perth there are bus stops in Drummond Street, Scone Street, Clarence Street and Arthur Street Main Rd which service the route Launceston-Evandale-Perth-Longford-Cressy operated by Tassielink Transit. Between Launceston and Cressy there are eleven weekday services and three Saturday services in each direction. There is currently no Sunday service.

2.6 Road Safety

Crash data was obtained from the Department of State Growth for a recent five (5) year period (2012 – 2017) for the study area and is summarised in Table 2.1 below. A map of the crash data by severity is shown Figure 2.9. Between 1 January 2012 and 3 January 2017, a total of 59 crashes were recorded, including two fatal crashes and 19 casualty crashes.

Table 2.1 Perth Area Crashes (2012-2017)

Location	Number of Crashes			Dominant Crash Type(s)
	Total	Fatal	Casualty	
Midland Highway (North)	3		2	Off carriageway on straight (3)
Midland Highway (Main Road Perth)	15		3	Manoeuvring (7) Vehicles from same direction (4) Parked (3)
Midland Highway (South)	4		1	Off carriageway on curve (3)
Illawarra Road	5	1	1	Off carriageway on curve (3)
Illawarra Road (Drummond Street)	5		1	
Youl Road	4		1	Off carriageway on straight (2)
Intersection of Midland Highway and Youl Road	6		1	Vehicles from same direction (5)
Intersection of Drummond Street and Illawarra Road and Youl Road	6		2	Cross Traffic (4)
Intersection of Drummond Street and Midland Highway	2	1	1	Vehicles from same direction (1) Vehicles from opposing directions (1)
Intersection of Drummond Street and Scone Street	2			Vehicles from same direction (2)
Other Youl Road Intersections	4		3	Vehicles from same direction (3) Cross Traffic (1)
Other Main Road Intersections	3		3	Cross Traffic (2)
Total	**59**	**2**	**19**	

Source: Department of State Growth (2012-2017)

Figure 2.9 Crashes by Severity (2012-2017)

Source: Google Earth, Department of State Growth (2012-2017)

The crash history does not suggest that there are any existing road safety deficiencies, which may be increased by the proposed Link Roads. The higher crash rates on Midland Highway (Main Road) are representative of the higher traffic volumes using this route.

3. Proposed Works

The proposed works are shown in Figure 3.1, and include a Southern Link and a Western Link.

Figure 3.1 Proposed Perth Links

3.1 Southern Link

The preferred design for the Southern Link includes:

- a new dual carriageway between Illawarra Main Road and the South Esk River Bridge (Southern Link);
- a new roundabout at the southern entrance to Perth, near the existing Midland Highway and Eskleigh Road;
- a new underpass for the existing rail line south of Illawarra Main Road;
- a new intersection (grade separation) at Illawarra Main Road.

3.2 Western Link

The Western Link will connect the Southern Link to the newly duplicated section between Perth and Breadalbane. Construction of the Western Link will remove most of the vehicles currently using Youl Main Road, shift the majority of traffic travelling through Perth onto the Midland Highway, remove a level railway crossing from the National Land Transport Network (the level crossing will still exist, but only crosses the local road). The preferred design for the Western Link includes:

- a new dual carriageway between Illawarra Main Road and the new Perth to Breadalbane duplication (Midland Highway) north of Perth;
- a new grade-separated intersection as the northern entrance to Perth, including two roundabouts;

- Provision of a roundabout at the junction of the existing Midland Highway (Main Road) and the access road to the northern interchange.

The design was developed in accordance with the guidelines and standards listed below:

- Department of State Growth Specifications
- Austroads Guidelines
- Australian Standards

4. Impact Assessment

4.1 Traffic Diversion

Table 4.2 shows an estimate of the change in traffic patterns, as a result of the proposal.

Youl Road currently provides a cross-connection between the Midland Highway just north of Perth and Illawarra Road. The Western Link would replace this function of Youl Road (for most traffic) and thus a reduction in traffic is predicted. There would be a daily reduction of 5,500 fewer vehicles using Youl Road. In the northbound direction, some 280 fewer vehicles would use Youl Road in the AM peak hour, with over 250 fewer vehicles in the PM peak hour. In the southbound direction, there would be 130 fewer vehicles in the AM peak hour and some 280 in the PM peak hour.

Drummond Street currently provides a cross-connection between the Midland Highway just south of Perth and Illawarra Road. The Southern Link would replace this function of Drummond Street and thus a reduction in traffic is predicted. There would be a daily reduction of 2,400 fewer vehicles using Drummond Street. In the eastbound direction, some 110 fewer vehicles would use Drummond Street in the AM peak hour and 140 in the PM peak hour. In the westbound direction, there would be 90 fewer vehicles in the AM and 100 in the PM peak hours.

The Midland Highway currently facilitates transport travelling along the north-south transport corridor. The Perth Links would replace this function of the Midland Highway and thus a reduction in traffic is predicted. There would be a daily reduction of 6,400 fewer vehicles using the Midland Highway. In the northbound direction, some 240 fewer vehicles would use the Midland Highway in the AM peak hour and 350 in the PM peak hour. In the southbound direction, there would be 300 fewer vehicles in the AM and 350 in the PM peak hour.

The Western Link and the Southern Link would each carry around 14,700 and 11,000 vehicles per day, respectively.

Table 4.1 Forecast Peak Traffic Volume Change on Key Roads 2043

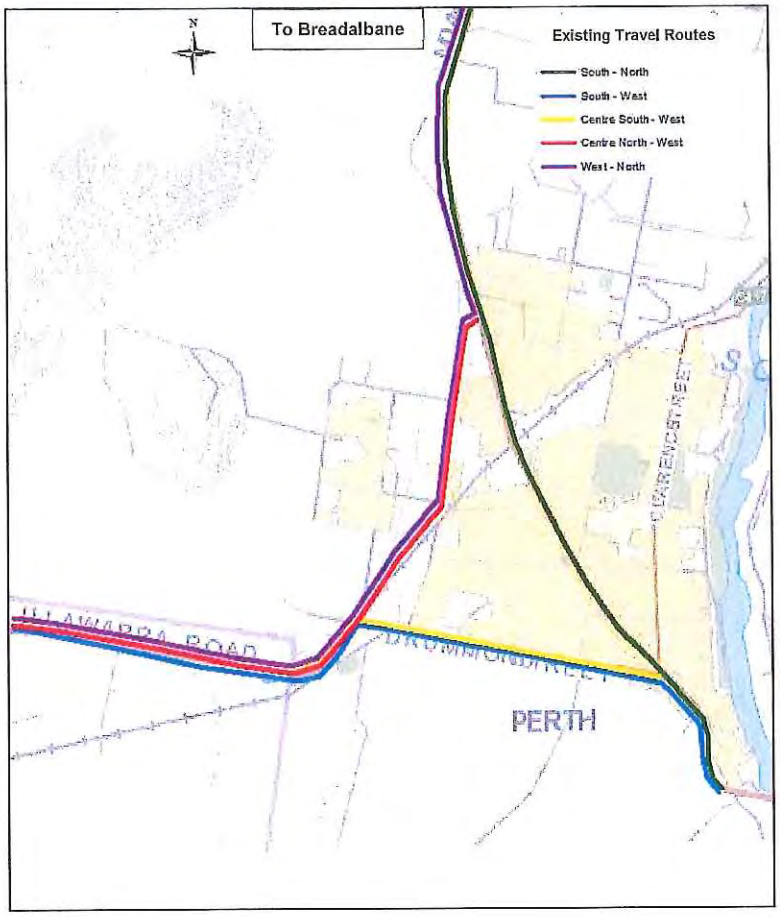
Road	Direction	Forecast Traffic Change (vehicles)		
		AM Peak Hour	PM Peak Hour	AADT
Youl Road	Northbound	-280	-250	-5,500
	Southbound	-130	-280	
Drummond Street	Eastbound	-110	-140	-2,400
	Westbound	-90	-100	
Midland Highway Central	Northbound	-240	-350	-6,400
	Southbound	-300	-350	
Perth Southern Link	Eastbound	+430	+510	11,400
	Westbound	+350	+520	
Perth Western Link	Northbound	+520	+640	14,700
	Southbound	+480	+730	
	Southbound	-300	-350	

4.2 Travel Time Impacts

Five routes within the study area were selected to compare travel times along the existing and proposed road network, as shown in Figure 4.1. Travel times for each of the routes was extracted from the AIMSUN mesoscopic traffic model. Travel times, distances and speeds for each route are compared in Table 4.2.

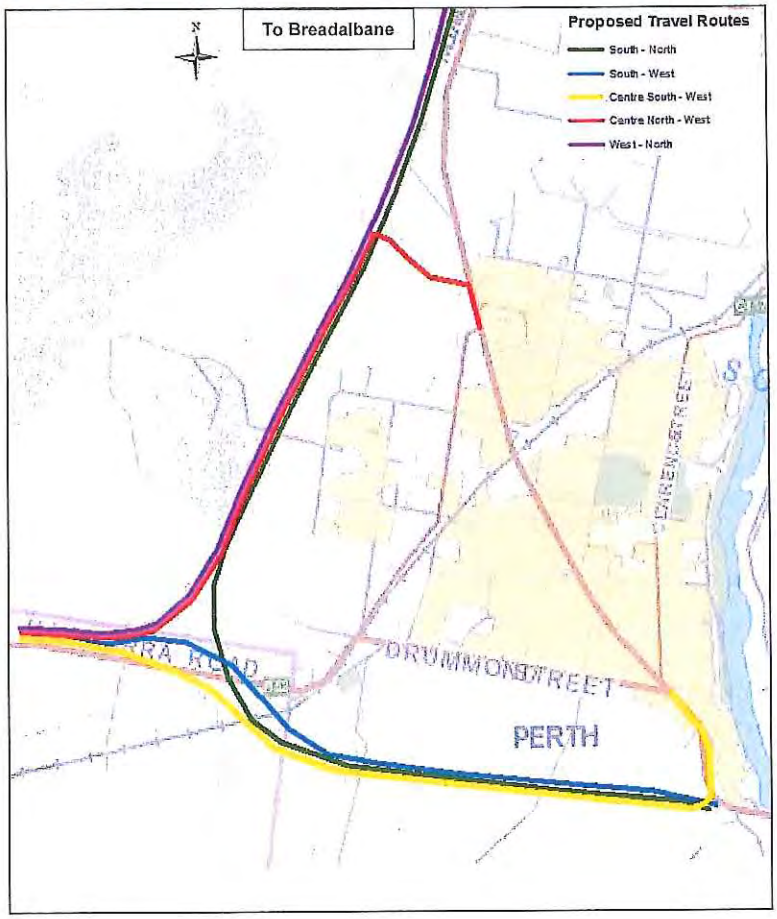
Based on the model results in Table 4.2 the proposal will reduce travel times in almost all cases, with the travel time for traffic travelling from the South to Launceston (North) remaining essentially the same as via the current network, although operating speeds will be substantially higher. Note that the difference in northbound and southbound travel speeds is related to the different speed limits that apply in each direction near the southern access to Perth.

Figure 4.1 Existing Travel Time Analysis Routes



Base Image Source: LISTMap

Figure 4.2 Proposed Travel Time Analysis Routes



Base Image Source: LISTMap

Table 4.2 Travel Times, Distances and Speeds of Proposed and Existing routes

Route	Description	Travel Time (Seconds)			Distance (km)			Average Speed (km/hr)		
		Existing	Proposed	Difference	Existing	Proposed	Difference	Existing	Proposed	Difference
South – North (NB)	South Perth – Breadalbane Rbt	350	352	+2	6.6	8.3	1.7	68	85	+17
North – South (SB)	Breadalbane Rbt - Southern Interchange	350	342	-8	6.6	8.3	1.7	68	87	+19
South - West	Perth Southern Link	166	125	-41	3.1	2.8	-0.3	67	79	+12
Centre South - West	Drummond/Main Rd - Illawarra Interchange	155	149	+5	2.6	3.3	0.7	59	80	+20
Centre North - West	Youl/Midland Hwy - Illawarra Interchange	158	126	-31	2.5	2.6	0.1	57	75	+18
West - North	Illawarra Interchange – Breadalbane Rbt	306	264	-42	7.1	6.3	-0.9	84	86	+2

4.3 Pedestrians and Cyclists

Pedestrian and cyclist movements travelling from north to south through Perth will most likely remain on the existing Midland Highway (Main Road), which provides a more direct route. The removal of through traffic will also improve amenity and safety for pedestrians and cyclists using this route.

Pedestrian and cyclist movements to or from Illawarra Main Road will be encouraged to remain on the existing road network, even though general traffic will need to use the new Perth Links. A pedestrian/cyclist underpass will be provided to connect Illawarra Main Road with Drummond Street and Youl Road.

4.4 Public Transport

The removal of the direct road connection between Illawarra Main Road and Drummond Street will necessitate a restructuring of the existing Launceston-Evandale-Perth-Longford-Cressy bus route.

The Department has been in consultation with operators on potential options, including:

- Introduction of a loop through Perth via Drummond Street.
- Separation of services to Perth and Evandale from services from Longford and Cressy.

Introducing a loop through Perth would maintain the public transport link between Longford, Perth and Evandale, but with a less efficient route through Perth that would increase travel times slightly.

The separation of services would require an additional vehicle to operate, which may result instead in a halving of existing service frequencies. However it would allow services between Longford and Launceston to take advantage of the travel time savings of the Western Link.

4.5 Road Safety

The proposal is expected to divert significant volumes of traffic away from Drummond Street, Youl Road and the Midland Highway. As shown in Figure 2.9, the majority of crashes in the study area have occurred on these roads, and crash frequency is expected to decrease along with traffic volumes.

An estimate of crash reduction has been undertaken, based on the existing number of crashes relative to the level of activity on a particular section of road. A crash rate is expressed in terms of crashes per 100 Million Vehicle Kilometres Travelled (100MVKT). As traffic activity increases or decreases, then the number of crashes would similarly vary.

So where traffic activity is reduced as a result of traffic diverting to the new Perth Links, then the number of crashes on the existing network will decrease.

Currently, crashes in the study area occur at an overall rate of 65 crashes per 100MVKT, resulting in 12 crashes per year. The rate on individual links in the existing network varies from 11 crashes per 100MVKT up to more than 300 crashes per 100MVKT. A rate of 12 crashes per 100MVKT has been adopted for the new Perth Links.

By 2043, it is expected that crashes would occur approximately 17 times per year. The construction of the Perth Links would reduce this by 10 crashes per year. In terms of casualty crashes, where a person is injured, these are expected to reduce by more than 3 injury crashes per year as a result of the Perth Links project.

5. Codes

5.1 Road and Railway Assets Code

This Code applies because the proposal will require relocated accesses and new junctions.

The road works (i.e. highway duplication) have been designed by a consultant engineer (GHD) on behalf of State Growth to improve the traffic safety and efficiency of the Midland Highway in accordance with subclause a). The attached plans reference the relevant Australian Standard requirements demonstrating compliance with Clause E4.5.2.

The proposal complies with the use standards under Clause E4.6.1, Acceptable Solution 3 as the proposed road itself will not increase the annual average daily traffic movements at the existing access or junction by more than 10%.

The proposed development will result in new road works and earthworks within 50m from a category 1 road in an area subject to a speed limit of more than 60km/hr. Accordingly, assessment is required against Clause E4.7.1 of the Scheme, Development on and adjacent to Existing and Future Arterial Roads and Railways, Performance Criteria 1.

Table 5.1 E4.7.1 Development on and adjacent to existing and Future Arterial Roads and Railways

Performance Criteria	Compliance Statement
Development including buildings, road works, earthworks, landscaping works and level crossings on or within 50m of a category 1 or 2 road, in an area subject to a speed limit of more than 60km/h, a railway or future road or railway must be sited, designed and landscaped to: a) maintain or improve the safety and efficiency of the road or railway or future road or railway, including line of sight from trains; and b) mitigate significant transport-related environmental impacts, including noise, air pollution and vibrations in accordance with a report from a suitably qualified person; and c) ensure that additions or extensions of buildings will not reduce the existing setback to the road, railway or future road or railway; and d) ensure that temporary buildings and works are removed at the applicant's expense within three years or as otherwise agreed by the road or rail authority.	Complies. As demonstrated above, the Perth Link Roads will improve both the safety and efficiency of the Midland Highway. The proposal will also result in less traffic on streets within Perth, improving safety and efficiency of local roads. The proposal would improve rail safety also, as there would be less traffic using the existing rail level crossings in Perth, on the existing Midland Highway (Main Road) and on Drummond Street (near the Youl Road junction). The proposal provides for grade-separation of the rail line from the new highway. As such, the proposal complies with a). The Department has undertaken a Noise Assessment, and this is discussed in the DA report. Impact of traffic noise has been mitigated using the Department's Tasmanian State Roads Traffic Noise Management Guidelines. The Noise Report is attached to the Development Application. As such, the proposal complies with b). Most dwellings near the current Midland Highway (near the southern junction) and along Drummond Street/Illawarra Main Road will be further from the Perth Link Roads than from existing roads. Outside these areas, no existing buildings will be located closer than

	165 metres from the Perth Link Roads alignment. The proposal complies with subclause c). The proposal will accord with subclause d) in relation to temporary structures required during the construction phase. This is a standard requirement under the Department's Standard Specification for road construction works. Given that State Growth is the applicant, this assessment is considered to satisfy the requirements in Clause E4.5.2 and E4.5.3 of the Scheme.

The proposal includes relocated accesses requiring assessment against E4.7.2 Management of Road Accesses and Junctions, Performance Criteria 2:

Table 5.2 E4.7.2 Management of Road Accesses and Junctions

Performance Criteria	Compliance Statement
P2 For limited access roads and roads with a speed limit of more than 60km/h: a) access to a category 1 road or limited access road must only be via an existing access or junction or the development must provide a significant social and economic benefit to the State or region; and b) any increase in use of an existing access or junction or development of a new access or junction to a limited access road or a category 1, 2 or 3 road must be dependent on the site for its unique resources, characteristics or locational attributes and an alternate site or access to a category 4 or 5 road is not practicable; and c) an access or junction which is increased in use or is a new access or junction must be designed and located to maintain an adequate level of safety and efficiency for all road users.	Rationalisation of entry and exit onto the proposed highway is required to provide safe access for neighbouring properties including the Perth residential area and local businesses while meeting the desired safety and efficiency outcomes of the upgrade. The proposal will provide for significant social and economic benefit to the State and region by providing for a state highway that complies with the safety requirements for a national highway consistent with subclause a). The proposed highway includes junctions to provide safe access to the local roads and highway. The proposal is not anticipated to increase the use of the existing access or junctions proposed to be upgraded consistent with subclause b) In accordance with subclause c) the road has been designed to meet the AusRAP system with a minimum 3 star rating. This represents an improvement to the existing road safety environment. The modifications to the road network will improve transport efficiency by providing improved, highway grades, and junction details.

Clause E4.7.3 'Management of Rail Level Crossings' does not apply as the proposal does not include a level crossing.

The proposed new access and junctions comply with the Safe Intersection Sight Distance shown in Table E4.7.4 Clause E4.7.4 'Sight Distance at Accesses, Junctions and Level Crossings'.

Table 5.3 Sight Distances at Accesses, Junctions and Level Crossings

Road	Design Speed (km/hr)	Required S.I.S.D.	Min. S.I.S.D. Achieved
Einoder Access (Eskleigh Road)	60	123	123
TasWater Reservoir Access (Highway)	110	300	400
Mountford Access (Illawarra Road)	100	262	262

5.2 Car Parking and Sustainable Transport Code

This code applies to all use and development, with no exemptions. However not all of the purposes of the Code are relevant to this current proposal, with the exception of "(b) ensure that cycling, walking and public transport are encouraged as a means of transport in urban areas."

Pedestrian and cyclist movements to or from Illawarra Main Road will be encouraged to remain on the existing road network, even though general traffic will need to use the new Perth Links. A pedestrian/cyclist underpass will be provided to connect Illawarra Main Road with Drummond Street and Youl Road. The lower traffic volumes within Perth will make walking and cycling these areas safer and more attractive than at present.

No car or bicycle parking is required for this development, and is not proposed to be provided. The proposal does not therefore require assessment against any of the standards.

6. Conclusion

This report has investigated the potential traffic and transport impacts of the proposed Perth Links.

The key findings are as follows:

- Through traffic using Drummond Street, Youl Road and Midland Highway (Main Road) will be diverted onto the new Link roads. Drummond Street will carry some vehicles per 2,400 day fewer than it would if the links were not built. Traffic on Youl Road will decrease by 5,500 vehicles, and the Midland Highway through Perth a daily reduction of 6,400 vehicles.
- The proposal will reduce travel time for the majority of routes, including a saving of almost 40 seconds for trips between the north and the west (Longford to Launceston). For traffic travelling from the South to the North of Perth travel times will be essentially the same as via the current network, but in most other cases travel times will be improved.
- The removal of through traffic will improve amenity and safety for pedestrians and cyclists using the existing road network within Perth, including Drummond Street, Youl Road and Midland Highway (Main Road).
- Crash frequency is expected to decrease in the study area, with 10 fewer crashes per year. There are forecast to be more than 3 fewer crashes resulting in injury each year.
- The proposed works comply with the applicable codes of the Northern Midlands Planning Scheme 2013: E4 Road and Railway Assets Code and E6 Car Parking and Sustainable Transport Code.

GHD

2 Salamanca Square
T: 61 3 6210 0600 F: 61 3 6210 0601 E: hbamail@ghd.com

3218285-40278/https://projects.ghd.com/oc/Tasmania/perthlinkroadsprelim/Delivery/Documents/3218285-REP-Traffic Impact Assessment_1.docx

Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	A. Andrews	T. Bickerstaff	Per email	Simon Lukies		21 June 2017

www.ghd.com

1-300

Department of State Growth

Perth Links Road
Noise Assessment

June 2017

Table of contents

Table index

Figure index

Appendices

1. Introduction

1.1 Introduction

The Department of State Growth (DSG) has engaged GHD Pty Ltd (GHD) to undertake a baseline noise monitoring and modelling assessment as part of the Perth Links (the project).

1.2 Scope of work

The noise assessment involved a noise survey to establish the existing noise environment parameters and noise contour modelling to generate traffic noise predictions. The detailed scope of work is presented below.

1.2.1 Baseline noise survey

The baseline noise survey involved the following tasks:

- An initial desktop review was conducted to identify key environmental noise sources and receivers from aerial photography, proposed alignment drawings. Potential noise logging and monitoring locations were also identified at this stage.
- During the site visits unattended noise logger equipment were deployed to conduct a noise survey with consideration to the *Environment Protection Policy (Noise), 2009* (Noise EPP) and Noise Measurement Procedure Manual, Second Edition 2008 (NMPM), both publications of the Tasmanian Government Department of Primary Industries, Parks, Water and Environment.
  - The monitoring was conducted using noise loggers concurrently at six locations within the study area.
  - Logger results were used to establish the existing ambient noise environment and also capture existing road traffic noise for assessment of impacts and for noise model validation.
  - Two 15-minute duration operator attended noise measurements were undertaken adjacent to each logger on deployment for identification of specific local noise sources and their relative noise levels.
- Noise was assessed and filtered to remove invalid data due to extraneous noise or adverse weather conditions. Concurrent weather data was captured from the Bureau of Meteorology's Launceston Airport automatic weather station (approximately four km east of the study area).
- The noise goals set in the *State Noise Strategy* (DIER 2011) and the *Tasmanian State Road Traffic Noise Management Guidelines* (DSG 2015) have been outlined in this report.

1.2.2 Noise contour modelling

The following noise modelling scenarios have been prepared for the study area:

An existing traffic noise model was prepared to predict the existing level of road traffic noise in the vicinity of the project for the current year of noise logging (Year 2017).The current year existing noise model was used for the road traffic noise model verification process considering data obtained from the road traffic noise monitoring.

- Build 'Opening Year' and '10 Year Horizon' scenarios. Opening year was modelled based on anticipated traffic volumes within one year of the project becoming operational while the *horizon* scenario was based on traffic volumes at least 10 years from opening.
- No Build 'Opening Year' and '10 Year Horizon' scenarios – The 'No Build' scenarios were developed to assess the increase in total traffic noise associated with the project. These models were based on the existing alignment and corresponding traffic volumes if the project were to not proceed.

The predicted noise levels from the detailed noise modelling were assessed against the noise criteria with a brief discussion of the results.

1.2.3 Operational noise mitigation options

The predicted noise levels from the detailed noise modelling were assessed against the noise criteria. Where the noise criteria were predicted to be exceeded, mitigation options have been discussed.

1.3 Limitations

This report has been prepared by GHD for Department of State Growth and may only be used and relied on by Department of State Growth for the purpose agreed between GHD and the Department of State Growth as set out in Section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Department of State Growth arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in Sections 4.1.1 and 4.1.2 of this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Department of State Growth and others who provided information to GHD, which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The findings of this report represent the findings apparent at the date and time of the assessment. It is the nature of environmental assessments that all variations in environmental conditions cannot be accessed and all uncertainty concerning the conditions of the ambient noise environment cannot be eliminated. Professional judgement must be exercised in the investigation and interpretation of observations.

Site conditions (including the presence of insect noise or other noise sources) may change after the date of this report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

2. Existing Environment

The project is located adjacent to the Midland Highway near the town of Perth.

The study area for this operational road traffic noise assessment is an area of a nominal distance of 300 m either side of the road project, as required by the TNMG.

Receivers near to the project consist of the residential receivers located within the town of Perth and several rural/residential receivers located around Perth.

The nearest sensitive receiver locations are identified in Figure 2-1 with residential receivers denoted by 'R_####'.

Figure 2-1 Proposed road alignment and receiver locations

LEGEND

- Receivers
- Buildings
- Proposed road alignment

Paper Size A4

0 25 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Department of State Growth
Perth Links Road
Noise Assessment

Proposed road alignment and receiver locations

Job Number 32-18285
Revision B
Date 06 Jun 2017

Figure 2-1a

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E ntlmail@ghd.com W www.ghd.com.au

N:\AU\Newcastle\Projects\32\18285\GIS\Maps\Deliverables\NoiseAssessment\3218285_NA004_Receivers_B.mxd

Data source: Land Tasmania: LIST Transportation, 2014. Created by: kpsroba

LEGEND

- Receivers
- Buildings
- Proposed road alignment

Paper Size A4

0 25 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Department of State Growth
Perth Links Road
Noise Assessment

Proposed road alignment and receiver locations

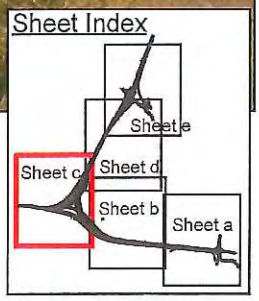
Job Number | 32-18285
Revision | B
Date | 06 Jun 2017

Figure 2-1b

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E ntlmail@ghd.com W www.ghd.com.au

N:\AU\Newcastle\Projects\32\18285\GIS\Maps\Deliverables\NoiseAssessment\3218285_NA004_Receivers_B.mxd

Data source: Land Tasmania: LIST Transportation, 2014. Created by: kpsroba



LEGEND

- Receivers
- Buildings
- Proposed road alignment

Paper Size A4

0 25 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Department of State Growth
Perth Links Road
Noise Assessment

Proposed road alignment and receiver locations

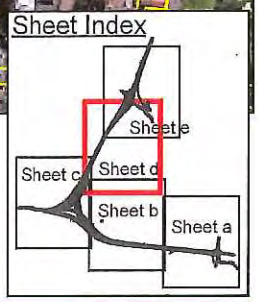
Job Number 32-18285
Revision B
Date 06 Jun 2017

Figure 2-1c

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E ntlmail@ghd.com W www.ghd.com.au

N:\AU\Newcastle\Projects\32\18285\GIS\Maps\Deliverables\NoiseAssessment\3218285_NA004_Receivers_B.mxd

Data source: Land Tasmania: LIST Transportation, 2014. Created by: kpsroba



LEGEND

- Receivers
- Buildings
- Proposed road alignment

Paper Size A4

0 25 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Department of State Growth
Perth Links Road
Noise Assessment

Proposed road alignment and receiver locations

Job Number 32-18285
Revision B
Date 06 Jun 2017

Figure 2-1d

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E ntlmail@ghd.com W www.ghd.com.au

N:\AU\Newcastle\Projects\32\18285\GIS\Maps\Deliverables\NoiseAssessment\3218285_NA004_Receivers_B.mxd

Data source: Land Tasmania: LIST Transportation, 2014. Created by: kpsroba

LEGEND

- Receivers
- Buildings
- Proposed road alignment

Paper Size A4

0 25 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Department of State Growth
Perth Links Road
Noise Assessment

Proposed road alignment and receiver locations

Job Number	32-18285
Revision	B
Date	06 Jun 2017

Figure 2-1e

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E ntlmail@ghd.com W www.ghd.com.au

N:\AU\Newcastle\Projects\32\18285\GIS\Maps\Deliverables\NoiseAssessment\3218285_NA004_Receivers_B.mxd

Data source: Land Tasmania: LIST Transportation, 2014. Created by: kpsroba

2.1 Noise monitoring methodology

2.1.1 Unattended noise monitoring

Unattended noise monitoring was undertaken between 7 April 2017 and 26 April 2017 at six monitoring locations (L01 to L06). These locations were considered to be representative of the existing ambient noise environment at nearby sensitive receivers and suitable to capture road traffic noise levels from the Midland Highway. Additionally, the monitoring locations were on private properties identified as being a safe and secure place for unattended equipment.

Noise monitoring was undertaken using SVAN 955 and SVAN 977 environmental noise loggers within current calibration, capable of measuring continuous sound pressure levels and L_{A90}, L_{A10} and L_{Aeq} noise descriptors. The instruments were programmed to accumulate environmental noise data continuously for the entire monitoring period.

Field calibration checks were undertaken immediately before and after the monitoring period with a sound pressure level of 94 dB at 1 kHz using a Larson Davis CAL200 acoustic calibrator (serial number 9193).

The data collected by the loggers was downloaded and analysed and any invalid data removed. Concurrent weather data for the monitoring period was sourced from the nearest Bureau of Meteorology Station in Launceston (approximately four kilometres east of the study area).

Details of the noise loggers and locations are provided in Table 2-1. All sampling activities were undertaken with consideration to the Noise EPP and NMPM.

Table 2-1 Unattended Noise Monitor Details

	L01	L02	L03
Location	114 Main Rd	35 Drummond St	390 Illawarra Rd
Equipment type (serial)	SVAN 955 (27621)	SVAN 955 (27622)	SVAN 977 (36820)
Measurement started	7/04/2017, 09:30	7/04/2017, 10:10	7/04/2017, 13:35
Measurement ceased	19/04/2017, 14:00	12/04/2017, 12:40	25/04/2017, 18:00
Frequency weighting	A	A	A
Time Response	Fast	Fast	Fast
Photo			

	L04	L05	L06
Location	168 Illawarra Rd	1 Napoleon St	6 Partington Place
Equipment type (serial)	SVAN 955 (27624)	SVAN 955 (27625)	SVAN 977 (45748)
Measurement started	7/04/2017, 14:30	7/04/2017, 16:30	7/04/2017, 15:30
Measurement ceased	22/04/2017, 22:00	12/04/2017, 6:30	26/04/2017, 20:00
Frequency weighting	A	A	A
Time Response	Fast	Fast	Fast
Photo			

2.1.1 Attended noise monitoring

Attended noise measurements were conducted at each logger location on deployment of the loggers. Attended monitoring was conducted for two measurements of 15 minute durations in order to identify ambient noise sources and validate logger data. Instantaneous noise levels for operator identified noise sources were observed and noted during measurements.

The attended measurements were taken using the noise loggers deployed. Field calibration checks were undertaken immediately before the survey with a sound pressure level of 94 dB at 1 kHz using a Larson Davis CAL200 acoustic calibrator (serial number 9193).

2.2 Summary of noise monitoring results

2.2.1 Unattended noise monitoring

A summary of the calculated background L_{A90} (day, evening and night) noise levels, ambient L_{Aeq} (day, evening and night) noise levels and road traffic descriptors for the monitoring period at the unattended logger locations with all invalid weather affected data removed are provided in Table 2-2. Noise monitoring charts are presented in Appendix A.

Table 2-2 Unattended noise monitoring results

Logger location	Background L_{A90} noise levels			Ambient noise levels L_{Aeq}				Road traffic noise descriptor $L_{A10(18hr)}$ (6am to 12am)
	Day (7am to 6pm)	Evening (6pm to 10pm)	Night (10 pm to 7am)	Day (7am to 6pm)	Evening (6pm to 10pm)	Night (10 pm to 7am)	16 hr (7am-11pm)	
L01	39	33	24	49	46	45	48	47
L02	35	30	22	48	47	41	48	44
L03	46	35	22	70	68	63	70	72
L04	45	32	21	65	52	58	64	66
L05	35	30	22	50	45	43	48	42
L06	44	34	20	57	54	50	56	56

2.2.2 Attended monitoring results

A summary of the calculated background L_{A90} (day, evening and night) noise levels, ambient L_{Aeq} (day, evening and night) noise levels and road traffic descriptors for the monitoring period at the attended logger locations is provided in Table 2-3.

Table 2-3 Attended monitoring results

Monitoring location	Date	Measurement time		Measured noise levels			Observed noise sources, dB(A) L_p range
		Start	Stop	L_{Aeq}	L_{A10}	L_{A90}	
L1 114 Main Rd	07/04/2017	10:33	10:43	48	50	40	Birds 42-60 Road traffic- 43-57 Siren- 43-63

Monitoring location	Date	Measurement time		Measured noise levels			Observed noise sources, dB(A) L_p range
		Start	Stop	L_{Aeq}	L_{A10}	L_{A90}	
		10:47	10:57	47	49	39	Road Traffic. 40-49 Birds- 40-60 Plane, 46-61
L2 35 Drummond St	07/04/2017	9:30	9:40	56	43	32	Tractor, 43-79 Sprinkler, 32-42 Birds, 32-47 Vehicle, 37-40
	07/04/2017	9:40	9:50	49	46	35	Sprinkler, 36-42 Vehicle, 39-42 Birds, 36-43 Tractor, 42-69 Cows, 36-42
L3 390 Illawarra Rd	07/04/2017	13:41	13:51	72	75	53	Road traffic, 59-78 Insects, 49
		13:53	14:03	72	76	53	Road traffic, 60-78 Insects, 48
L4 168 Illawarra Rd	07/04/2017	14:30	14:40	64	68	53	Road traffic, 56-74
		14:40	14:50	66	69	54	Road traffic, 62-81
L5 1 Napoleon St	07/04/2017	8:44	8:56	42	40	30	Birds, 33-43 Road traffic, 30-60 Frogs, 35-40 Resident noise, 38-47
		8:56	9:06	38	39	29	Distant road noise, 30-39 Birds, 36-46 Resident noise, 35-39 Dog barking, 42-45 Insects, 32-33
L6 6 Partington Place	07/04/2017	15:32	15:42	59	61	51	Road traffic noise, 55-67 Dog barking, 54-74
		15:45	15:55	59	61	52	Road traffic noise, 56-70

3. Noise Criteria

3.1 Road traffic noise criteria

In Tasmania, transport related noise emissions on State roads are managed in accordance with the *Environmental Management and Pollution Control Act 1994* (EMPCA) under a subsidiary policy, *Noise EPP* (DEPHA 2009).

The *State Noise Strategy* (DIER 2011) and the *Tasmanian State Road Traffic Noise Management Guidelines* (DSG 2015) (TNMG) set the target criteria for State roads and provide guidance to road and land use planners, road designers and the community on how traffic noise on the state road network is managed.

The TNMG (DSG 2015) discusses an assessment location of 1.5 metres above ground at 1 metre from the most exposed façade of a dwelling. However as there are multiple two-storey residential dwellings present in the study area this assessment includes calculated noise levels at 4.5 metres height at identified two-storey residence locations. While these additional locations are not specified by the TNMG (DSG 2015), it is recommended that they be considered when formulating noise mitigation measures.

The target criteria adopted for this assessment for new and major road upgrades is shown in Table 3-1.

Table 3-1 Target traffic noise criteria for new roads and major road upgrades, dB(A) (DSG 2015)

Target traffic noise level	Application	Comments
$L_{A10(18\ hour)}$ 63	On road construction and upgrade projects, the Department will aim to meet a design traffic noise level of $L_{A10(18\ hour)}$ 63 dB(A) or below for noise sensitive land uses, subject to what is considered reasonable, practical and cost-effective.	A traffic noise level of 63 dB(A) or less (measured at the building façade), is considered by the Department to be acceptable for most adjacent uses for most people.
$L_{A10(18\ hour)}$ 68	Outside road construction and upgrade projects, where increases in traffic noise levels occur the Department will consider an operation traffic noise level of $L_{A10(18\ hour)}$ 68 dB(A) to be a practical upper limit	As levels increase above 63 dB(A) impacts become less acceptable to more people. A level above 68 dB(A) (measured at building façade) is considered by the Department to be undesirable for sensitive uses.

4. Road traffic noise assessment

4.1 Noise modelling methodology

Acoustic modelling was undertaken using Computer Aided Noise Abatement (CadnaA) to predict the traffic noise levels generated from the project within the study area.

CadnaA is a computer program for the calculation, assessment and prognosis of noise propagation. The CadnaA noise model was configured using The United Kingdom Department of Environment's Calculation of Road Traffic Noise (CoRTN). Using the physical properties of traffic volume and mix, ground topography, road gradient, air and ground absorption and source and receiver height, scenarios were modelled using CoRTN to predict the $L_{10(18hr)}$ noise indices.

Three scenarios were modelled:

- An existing traffic noise model – 'No Build' Year 2017 - to verify the operational noise model with reference to data obtained from the road traffic noise monitoring. Once verified, this noise model provides existing road traffic noise levels at identified receivers.
- A traffic noise model for the year of anticipated project completion – 'Build' Year 2019 - to assess compliance with the noise criteria and assess any increases in road traffic noise resulting from the project.
- A traffic noise model for 10 years after the project completion – 'Build' Year 2029 - to assess compliance with the noise criteria and assess any increases in road traffic noise resulting from the project.

The noise models incorporate three-dimensional alignments of the proposed road upgrades, noise sensitive buildings and receivers, traffic volumes, vehicle posted speeds, heavy vehicle percentages and road surface characteristics.

The existing traffic noise model validated without application of road surface corrections for chip-seal. It is expected that this is due to wear and smoothing of the surface on the existing roads over time. To accommodate the potential for higher noise levels due to new chip-seal on the proposal, road surface corrections have been applied to the "Build" scenario models for chip-seal road sections undergoing redevelopment or construction works.

The assessment has been modelled based on available data at the time of assessment.

4.1.1 Model inputs and assumptions

The inputs and assumptions included in the noise models are outlined below and presented in Table 4-1.

Table 4-1 Noise model inputs

Inputs	Assumption
Traffic speeds	Existing roads • Signposted speeds Design roads • 110 km/h for main highway • 100 km/h for ramps • 40km/h for roundabouts

Inputs	Assumption
Australian Road Research Board corrections for Australian conditions (standard corrections)	-1.7 dB(A) for 'façade' -0.7 dB(A) for 'free-field'
Façade correction	+2.5 dB(A) to account for sound reflected from the façade
Surface Corrections	Design Roads: • DGA = +0dB • 14mm Chip Seal = +4dB
Source heights above road surface	Light vehicles and heavy vehicle tyre interaction noise – 0.5 m Heavy vehicle engines – 1.5 m Heavy vehicle exhaust – 3.6 m
Receiver heights	Ground floor – 1.5 m above building ground level
Ground topography, existing alignment and design	Existing: LIDAR 1 m contours and 5 m contours (Design: DXF design strings and terrain
Road gradient	Taken into account based on road design model and road survey
Ground absorption	G = 0.75
Atmospheric conditions	10°C and 70 % humidity

4.1.2 Traffic volumes

The CoRTN algorithm calculates traffic noise emissions levels based on traffic flows, heavy vehicle percentages, vehicle speeds, road gradients and road pavement types. The CoRTN algorithm requires 18-hour traffic volumes (6.00 am to 12.00 am (midnight)).

The traffic volumes used in the noise models are summarised in Table 4-2.

Table 4-2 Noise modelling traffic volumes

Segment	2017- Existing		2019 No Build		2019 Build		2029 No Build		2029 Build	
	Total	HV	Total	HV	Total	HV	Total	HV	Total	HV
Perth Link South	0	0	0	0	8,947	1,312	0	0	9,902	1,451
Perth Link West	0	0	0	0	11,423	1,137	0	0	12,834	1,250
Drummond Street	2,567	508	2,608	518	493	14	2,815	570	567	14
Youl Road	4,994	350	5,167	354	1,040	45	6,032	375	1,674	49
Midland Highway (North of Perth)	12,423	1,088	12,776	1,111	3,319	65	14,540	1,226	4,227	67
Illawarra Main Road	8,145	899	8,327	911	8,316	911	9,235	971	9,232	971
Midland Highway South	7,555	1,224	7,737	1,251	7,726	1,247	8,645	1,388	8,614	1,376

4.1.1 Model validation

The predicted noise levels from the Year 2017 existing traffic noise model were verified against measured noise levels at three noise monitoring locations located near to existing roads. Other logger locations were located too far from existing roads for validation purposes. Noise levels were predicted at the same location and height as the noise logger microphone position. The model is deemed to be verified if the difference between the measured and calculated values of the descriptors is within +/- 2.0 dB(A).

Verification of calculated noise receivers at noise monitoring locations are shown in Table 4-3. The average difference between the measured and calculated results are well within 2.0 dB(A) therefore the noise model is considered to be verified.

Table 4-3 Noise Model Validation, dBA

Location	Measured $L_{A10,18\ hour}$	Calculated $L_{A10,18\ hour}$	Difference (measured – calculated)
L03	72.0	71.3	0.7
L04	66.2	66.4	-0.2
L06	56.1	57.7	-1.6
Average difference			**-0.4**

4.1 Predicted noise levels

Predicted noise contours are presented in Figure 4-1, for the $L_{A10(18\ hour)}$ 63 dB(A) contour for 2017 'existing', 2029 'no build' and 2029 'build scenarios.

The modelling indicates that the future project road traffic noise levels are expected to comply with the 63 dB(A) $L_{A10\ 18hr}$ target criteria at the majority of the nearest sensitive receivers. In particular:

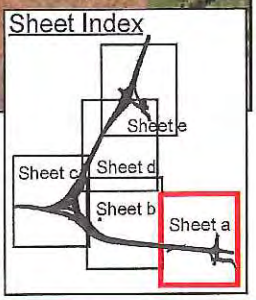
- 46 receivers are currently predicted to be above the 63 dB(A) $L_{A10\ 18hr}$ target criteria for the year 2017 existing scenario.
- Four receivers are predicted to exceed the 63 dB(A) $L_{A10\ 18hr}$ target criteria for year 'Build' 2029 traffic noise model.
- Many of the receivers with predicted traffic noise levels above 63 dB(A) $L_{A10\ 18hr}$ for the existing road configuration at 2017, 2019 or 2029 are predicted to be subject to traffic noise levels lower than 63 dB(A) $L_{A10\ 18hr}$ if the proposal is to proceed. This is because the proposal generally has a greater separation distance to sensitive receiver locations than existing traffic carrying roads.
- Two of the four receivers exceeding 63 dB(A) $L_{A10\ 18hr}$ target criteria for year 'Build' 2029 traffic noise model currently exceed 63 dB(A) $L_{A10\ 18hr}$ and do not exceed the upper limit target of 68 dB(A) $L_{A10\ 18hr}$.
- One receiver (R_0176) is predicted to exceed the upper limit target of 68 dB(A) $L_{A10\ 18hr}$ for year 2029 traffic volumes.
- One receiver (R_0103) is predicted to exceed the 63 dB(A) $L_{A10\ 18hr}$ target criteria for the 'Build' 2029 while also not currently exceeding this level for the 'No-Build' scenarios.

Under the TNMG (DSG 2015) an exceedance of the target criterion may trigger the requirement of noise mitigation measures. Road traffic noise mitigation measures are discussed in Section 5.1.

The results indicate that noise levels are anticipated to increase over the 10 year period by between 0 dB and approximately 1 dB due to natural traffic volume growth. This increase in noise would also be expected if the project did not proceed.

Figure 4-1 Existing – Year 2017, 'no build' – Year 2029 and 'build' Year 2029 noise contours

Sheet Index



LEGEND

- Receivers
- Proposed road alignment
- 2029 Build 63 dBA contour, +2.5 dB(A) façade effect correction included
- 2029 No-Build 63 dBA contour, +2.5 dB(A) façade effect correction included
- Existing 63 dBA contour, +2.5 dB(A) façade effect correction included

Paper Size A4

0 25 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Department of State Growth
Perth Links Road
Noise Assessment

Existing and Future 'build' and 'no-build' noise contours

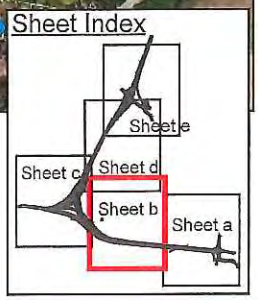
Job Number 32-18285
Revision B
Date 06 Jun 2017

Figure 4-1a

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E ntlmail@ghd.com W www.ghd.com.au

G:\32\18285\GIS\3218285_DA_noise contours.mxd

Data source: Land Tasmania: LIST Transportation, 2014. Created by: kpsroba



LEGEND

- Receivers
- Proposed road alignment
- 2029 Build 63 dBA contour, +2.5 dB(A) façade effect correction included
- 2029 No-Build 63 dBA contour, +2.5 dB(A) façade effect correction included
- Existing 63 dBA contour, +2.5 dB(A) façade effect correction included

Paper Size A4

0 25 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Department of State Growth
Perth Links Road
Noise Assessment

Existing and Future 'build' and 'no-build' noise contours

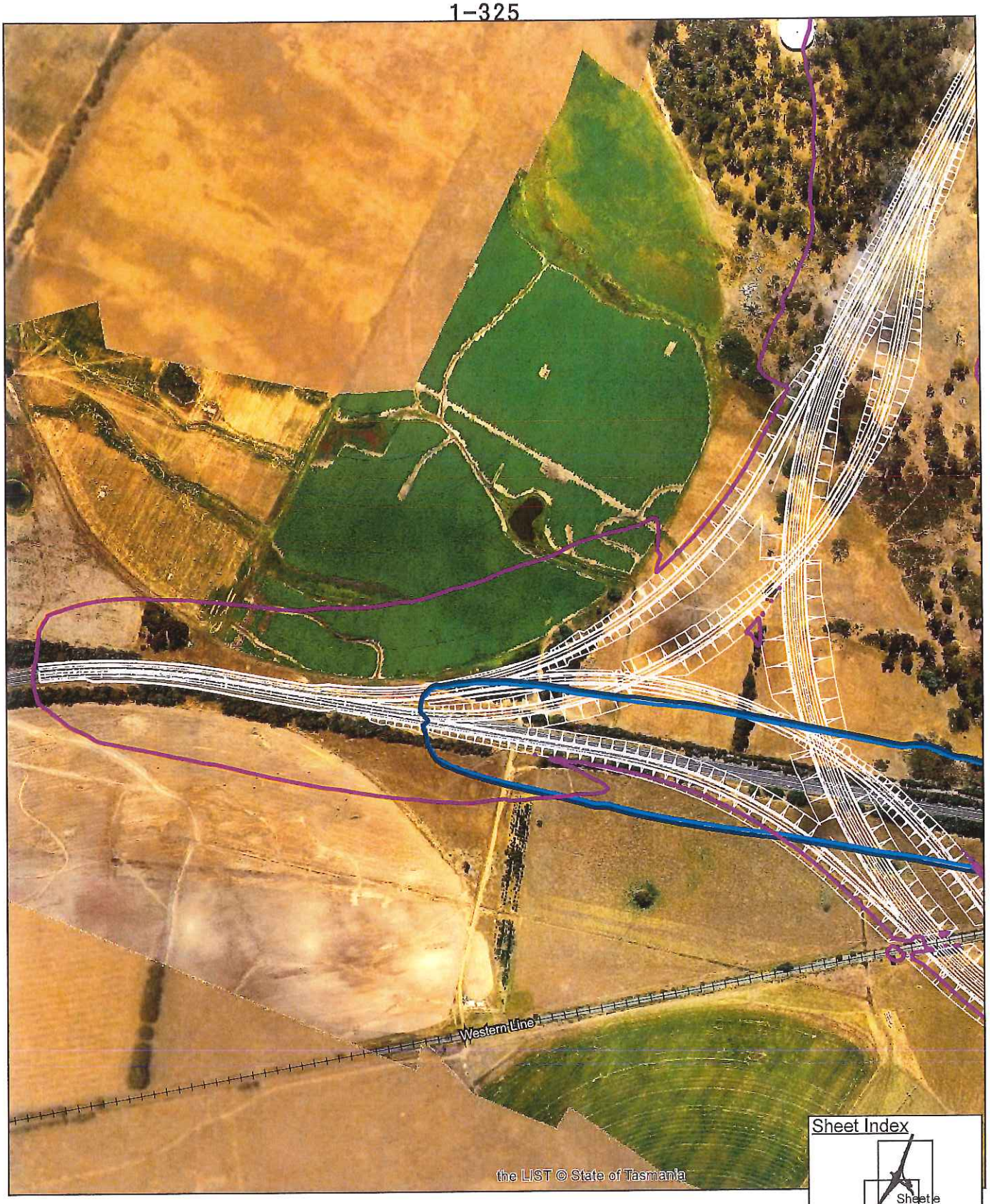
Job Number 32-18285
Revision B
Date 06 Jun 2017

Figure 4-1b

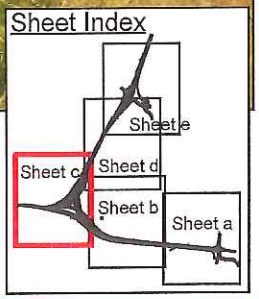
Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E ntlmail@ghd.com W www.ghd.com.au

G:\32\18285\GIS\3218285_DA_noise contours.mxd

Data source: Land Tasmania: LIST Transportation, 2014. Created by: kpsroba



Sheet Index



LEGEND

- Receivers
- Proposed road alignment
- 2029 Build 63 dBA contour, +2.5 dB(A) façade effect correction included
- 2029 No-Build 63 dBA contour, +2.5 dB(A) façade effect correction included
- Existing 63 dBA contour, +2.5 dB(A) façade effect correction included

Paper Size A4

0 25 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Department of State Growth
Perth Links Road
Noise Assessment

Existing and Future 'build' and 'no-build' noise contours

Job Number 32-18285
Revision B
Date 06 Jun 2017

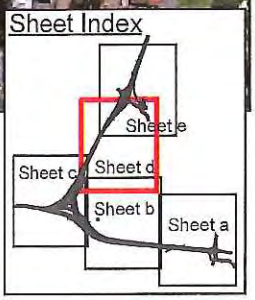
Figure 4-1c

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E ntlmail@ghd.com W www.ghd.com.au

G:\32\18285\GIS\3218285_DA_noise contours.mxd

Data source: Land Tasmania: LIST Transportation, 2014. Created by: kpsroba

Sheet Index



LEGEND

- Receivers
- Proposed road alignment
- 2029 Build 63 dBA contour, +2.5 dB(A) façade effect correction included
- 2029 No-Build 63 dBA contour, +2.5 dB(A) façade effect correction included
- Existing 63 dBA contour, +2.5 dB(A) façade effect correction included

Paper Size A4

0 25 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Department of State Growth
Perth Links Road
Noise Assessment

Existing and Future 'build' and 'no-build' noise contours

Job Number 32-18285
Revision B
Date 06 Jun 2017

Figure 4-1d

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E ntlmail@ghd.com W www.ghd.com.au

G:\32\18285\GIS\3218285_DA_noise contours.mxd

Data source: Land Tasmania: LIST Transportation, 2014. Created by: kpsroba

LEGEND

- Receivers
- Proposed road alignment
- 2029 Build 63 dBA contour, +2.5 dB(A) façade effect correction included
- 2029 No-Build 63 dBA contour, +2.5 dB(A) façade effect correction included
- Existing 63 dBA contour, +2.5 dB(A) façade effect correction included

Paper Size A4

0 25 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Department of State Growth
Perth Links Road
Noise Assessment

Existing and Future 'build' and 'no-build' noise contours

Job Number 32-18285
Revision B
Date 06 Jun 2017

Figure 4-1e

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 T 61 2 4979 9999 F 61 2 4979 9988 E ntlmail@ghd.com W www.ghd.com.au

G:\32\18285\GIS\3218285_DA_noise contours.mxd

Data source: Land Tasmania: LIST Transportation, 2014. Created by: kpsroba

5. Mitigation measures

5.1 Road traffic noise mitigation

The TNMG (DSG 2015) presents a step by step process for identification of buildings that are eligible for noise mitigation treatments, *Table 12: Identification of eligible buildings*, which is reproduced as Table 5-1.

Table 5-1 TNMG (DIER 2011), Table 12: identification of eligible buildings

Step	
1	Identify all sensitive use buildings within the traffic noise assessment area, being an area out to a nominal distance of 300 m either side of the road
2	Where there is an existing approved but undeveloped residential subdivision within the noise assessment area, assume a reasonable location for future sensitive use building and adopt those locations as presumed sensitive use buildings.
3	Exclude from further assessment all buildings that are less than 50 m away from the edge of the road corridor and which were built subsequent to the construction of the road or the proclamation of the road corridor or the depiction of the road corridor in a planning scheme.
4	Measure existing LA10(18 hour) traffic noise and traffic counts at representative locations(s) along the road or, in the case of a greenfield situation, measure LAeq(16 hour) ambient noise at representative locations along the proposed road alignment.
5	Determine (by measurement or modeling) existing LA10(18 hour) traffic noise at assessment building facades (allowing for the 2.5 dB(A) façade effect**).
6	Predict LA10(18 hour) noise at assessment building facades (allowing for the 2.5 dB(A) façade effect) for 10 years in the future for existing roads or 10 years after the completion of the road works for future roads.
7	Identify all ***63-plus*** buildings, being assessment buildings where the existing LA10(18 hour) traffic noise at the building façade is less than or equal to 63 dB(A) but at which the 10-year future noise will be greater than 63 dB(A).
8	Exclude from further assessment all ***63-stet*** buildings, being assessment buildings where the existing LA10(18 hour) traffic noise is already greater than 63 dB(A) but at which the 10-year future LA10(18 hour) traffic noise will be less than or equal to 68 dB(A).
9	Identify all ***68-plus*** buildings, being assessment buildings where the existing LA10(18 hour) traffic noise is already greater than 63 dB(A) and at which the 10-year future LA10(18 hour) traffic noise will be greater than 68 dB(A).
10[1]	For a greenfield situation, identify all ***15-delta*** buildings, being assessment buildings where the 10-year future LA10(18 hour) traffic noise will be more than 15 dB(A) greater than the existing LAeq(16 hour) ambient noise.
11*	Identify any ***45-heavy*** buildings where a permanent increase in the proportion of heavy vehicles as a result of a Departmental decision will take 10-year future night time heavy vehicle traffic noise on a category 1, 2 or 3 road above LAeq(8 hour) 45 dB(A).
12	Carry all ***63-plus***, ***68-plus***, ***15-delta*** and ***45-heavy*** buildings forward as eligible buildings and apply Table 13 (see Table 5-2) to develop mitigation solutions.

*Note *: step 11 not relevant for this assessment*

Using the TNMG (DSG 2015) 'Table 12' method, analysis of mitigation eligibility was undertaken. Following the eligibility check process, two assessed receiver locations were

[1] The lowest measured ambient level, $L_{Aeq16hr}$ (48 dBA), has been adopted for this project to assess greenfield sites in order to provide a conservative assessment.

identified as being eligible for noise mitigation. The corresponding noise mitigation target levels have also been presented and are based on whether the predicted future level at a receiver is greater than 63 dB(A) $L_{A10\ 18hr}$ or 68 dB(A) $L_{A10\ 18hr}$ as per Table 13 of the TNMG (DSG 2015).

The TNMG (DSG 2015) also presents '*Table 13 Development of mitigation solutions for eligible buildings*'. A step by step process to aid in development of noise mitigation solutions for receiver buildings that have been identified as being eligible from the *Table F* process. Table G of the TNMG (DSG 2015) is reproduced in Table 5-2.

Table 5-2 TNMG (DSG 2015), Table 13 Development of mitigation solutions for eligible buildings

Step	
1	For ***63-plus*** buildings, determine the external noise mitigation requirements (speed changes, road seal type, noise barriers, noise mounds etc) that would be required to reduce the external 10 year future road traffic noise at the most exposed sensitive use building façade to $L_{A10(18\ hour)}$ 63 dB(A) or less
2	For ***68-plus*** buildings, determine the external noise mitigation requirements (speed changes, road seal type, noise barriers, noise mounds etc) that would be required to reduce the external 10 year future road traffic noise at the most exposed sensitive use building façade to $L_{A10(18\ hour)}$ 68 dB(A) or less.
3	For ***15-delta*** buildings, determine the external noise mitigation requirements (speed changes, road seal type, noise barriers, noise mounds etc) that would be required to reduce the external 10 year future road traffic noise increase at the most exposed sensitive use building façade to $L_{A10(18\ hour)}$ 15 dB(A) or less.
4	Assess the reasonableness and practicality of the required noise mitigation to determine whether the relevant noise criterion can be achieved within the budget.
5	Where the external noise targets at the most exposed façade of a ***63-plus***, ***68-plus*** or ***15-delta*** building cannot be achieved, determine the reasonableness, practicality and desirability of achieving the alternative external noise criterion of $L_{A10(18\ hour)}$ 52 dB(A) in any existing outdoor living area located on the opposite side of the sensitive use building to the façade most exposed to road traffic noise.
6	Where external noise criteria can reasonably and practicably be achieved for a ***63-plus***, ***68-plus*** or ***15-delta*** building, proceed with the road design on that basis.
7	Where external noise criteria cannot reasonably and practicably be achieved for a ***63-plus***, ***68-plus*** or ***15-delta*** building, develop any reasonable and practicable acoustic treatment solutions calculated to achieve a nominal daytime internal traffic noise design criterion of $L_{Aeq(16\ hour)}$ 35 dB(A)).
8	For any ***45-heavy*** buildings, develop any reasonable and practicable acoustic treatment solutions calculated to achieve a nominal internal night time traffic noise design criterion of $L_{Aeq(8\ hour)}$ 30 dB(A)).
9	For any building where acoustic treatment is proposed, offer that treatment to the sensitive use building owner and, if the offer is accepted, enter into a corresponding agreement.
10	Proceed with the project, incorporating all reasonable and practicable external noise mitigations and agreed acoustic treatments.

Steps relating to 68-plus buildings have been followed in developing possible mitigation measures in relation to the project.

5.1.1 Description of mitigation options considered

The following sections presenting noise mitigation options address the relevant steps of the TNMG (DSG 2015) Table G mitigation process.

Pavements

Section 8.8 of the TNMG (DSG 2015) provides information regarding noise from various pavement types. Table 5-3 provides a comparison of surface noise from different seal types.

Table 5-3 Relative surface noise of pavement types

Surface type	Noise variation dB(A)
14 mm chip seal	+ 4
10 mm chip seal	+ 4
7 mm chip seal	+ 2
Tyned/broomed concrete	+ 1 to + 4
Dense graded asphalt	0
Exposed aggregate concrete	- 1 to + 1
Open graded asphalt	- 2

The TNMG (DSG 2015) states that the "*quietest road surface is open graded asphalt; however, it is also expensive and more subject to wear and tear comparable to surfaces such as chip seal.*"

Although noise is a consideration in determining pavement type, it is typically only one of several competing factors, such as:

- The likely users of the pavement e.g. light vehicle, heavy vehicles
- The performance of the surface over time.
- The capital and maintenance costs.

Principle 24 of the TNMG (DSG 2015) states:

"*When selecting seal type, DIER will include noise minimisation amongst its design objectives but the final choice of seal will be one that achieves the best overall balance of all objectives.*"

In the context of the project, there is one area where road traffic is predicted to exceed the target criteria. Pavement such as open graded asphalt has the potential for a noise reduction of up to 2 dB in this area when compared to dense graded asphalt proposed in the vicinity of the nearby roundabout. This would however not be sufficient to reduce project traffic noise to meet the 68 dB(A) $L_{A10\ 18hr}$ target criteria at this receiver for the design year 2029.

Factors other than noise would also need to be considered when determining if quieter pavement types are a reasonable and feasible option.

Speed reduction

A small reduction in traffic speed of 10 to 20% has the potential to reduce noise levels by 1 to 2 dB while a larger reduction of 50% may provide a 5 to 6 dB reduction in noise levels. However, one of the aims of a road project would generally be to improve traffic flow and reduce travel times; therefore speed reductions are usually not favoured.

In the case of this project, the required speed reductions along the main carriageway would not be feasible to mitigate traffic noise at the 68-plus receiver.

R_0176 is at the southern end of the project, not far from reduced speeds through the township of Perth. A noise reduction of 3 dB is required at this sensitive receiver to achieve the 68 dB(A) $L_{A10\ 18hr}$ target criterion. A significant reduction in traffic speed in this area adjacent to the receiver would achieve the required reduction, however is not preferred at this stage.

Noise barriers / mounds

Noise barriers or mounds are usually the most cost effective where road noise targets are exceeded for groups of houses close together as multiple residences and their outdoor areas are able to benefit from the single barrier. In addition, earth mounds and noise walls are most effective when the receiver is close (e.g. within 100 m) to the traffic noise source and are subject to adequate space within the corridor and access to fill material. For an individual receiver, architectural treatment would generally be the recommended option.

At the southern end of the project, a single receiver has been identified as being eligible for mitigation; therefore the implementation of a noise barrier is not considered a reasonable option for this receiver.

Receiver building treatments

Where noise targets cannot be reasonably and practically achieved through the abovementioned options, for '63-plus' and '68-plus' eligible receivers, the TNMG (DSG 2015) states:

> *"develop any reasonable and practicable acoustic treatment solutions calculated to achieve a nominal daytime internal traffic noise design criterion of $L_{Aeq(16\ hour)}$ 35 dB(A))."*

Where other measures are deemed not reasonable or practical, building treatments would be offered to the owner of the eligible property by the proponent and if accepted, an agreement would then be negotiated.

Building treatments aim to reduce internal noise levels. Typical building treatments include upgrades to window glazing, doors and/or sealing of air gaps. A typical allowance of $30,000 - $50,000 is made for building treatments, per property. Based on the one identified receiver, the total cost of building treatment would be in the order of $50,000. The cost of building treatment is likely to be less expensive than pavement or noise wall options; however, it should be acknowledged that building treatment does not provide mitigation to areas external to the building envelope. This should be considered when determining reasonable and feasible measures.

Consideration of suitable building treatments would be determined with consideration to the TNMG (DSG 2015) *Chapter 8.12 Building treatments* and following appropriate consultation with property owner. The existing condition of the building and the realistic effectiveness of building treatment would also need to be considered.

6. Conclusion

A baseline noise monitoring and modelling assessment has been undertaken on behalf of the Department of State Growth for the Perth Links project. This assessment has led to the following conclusions, which are subject to the limitations outlined in Section 1.3:

- Existing road traffic noise at identified receivers is generally under the 63 dB(A) $L_{A10\ 18hr}$ target criteria. Existing road traffic noise exceed the 63 dB(A)) $L_{A10\ 18hr}$ criterion at 46 receivers.
- Project road traffic noise is predicted to exceed the 63 dB(A) $L_{A10\ 18hr}$ target criteria at four receivers for the year 2029 traffic noise model.
  - Existing noise levels at two of these receivers are greater than 63 dB(A), and 2029 project levels less than 68 dB(A), therefore they are not eligible for mitgiation under the TNMG.
  - Project traffic noise at one receiver (R_0176) is predicted to exceed the upper limit target of 68 dB(A) $L_{A10\ 18hr}$ by 3 dB(A). This receiver was found to be eligible for noise mitigation.
- Options for road traffic noise mitigation measures have been considered and discussed:
  - one receiver was identified as being eligible for consideration of noise mitigation measures as a '68-plus' receiver
  - one receiver was identified as being eligible for consideration of noise mitigation measures as a '63-plus' receiver.
  - Building treatment has been identified as a potentially reasonable and feasible option for these receivers. Existing noise attenuating architectural features of this property should be investigated and considered.

Appendix A – Unattended monitoring charts

Appendices

GHD

Level 3 GHD Tower 24 Honeysuckle Drive Newcastle NSW 2300
PO Box 5403 Hunter Region Mail Centre NSW 2310
T: (02) 4979 9999 F: (02) 4979 9988 E: ntlmail@ghd.com

N:\AU\Newcastle\Projects\32\18285\WP\114404.docx

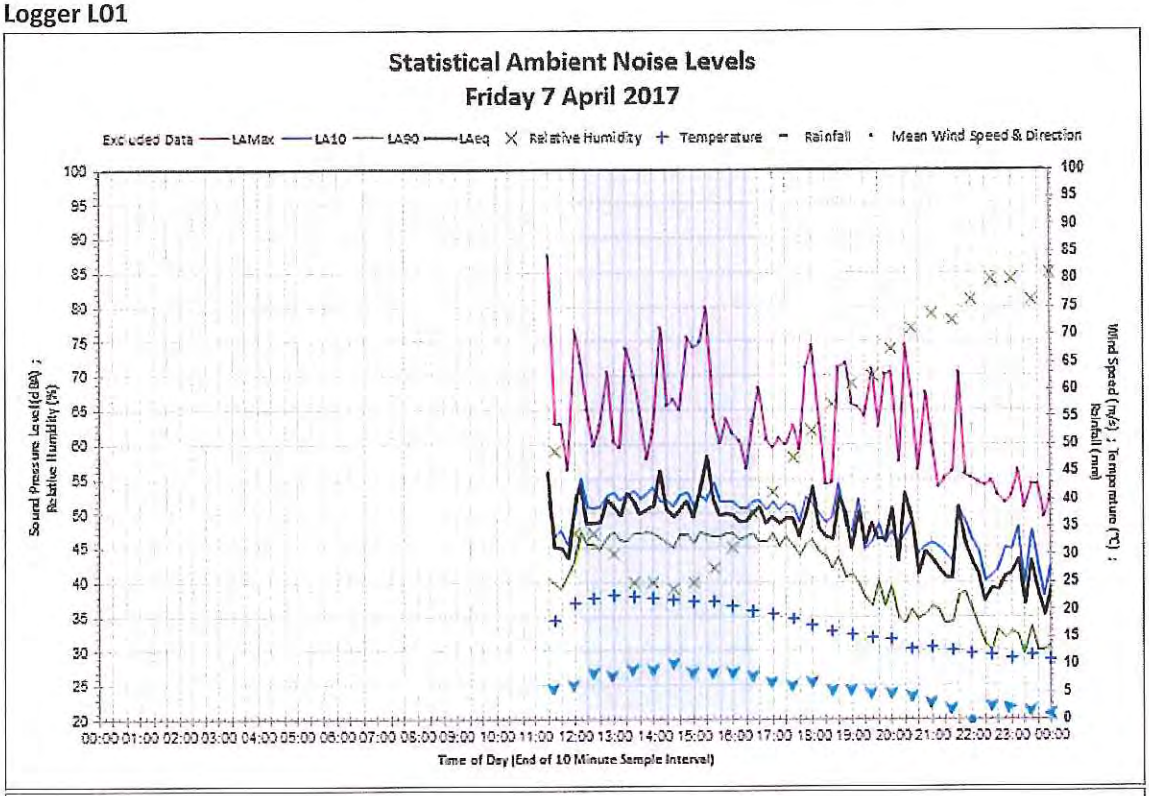
Document Status

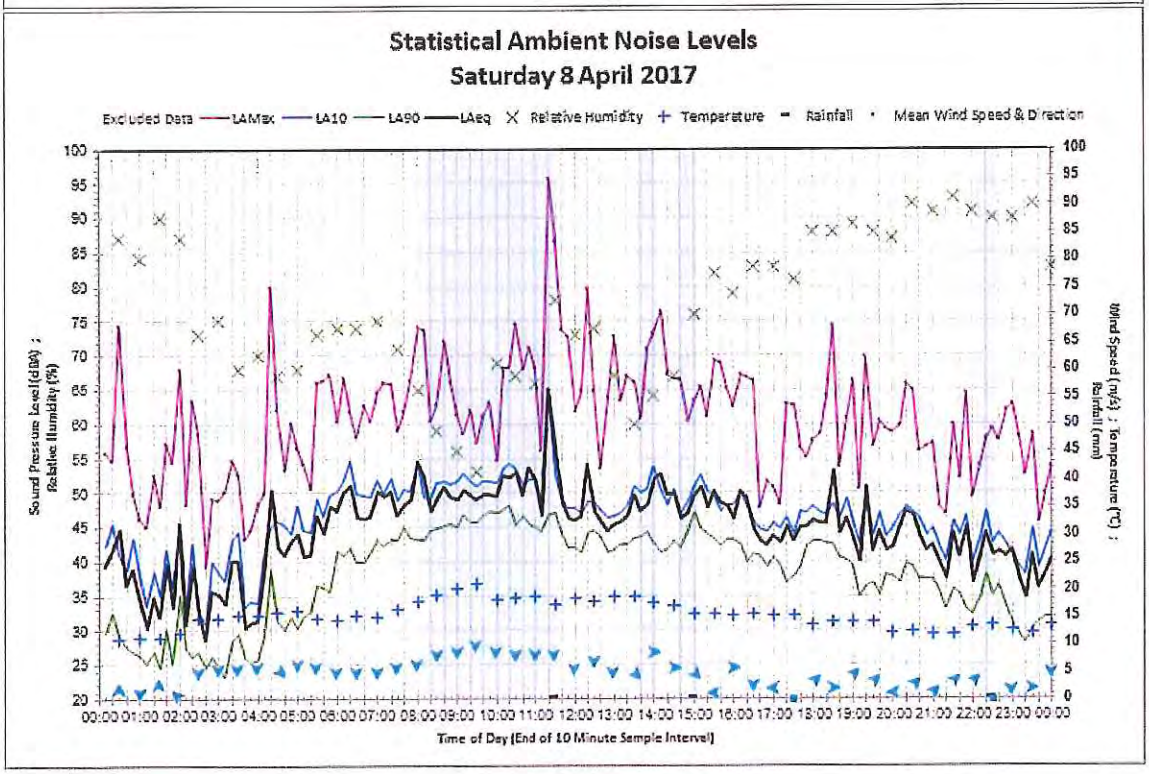
Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Draft A	J. Vallis	S. Ritchie				
Draft B	J. Vallis	S. Ritchie				

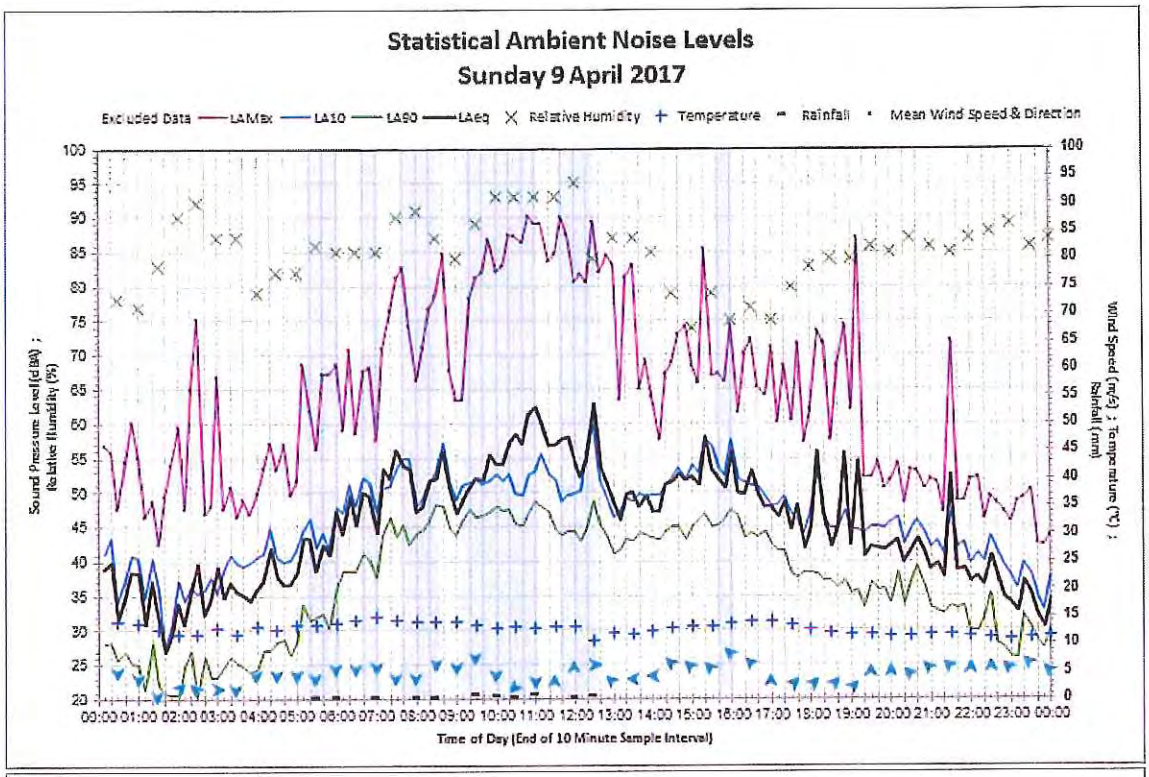
www.ghd.com

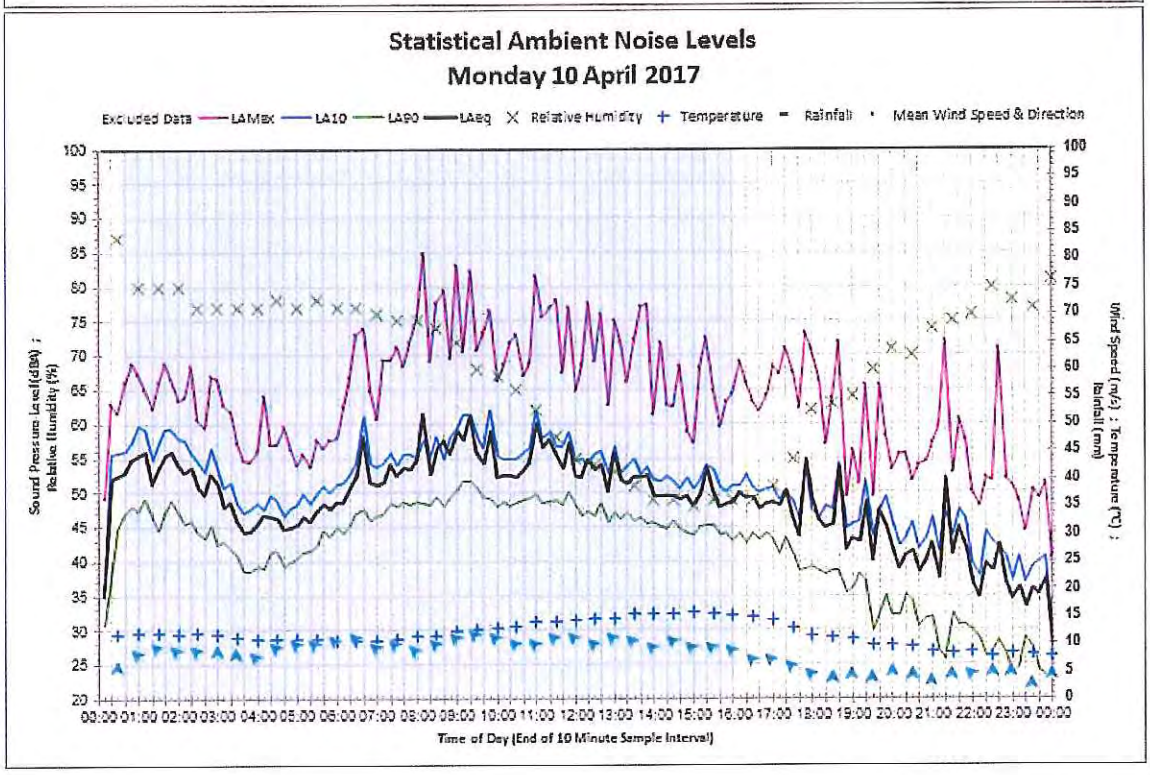
Appendix A – Unattended monitoring charts

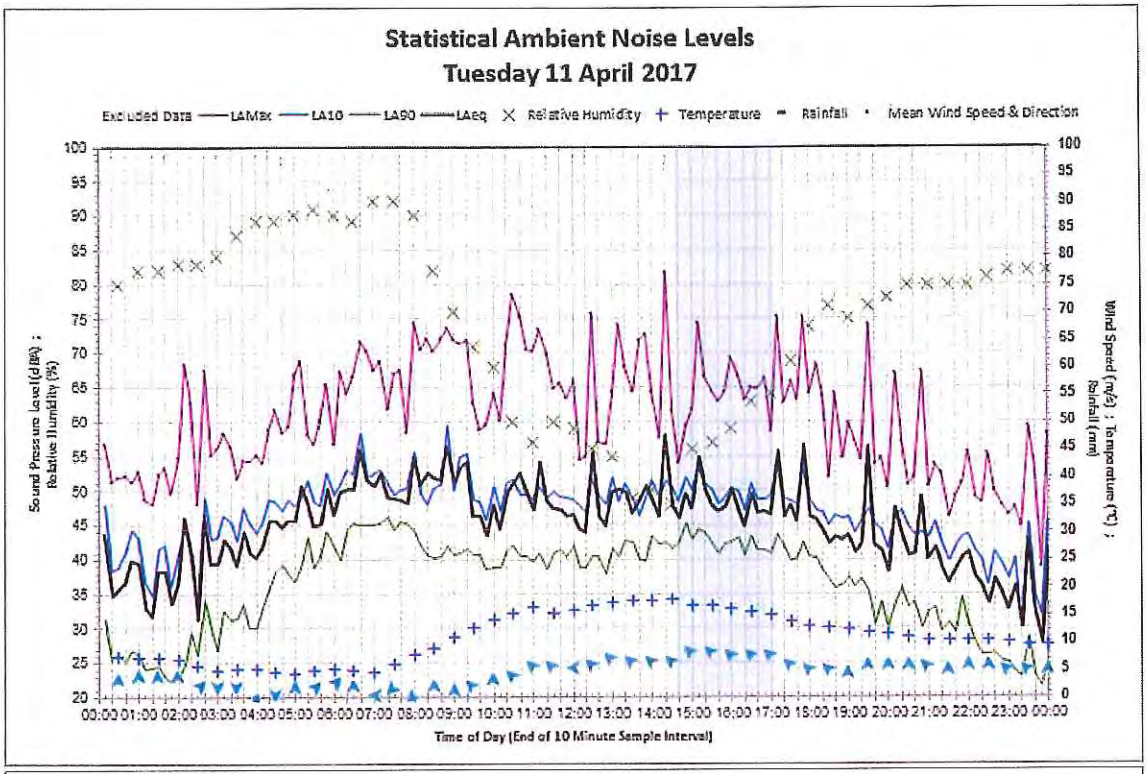
Logger L01

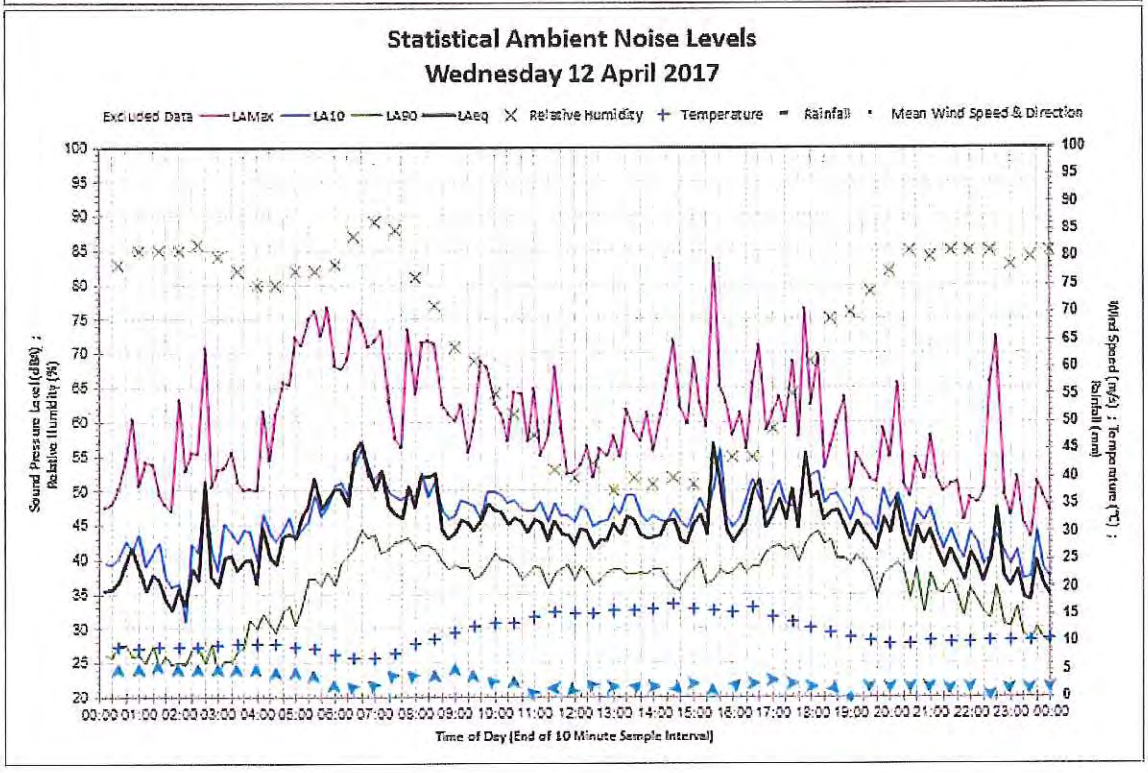


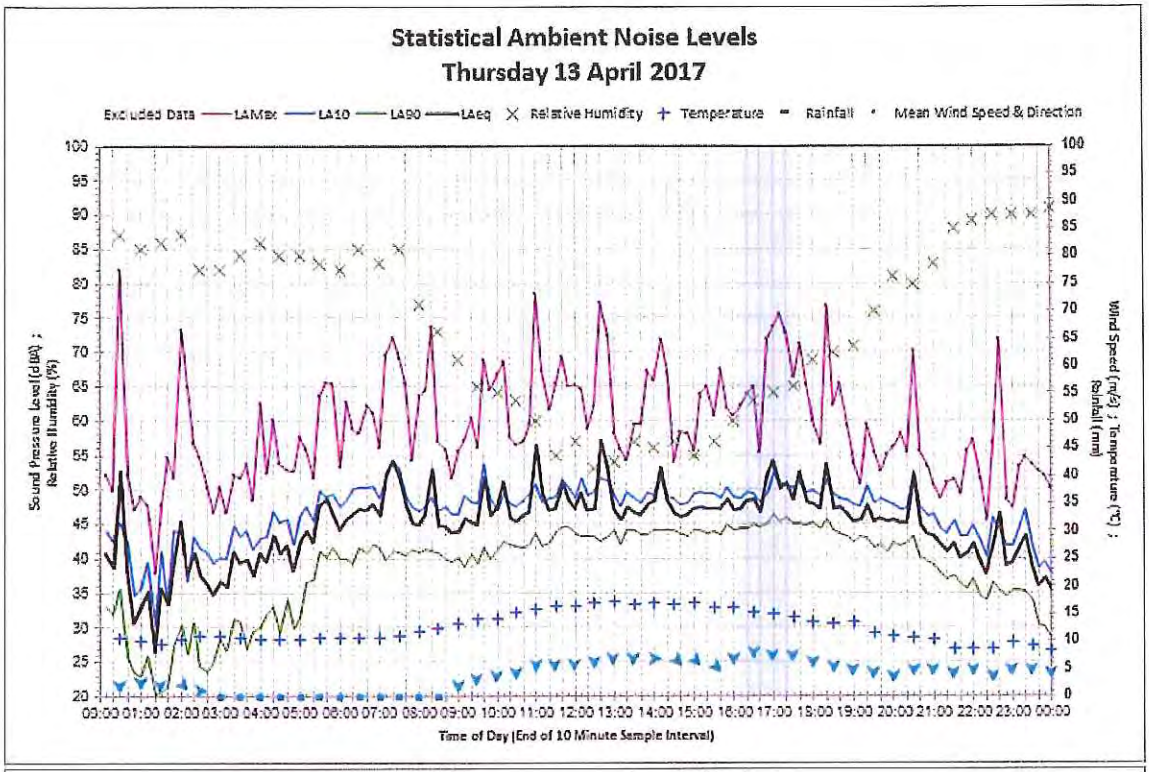


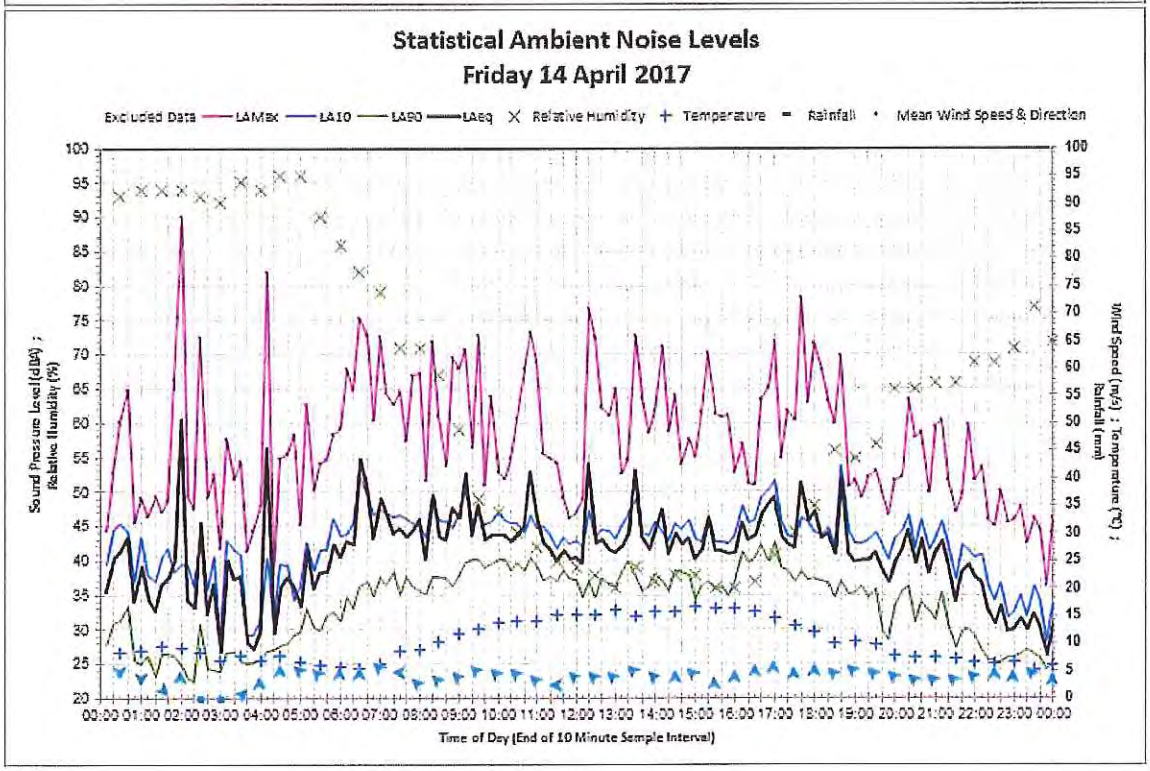

Statistical Ambient Noise Levels
Sunday 9 April 2017
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 10 Minute Sample Interval)

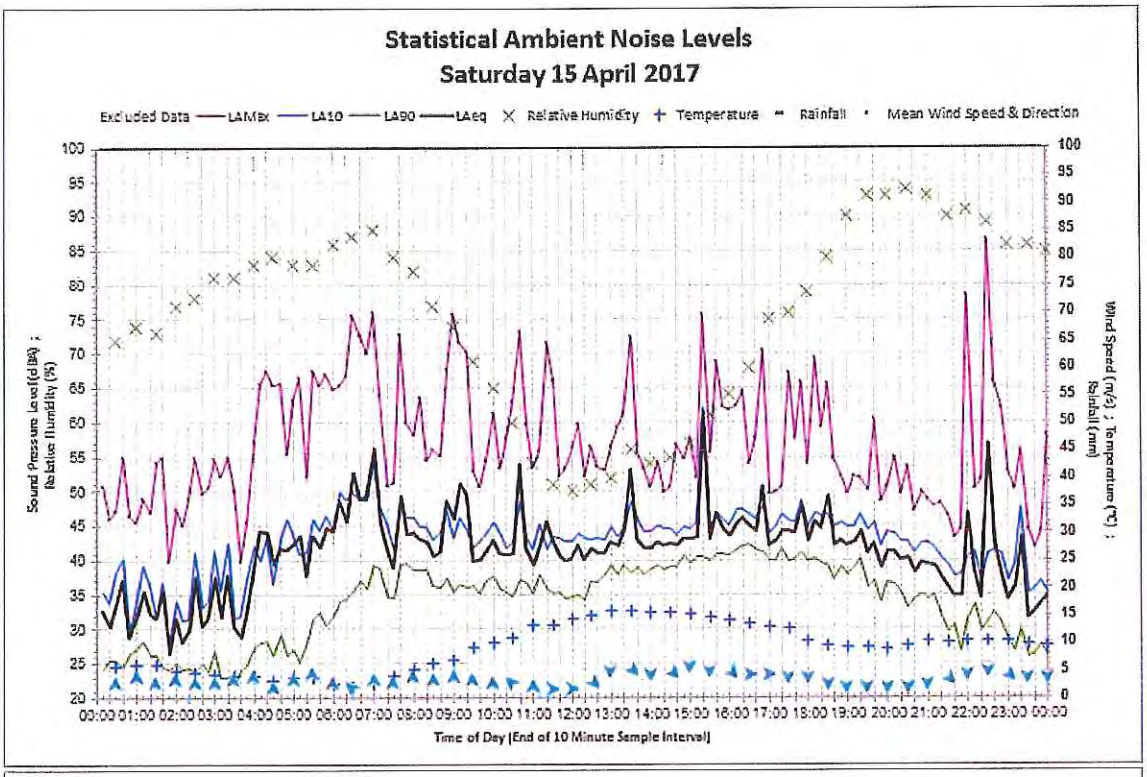

Statistical Ambient Noise Levels
Monday 10 April 2017
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 10 Minute Sample Interval)

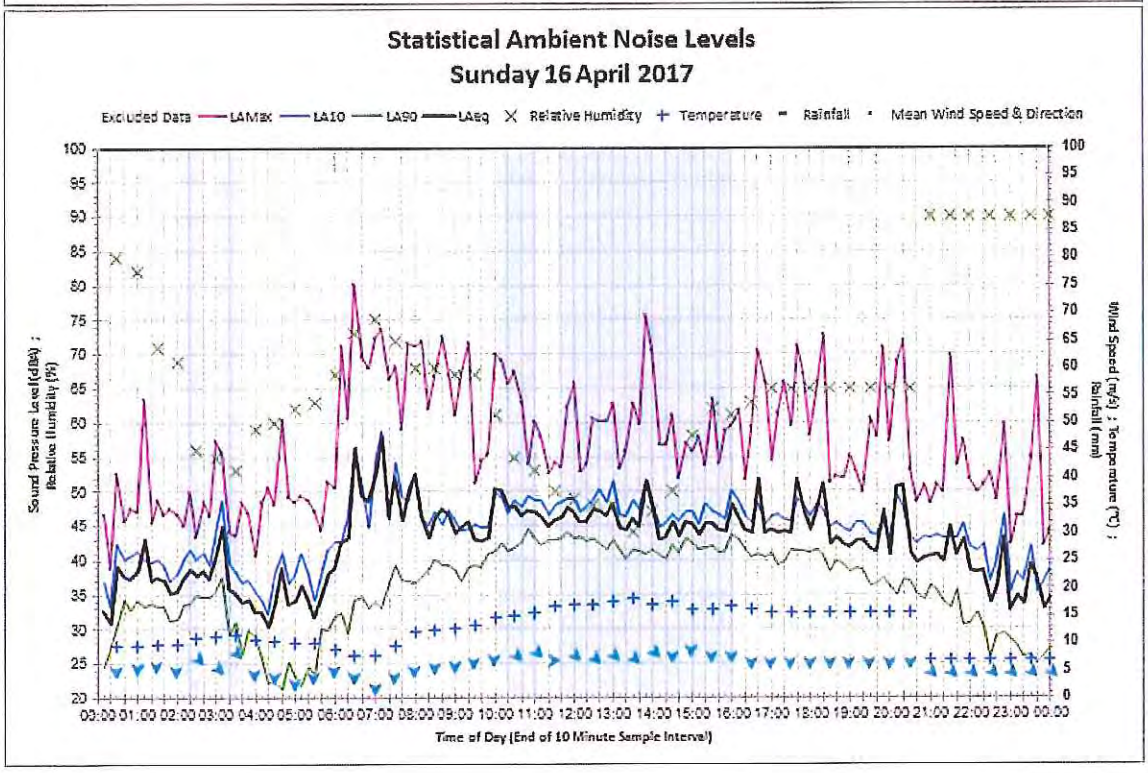

Statistical Ambient Noise Levels
Tuesday 11 April 2017
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 10 Minute Sample Interval)

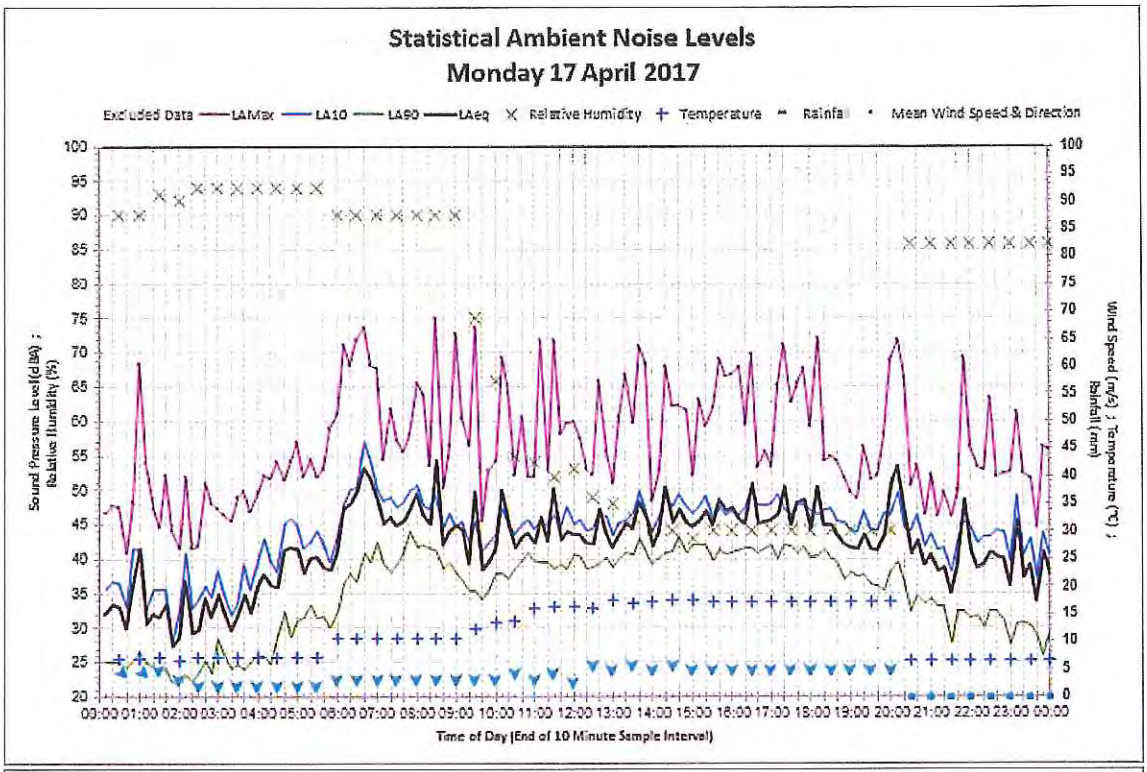

Statistical Ambient Noise Levels
Wednesday 12 April 2017
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 10 Minute Sample Interval)

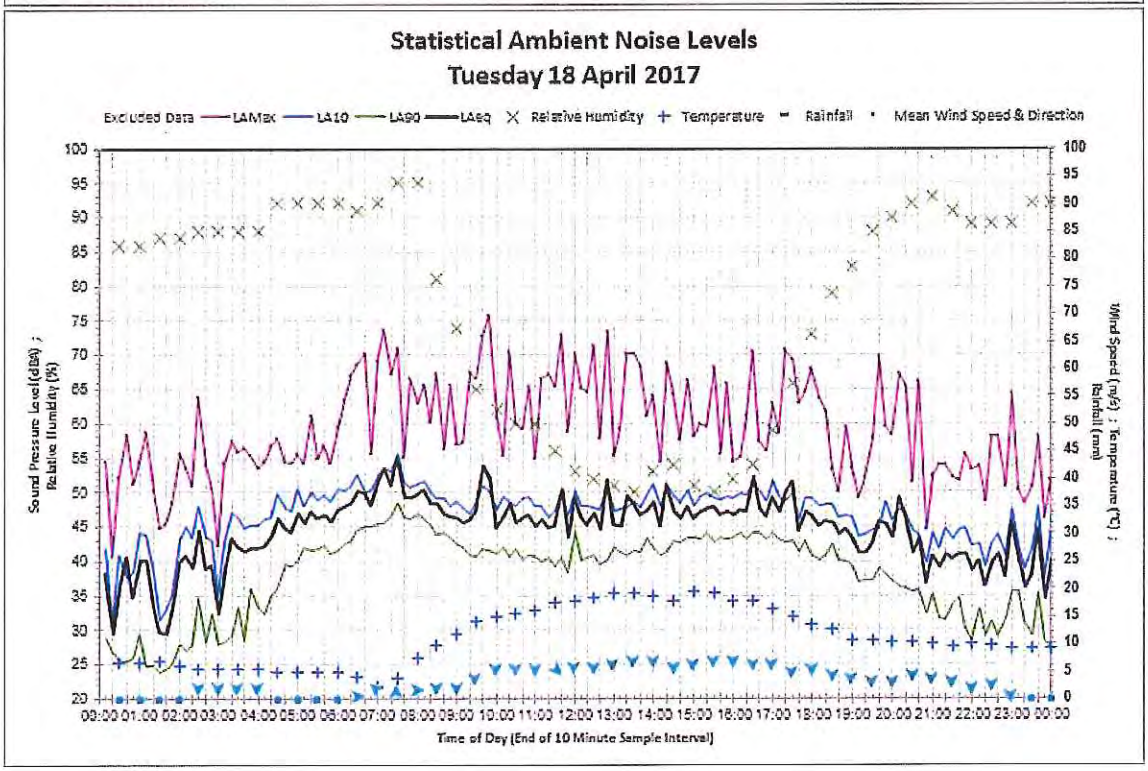

Statistical Ambient Noise Levels
Thursday 13 April 2017
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 10 Minute Sample Interval)

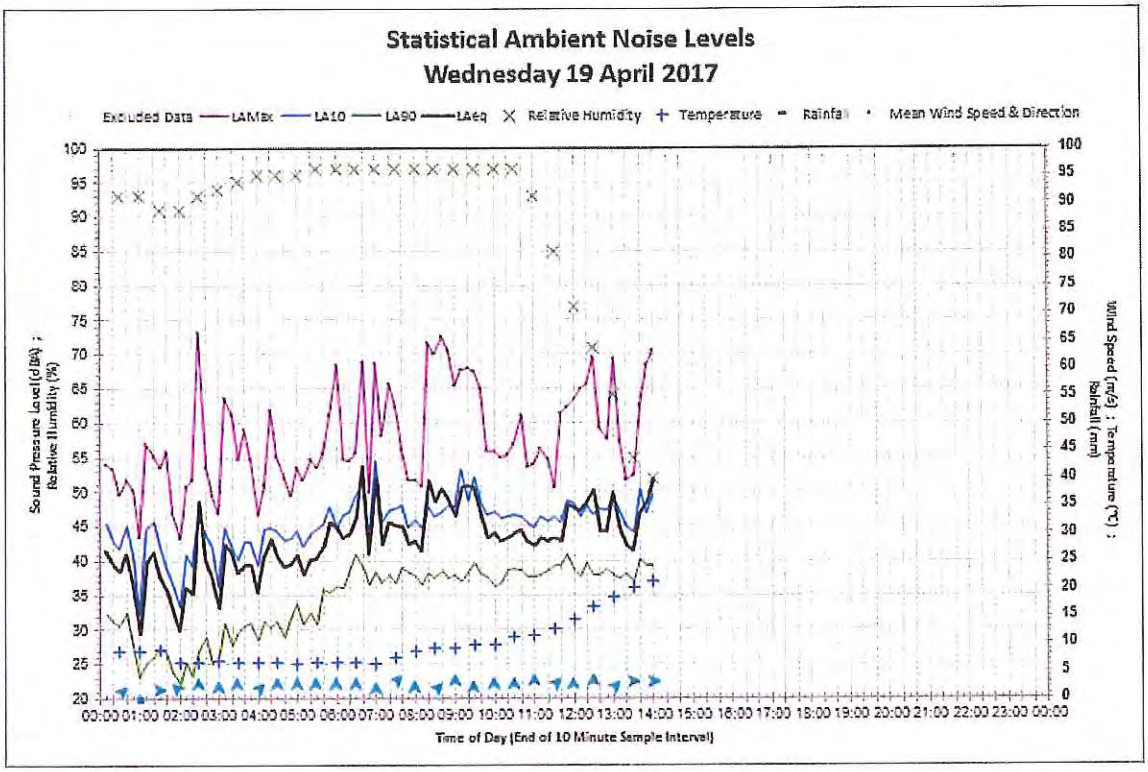

Statistical Ambient Noise Levels
Friday 14 April 2017
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 10 Minute Sample Interval)


Statistical Ambient Noise Levels
Saturday 15 April 2017
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 10 Minute Sample Interval)

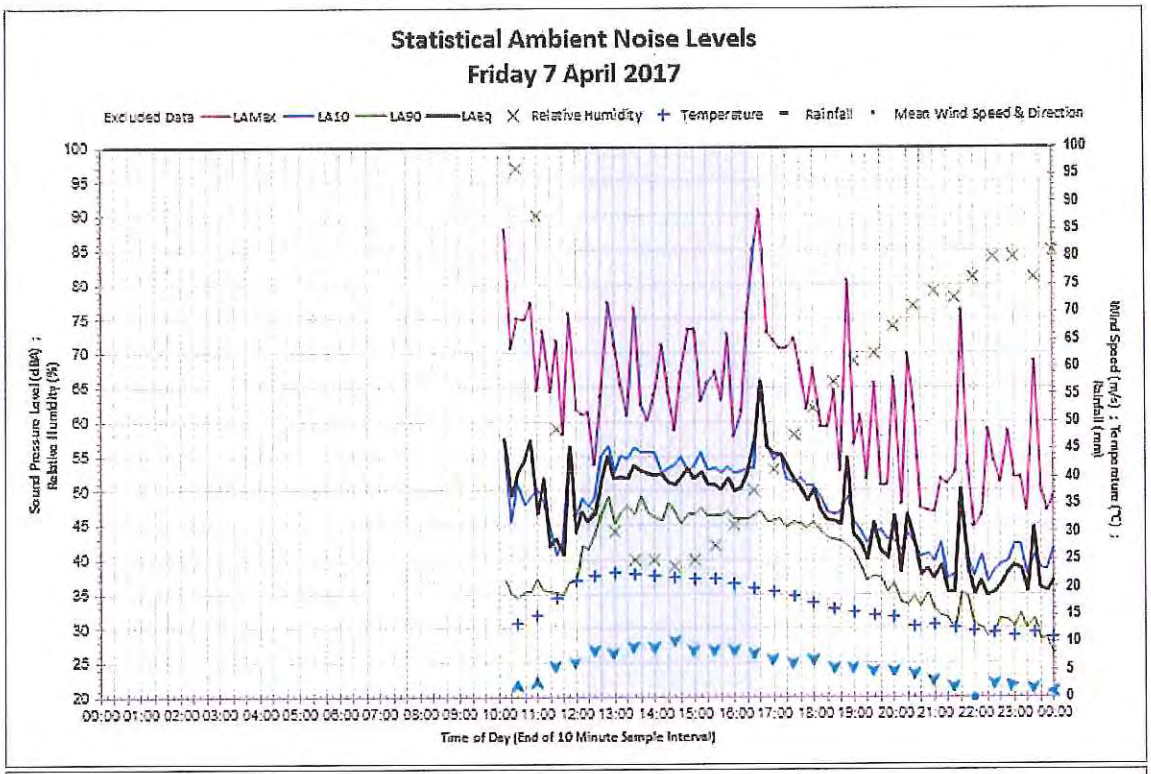

Statistical Ambient Noise Levels
Sunday 16 April 2017
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 10 Minute Sample Interval)

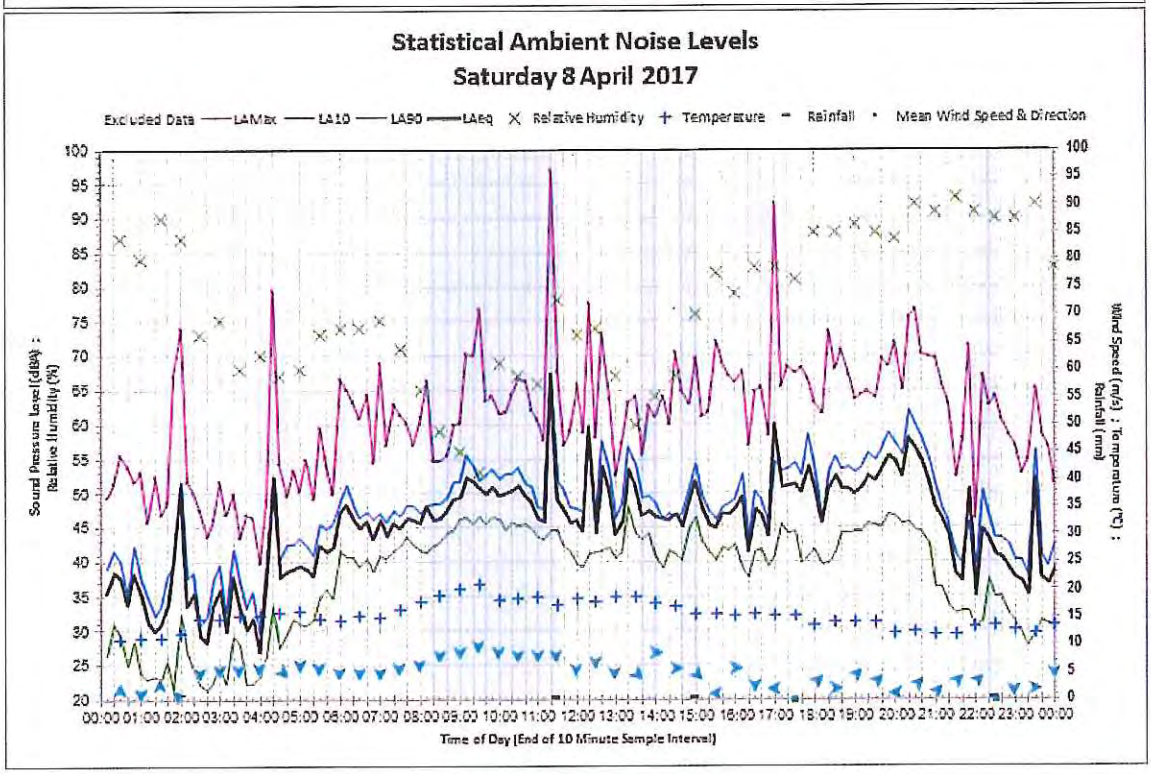

Statistical Ambient Noise Levels
Monday 17 April 2017
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 10 Minute Sample Interval)


Statistical Ambient Noise Levels
Tuesday 18 April 2017
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 10 Minute Sample Interval)


Statistical Ambient Noise Levels
Wednesday 19 April 2017
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 10 Minute Sample Interval)

Logger L02


Statistical Ambient Noise Levels
Friday 7 April 2017
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 10 Minute Sample Interval)


Statistical Ambient Noise Levels
Saturday 8 April 2017
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 10 Minute Sample Interval)