APPENDIX

O

Construction Noise and Vibration

Part 1 of 3

GOWRIE TO HELIDON ENVIRONMENTAL IMPACT STATEMENT

INLAND RAIL

ARTC

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

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Inland Rail Gowrie to Helidon EIS

Appendix O – Construction Noise and Vibration Technical Report

Australian Rail Track Corporation

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Abbreviations

Abbreviation	Explanation
3D	Three-dimensional
AEP	Annual exceedance probability
ANZEC	Australian and New Zealand Environmental Council
ARTC	Australian Rail Track Corporation Ltd
AS	Australian Standard
B2G	NSW/QLD border to Gowrie section of the Inland Rail Project
BS	British standard
CoP Vol 1	DTMR's guideline *Transport Noise Management Code of Practice: Volume 2 – Construction Noise and Vibration*
CoP Vol 2	DTMR's guideline *Transport Noise Management Code of Practice: Volume 1 – Road Traffic Noise*
DEHP	Department of Environment and Heritage Protection (now Department of Environment and Science)
DES	Department of Environment and Science (Qld)
DIN	Deutsches Institut für Normung – the German national organisation for standardisation
DTMR	Department of Transport and Main Roads
EIS	Environmental Impact Statement
EP Act	Environmental Protection Act 1994 (Qld)
EPP (Noise)	Environment Protection (Noise) Policy 2019
ERA	Environmentally relevant activity
FFJV	Future Freight Joint Venture
G2H	Gowrie to Helidon section of the Inland Rail Project
H2C	Helidon to Calvert section of the Inland Rail Project
Hz	Hertz
IEC	International Electrotechnical Commission, an international standards organisation
Inland Rail	Melbourne to Brisbane Inland Rail
ISO	International Organisation for Standards
kg	kilogram
km	kilometre
km/h	Kilometres per hour
LEP	Long-Egress Passage
Lidar	Light detection and ranging
LGA	Local government area
m	metre
m^2	Square metres
mm	Millimetre
mm/s	Millimetre per second
ms	Millisecond
N/A	Not applicable
NATA	National Association of Testing Authorities, Australia
NCA	Noise Catchment Areas
NSR	Noise sensitive receptor

Abbreviation	Explanation
NSW	New South Wales
PPV	Peak Particle Velocity
QLD	Queensland
QR	Queensland Rail
RBL	Rating background level
RMAR	Rail maintenance access roads
s	Second
SDPWO Act	*State Development and Public Works Organisation Act 1971* (Qld)
SEQ	South-east Queensland
SLM	Sound level meter
SWL	Sound power level
t	Tonne
TBD	To be determined
TBM	Tunnel boring machine
TI Act	*Transport Infrastructure Act 1994* (Qld)
ToR	Terms of Reference
TPC Act	*Transport Planning and Coordination Act 1994* (Qld)
TRC	Toowoomba Regional Council
TSRC	Toowoomba Second Range Crossing

Glossary

Term	Explanation
A Weighted decibel [dB(A)]	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1kHz and 4 kHz) which the human ear is most sensitive to and therefore places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).
Ambient noise	The all-encompassing noise at a point composed of sound from all sources near and far.
Assessment background level [ABL]	The overall background level for each day, evening and night period for each day of the noise monitoring.
Background noise	The underlying level of noise present in the ambient noise when extraneous noise (such as transient traffic and dogs barking) is removed. The L_{90} sound pressure level is used to quantify background noise.
Decibel [dB]	The measurement unit of sound.
Decibel scale	The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows: ■ 0 dB(A) Threshold of human hearing ■ 30 dB(A) A quiet country park ■ 40 dB(A) Whisper in a library ■ 50 dB(A) Open office space ■ 70 dB(A) Inside a car on a freeway ■ 80 dB(A) Outboard motor ■ 90 dB(A) Heavy vehicle pass-by ■ 100 dB(A) Jackhammer/subway train ■ 110 dB(A) Rock concert ■ 120 dB(A) 747 take off at 250 m
Diagonal distance	The nearest distance between the edge of the tunnel and the building foundation of each sensitive receptor
Equivalent continuous sound level [L_{eq}]	The constant sound level which, when occurring over the same period of time, would result in the receptor experiencing the same amount of sound energy.
Frequency [f]	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high-pitched sound and a low frequency to a low pitched sound.
Ground-borne noise	Noise generated by the vibration of a structure impacted by ground vibration
L_{10}	The sound pressure level exceeded for 10% of the measurement period. For 10% of the measurement period it was louder than the L_{10}.
L_{90}	The sound pressure level exceeded for 90% of the measurement period. For 90% of the measurement period it was louder than the L_{90}.
L_{A10}	The A-weighted sound pressure level exceeded for 10% of the measurement period. For 10% of the measurement period it was louder than the L_{A10}.
L_{Aeq}	The A-weighted equivalent steady sound pressure level over the measurement period
$L_{A,max}$	The A-weighted maximum sound pressure level measured over the measurement period
$L_{A,min}$	The A-weighted minimum sound pressure level over the measurement period.
L_{ASMax}	The A-weighted maximum sound pressure level with slow response
L_{max}	The maximum sound pressure level measured over the measurement period.
L_{min}	The minimum sound pressure level measured over the measurement period.
$L_{A,90}$	The A-weighted sound pressure level exceeded for 90% of the measurement period. For 90% of the measurement period it was louder than the $L_{A,90}$.

Term	Explanation
Non-standard hours	Hours defined by the CoP Vol 2 at which non-standard hours construction noise criteria are applicable. ■ General construction and construction traffic – Evening ▪ Monday to Friday 6.00 pm to 10.00 pm ▪ Saturday 1.00 pm to 10.00 pm ▪ Sunday 7.00 am to 10.00 pm – Night ▪ Monday to Sunday 10.00 pm to 7.00 am Generally, blasting is not to be conducted outside standard hours. Any blasting outside of standard hours must be approved by DTMR prior to blasting. It is noted that reduced limits may be required to be achieved.
Peak particle velocity (PPV)	A measure of ground vibration magnitude, PPV is the maximum instantaneous particle velocity at a point during a given time interval in mm/s.
Rating background level [RBL]	The overall background level for each day, evening and night period for the entire length of noise monitoring.
Sound power level [SWL]	The total sound emitted by a source.
Sound pressure level	The amount of sound at a specified point.
Standard hours	Hours defined by the CoP Vol 2 at which standard hours construction noise criteria are applicable. ■ General construction and construction traffic – Monday to Friday 7.00 am to 6.00 pm – Saturday 8.00 am to 1.00 pm ■ Blasting – Monday to Friday 9.00 am to 5.00 pm – Saturday 9.00 am to 1.00 pm
Unweighted (linear) decibel [dB(Z)]	Unfiltered measured noise levels are quantified by unweighted or linear decibels. These units are abbreviated as dB(Z) or dB(linear).

Executive summary

The Gowrie to Helidon (G2H) Project (the Project) consists of 28 kilometres (km) of predominantly greenfield railway with three crossing loops located approximately between the towns of Gowrie and Helidon. It will also involve the construction of a 6.24 km tunnel through the Toowoomba Range and several bridge and viaduct structures on the eastern side of the range to facilitate the required gradient across the undulating topography. Future Freight Joint Venture (FFJV) has been commissioned by Australian Rail Track Corporation (ARTC) to carry out a construction noise and vibration, operational road traffic noise and operational fixed infrastructure noise impact assessment in accordance with the Project Terms of Reference (ToR). Operational railway noise and vibration is reported separately in the Environmental Impact Statement (EIS) Appendix P: Operational noise and vibration technical report.

The construction noise and vibration, operational road traffic noise and operational fixed infrastructure noise assessment has been carried out under relevant legislation including the *Transport Infrastructure Act 1994* (Qld) (TI Act) and the *Environmental Protection Act 1994* (Qld) (EP Act).

Within the noise and vibration study area 3,811 sensitive receptors (e.g. residential and commercial buildings) have been identified. The existing noise and vibration environment has been described by noise and vibration monitoring conducted at 10 locations. Baseline noise measurements were used to determine applicable construction noise criteria under the Department of Transport and Main Roads (DTMR) *Transport Noise Management Code of Practice Volume 2: Construction Noise and Vibration* (DTMR 2016) (CoP Vol 2).

Worst-case construction scenarios have been assessed for each of the main construction activities. The assessment was undertaken in accordance with the CoP Vol 2. Construction noise and vibration impacts vary depending on the construction activity undertaken and the time of day in which it occurs. As the current construction methodology does not specify the times of day at which construction activities occur, impacts have been assessed against criteria for all times of day. The worst-case impacts of construction noise and vibration against the most stringent criterion are summarised in Table 1.

A desktop assessment of the operational road traffic noise associated with the Project has been carried out in accordance with the DTMR *Transport Noise Management Code of Practice: Volume 1 – Road Traffic Noise* (DTMR 2013) (CoP Vol 1) and ToR. Table 1 summarises the findings of the operational road traffic noise assessment.

An assessment of the operational fixed infrastructure noise has been carried out using *ISO 9613-2: Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*. Operational fixed infrastructure noise is predicted to meet the Environmental Protection (Noise) Policy 2019 (EPP (Noise)) acoustic quality objectives at all sensitive receptors. Table 1 summarises the findings of the operational fixed infrastructure assessment.

Table 1 Non-operational noise and vibration impact assessment findings

Impact	Activity (highest impact)	Criterion (most stringent)	Criterion source	Worst-case unmitigated impacts
Construction noise	Earthworks	Monday – Sunday 10:00 pm to 7:00 am: 45 dB(A) $L_{Aeq,\ 15\ min}$ at receptor façade	CoP Vol 2	Worst-case 15-minute construction noise impacts at 2,131 noise sensitive receptors are predicted to exceed this night-time noise limit.
Construction road traffic noise	Construction traffic movements	3 dB(A) increase in the $L_{A10,\ 1hr}$ due to construction traffic	CoP Vol 2	Five roads are predicted to exceed this limit. The maximum predicted increase is 6 dB(A)
Construction vibration	Percussive (impact) piling	Non-standard hours, human comfort: 0.3 mm/s peak particle velocity (PPV) at ground level	CoP Vol 2	Vibration impacts up to 175 vibration sensitive receptors are expected to exceed this limit.
Blasting ground vibration and airblast overpressure	Construction blasting	Blasting charge masses are not known at this stage. Therefore, maximum allowable instantaneous charge masses have been provided at indicative distances and sensitive receptors.		

Impact	Activity (highest impact)	Criterion (most stringent)	Criterion source	Worst-case unmitigated impacts
Tunnel construction ground-borne noise	Tunnel boring machine (TBM) operation	Non-standard hours: 35 dB(A) $L_{Aeq,\ 15\ min}$ internal	CoP Vol 2	72 residential receptors are predicted to exceed the non-standard hours noise criterion. These exceedances are only predicted while the TBM is within a 390 m diagonal distance of the receptors.
Tunnel construction vibration	TBM operation	Non-standard hours, human comfort: 0.3 mm/s PPV at ground level	CoP Vol 2	Vibration levels at the foundation of all sensitive receptors are predicted to comply with criteria.
Operational road traffic noise	Traffic movements on roads undergoing works as part of the Project	New roads: 60 dB(A) $L_{A10,\ 18\ hr}$ at receptor façade Existing roads: 68 dB(A) $L_{A10,\ 18\ hr}$ at receptor façade	CoP Vol 1	Two new roads are predicted to exceed the road traffic noise criterion – Morris Road (3 sensitive receptors up to 62 dB(A)) and Gowrie Junction Road (18 sensitive receptors up to 69 dB(A)))
Operational fixed infrastructure noise	Operation of tunnel ventilation fans	30 dB(A) internal $L_{Aeq,\ 1\ hr}$	EPP (Noise)	Physical attenuation is specified such that all fixed infrastructure associated with the Project is predicted to comply with the noise objective.

Limiting Project's construction hours to within the CoP Vol 2 standard hours has the potential to significantly reduce the number of sensitive receptors impacted by the construction of the Project. During CoP Vol 2 standard hours, less stringent construction noise and vibration criteria apply. Restricting works to these hours reduces the number of impacted receptors by approximately 40 per cent for drainage works, rail and road civil works, and up to a 65 per cent reduction for site setup/laydown and structures.

This noise and vibration assessment has been based on a preliminary construction methodology. During detailed design, a detailed noise and vibration assessment is to be undertaken based on a detailed construction methodology. Specific measures to mitigate the impacts predicted by the detailed noise and vibration assessment are to be developed will form part of the Construction Environmental Management Plan (CEMP) and are to be incorporated in the Noise and Vibration Management Sub-plan. Mitigation measures may include the following:

- Effective community consultation
- Training of construction site workers
- Use of temporary noise barriers
- Monitoring
- Appropriate selection and maintenance of equipment
- Scheduling of work for less sensitive time periods
- Situating plant in less noise sensitive locations
- Construction traffic management
- Respite periods.

Based on the construction noise assessment and proposed mitigation, worst-case construction noise impacts at approximately 46 per cent of construction noise sensitive receptors are not predicted to be feasibly mitigated to below the appropriate criterion by physical attenuation alone. Where further mitigation is also similarly impractical or unreasonable, residual impacts may need to be managed. Management of residual impacts will be undertaken in consultation with the community and affected residents. Residual construction noise impacts present after the application of mitigation will be temporary and will cease once construction finishes. Residual construction noise impacts may be managed through:

- Temporary relocation of affected occupants
- Respite periods
- Architectural treatments.

Operational noise impacts from fixed infrastructure and proposed changes to the road network will be mitigated as required to meet the relevant criteria. Residual operational noise levels after the application of mitigation will therefore be acceptable.

1 Introduction

1.1 Project background

The Inland Rail Program will provide a dedicated rail corridor between Melbourne and Brisbane via regional Victoria, New South Wales (NSW) and Queensland (QLD). The Australian Government has appointed the Australian Rail Track Corporation (ARTC) to deliver Inland Rail, in partnership with the private sector. The 1,700 kilometre (km) route is being delivered in 13 distinct project sections.

The Future Freight Joint Venture (FFJV) was commissioned by ARTC to undertake the noise assessment for the Gowrie to Helidon (G2H) Project (the Project) section of the Inland Rail Program.

The Project involves a new 28 km rail corridor, which generally follows the Gowrie to Grandchester future State transport corridor, between Charlton and Helidon. The Project will also include a 6.24 km long tunnel through the Toowoomba Range.

Given the complexity and significance of the Project, the Project was declared a coordinated project under the *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO Act). This declaration initiates the statutory environmental impact assessment procedure detailed in Part 4 of the SDPWO Act, which requires a proponent to prepare an Environmental Impact Statement (EIS) for the Project in accordance with the Terms of Reference (ToR).

The noise assessment aims to address the requirements of the ToR, including the relevant guidelines. The assessment will also inform design and construction, including impacts and proposed mitigation measures, along with any legislative requirements.

1.2 Key features of the Project

The key components to the Project are described in Table 1.1.

Table 1.1 Key features of the Project

Aspect	Description
Permanent features	
New track	▪ Approximately 28 km of new single-track dual gauge railway
Rail corridor	▪ Establishment of approximately 22.4 km of new “greenfield” rail corridor ▪ Development of approximately 5.6 km of “brownfield” rail corridor ▪ The land required for the Project comprises a corridor with a minimum width of 62.5 m. A reduced corridor is required where the Project is co-located with the existing rail corridor or for the tunnel. ▪ The rail corridor will be of sufficient width to allow future crossing loop extensions to accommodate trains of up to 3,600 m in length ▪ The rail corridor will include land associated with the intermediate tunnel ventilation shaft and supporting infrastructure, access roads and other supporting infrastructure (e.g. water pipelines)
Tunnel	▪ Construction of an approximately 6.24 km long undrained tunnel through the Toowoomba Range including expanded corridor to accommodate tunnel portal infrastructure (e.g. tunnel operations facilities and tunnel material stockpile at the western tunnel portal) ▪ Intermediate ventilation shaft (which draws in air to ventilate the tunnel) and associated infrastructure to be established at Cranley ▪ Land acquisition (volumetric) for the tunnel will include a provisional area around the tunnel to protect the asset from future development

Aspect	Description
Crossing loops and turnouts	■ Crossing loops are places on a single-line track where trains in opposing directions can pass each other ■ Three crossing loops will be constructed as part of the Project, each a minimum of 2,200 m in length ■ Turnouts allow the train to be guided from one section of track to another. Turnouts that tie-in to the existing West Moreton System rail corridor will be incorporated. There are 16 turnouts proposed along the alignment, including those associated with: – Crossing loops – Maintenance sidings – Cross overs between Inland Rail and the existing West Moreton System – Connection to the proposed InterLinkSQ facility – Connection at the western tunnel portal to the West Moreton System to allow for train movements between Brisbane and Toowoomba
Bridges and viaducts	■ Bridges and viaducts to accommodate topographical variation, crossings of waterways or other infrastructure such as roads ■ There are 13 new bridge and viaduct structures, totalling approximately 6.7 km in length, proposed for the Project, comprising: – Two rail-over-waterway viaducts – Three rail-over-terrain-and-waterway viaducts – Four rail-over-terrain-road-and-waterway viaducts – One rail-over-road-rail-and-waterway viaduct – One rail-over-waterway bridge – One road-over-rail-and-waterway bridge – One road-over-rail bridge ■ Instream structures and scour protection measures associated with waterway crossings where relevant
Drainage	■ Reinforced concrete pipe (RCP) culverts and reinforced concrete box (RCBC) culverts. Scour protection measures will generally be installed around culverts and other drainage structures to minimise the potential for erosion.
Rail crossings	■ Rail crossings including grade separations/rail or road overbridges, occupational/private crossings and fauna crossing structures
Embankments and cuttings	■ Embankments and cuttings will be required along the length of the alignment, this includes road and rail infrastructure within the alignment such as crossing loops and road of rail bridges ■ The total length of embankments required for the Project will be in the order of 15.4 km with a maximum embankment height of 33.3 m ■ The total length of cut for the Project will be in the order of 6.65 km with a maximum cut depth of 45.7 m
Ancillary works	■ Associated rail infrastructure including maintenance sidings, safe working systems and signalling infrastructure ■ Ancillary works include signalling and communications, signage and fencing, drainage works, establishment and/or reinstatement of access roads, and installation or modification of services and utilities ■ Road closures and realignments; including closure of an existing level crossings on the QR West Moreton System rail line at Gowrie
Environmental treatments	■ Potential noise barriers, fauna crossing structures, instream structures and fish passage design, fauna exclusion fencing, and rehabilitation and landscape treatments

Aspect	Description
Temporary features	
Land	■ Temporary access tracks will be used to access construction sites. Where required, they will be retained to serve as rail maintenance access roads (RMAR) during the operation of the Project ■ Land requirements for construction will include temporary workspace, site offices and laydown facilities ■ Laydown areas will be located approximately every 5 to 10 km (avoiding 1% annual exceedance probability (AEP) floodplains where possible). Laydown areas will be required for activities such as tunnel construction, flash butt welding, concrete batching, water treatment facilities and rail assembly. ■ Approximately 2,500 square metres (m^2) of laydown areas to support bridge construction (where practicable, smaller near sensitive habitats)
Material sourcing	■ Identification, and lawful use of established quarries for sourcing construction materials
Utilities	■ Clashes with utilities flagged and treatments identified for refinement during detailed design with utility relocations will be subject to separate assessments, with all necessary approvals obtained prior to any relocation being undertaken ■ Major utility impacts and treatments have been confirmed with utility owners

1.3 Purpose of the report

This technical report provides an assessment of noise and vibration impacts related to construction activities, operational road traffic noise, and operational fixed infrastructure noise of the Project and has been prepared to support the Project EIS.

The construction of the Project has been assessed using the applicable noise and vibration guidelines summarised in Section 2 to adequately meet the requirements of assessment outlined within the Project ToR.

Operational noise from roads which are to be changed as part of the Project, and from fixed infrastructure such as tunnel ventilation fans has also been assessed within this report.

Operational noise and vibration associated with railway operation has been assessed separately in EIS Appendix P: Operational railway noise and vibration technical report. This includes noise sources such as train horns and alarms.

1.4 Scope of this report

The scope of this noise and vibration impact assessment has been to:

- Identify nearby sensitive receptors potentially affected by the Project
- Undertake baseline noise and vibration measurements
- Establish construction noise criteria based upon the measured background noise levels, Department Transport and Main Roads' (DTMR) document *Transport Noise Management Code of Practice: Volume 2 – Construction Noise and Vibration* (CoP Vol 2) (DTMR 2016)
- Undertake a construction noise and vibration impact assessment of the construction works in accordance with the ToR (refer Table 1.2) and applicable legislation, guidelines and policies, as detailed in Section 2
- Assess the potential noise impact resulting from construction activities and potential mitigation methods, where required, including buffer distances, silencing treatment of mobile plant, management of mobile plant, community consultation and other management mitigation measures, such as respite periods
- Review vibration intensive construction works and recommend minimum working distances and mitigation measures where required, including the use of alternative equipment and construction methods, respite periods and other management mitigation measures

- Establish operational road traffic criteria, and construction road traffic criteria in accordance with DTMR's *Transport Noise Management Code of Practice Volume 1 – Road Traffic Noise* (CoP Vol 1) (DTMR 2013), and CoP Vol 2 respectively
- Undertake an assessment of operational road traffic noise impacts in accordance with the CoP Vol 1
- Undertake an assessment of noise impacts from operational fixed infrastructure such as tunnel ventilation fans in accordance with the Environmental Protection (Noise) Policy 2019 (EPP (Noise)) and *International Standard ISO 9613-2: Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation* (International Standards 1996).

1.5 Terms of Reference requirements

The noise and vibration section of the ToR (Part B, Section 11) has been reproduced in Table 1.2, alongside the relevant sections of this report which address these requirements. The ToR include requirements that are to be assessed within the wider EIS report to ensure compliance.

Table 1.2 Terms of reference requirements

Terms of reference requirements	Addressed in report
Existing environment	
11.114. Describe the existing noise and vibration environment that may be affected by the Project in the context of the environmental values.	Section 3
11.115. Describe and illustrate on maps at a suitable scale, the location of all sensitive noise receptors adjacent to all project components and estimate typical background noise and vibration levels based on surveys at representative sites.	Section 3.2
11.116. If the proposed project could adversely impact on the noise environment, undertake baseline monitoring at a selection of sensitive receptors potentially affected by the Project. Describe the results of any baseline monitoring.	Section 3.3
Impact assessment	
11.117. Describe the characteristics of the noise and vibration sources that would be emitted when carrying out the activity (point source and general emissions). Describe noise and vibration emissions (including fugitive sources) that may occur during construction, commissioning and operation.	Section 5, Operational rail noise and vibration sources are described in EIS Appendix P: Operational railway noise and vibration technical report.
11.118. Predict and map the impacts of the noise and vibration emissions from the construction and operation of the Project on the environmental values of the receiving environment, including sensitive receptors. Noise and vibration objectives and goals should be sourced from the following: a) EPP (Noise) 2008[1], using recognised quality assured methods b) Environmentally Relevant Activities – DEHP Application requirements for activities with noise impacts (Guideline ESR/2015/1838) c) Construction – The Department of Transport and Main Roads Transport Noise Management Code of Practice: Volume 2 - Construction Noise and Vibration dated March 2016 and gazetted on 29 July 2016 d) Operational Noise – The Department of Transport and Main Roads *Policy for Development on Land Affected by Environmental Emissions from Transport and Transport Infrastructure Versions 2, 10 May 2013* (Rail noise external criteria contained in Table 3 of this document) e) Operational vibration – British Standard BS 6472-1:2008 *Guide to evaluation of human exposure to vibration in buildings – Vibration sources other than blasting.* British Standards Institution, London	a) EPP (Noise) 2019[1] acoustic quality objectives have been adopted as operational fixed infrastructure objectives (Section 4.4.2). b) No Environmentally Relevant Activities (ERAs) approvals are being sought as part of this approval process (i.e. EIS). Where an ERA is required to be sourced for the Project during detailed design, the required approval process will consider this guideline. c) Construction noise and vibration criteria have been sourced from the CoP Vol 2 (Sections 4.1, 4.2 and 4.3) d) Operational rail noise criteria are discussed in EIS Appendix P: Operational railway noise and vibration technical report. e) Operational rail vibration criteria are discussed in EIS Appendix P: Operational railway noise and vibration technical report.

Terms of reference requirements	Addressed in report
f) Operational Noise – The Department of Transport and Main Roads *Policy for Development on Land Affected by Environmental Emissions from Transport and Transport Infrastructure Versions 2, 10 May 2013* (criteria contained in Table 6 of the document).	f) Table 6 contains operational vibration criteria. Operational rail vibration criteria are discussed in EIS Appendix P: Operational railway noise and vibration technical report.
11.119. Discuss separately the key project components likely to present an impact on noise and vibration for the construction and operation phases of the Project.	Section 5, Operational rail noise and vibration impacts are predicted in EIS Appendix P: Operational railway noise and vibration technical report
11.120. Taking into account the practices and procedures that would be used to avoid or minimise impacts, the impact prediction must address the: a) activity's consistency with the objectives b) cumulative impact of the noise with other known emissions of noise associated with existing major projects and/or developments and those which are progressing through planning and approval processes publicly available c) potential impacts of any low-frequency (<200 Hz) noise emissions.	Cumulative impacts are addressed in Section 7 Low frequency noise emissions are addressed in Table 4.3 Low frequency noise from operational rail impacts are assessed separately in EIS Appendix P: Operational railway noise and vibration technical report
Mitigation measures	
11.121. Describe how the proposed project, and in particular, the key project components described above, would be managed to be consistent with best practice environmental management for the activity. Where a government plan is relevant to the activity, or the site where the activity is proposed, describe the activity's consistency with that plan.	Section 8
11.122. Describe any expected exceedances of noise and vibration goals or criteria following the provision or application of mitigation measures and how any residual impacts would be addressed.	Section 8.3
11.123. Describe how the achievement of the objectives would be monitored and audited, and how corrective actions would be managed	Section 8

Table note:

1 EPP (Noise) 2008 has been superseded by EPP (Noise) 2019, which has been used for this assessment

2 Legislation, policies, standards and guidelines

2.1 Legislation

Queensland legislation which defines requirements for the noise and vibration assessment and environmental approval processes for the Project includes:

- *Transport Infrastructure Act 1994* (Qld) (TI Act)
- *Environmental Protection Act 1994* (Qld) (EP Act).

The TI Act requires the construction, maintenance and operation of all government supported infrastructure to be carried out according to standards published by the Chief Executive. The CoP Vol 1 is implemented as a legislative requirement under the TI Act.

The EP Act outlines the general environmental duty in Queensland. Under the EP Act, a person must not carry out any activity that causes, or is likely to cause, environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm and environmental nuisance (pursuant to the general environmental duty). Failure to do this is an offence under the EP Act. DTMR's Code of Practice provides a framework for a transport infrastructure project to comply with its general environmental duty requirements.

The CoP Vol 2 has been gazetted under s318E of the EP Act. It is also named as an applicable guideline of the ToR. The CoP Vol 2 has requirements for various stages of projects and is a means of demonstrating compliance with the general environmental duty under the EP Act.

The EPP (Noise) is subordinate legislation under the EP Act. The EPP (Noise) supports the operation of the EP Act by identifying environmental values to be enhanced or protected, stating acoustic quality objectives for enhancing or protecting environmental values and providing a framework for consistent, equitable and informed decisions about the acoustic environment.

Environmental values to be protected under the policy include the health and biodiversity of ecosystems; human health and wellbeing, and the amenity of the community. Schedule 1 of the EPP (Noise) details acoustic quality objectives for protecting these environmental values. Noise impacts from tunnel ventilation were evaluated against these acoustic quality objectives. EPP (Noise) is an applicable policy in the ToR.

2.2 Guidelines and policies

Table 2.1 lists the policies and guidelines relevant to the Project. No government plans were considered relevant for this assessment.

Table 2.1 Guidelines and policies relevant to the Project

Policy or Guideline	Relevance to Project
CoP Vol 1 (DTMR 2013)	The CoP Vol 1 is a standard under the TI Act and its implementation is a legislative requirement. It identifies the requirements for road traffic noise associated with the completion of the Project. Applicable criteria and assessment methodologies are included within this document to adequately assess noise and vibration associated with road traffic noise. The assessment of operational road traffic noise has been undertaken in accordance with the CoP Vol 1 (refer Section 6.2), and operational road traffic noise impacts have been assessed against CoP Vol 1 criteria (refer Section 4.4.1).
CoP Vol 2 (DTMR 2016)	The CoP Vol 2 is gazetted under the EP Act. It identifies the requirements for construction activities completed for the Project. Applicable criteria and potential mitigation measures are included within this document to adequately assess noise and vibration associated with construction works. The assessment of construction noise and vibration has been undertaken in accordance with the CoP Vol 2, and construction noise and vibration impacts have been assessed against CoP Vol 1 criteria.

Policy or Guideline	Relevance to Project
German Standard DIN 4150: Part 3 1999 *Structural Vibration in Buildings - Effects on Structures* (DIN 1999)	This standard is recommended by CoP Vol 2. It provides recommended maximum levels of vibration that reduce the likelihood of building damage caused. These recommended maximum levels have been used in the development of vibration criteria for the Project.
Australian Standard (AS) 1055:1997 – *Acoustics – Description and measurement of environmental noise* (Australian Standards 1997)	The CoP Vol 2 provides that noise measurement and reporting should be conducted in accordance with the construction and ambient noise provisions included in this standard. The environmental noise monitoring described in Section 3.3 was undertaken in accordance with this standard.
AS 2187.2-2006 *Explosives – Storage and Use Part 2: Use of Explosives* – Appendix J (Australian Standards 2006).	The CoP Vol 2 recommends the use of AS 2187.2 with respect to blasting vibration criteria for human comfort and structural damage. These ground vibration criteria have been adopted for this assessment.
Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration (Australian and New Zealand Environment Council (ANZEC) 1990)	This document specifies recommended blasting overpressure and vibration impact limits to minimise annoyance and discomfort. The CoP Vol 2 references the blasting airblast overpressure criteria contained within this document. This document also provides suggested mitigation measures for blasting noise and vibration impacts. Airblast overpressure criteria were instead sourced from the Department of Environment and Heritage Protection Guideline – *Noise and vibration from blasting,* consistent with the CoP Vol 2.
Department of Environment and Heritage Protection (DEHP) Guideline – *Noise and Vibration from Blasting* (DEHP 2016)	This guideline sets out performance criteria to be used when setting operating requirements in conditions of environmental approvals under the EP Act. The CoP Vol 2 adopts the criteria from this guideline to minimise annoyance from airblast resulting from blasting. Predicted Project blasting airblast overpressure impacts have been assessed against these criteria.
Department of Environment and Science (DES) *Application requirements for activities with noise impacts* (DES 2019)	This guideline under the EP Act provides guidance on the requirements for assessments of noise impacts, including the requirement for supplementary approvals for ERAs. No ERA approvals are being sought as part of this approval process (i.e. EIS). Where an ERA is required to be sourced for the Project during detailed design, the required approval process will consider this guideline.
British Standard (BS) 5228-1 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise* (British Standards 2009a)	Noise source data from this standard is recommended for the modelling of construction noise impacts by the CoP Vol 2. This noise source data was used in the modelling of construction noise for this assessment.
BS 5228-2:2009 *Code of Practice for Noise and Vibration Control on Construction and Open Sites Part 2 Vibration* (British Standards 2009b)	Ground vibration criteria for human comfort have been adopted for this assessment from this guideline, consistent with the CoP Vol 2.
EPP (Noise)	This policy provides support to the operation of the EP Act by identifying environmental values to be enhanced or protected, stating acoustics quality objectives for enhancing or protecting environmental values and providing a framework for consistent, equitable and informed decisions about the acoustic environment. The noise and vibration assessment has been undertaken in accordance with the EPP (Noise) and operational fixed infrastructure noise impacts have been evaluated against the EPP (Noise) acoustic quality objectives.
Concawe *Report no.4/81 the propagation of noise from petroleum and petrochemical complexes to neighbouring communities'* (Concawe 1981)	This report details a method of calculation of the propagation of noise which is recommended by the CoP Vol 2. This method was used for the modelling of construction noise.
ISO 9613-2:1996 *Acoustics - Attenuation of sound during propagation outdoors – Part 2: General method of calculation* (International Standards 1996)	This standard details a method of calculation of the propagation of noise recommended by the CoP Vol 2. This method was used for the modelling of operational fixed infrastructure noise.

Policy or Guideline	Relevance to Project
DTMR *Policy for Development on Land Affected by Environmental Emissions from Transport and Transport Infrastructure Version 4* (criteria contained in Table 6 of the document) (DES 2017)	This policy outlines the DTMR policy position in relation to the development of land affected by environmental emissions from linear State transport corridors and infrastructure. The Project design includes no new sensitive development. This policy has therefore not been used as part of this assessment.
BS 6472-1:2008 *Guide to evaluation of human exposure to vibration in buildings – Vibration sources other than blasting* (British Standards 2008)	In accordance with the CoP Vol 2, construction ground vibration criteria relevant to human comfort have been adopted from BS 5228-2 rather than this standard. Operational rail noise criteria are discussed in EIS Appendix P: Operational railway noise and vibration technical report.
DES *Noise Measurement Manual, August 2020* (DES 2020)	This document describes the noise measurement processes for assessments under the EP Act. The noise monitoring described in Section 3.3 was undertaken in accordance with this document.

Applicable criteria and potential mitigation measures are included within this document to adequately assess noise and vibration impacts associated with construction works, along with the noise and vibration impacts from fixed operational components of the Project (e.g. ventilation fans). This report outlines the applicable criteria and preliminary requirements.

By complying with relevant legislation, and government plans, policies, standards and guidelines (such as the CoP Vol 1 and CoP Vol 2), the Project is consistent with best practice environmental management.

3 Existing noise environment

3.1 Site description

The Project is located within the Toowoomba and Lockyer Valley local government areas (LGAs) in South East Queensland (SEQ). The proposed corridor is classed as both greenfield and brownfield, as part of the alignment will utilise the existing Queensland Rail (QR) West Moreton System rail corridor. The Project will join the NSW/QLD Border to Gowrie Inland Rail project (B2G) and the Helidon to Calvert Inland Rail project (H2C) sections of the Inland Rail Program across the Toowoomba Range.

The Project will generally be located within the existing Gowrie to Grandchester future State transport corridor protected by the *Transport Planning and Coordination Act 1994* (Qld) (TPC Act) in 2005.

The Project alignment begins at Charlton and follows the southern side of the existing West Moreton System rail corridor (Western Line) for approximately 4.8 km eastwards through Gowrie. The Project deviates from the existing rail corridor to the south-east, before passing into the proposed western tunnel portal within the vicinity of the Boundary Street and the Toowoomba Bypass interchange at Gowrie Junction.

The alignment then continues with a 6.24 km undrained tunnel under the Toowoomba Range, passing under the localities of Cranley, Mount Kynoch and Ballard (including the Toowoomba Bypass) and emerging on the eastern side of the Great Dividing Range at the eastern tunnel portal, within the vicinity of Mount Kynoch. The eastern tunnel portal is in a rural area predominantly consisting of undisturbed natural vegetation. At each of the tunnel portals, ventilation and other tunnel infrastructure are proposed, along with an intermediate ventilation shaft and supporting infrastructure at Cranley.

The Project then crosses through the northern edge of an area of Commonwealth land, previously utilised by the Department of Defence. Continuing east, the alignment passes on the northern side of Withcott, and traverses areas of native vegetation and grazing properties, with proposed crossings over the valleys of Oakey/Rocky Creek, Six Mile Creek and the Toowoomba Bypass. The alignment continues to the north of the Toowoomba Bypass through Postmans Ridge, Lockyer and Helidon Spa, crossing Lockyer Creek, before tying into the existing rail corridor northwest of Helidon. The alignment runs parallel to the northern side of the West Moreton System rail corridor (Main Line) for approximately 0.8 km before joining the proposed H2C project alignment.

The Project and surrounds are predominantly in a rural setting with agricultural land associated with the Gowrie Junction, scattered rural residential properties and large areas of native vegetation (Lockyer Valley). The Project is also in close proximity to residential areas including Gowrie, Mount Kynoch, Withcott, Postmans Ridge and Helidon Spa.

The Project intersects a range of built infrastructure, including the Toowoomba Bypass, New England Highway, the West Moreton System rail corridor, Roma Brisbane Gas Pipeline, water and sewer pipelines and powerlines.

The EIS investigation corridor comprises the Project disturbance footprint, including the temporary construction disturbance footprint and the permanent disturbance footprint, with a buffer zone of approximately 1 km either side of the Project disturbance footprint. The noise and vibration study area for the Project is the area also known as the EIS investigation corridor, and is shown in Appendix A.

As the noise and vibration study area includes the Toowoomba Range, and therefore includes many topographical features and changes in ground elevation. The topography has been taken into consideration by this assessment, and the effects of the topography on the propagation of noise have been modelled. More detail on the modelling methodology is included in Section 5.2.

3.2 Sensitive receptors

Sensitive receptors applicable to the Project have been identified throughout the noise and vibration study area. The CoP Vol 2 outlines the sensitive land uses that could be potentially impacted by construction noise and vibration. Additionally, the EPP (Noise) defines sensitive receptors; these are covered by the CoP Vol 2 definitions.

Sensitive land uses/receptors to be considered for this assessment include:

- A dwelling (detached or attached) including house, townhouse, unit, reformatory institution, caravan park or retirement village
- A library, childcare centre, kindergarten, school, school playground, college, university, museum, art gallery or other educational institution, hospital, respite care facility, nursing home, aged care facility, surgery or other medical centre
- A community building including a place of public worship
- A court of law
- A hotel, motel or other premises which provides accommodation for the public
- A commercial (office) or retail facility
- A protected area, or an area identified under a conservation plan as a critical habitat or an area of major interest under the *Nature Conservation Act 1992* (Qld)
- An outdoor recreational area (such as public park or gardens open to the public, whether or not on payment of a fee, for passive recreation other than for sport or organised entertainment) or a private open space.

Sensitive receptors within the noise and vibration study area were identified and classified as above using a combination of land property information and investigation of high-resolution aerial imagery.

A total of 3,811 sensitive receptors were found to be within the noise and vibration study area. Of these:

- Fifty-six receptors are used for industrial purposes and are not classified as noise sensitive. As such these have only been included within the vibration and blasting assessments.
- Twelve receptors were identified by the EIS cultural heritage survey (EIS Appendix S: Cultural heritage survey report) and have been considered by this assessment to be historical heritage structures and vibration sensitive receptors.
- The remaining 3,743 receptors are considered noise and vibration sensitive receptors.

All sensitive receptors within the noise and vibration study area were allocated a unique identifier and are illustrated in Appendix B. Six noise and vibration sensitive receptors, and a further eight vibration sensitive receptors are located within the Project disturbance footprint. These receptors are:

- Noise and vibration sensitive receptors:
  - RES0953
  - RES0964
  - RES0940
  - RES0433
  - RES0347
  - RES0967
- Eight vibration sensitive receptors, noting that the G2H sites are described in EIS Appendix S: Cultural heritage survey report:
  - IND0004
  - G2H-19-H23
  - G2H-19-H27
  - G2H-19-H13

- G2H-19-H16
- G2H-19-H15
- G2H-19-H30
- G2H-19-H19

For a Project of this scale, it is not unusual for the location at which sensitive receptors are modelled to differ slightly from their true location. Differences of this magnitude will not materially impact the results of this assessment. Sensitive receptors were identified both within townships, and on rural properties scattered throughout the noise and vibration study area. The resultant set of sensitive receptors may differ from those of other environmental assessments of the Project, including the Operational Railway Noise and Vibration Assessment (EIS Appendix P), which digitised buildings using GIS and identified receptors based on area.

Due to the large number of sensitive receptors within the noise and vibration study area, nine noise catchment areas (NCAs) were formed and are summarised in Table 3.1. The extent of each NCA is included in Appendix B.

Table 3.1 Construction noise catchment areas

NCA	Localities	General description	Number of noise sensitive receptors
NCA_01	Gowrie Junction	Gowrie Junction township, agriculture, isolated residences	593
NCA_02	Cranley	Cranley residences, isolated residences, Baillie Henderson Hospital, agriculture	701
NCA_03	Blue Mountain Heights	Agriculture, residences	246
NCA_04	Mount Kynoch	Agriculture, Mount Kynoch residences, isolated residences	84
NCA_05	Harlaxton	North Harlaxton, Harlaxton Quarry, agriculture	759
NCA_06	Remainder of study area	Agriculture, isolated residences, Wilsonton Heights, east Harlaxton, Cotswold Hills	974
NCA_07	Postmans Ridge	Agriculture, isolated residences	74
NCA_08	Lockyer, Upper Lockyer	Agriculture, isolated residences	30
NCA_09	Helidon, Helidon Spa	Agriculture, Helidon township	282
Total			**3,743**

3.3 Noise and vibration monitoring

Attended and unattended ambient noise monitoring was conducted at 10 locations within the noise and vibration study area in December 2018. These locations are mapped in Appendix A. Noise monitoring locations were selected as representative of clusters of sensitive receptors, particularly those most at risk of being impacted by construction noise. Monitoring included both long-term monitoring and short-term attended measurements. The monitoring was conducted in accordance with the CoP Vol 2.

Noise monitoring was undertaken using a microphone height of 1.8 m at single storey buildings on slab (adjusted for elevated buildings). Microphones were located nominally 1.0 m from the building facade or located 3.5 m away from reflecting walls, depending on the operator's judgement when setting up the equipment. L_{Amax}, L_{A1}, L_{A10}, L_{A90} and L_{Aeq} parameters were taken in 15-minute averaging periods (refer to Glossary for definitions of these terms).

Unattended noise monitoring was performed at each location over a 7-day period. The first and last 24 hours of noise monitoring additionally included attended measurements. One 15-minute attended measurement at each location over the first 24 hours and one 15 minute attended measurement at each location over the final 24 hours was undertaken.

Vibration monitoring was undertaken to describe the existing vibration environment as per ToR 11.114 and 11.115. Locations were selected across the study area to provide a representative description of the noise and vibration study area. Fifteen-minute attended vibration measurements were conducted at three locations within the noise and vibration study area, using a handheld vibration monitor with a triaxial geophone. These locations are considered representative of the existing vibration environment as very little variation in vibration levels was measured, as is typical of rural locations. The geophone was mounted using small ground stakes where possible in conjunction with a 20-kilogram sandbag weight on top. Root Mean Square particle velocity and Peak Particle Velocity (PPV) were measured.

The unattended noise measurements define the long-term noise environment throughout the noise and vibration study area and were used to determine the external construction noise limits for standard and non-standard hours. Attended noise measurements were carried out to provide additional information about the existing noise environment and the most significant noise sources.

Unattended weather monitoring was undertaken concurrently with noise monitoring at location G2H_08. The weather station measured:

- Temperature
- Humidity
- Rainfall
- Wind speed and direction.

Noise measurements gathered during periods of inclement weather were excluded from analysis. Inclement weather is classified, in accordance with the DEHP (now DES) Noise Measurement Manual (DEHP 2013), as:

- Average wind speed over 5 metres per second (m/s)
- Any measurement of rainfall.

3.3.1 Instrumentation

3.3.1.1 Noise instrumentation

Details of the equipment used for unattended long-term noise monitoring are presented in Table 3.2. The noise monitoring locations are shown within the site overview map included in Appendix A. All noise loggers used for long-term monitoring met the AS International Electrotechnical Commission (IEC) 61672.1-2004 *Electroacoustics – Sound level meters* (Australian Standards 2004) Class 1 requirements for a sound level meter (SLM).

Table 3.2 Unattended noise monitoring details

Monitor ID	Address	NCA	Start date	End date	Logger type	Serial number
G2H_01	92 Paulsens Road, Gowrie Junction	NCA_01	11/12/2018	19/12/2018	01dB DUO	12608
G2H_02	14 Junction Street, Gowrie Junction	NCA_01	11/12/2018	19/12/2018	01dB DUO	12605
G2H_03	130 Morris Road, Gowrie Junction	NCA_01	11/12/2018	19/12/2018	01dB DUO	12604
G2H_04	25 McShane Drive, Mount Kynoch	NCA_04	11/12/2018	19/12/2018	01dB Cube	10824
G2H_05	1 O'Brien Street, Harlaxton	NCA_05	10/12/2018	18/12/2018	01dB Cube	11107
G2H_06	3 Hillsdale Crescent, Blue Mountain Heights	NCA_03	10/12/2018	19/12/2018	01dB DUO	12606
G2H_07	5 Coonan Street, Harlaxton	NCA_05	10/12/2018	19/12/2018	RION NL-52	00175550
G2H_08	412 Gittins Road, Withcott	NCA_06	10/12/2018	18/12/2018	01dB DUO	12601
G2H_09	86 Rossiters Road, Lockyer	NCA_08	10/12/2018	18/12/2018	01dB DUO	12602
G2H_10	80 Ashlands Drive, Helidon Spa	NCA_09	10/12/2018	18/12/2018	01dB DUO	12609

All noise instrumentation used for the assessment complied with the requirements of AS IEC 61672.1-2004 (Australian Standards 2004) and were calibrated with a field calibrator before and after monitoring sessions with a drift in calibration not exceeding ± 0.5 dB. Field calibrator details are included within Table 3.3.

Table 3.3 Field calibrator details

Monitor ID	Calibrator type	Serial number	Laboratory calibration date
G2H_01	Quest QC-20	QF3020010	23/02/2018
G2H_02	Quest QC-20	QF3020010	23/02/2018
G2H_03	RION NC-74	34483785	5/10/2018
G2H_04	RION NC-74	34483785	5/10/2018
G2H_05	RION NC-74	34483785	5/10/2018
G2H_06	RION NC-74	34483785	5/10/2018
G2H_07	RION NC-74	34483785	5/10/2018
G2H_08	Quest QC-20	QF3020010	23/02/2018
G2H_09	Quest QC-20	QF3020010	23/02/2018
G2H_10	Quest QC-20	QF3020010	23/02/2018

All instruments used were within their current National Association of Testing Authorities, Australia (NATA) certified in-calibration period (i.e. laboratory calibration in the last two years). All laboratory calibration certificates have been included within Appendix C.

The sound level meters used to conduct attended noise measurements are presented in Table 3.4. Each item of equipment also has a certificate of laboratory calibration from the manufacturer or a NATA laboratory calibration certificate and met the AS IEC 61672.1-2004 (Australian Standards 2004) Class 1 requirements for SLM. Attended measurements were conducted at the deployment and removal of each long-term noise logger.

Table 3.4 Attended measurement monitoring details

Monitor ID	Attended measurement 1 date	Logger type	Serial number	Attended measurement 2 date	Logger type	Serial number
G2H_01	11/12/2018	SVAN 957	27551	19/12/2018	NTI-XL2	A2A-09320-E0
G2H_02	11/12/2018	SVAN 957	27551	19/12/2018	NTI-XL2	A2A-09320-E0
G2H_03	11/12/2018	SVAN 957	27537	19/12/2018	SVAN 957	27537
G2H_04	11/12/2018	SVAN 957	27537	19/12/2018	SVAN 957	27537
G2H_05	10/12/2018	SVAN 957	27537	18/12/2018	SVAN 957	27537
G2H_06	10/12/2018	SVAN 957	27537	19/12/2018	SVAN 957	27537
G2H_07	10/12/2018	SVAN 957	27537	19/12/2018	SVAN 957	27537
G2H_08	10/12/2018	SVAN 957	27551	18/12/2018	NTI-XL2	A2A-09320-E0
G2H_09	10/12/2018	SVAN 957	27551	18/12/2018	NTI-XL2	A2A-09320-E0
G2H_10	10/12/2018	SVAN 957	27551	18/12/2018	NTI-XL2	A2A-09320-E0

3.3.1.2 Vibration instrumentation

Vibration monitoring was conducted at three locations within the noise and vibration study area during August 2019. Details of the equipment used for attended vibration monitoring are presented in Table 3.5. All equipment used at the locations listed were calibrated within no more than 12 months prior to monitoring at a NATA certified laboratory. The vibration monitoring locations are shown in Appendix A.

Table 3.5 Vibration monitoring instrumentation

Monitor ID	Address	Equipment type	Serial number	Laboratory calibration date
G2H_V01	Morris Road, Gowrie, 4352	Instatel Minimate Plus	14070	10/05/19
		Instatel Standard Triaxial Geophone	BT2091	10/05/19
G2H_V02	Cassidy Terrace, Mount Kynoch, 4350	Instatel Minimate Plus	14070	10/05/19
		Instatel Standard Triaxial Geophone	BT2091	10/05/19
G2H_V03	Gittins Road, Postmans Ridge, 4352	Instatel Minimate Plus	14070	10/05/19
		Instatel Standard Triaxial Geophone	BT2091	10/05/19

3.3.1.3 Weather instrumentation

Weather monitoring was conducted at G2H_08 using a Davis 6250M portable weather station. Weather data gathered includes wind speed, wind direction and rainfall.

3.3.2 Unattended noise monitoring results

A noise logger measures the noise level over the sample period and then determines L_{A1}, L_{A10}, L_{A90}, and L_{Aeq} levels of the noise environment. The L_{A1}, L_{A10} and L_{A90} levels are the levels exceeded for 1 per cent, 10 per cent and 90 per cent of the sample period respectively. The L_{A1} is indicative of maximum noise levels due to individual noise events. The L_{A90} is considered to be the background noise level. The L_{Aeq} is the energy averaged sound level over the measurement period. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

The ambient background levels are established by determining the lowest tenth-percentile level of the L_{A90} noise data acquired over each period of interest. The background noise level or rating background level (RBL) representing the day, evening and night-time assessment periods is based on the median of individual background levels determined over the entire monitoring duration for each period of interest. The RBL is representative of the average minimum background sound level, or simply the background level.

Reports including graphical representations of the logging results, a summary of the results and the measurement locations are provided in Appendix C. A summary of the existing measured RBL noise levels is presented in Table 3.6.

Table 3.6 Existing background noise levels

Monitoring location	Rating background level, dB(A)		
	Day[1]	Evening[1]	Night[1]
G2H_01	36	37	31
G2H_02	40	41	32
G2H_03	38	39	36
G2H_04	46	45	37
G2H_05	41	42	32
G2H_06	35	34	30
G2H_07	45	41	31
G2H_08	31	33	36

Monitoring location	Rating background level, dB(A)		
	Day[1]	Evening[1]	Night[1]
G2H_09	32	29	27
G2H_10	34	31	29

Table notes:

1 In accordance with the CoP Vol 2, time of day is defined as follows:
- Day: the period from 7.00 am to 6.00 pm Monday to Friday or 8.00 am to 1.00 pm on Saturday
- Evening: the period from 6.00 pm to 10.00 pm Monday to Friday, 1.00 pm to 10.00 pm on Saturday or Sunday 7.00 am to 10.00 pm on Sunday.
- Night: Monday to Sunday 10.00 pm to 7.00 am.

The RBL noise levels for location G2H_08 were highest at night due to the proximity to local continuous noise sources including a rural water pump. These noise sources were only present during evening and night hours and dominate the RBL due to the otherwise low ambient noise environment. While noise sources such as these are not necessarily typical of the wider existing noise environment, they do not have a material impact on this assessment. The RBL for site G2H_08 are sufficiently low for the minimum construction noise criteria to be prescribed as per the CoP Vol 2, as stated in Table 4.1.

3.3.3 Weather monitoring results

Average wind speed measurements were below 5 m/s throughout the monitoring period. There were occasional, short periods of rainfall. Noise measurements gathered during these periods were omitted as per the DES Noise Measurement Manual (DES 2020). Details of the weather monitoring results can be found in Appendix C.

3.3.4 Attended noise monitoring results

Attended noise monitoring was conducted at all unattended monitoring locations during December 2018. Each measurement was conducted over a 15-minute period. Weather conditions were clear on the days of monitoring, with minimal wind unless stated otherwise in the summary of observations (refer Table 3.7). The monitoring results from the attended measurements are presented in Table 3.7.

It was noted that construction noise from the Toowoomba Bypass was audible at some noise monitoring locations. Noise monitoring equipment was positioned to be shielded from the source of construction noise. At all but one location (G2H_07) at which construction noise was audible, sufficiently low background noise levels were recorded to warrant the application of the minimum construction noise criteria under CoP Vol 2.

Table 3.7 Attended noise monitoring results

Monitoring location	Date	Time	Summary of observations	$L_{Amax,15min}$, dB(A)	$L_{A10,15min}$, dB(A)	$L_{A90,15min}$, dB(A)	$L_{Aeq,15min}$, dB(A)
G2H_01	11/12/2018	10:45 am	▪ Train pass-by at 75 dB(A) ▪ Distant train horn at 68 dB(A) ▪ Birds and insects at 35 to 38 dB(A) ▪ Cicada at 41 dB(A)	79	43	33	46
	19/12/2018	11:15 am	▪ Birds at 40 to 63 dB(A) ▪ Wind gusts at 46 dB(A) ▪ Insects at 34 to 41 dB(A) ▪ Distant train at 37 to 39 dB(A) ▪ Plane at 37 dB(A) ▪ Distant birds at 34 to 40 dB(A)	63	45	35	43

Monitoring location	Date	Time	Summary of observations	$L_{Amax,15min}$, dB(A)	$L_{A10,15min}$, dB(A)	$L_{A90,15min}$, dB(A)	$L_{Aeq,15min}$, dB(A)
G2H_02	11/12/2018	9:15 am	▪ Light wind and bird noise at 38 to 40 dB(A) ▪ Dirt road traffic at 45 to 49 dB(A) ▪ Distant road traffic at 42 to 43 dB(A) ▪ Wind gust at 50 dB(A)	81	46	36	48
	19/12/2018	10:15 am	▪ Birds and insects at 39 to 48 dB(A) ▪ Trucks and cars at 45 to 52 dB(A) ▪ Wind gusts at 40 to 47 dB(A) ▪ Frog at 48 to 54 dB(A) ▪ Flag knocking at 47 to 48 dB(A) ▪ Excavator broadband reversing beeper at 44 dB(A)	57	47	39	44
G2H_03	11/12/2018	11:15 am	▪ Distant traffic at 38 to 44 dB(A) ▪ Noise from residence at 48 to 59 dB(A) ▪ Birds at 50 dB(A) ▪ Truck at 54 dB(A) ▪ Wind gusts at 51 to 52 dB(A)	60	49	38	45
	19/12/2018	8:45 am	▪ Construction back beeper and distant bird noise at 38 to 48 dB(A) ▪ Noise from residence at 63 dB(A) ▪ Bird noise at 53 to 72 dB(A) ▪ Truck at 72 dB(A) ▪ Car horn at 53 dB(A)	72	45	38	46
G2H_04	11/12/2018	9:00 am	▪ Local truck at 77 dB(A) ▪ Car at 53 dB(A) ▪ Bird at 57 dB(A) ▪ Truck idling at 52 to 53 dB(A) ▪ Truck accelerating at 56 to 59 dB(A)	77	55	50	54
	19/12/2018	7:15 am	▪ Birds at 56 to 66 dB(A) ▪ Distant traffic at 46 to 52 dB(A) ▪ Trucks at 52 to 58 dB(A)	69	54	48	52
G2H_05	10/12/2018	3:45 pm	▪ Plane at 49 to 53 dB(A) ▪ Distant traffic at 44 to 50 dB(A) ▪ Birds at 55 to 72 dB(A) ▪ Local truck at 55 dB(A)	72	49	45	48

Monitoring location	Date	Time	Summary of observations	$L_{Amax,15min}$, dB(A)	$L_{A10,15min}$, dB(A)	$L_{A90,15min}$, dB(A)	$L_{Aeq,15min}$, dB(A)
	18/12/2018	11:15 am	▪ Distant traffic at 44 to 52 dB(A) ▪ Birds at 60 to 66 dB(A) ▪ Local truck at 85 dB(A)	85	52	44	56
G2H_06	10/12/2018	2:15 pm	▪ Insects at 48 to 49 dB(A) ▪ Construction roller at 38 dB(A) ▪ Back beeper at 43 to 50 dB(A) ▪ Noise from residence at 54 dB(A) ▪ Birds at 64 to 70 dB(A)	70	48	38	45
	18/12/2018	2:45 pm	▪ Insects at 37 to 43 dB(A) ▪ Distant traffic at 33 to 40 dB(A) ▪ Birds at 53 dB(A) ▪ Plane 55 dB(A)	55	41	35	39
G2H_07	10/12/2018	12:15 pm	▪ Cars at 46 to 53 dB(A) ▪ Construction noise at 51 to 57 dB(A) ▪ Trucks at 59 dB(A) ▪ Local cars at 53 to 59 dB(A)	64	53	47	51
	19/12/2018	12:15 pm	▪ Distant traffic at 42 to 55 dB(A) ▪ Mower at 52 to 58 dB(A) ▪ Motorbike at 58 dB(A) ▪ Birds at 57 to 68 dB(A) ▪ Truck at 57 dB(A) ▪ Bulldozer at 57 dB(A)	64	55	49	53
G2H_08	10/12/2018	12:00 pm	▪ Bird and insect noise at 35 to 45 dB(A) ▪ Resident inside house at 47 dB(A) ▪ Bird calling at 55 dB(A) ▪ Light wind noise in trees at 45 to 47 dB(A)	83	47	29	51
	18/12/2018	1:45 pm	▪ Insects at 33 to 38 dB(A) ▪ Unidentifiable source at 43 dB(A) ▪ Wind gusts at 39 dB(A) ▪ Impact noises at 50 to 51 dB(A) ▪ Birds 33 to 48 dB(A) ▪ Water tank at 50 dB(A) ▪ Horse at 40 dB(A)	64	38	34	39
G2H_09	10/12/2018	1:15 pm	▪ Bird and insect noise at 42 to 47 dB(A) ▪ Distant dogs barking at 35 to 37 dB(A)	61	43	32	40

Monitoring location	Date	Time	Summary of observations	$L_{Amax,15min}$, dB(A)	$L_{A10,15min}$, dB(A)	$L_{A90,15min}$, dB(A)	$L_{Aeq,15min}$, dB(A)
	18/12/2018	12:30 pm	▪ Natural sources at 34 to 38 dB(A) ▪ Dog at 53 to 55 dB(A) ▪ Plane at 42 dB(A) ▪ Wind gust at 39 dB(A) ▪ Bird at 45 dB(A)	59	45	34	42
G2H_10	10/12/2018	11:15 am	▪ Bird noise at 38 to 43 dB(A) ▪ Light wind through trees at 35 dB(A)	74	42	32	44
	18/12/2018	11:15 am	▪ Insects at 36 to 38 dB(A) ▪ Birds at 41 to 55 dB(A) ▪ Local car at 43 dB(A) ▪ Impact noise at 54 dB(A) ▪ Insects near microphone at 38 to 47 dB(A) ▪ Plane at 45 dB(A)	57	43	34	41

3.3.5 Vibration monitoring results

Vibration monitoring was conducted at three locations within the noise and vibration study area during April 2019. Table 3.8 contains the vibration measurement location summary showing the PPV vibration levels from the monitoring period. Each measurement was 15 minutes in duration. The existing ground vibration measurements are given in PPV. This is considered to best describe the potential for damage to buildings and infrastructure. Sources of existing background vibration include vehicle movements.

Table 3.8 Background vibration measurements

Location	Date	Start time	PPV (mm/s)
G2H_V01	4/07/2019	4:31 pm	0.24
G2H_V02	4/07/2019	5:24 pm	0.10
G2H_V03	5/07/2019	9:36 am	0.10

Table note:

mm/s = millimetres per second

4 Assessment criteria

Noise and vibration criteria are specific to the type of source of noise or vibration being assessed. Noise criteria for different types of noise use various noise parameters as well as various limits/goals. Each of the following categories of noise and vibration sources is assessed individually:

- External construction noise limits applied to the assessment of construction activities and construction sites
- Noise assessment criteria for construction traffic
- Vibration assessment standards for intensive vibration generating construction activities
- Vibration and overpressure standards for blasting activities
- Operational rail noise criteria (refer EIS Appendix P: Operational noise and vibration technical report)
- Operational noise criteria for the fixed infrastructure associated with the Project
- Operational road traffic noise criteria for changes to public roads.

The assessment of the above various sources is consistent with the ToR and the relevant noise and vibration legislation, policies and guidelines.

The legislation, guidelines and policies relevant to this assessment are based on noise impacts to human health and amenity. The relevant legislation, guidelines and policies do not include requirements for noise impacts to livestock or other fauna. Noise and vibration impacts to fauna have not been included in this assessment.

4.1 Construction noise criteria

4.1.1 External construction airborne noise criteria

For dwellings (including short-term accommodation such as hotels and motels), airborne noise impacts associated with general construction activities (excluding underground tunnelling activities) are to be assessed using the noise criteria in Table 4.1, adopted from the CoP Vol 2. The upper limits are considered to cause significant annoyance if exceeded and are used as noise criteria. The lower limits are generally considered to be just perceptible and the CoP Vol 2 states that all reasonable and practicable measures should be implemented to achieve the lower limit.

The limits are for the noise contribution from construction only (component limit) and are defined as external façade corrected noise levels at 1.5 m above floor level. The external noise level is determined based on the measured RBL at representative locations within the noise and vibration study area.

The definition of standard hours and non-standard hours is presented in Table 4.2.

Table 4.1 External airborne construction noise criteria (CoP Vol 2)

Receptor period[7]		External noise level $L_{Aeq, adj, 15min}$[4,5,6] dB(A)	
		Lower limit	**Upper limit**
Standard hours		RBL* + 10 [1,2,3] Minimum limit: 50 dB(A)	75 where: RBL > 55
			70 where: 40 < RBL ≤ 55
			65 where: RBL ≤ 40
Non-Standard Hours	Evening	RBL + 5 [3] Minimum limit: 45 dB(A)	RBL + 5 Minimum limit: 45 dB(A)
	Night-time		

Table notes:

* Rating Background Level

1 RBL + 5 dB(A) should be considered where a facility, equipment and long-term earthworks are required in an area for greater than six months

2 Where the lower limit value exceeds the upper limit value, the lower limit value is taken to equal the upper limit value

3 Minimum lower limits are 50 dB(A) for standard hours and 45 dB(A) for non-standard hours. A maximum lower limit of 75 dB(A) applies for non-standard hours.

4 Noise contribution from construction activity determined as the component level

5 The noise level from construction includes adjustment factors in Table 4.3 (for example, low frequency noise, impulsivity, tonality, intermittency and modulation)

6 For a single short event in a 24-hour period, the upper limit may be increased by:

- For standard hours
  - 2 dB(A) for event of 6 minutes to 15 minutes
  - 10 dB(A) for event of 1.5 minutes to 6 minutes
  - 15 dB(A) for event of less than 1.5 minutes
- For non-standard hours
  - 5 dB(A) for event of less than 1.5 minutes

7 Defined in Table 4.2

The single short event adjustment from Table note 6 in Table 4.1, is designed to account for unusual and one-off events and does not apply to regular high-noise levels that occur more frequently than once per day.

Table 4.2 defines the hours at which CoP Vol 2 construction noise criteria are applicable. This table does not indicate planned hours of work. Planned construction hours are listed in EIS Chapter 6: Project description. Construction hours for specific activities will be determined during detailed design, for example piling may only be undertaken during CoP Vol 2 standard hours in order to minimise noise impacts.

Table 4.2 CoP Vol 2 work periods for construction activities (CoP Vol 2)

Work period	General construction and construction traffic	Blasting
Standard hours	Monday to Friday 7.00 am to 6.00 pm Saturday 8.00 am to 1.00 pm	Monday to Friday 9.00 am to 5.00 pm Saturday 9.00 am to 1.00 pm
Non-standard hours – day/evening	Monday to Friday 6.00 pm to 10.00 pm Saturday 1.00 pm to 10.00 pm Sunday 7.00 am to 10.00 pm	Generally, blasting is not to be conducted outside standard hours. Any blasting outside of standard hours must be approved by DTMR prior to blasting. It is noted that reduced limits may be required to be achieved.
Non-standard hours – night time	Monday to Sunday 10.00 pm to 7.00 am	

Table 4.3 outlines the adjustment factors that should be applied to construction noise of particular characteristics such as low frequency noise, as specified by Table 2.1.2.1(b) in the CoP Vol 2, to more accurately model the impact of the noise.

Table 4.3 Construction noise adjustment factors (CoP Vol 2)

Factor	Assessment/ measurement	When to apply	Correction	Comments
Tonal noise	1/3 octave or narrow band analysis	Level of 1/3 octave band exceeds the level of the adjacent bands on both sides by: ■ 5 dB or more if the centre frequency of the band containing the tone is above 400 Hz. ■ 8 dB or more if the centre frequency of the band containing the tone is 160 to 400 Hz inclusive ■ 15 dB or more if the centre frequency of the band containing the tone is below 160 Hz.	5 dB	Narrow-band frequency analysis may be required to precisely detect presence of tonality.
Low frequency noise	Measurement of C-weighted and A-weighted level	Measure/assess C and A frequency weighted levels over same time period. Correction to be applied if the difference between the two levels is 15 dB or more	5 dB	C-weighting is designed to be more responsive to low-frequency noise. All noise energy down to 10 Hz should be considered.
Impulsive noise	A-weighted fast response and impulse (I) response or C-weighted for low frequency noise	If difference in A-weighted maximum noise levels between fast response and impulse response is greater than 2 dB. If difference in C-weighted maximum noise levels between fast response and impulse response is greater than 2 dB for low frequency noise.	Apply difference in measured levels as the correction, up to a maximum of 5 dB	Impulse response is defined by a short rise time of 35 milliseconds (ms) and decay time of 1.5 seconds (s).
Intermittent / modulating noise	Measurement of difference between L_{A10} and L_{A90}, average difference between short-term samples, or subjectively assessed	■ Difference between L_{A10} and L_{A90} exceeds 5 dB repeatedly for a characteristic averaging period (for example, 10 seconds) for intermittent sources ■ Average difference between measured L_{Aeq} levels exceeds 5 dB for a characteristic sampling frequency (for example, 10 Hz) for rapidly varying source ■ Subjectively annoying for a combination not easily characterised.	5 dB	Adjustment to be applied for night-time only.
Maximum adjustment	Refer to individual modifying factors	Where two or more adjustment factors are indicated	Maximum correction of 10 dB(A)	-

The external noise construction criteria presented in Table 4.1 were applied at each of the noise monitoring locations to obtain lower and upper limit external construction noise, shown in Table 4.4. In accordance with the CoP Vol 2, a minimum lower limit of 50 dB(A) for standard hours and 45 dB(A) for non-standard hours has been adopted. That is, the external construction noise criteria has been applied where the rating background level (based on the monitoring assessment) plus the relevant qualifier is less than the minimum lower limit (e.g. 50 dB(A) for standard hours and 45 dB(A) for non-standard hours).

Table 4.4 External construction noise criteria

Monitor ID	CoP Vol 2 work period[3]	Monitor level	External façade corrected noise level (dB(A))	
		RBL, dB(A)	Construction $L_{Aeq,adj,15min}$	
			Lower limit	Upper limit
G2H_01	Standard hours	36	50[1]	65
	Non-standard hours (evening)	37	45[1]	45[2]
	Non-standard hours (night-time)	31	45[1]	45[2]
G2H_02	Standard hours	40	50[1]	65
	Non-standard hours (evening)	41	46	46
	Non-standard hours (night-time)	32	45[1]	45[2]
G2H_03	Standard hours	38	50[1]	65
	Non-standard hours (evening)	39	45[1]	45[2]
	Non-standard hours (night-time)	36	45[1]	45[2]
G2H_04	Standard hours	46	56	70
	Non-standard hours (evening)	45	50	50
	Non-standard hours (night-time)	37	45[1]	45[2]
G2H_05	Standard hours	41	51	70
	Non-standard hours (evening)	42	47	47
	Non-standard hours (night-time)	32	45[1]	45[2]
G2H_06	Standard hours	35	50[1]	65
	Non-standard hours (evening)	34	45[1]	45[2]
	Non-standard hours (night-time)	30	45[1]	45[2]
G2H_07	Standard hours	45	55	70
	Non-standard hours (evening)	41	46	46
	Non-standard hours (night-time)	31	45[1]	45[2]
G2H_08	Standard hours	31	50[1]	65
	Non-standard hours (evening)	33	45[1]	45[2]
	Non-standard hours (night-time)	36	45[1]	45[2]
G2H_09	Standard hours	32	50[1]	65
	Non-standard hours (evening)	29	45[1]	45[2]
	Non-standard hours (night-time)	27	45[1]	45[2]
G2H_10	Standard hours	34	50[1]	65
	Non-standard hours (evening)	31	45[1]	45[2]
	Non-standard hours (night-time)	29	45[1]	45[2]

Table notes:

1 In accordance with CoP Vol 2, a minimum lower limit of 50 dB(A) for standard hours and 45 dB(A) for non-standard hours has been adopted
2 Where the lower limit value exceeds the upper limit value, the lower limit value is taken to equal the upper limit value
3 Work periods are defined as per CoP Vol 2 in Table 4.2

In accordance with the CoP Vol 2, noise criteria were developed for each of the NCAs, the criteria was based on the measured noise levels at the relevant noise monitoring locations within the NCA (refer Table 4.5). Where no noise monitoring was conducted within an NCA, the minimum CoP Vol 2 criteria were adopted. Where multiple noise monitoring locations were within one NCA, the minimum applicable criteria were adopted. The NCAs, their associated noise monitoring locations and resultant construction noise criteria are summarised in Table 4.5. The extent of each NCA is shown in Appendix A.

Table 4.5 Noise catchment area construction criteria

NCA	Noise monitoring locations	Locality	External noise level $L_{Aeq,adj,15\ min}$ dB(A)			
			Day		Evening	Night
			Upper limit	Lower limit		
NCA_01	G2H_01 G2H_02 G2H_03	Gowrie Junction	65	50	45	45
NCA_02	-	Cranley	65	50	45	45
NCA_03	G2H_06	Blue Mountain Heights	65	50	45	45
NCA_04	G2H_04	Mount Kynoch	70	56	50	45
NCA_05	G2H_05 G2H_07	Harlaxton	70	51	46	45
NCA_06	G2H_08	Remainder of study area	65	50	45	45
NCA_07	-	Postmans Ridge	65	50	45	45
NCA_08	G2H_09	Lockyer/Upper Lockyer	65	50	45	45
NCA_09	G2H_10	Helidon/Helidon Spa	65	50	45	45

4.1.2 Noise criteria for critical facilities

CoP Vol 2 defines internal noise criteria for critical facilities, which are to be met where reasonable and practicable, and which applies for the operational hours of the facility. These are presented in Table 4.6. A 7 dB(A) difference between internal and façade noise level has been assumed at these receptors, to determine equivalent façade noise criteria. This difference is based on AS 3671-1989 – Acoustics – Road traffic noise intrusion – Building siting and construction (Australian Standards 1989), which is recommended by the CoP Vol 2 for use in estimating construction noise transmission loss through a façade.

Table 4.6 Internal construction noise criteria for critical facilities (CoP Vol 2)

Type of occupancy/activity	Internal noise level $L_{Aeq,adj,15\ minute}$, dB(A)	Façade noise level $L_{Aeq,adj,15\ minute}$, dB(A) (7 dB(A) difference assumed)
Medical/health buildings (wards, surgeries, operating theatres, consulting rooms)	40	47
Educational/research facilities (rooms designated for teaching/research purposes)	45	52
Court of law (court rooms)	35	42
Court of law (court reporting and transcript areas, Judges' chambers)	40	47
Community buildings (libraries, places of worship)	45	52

Critical facilities have been identified within the noise and vibration study area. All applicable facilities are presented in Table 4.7 and are mapped in Appendix B.

Table 4.7 Identified critical facilities

Receptor type	Name	Locality	NCA	ID	Approximate distance to Project alignment (m)
Medical	Baillie Henderson Hospital (23 receptors)	Cranley	NCA_02	MED0001 – MED0023	980 – 1,340
Community	Wilsonton Congregation of Jehovah's Witnesses	Wilsonton Heights	NCA_06	COM0001	1,740
	Toowoomba Christian Fellowship	Birnam	NCA_06	COM0002	1,480
	New Hope Church	Harlaxton	NCA_05	COM0003	1,900
	Toowoomba North Church of Christ	Harlaxton	NCA_05	COM0004	1,650
	Harlaxton Neighbourhood Centre	Harlaxton	NCA_05	COM0005	890
	Harlaxton Community Hall	Harlaxton	NCA_05	COM0006	680
	Gateway Church Toowoomba	Harlaxton	NCA_05	COM0007	820
	Postmans Ridge Pioneers Memorial Hall	Postmans Ridge	NCA_07	COM0008	1,330
	Saint Joseph's Church	Helidon	NCA_09	COM0009	1,780
Educational	Gowrie State School	Gowrie Junction	NCA_01	EDU0001	770
	Rockville Primary School	Rockville	NCA_06	EDU0002	1,890
	Youth and Community Learning Centre	Harlaxton	NCA_05	EDU0003	1,650
	Downlands College	Harlaxton	NCA_05	EDU0004	1,820

The criteria listed in Table 4.6 are applicable during the facility's hours of operation. Construction noise impacts which may result from the Project have been assessed against these criteria at all hours. Each critical facility's hours of operation will be determined during detailed design based on consultation with owners and occupants.

4.1.3 Construction road traffic noise criteria

Haulage/transportation associated with construction activities on public roads within the noise and vibration study area or beyond has the potential to increase noise levels in the vicinity of existing sensitive receptors. CoP Vol 2 specifies the following criteria to limit traffic noise caused by construction traffic:

- Construction traffic should not increase the pre-construction traffic noise level $L_{A10,\ 1\ hour}$ by more than 3 dB(A).

A desktop assessment approach has been implemented to assess construction traffic noise for the Project. The assessment has been completed in accordance with CoP Vol 2.

4.1.4 Construction ground-borne noise criteria

The construction ground-borne noise criteria set out in the CoP Vol 2 have been applied to the Project and are presented in Table 4.8. There is no applicable ground-borne noise limit for industrial buildings.

Table 4.8 Construction ground-borne noise investigation limits (CoP Vol 2)

Building	Ground-borne noise limit	
	Work period	L_{ASMax}, dB(A)
Dwellings (including hotels and motels)	(Standard hours) Monday to Friday, 7.00 am to 6.00 pm Saturday, 8.00 am – 1.00 pm	40
	(Non-standard hours – day/evening) Monday to Friday, 6.00 pm to 10.00 pm Saturday, 1.00 pm to 10.00 pm Sunday, 7.00 am to 10.00 pm	35
	(Non-standard hours - night) Monday to Sunday, 10.00 pm to 7.00 am	35
Medical/health buildings (wards, surgeries, operating theatres, consulting rooms)	All	35
Educational/research facilities (rooms designated for teaching/research purposes)	While in use	35
Community buildings (libraries, places of worship)		40
Commercial (offices)		40
Retail areas		45

4.2 Construction ground vibration criteria

Ground vibration criteria are defined in CoP Vol 2. The effects of ground vibration from construction activities are split into the following two categories:

- Human comfort – disturbance to building occupants, arising from vibration which inconveniences or possibly disturbs the occupants or users of the building. The vibration criteria are based on the requirements of British Standard BS 5228-2:2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites Part 2 Vibration (British Standards 2009b).
- Building damage – vibration which may compromise the integrity of the building structure itself. The vibration criteria are based on the requirements of German Standard DIN 4150 - Part 3 - Structural Vibration in Buildings - Effects on Structures 1999 (German Standard 1999).

As CoP Vol 2 specifically prescribes the 1999 version of DIN 4150.3, the 1999 version of this standard has been used.

Generally, road and rail infrastructure are not considered to be sensitive to vibration under the CoP Vol 2. However, the CoP Vol 2 defines critical infrastructure as being particularly sensitive to disruption by vibration or where the consequences of disruption would be severe. Critical infrastructure is a subset of sensitive receptors and should be considered on a project-specific basis. Road bridge sections of the Toowoomba Bypass may be considered critical infrastructure. Potential structural impacts to the Toowoomba Bypass are discussed in Section 5.5.5.1.

4.2.1 Human comfort

To minimise annoyance due to ground-borne construction vibration, CoP Vol 2 adopts the vibration levels that are presented in Table 4.9. The lower limits are generally considered to be just perceptible if exceeded. The upper limits are considered to cause significant annoyance if exceeded.

All reasonable and practicable measures will be implemented to achieve the lower limit. CoP Vol 2 also requires that "*exceedance of the upper limit requires immediate action and extensive community consultation to determine further mitigation measures*".

Table 4.9 Human comfort vibration limits to minimise annoyance (CoP Vol 2)

Building	Work period	Resultant PPV (mm/s)	
		Lower limit	Upper limit
Dwellings (including hotels and motels)	Standard hours	1.0	2.0
	Non-standard hours – evening	0.3	1.0
	Non-standard hours – night	0.3	1.0
Medical/health buildings (wards, surgeries, operating theatres, consulting rooms)	All	0.3	1.0
Educational facilities (rooms designated for teaching purposes)	While in use		
Court of law (court rooms)			
Court of law (court reporting and transcript areas, judges' chambers)			
Community buildings (libraries, places of worship)	While in use	1.0	2.0
Commercial (offices) and retail areas			

For this assessment, all the criteria are applicable apart from the criteria relevant to courts of law (i.e. no courts of law were identified within the noise and vibration study area).

4.2.2 Building/structural damage

CoP Vol 2 relies upon DIN 4150.3 as well as BS 5228.2 for building damage. DIN 4150.3 distinguishes between short-term and long-term vibration (refer Table 4.10).

Table 4.10 DIN 4150.3 Definitions

Vibration type	DIN 4150.3 definition
Short-term	Vibration which does not occur often enough to cause structural fatigue and which does not produce resonance in the structure.
Long-term	All types of vibration not covered by the definition of short-term vibration

DIN 4150.3 provides recommended maximum levels of short-term vibration that limit the likelihood of building damage. These levels are presented in Table 4.11. DIN 4150.3 states that buildings exposed to higher levels of vibration than recommended limits would not necessarily result in damage.

Table 4.11 Structural damage 'safe limits' for short-term building vibration (DIN 4150.3)

Group	Type of structure	PPV (mm/s)		
		At foundation at a frequency of		
		1 to 10 Hz	10 to 50 Hz	50 to 100 Hz[1]
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50
2	Dwellings and buildings of similar design and/or use (i.e. residential)	5	5 to 15	15 to 20
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Group 1 or 2 above and have intrinsic value (e.g. heritage-listed)	3	3 to 8	8 to 10

Table notes:

1 For frequencies above 100 Hz, the higher values in the 50 to 100 Hz column should be used.

DIN 4150.3 limits listed in Table 4.12 have been adopted as long-term vibration criteria for building/structural damage. DIN 4150.3 states that buildings exposed to higher levels of vibration than recommended limits would not necessarily result in damage.

Table 4.12 Structural damage 'safe limits' for long-term building vibration (DIN 4150.3)

Group	Type of structure	PPV in mm/s of vibration in horizontal plane of highest floor, at all frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	10
2	Dwellings and buildings of similar design and/or use (i.e. residential)	5
3	Structures that, because of their particular sensitivity to vibration, cannot be classified under groups 1 or 2 and are of great intrinsic value (e.g. listed buildings under preservation order)	2.5

'Damage' is defined by DIN 4150.3 to include even minor non-structural effects such as superficial cracking in cement render, the enlargement of cracks already present, and the separation of partitions or intermediate walls from load-bearing walls. DIN 4150.3 also states that when vibrations higher than the 'safe limits' are present, it does not necessarily follow that damage will occur.

DIN 4150.3 also provides guideline values for evaluating the effects of vibration on buried pipework, which are summarised in Table 4.13. For consideration of long-term vibration, guideline values should be reduced by 50 per cent.

Table 4.13 Guideline values for evaluating the effects of short-term vibration on buried pipework (DIN 4150.3)

Line	Pipe material	Guideline values for velocity measured on the pipe in mm/s
1	Steel (including welded pipes)	100
2	Clay, concrete, reinforced concrete, pre-stressed concrete, metal (with or without flange)	80
3	Masonry, plastic	50

Vibration limits specific to particular underground infrastructure will be confirmed in consultation with stakeholders, with ARTC currently consulting with all impact utility providers. The Roma Brisbane Gas Pipeline operated by APT Petroleum, a subsidiary of APA, is traversed by the Project at the locations listed in Table 5.17, including in tunnel (Project Chainage (Ch) 7.7 km). Vibration impacts at these locations should not exceed the limits listed in Table 4.14.

Table 4.14 Roma Brisbane Gas Pipeline vibration limits

Line	Pipe material	PPV limit (mm/s)
1	Coal tar enamel coated, poorly coated	10
2	Other	20

4.3 Construction blasting criteria

Controlled blasting is anticipated to be used in order to excavate material along some sections of the Project alignment. Construction blasting can result in two adverse environmental effects – airblast and ground vibration. The airblast and ground vibration produced may cause human discomfort and may have the potential to cause damage to structures, architectural elements and services.

The CoP Vol 2 references four documents in relation to airblast overpressure:

- ANZEC Guidelines – Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration (ANZEC 1990)
- AS 2187.2-2006 Explosives - Storage and Use Part 2: Use of Explosives – Appendix J (Australian Standards 2006)

- Section 440ZB, EP Act
- DEHP Guideline – Noise and vibration from blasting (DEHP 2016).

The DEHP guideline – Noise and vibration from blasting is adopted by the CoP Vol 2 to minimise annoyance and discomfort to persons at noise sensitive land uses as a result of blasting. The CoP Vol 2 also recommends the use of AS 2187.2 (Australian Standards 2006) with respect to criteria for human comfort and structural damage. This includes consideration of different types of structures such as more sensitive masonry and plasterboard or heritage structures and/or buildings and less sensitive reinforced concrete buildings.

4.3.1 Blasting criteria

In relation to airblast overpressure, the following criteria have been adopted from the DEHP Guideline – Noise and vibration from blasting. These criteria have been used to assess the annoyance from airblast to sensitive land uses:

- Not more than 115 dB(Z) peak for 9 out of any 10 consecutive blasts
- Not more than 120 dB(Z) peak for any blasts.

For the purposes of the Project, the AS 2187.2 (Australian Standards 2006) and CoP Vol 2 blasting ground vibration criteria have been adopted for the Project, which are summarised in Table 4.15.

Table 4.15 Blasting ground vibration criteria summary

Category	Blasting PPV Limit	
	Human comfort	**Structural damage[1]**
Sensitive structures (e.g. residential, theatres, schools etc.)	5 mm/s for 95% blasts per year 10 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply[2]	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
Occupied non-sensitive structures of reinforced concrete or steel construction (e.g. factories and commercial premises)	25 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply. For sites containing equipment sensitive to vibration, the vibration should be kept below manufacture's specifications or levels that can be shown to adversely affect the equipment operation.	50 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply
Occupied non-sensitive structures that include masonry, plaster and plasterboard in their construction (e.g. factories and commercial premises)	25 mm/s maximum unless agreement is reached with the occupier that a higher limit may apply. For sites containing equipment sensitive to vibration, the vibration should be kept below manufacture's specifications or below levels that can be shown to adversely affect the equipment operation.	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
Unoccupied non-sensitive structures of reinforced concrete or steel construction (e.g. factories and commercial premises)	N/A	100 mm/s maximum unless agreement is reached with the owner that a higher limit may apply
Unoccupied non-sensitive structures that include masonry, plaster and plasterboard in their construction	N/A	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above
Buildings of special value or significance (may include historical buildings, monuments)	2 mm/s	N/A

Table notes:

Hz = hertz

1 The values above are less stringent than those in DIN 4150.3. This is because DIN 4150.3 considers resonance in buildings from continuous vibration. Due to the short duration of blasting events the propensity for resonance within buildings is minimal, giving rise to higher criteria

2 It should be noted that the human comfort limits should be based off the values presented above from the DEHP guideline - Noise and vibration from blasting as per the CoP Vol 2.

The criteria outlined in Table 4.15, does not apply to buildings with long span floors, specialist structures such as reservoirs, dams and hospitals, or buildings housing equipment sensitive to vibration. These require special considerations, which may necessitate obtaining additional measurements on the structure itself. No structures with a particular sensitivity to vibration have been identified in proximity to potential blasting locations. This will need to be confirmed during detailed design and if any structures with a particular sensitivity to vibration are identified, these should be addressed on a case by case basis.

4.3.2 Recommended hours and frequency of blasting activities

The CoP Vol 2 defines the working periods for blasting activities as follows:

- Blasting should generally only be permitted during the hours of 9.00 am to 5.00 pm Monday to Friday and Saturday 9.00 am to 1.00 pm (standard hours)
- Generally blasting is not to be conducted outside standard hours. Any blasting outside of standard hours must be approved by the DTMR prior to blasting. It is noted that reduced PPV limits may be required to be achieved.

4.4 Operational noise criteria

This section includes operational road traffic noise criteria and operational fixed infrastructure (e.g. tunnel infrastructure) criteria.

Operational rail noise and vibration criteria can be found in EIS Appendix P: Operational noise and vibration technical report.

4.4.1 Operational road traffic noise criteria

The Project includes a number of changes to the road network, including realignments, road closures and new roads. These have been mapped in Appendix A. A desktop assessment approach has been implemented for the assessment of operational road noise for each of the proposed changes to the road network. The assessment has been completed in accordance with CoP Vol 1. Road changes were categorised as either new roads or upgraded roads, as per the definitions adopted from the CoP Vol 1. These definitions are provided in Table 4.16 and are acoustic terminology.

Table 4.16 CoP Vol 1 road category definitions

Road category	CoP Vol 1 definition
New road – access controlled	A new access-controlled road in a proposed or existing unused corridor adjacent to existing residences or in a proposed corridor where formal approval by a local government or other statutory authority for adjacent land development is current at the date of acquisition, even if the development is not yet in existence. A new road may include the upgrading of a road (State or local government) to one of a higher functional road hierarchy where there is an increase in the contribution to road traffic noise exposure of at least 3 dB(A). The higher functional road hierarchy must be an access-controlled road of at least a collector/distributor function. Also, a new road is applicable to the situation where land acquisition (resumption) is taken beside an existing corridor and all State - controlled road lanes fall outside the existing corridor.
Upgrading existing road	A substantial upgrading such as duplication or additional through lanes within some portion of the existing road corridor. Some additional lanes may fall outside the existing road corridor where land acquisition (resumption) is required.

The assessed Project changes to the existing road network are listed in Table 4.17. All changes are to local government roads.

Table 4.17 Project road changes

Road name	Locality	Approximate chainage (m)	Proposed treatment	CoP Vol 1 category
Toowoomba Regional Council (TRC)				
Ganzer Road	Gowrie Junction	1,800	Realignment outside existing road corridor	New road
Morris Road	Gowrie Junction	1,800	Realignment outside existing road corridor and section closure	New road
Gowrie Junction Road	Gowrie Junction	2,000	Realignment outside existing road corridor and grade separation – road over rail	New road
Old Homebush Road	Gowrie Junction	2,200	Realignment outside existing road corridor	New road
East Paulsens Road	Gowrie Junction	2,400	Realignment within existing road corridor	Upgrading existing road
Lockyer Valley Regional Council (LVRC)				
Jones Road	Withcott	11,200	Realignment outside existing road corridor and grade separation – rail over road	New road
McNamaras Road	Withcott	15,400	Realignment outside existing road corridor	New road
Cattos Road	Helidon	24,800	Realignment within existing unused road corridor	Upgrading existing road

In addition to the road network changes noted above, two changes to the road network in the Gowrie Junction area were not assessed:

- An intersection upgrade at the intersection of Gowrie Junction Road and McMahon Road was considered to be a material change to Gowrie Junction Road in the context of the operational road traffic noise assessment. The operational road traffic noise impacts of Gowrie Junction Road have been assessed.
- Access to three residential properties currently accessible via Gowrie Junction Road will require local access within the existing road corridor. Local access roads are not assessed as part of the operational road traffic noise assessment.

Table 4.18 presents the applicable CoP Vol 1 assessment criteria for different noise sensitive land uses with potential to be affected by the operation of roads subject to change as part of the Project. The external criteria are assessed 1.0 m from the façade at a height of 1.5 m from finished floor level or mid-window height, whichever is the higher. Outdoor educational and passive recreational areas are assessed in the free field. Note that due to the low existing noise levels throughout the noise and vibration study area described in Section 3.3, the more stringent criteria of 60 $L_{A10\ (18h)}$ dB(A) has been adopted as a conservative measure for residential land uses.

Table 4.18 Operational road traffic assessment criteria (CoP Vol 1)

Category	Criteria (dB(A))		
	Existing residences (façade corrected)	**Educational, community and health buildings (façade corrected)**	**Outdoor educational and passive recreational areas (including parks) (free field)**
New road – access controlled	63 L_{A10} (18h), existing level > 55 L_{A10} (18h) 60 L_{A10} (18h), existing level ≤ 55 L_{A10} (18h)	58 L_{A10} (1h)	63 L_{A10} (12h)
Upgrading existing road	68 L_{A10} (18h)	65 L_{A10} (1h)	

In cases where existing traffic noise levels are above the noise assessment criteria, the primary objective is to reduce these through reasonable and practicable measures to meet the assessment criteria.

4.4.2 Operational fixed infrastructure noise criteria

Noise impacts of the operation of fixed infrastructure included in the design of the Project have been assessed under EPP (Noise). Operational fixed infrastructure for the Project includes:

- Tunnel ventilation fans for purging, emergency, and maintenance operations
- Pumps, pump stations and water treatment plants associated with the tunnel
- Transformers, substations and generators associated with the tunnel.

Safety systems such as door alarms have not been assessed as operational fixed infrastructure but should be fit for purpose and meet safety system requirements. Where possible, the contractor will select systems with the aim of achieving the EPP (Noise) 35 dB(A) $L_{Aeq,\ 1\ hr}$ acoustic quality objective at all sensitive receptors.

As operation can occur during any time of the day or night, the most onerous objectives for the night-time (10.00 pm to 7.00 am) have been utilised for the assessment. The following acoustic quality objectives from the EPP (Noise) have been used to assess fixed infrastructure noise impacts. These are shown in Table 4.19.

Table 4.19 Acoustic quality objectives (EPP (Noise))

Sensitive receptor	Internal noise objective		
	$L_{Aeq,1hr}$, dB(A)	$L_{A10,1hr}$, dB(A)	$L_{A1,1hr}$, dB(A)
Residential (indoors - night-time)	30	35	40
Hospital, surgery, or other medical institutions (for indoors) – anytime, other than visiting hours	30	-	-
Commercial and retail activity (for indoors) – when the activity is open for business	45	-	-

To predict the noise levels inside a property:

- Noise levels due to simultaneous operation of the fan systems were predicted at the façade of the nearest noise sensitive receptor
- 7 dB was subtracted from the predicted value at the façade, corresponding to the indicative outside to inside noise reduction of an open window, resulting in the internal noise level. This is consistent with AS 3671-1989 – Acoustics – Road traffic noise intrusion – Building siting and construction (Australian Standards 1989).

5 Construction noise and vibration assessment

5.1 Construction activities

Construction noise emissions for linear infrastructure Projects are complex due to a large number of construction activities, the distribution of construction activities across a large geographical area, and the transitory nature of many individual construction activities at particular locations.

Construction activities to be carried out as part of the Project are outlined in Table 5.1. The work has been grouped into the following distinct construction stages based on indicative proposed construction activities specific to the Project. Noise emission data for each plant item is given in Table 5.2.

Table 5.1 Construction stages and proposed equipment

Construction stage/activity	Activities	Plant and equipment	Overall sound power level (SWL) (dB(A))	Indicative timing
Site setup/ laydown areas	▪ Establishment of site compounds/laydown areas and site facilities ▪ Potential construction of water storage dams to harvest/store construction water ▪ Haul road and access roads construction ▪ Haul road maintenance	Grader, truck, dump truck, 40 tonne (t) excavator, scraper, water cart	120	December 2022 – August 2023
Earthworks	▪ Clearing and grubbing/topsoil stripping ▪ Cut to fill ▪ Import general fill ▪ Place and compact general fill ▪ Import structural fill ▪ Place structural fill ▪ Removal of fill and spoil ▪ intermediate ventilation shaft	Dozer, 40 t excavator, trucks, scraper, water cart, scraper, front end loader, padfoot roller, compactor, grader, 15 t roller, mulcher[1]	127 – standard hours 122 – non-standard hours[1]	January 2024 – January 2025
Structures	▪ Substructure/foundations construction ▪ Pier construction ▪ Superstructure construction ▪ Intermediate ventilation shaft ▪ Eastern tunnel portal construction	40 t excavator, piling rig, concrete truck, crane	118	May 2023 – Jun 2026
Tunnelling	▪ Tunnel boring ▪ Spoil removal (to western tunnel portal stockpile)	TBM, centrifuge, water pump	N/A – ground-borne noise[2]	January 2023 – February 2026
Drainage	▪ Install cross drainage	Backhoe, 30 t excavator, work truck (hiab), compactor, concrete truck, concrete pump, franna crane	120	April 2023 – June 2025

Construction stage/activity	Activities	Plant and equipment	Overall sound power level (SWL) (dB(A))	Indicative timing
Rail civil works	▪ Capping material import ▪ Capping material placement ▪ Bottom ballast ▪ Sleeper installation ▪ Rail installation ▪ Top ballast ▪ Track tamping and regulating ▪ Rail stressing ▪ Rail grinding	Tamper, regulator, 20 t excavator, water cart, trucks, dozer, 40 t excavator, 15 t roller, compactor, grader, 20 t excavator, smooth drum roller, ballast train, rail grinder	123	December 2025 – October 2026
Road civil works	▪ Road works	Grader, 30 t excavator, compactor, water cart, trucks	120	July 2023 – September 2026
Concrete batching	▪ Preparation, mixing and discharging of concrete	Concrete batching plant	108	To be determined
Flash-butt welding	▪ Track welding	Generator for welding, welder	104	To be determined

Table notes:

1. The mulcher is expected to only typically operate during standard working hours and as such two scenarios have been assessed to represent typical conditions during standard and non-standard hours.
2. It is expected that tunnel construction will involve the operation of at least one water pump and centrifuge external to the tunnel. Whilst these sources will generate airborne construction noise, they have not yet been located or selected. During detailed design, these plant items will be selected and mitigated such that noise impacts will not materially increase the construction noise impacts to any sensitive receptors. As these plant items will be stationary, this is likely to be feasibly achieved through physical mitigation at the noise source, such as acoustic enclosures and engine mufflers.

It is expected that similar equipment would be used for demolition and construction. Any demolition undertaken as part of the Project is not predicted to generate greater noise impacts than the worst-case construction noise impacts predicted based on the construction activities in Table 5.1.

Specific locations of construction works or plant are not currently known. Based on the design and constructability assessment, construction activity footprints were derived for each construction activity. These are the areas within which the relevant construction activity (other than tunnelling) is expected to occur. It was assumed that the plant associated with a construction activity could operate anywhere within the construction activity footprint. The equipment listed in Table 5.1 is sufficient to predict the worst-case noise impacts as per the ToR.

For the purposes of noise modelling, construction activity footprints were derived from the temporary construction disturbance footprint designatedfor the Project. Therefore, predicted noise impacts align with the current design, and are mapped in Appendix D. The construction activity footprints mapped in Appendix D are consistent with temporary construction disturbance footprint used in the EIS and differ slightly from those used for noise modelling in two locations. These differences are minor and do not materially impact the conclusions of the construction noise assessment or the construction noise mitigation measures.

5.2 Noise modelling methodology

5.2.1 Airborne noise

Noise levels due to the construction activities shown in Table 5.1 were predicted at nearby noise sensitive receptors using SoundPLAN (version 8.0) noise modelling software. The calculation method detailed in Concawe's Report no.4/81 the propagation of noise from petroleum and petrochemical complexes to neighbouring communities, 1981 (hereafter referred to as the Concawe method) was used, as it is especially suited to predicting noise propagation over large distances as it accounts for a range of atmospheric conditions that can significantly influence noise levels over larger distances. The Concawe method is recommended by CoP Vol 2 for the prediction of airborne construction noise.

The noise model was created to represent 'reasonable' worst periods of construction work.

The following features were included in the noise model:

- Ground topography
- Ground absorption and reflection
- Receptors
- Construction noise sources
- Different meteorological conditions in accordance with the requirements of CoP Vol 2.

It can be expected that there may be differences between predicted and measured noise levels due to variations in instantaneous operating conditions, plant in operation during the measurement and also the location of the plant equipment.

The following assumptions were made in modelling the construction noise scenarios:

- All construction equipment would be operating simultaneously, which is unlikely and hence is a conservative assumption. Noise levels associated with more realistic intermittent and non-simultaneous construction would be expected to be approximately 5 to 15 dB(A) lower.
- Equipment was assumed to be operating at the closest point in the Project construction activity footprint to each receptor, in order to represent the worst-case scenario. In reality the equipment could only operate at the closest point to each receptor for a limited period and could not do so simultaneously. Furthermore, some equipment and activities such as piling will be offset from the Project boundaries within the construction area. Noise levels associated with more realistic separation distances between noise sources and receptors would be expected to be approximately 0 to 3 dB(A) lower.
- All dwellings are modelled at two storeys, 4.6 m above ground level. This assumption is conservative as noise impacts are typically greatest at the highest storey due to being more exposed.
- At this stage, a detailed construction methodology has not been developed. Planned hours of construction are yet to be confirmed and as such construction noise impacts have been assessed against CoP Vol 2 noise criteria for all work periods (Table 4.2).

The construction noise modelling took into consideration topography and ground effects through the generation of a digital ground model based on 1 m interval LiDAR terrain elevation contours. Effects of topographical features on noise propagation such as reflections and shielding have been considered in modelling construction noise impacts. This was achieved through the generation of a 3D digital ground model of the terrain within the noise and vibration study area, based on the terrain elevation contours. Ground absorption is discussed in detail in Section 5.2.2.3.

5.2.2 Airborne noise emission sources

Table 5.2 presents a summary of the typical sound power levels of the construction equipment to be used for each construction stage. Except where otherwise noted, these sound power levels are typical values taken from British Standard BS 5228-1:2009 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise (British Standards 2009a), in accordance with selecting an available database from CoP Vol 2.

For the noise assessment, the construction activities listed in Table 5.1 have been considered with an indicative construction duration which would be confirmed during detailed design. Proposed measures to control noise are provided in Section 8. The modelled scenarios include all equipment that could be reasonably assumed to be operating at the same time for an entire 15-minute period.

During the detailed design, local site conditions and changes in work practices may cause some variation in the equipment used.

This approach is used at this point in the assessment to ensure that identified impacts are not under predicted and adequate noise management and mitigation measures are considered early in the Project.

Table 5.2 Noise emission sources octave band data

Source	Overall SWL (dB(A))	Spectral SWL (dB(Z))						
		63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Backhoe	**116**	114	108	106	105	109	111	110
Ballast train	**111**	106	105	105	108	107	104	101
Compactor	**108**	98	106	107	100	105	96	94
Concrete batching plant	**108**	BS 5228.1 does not specify spectral sound power levels for this noise source						
Concrete pump	**110**	111	109	106	107	105	102	99
Concrete truck	**108**	111	102	94	97	98	106	88
Crane	**99**	96	99	96	90	94	94	83
Dozer	**108**	117	118	109	101	102	98	96
Drill (surface works)	**123**	115	126	122	121	119	114	108
Dump truck	**115**	114	107	107	107	107	112	97
Excavator – 20 t	**103**	100	99	102	101	97	94	91
Excavator – 30 t	**103**	100	99	102	101	97	94	91
Excavator – 40 t	**107**	113	106	105	105	101	99	96
Franna crane	**94**	94	95	88	89	90	89	78
Front end loader	**83**	88	81	77	80	79	76	71
Generator for welding	**101**	103	100	95	96	98	94	90
Grader	**114**	116	115	111	107	112	106	102
Light vehicle movements	**88**	95	89	86	84	84	80	76
Mulcher	**125**	104	113	105	111	119	121	117
Padfoot roller	**109**	111	105	105	104	104	103	96
Piling rig	**117**	110	110	110	117	111	106	103
Rail grinder[1]	**116**	114	108	106	105	109	111	110
Regulator	**116**	114	108	106	105	109	111	110
Rock breaker	**110**	119	104	105	106	107	104	97
Rock crusher	**126**	117	118	117	121	122	120	111
Roller – 15 t	**101**	108	103	105	100	95	90	82

Source	Overall SWL (dB(A))	Spectral SWL (dB(Z))						
		63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Scraper	**114**	116	115	111	107	112	106	102
Smooth drum roller	**101**	108	103	105	100	95	90	82
Tamper	**114**	116	115	111	107	112	106	102
Truck	**118**	127	123	115	114	112	111	105
Water cart	**116**	109	107	107	111	112	109	104
Welder	**101**	95	96	97	96	97	94	89
Work truck (hiab)	**107**	109	110	95	100	99	102	101

Table notes:

1 Rail grinding SWL has been conservatively approximated as that of six angle grinders, in the absence of data on the specific plant to be used

dB(Z) = z-weighted decibels: Unfiltered measured noise levels are quantified by unweighted or linear decibels. These units are abbreviated as dB(Z) or dB(linear).

5.2.2.1 Equipment locations

Specific locations of construction activities and plant are not confirmed. Construction plant was modelled as potentially operating anywhere within the relevant construction activity footprint. The locations of the equipment may change as the design develops. For the assessment, the construction activity footprint aligns with the permanent disturbance footprint for the following construction activities:

- Earthworks
- Drainage
- Rail civil works.

The construction activity footprints for laydown areas, structures and road civil works were also based on the constructability assessment as the activities are proposed at specific locations within the temporary construction disturbance footprint.

5.2.2.2 Meteorological conditions

In accordance with the CoP Vol 2 Table 6.1.1.2, different meteorological conditions were considered in the assessment. These parameters are summarised in Table 5.3. These meteorological conditions are prescribed by the CoP Vol 2 for modelling noise impacts at various times of day and correspond to the worst-case meteorological conditions within the Concawe method.

Table 5.3 Meteorological conditions for use in noise modelling (CoP Vol 2)

Time	Temperature, °C	Humidity, %	Wind speed, m/s	Wind direction	Temperature lapse rate	Pasquil stability class (implied by temperature lapse rate)
Day	20	70	3	All	0°C/100 m	E
Evening	15	70	2	Drainage flow	+3°C/100 m	F
Night	15	70	None	None	F+3°C/100 m	F

5.2.2.3 Ground absorption

Noise propagation is affected by the type of ground cover between the source and receptor. Most standards use a 'ground absorption factor' to evaluate the ground effect. The ground absorption factor ranges from zero (which is applied to hard surfaces such as asphalt and water) to one (which is applied to soft surfaces such as fields and grass). It can be set to any value in-between to represent an average of soft and hard ground in the noise and vibration study area. A consistent ground absorption coefficient of 0.5 was applied throughout the entire noise and vibration study area. The ground within the noise and vibration study area was characterised as typically dry fields, with some grass. A coefficient of 0.5 was chosen to conservatively model the combination of soft and dry ground across the noise and vibration study area.

5.3 Blasting assessment methodology

AS 2187.2, Appendix J provides formulae for the prediction of blasting impacts. These formulae are summarised in Table 5.4. The parameters used are those which correspond to worst-case impacts.

Table 5.4 AS 2187.2 Appendix J Blasting Formulae

Operation	Formula	Parameters	Parameters used
Ground vibration resulting from blasting	$V = K_g \left(\frac{R}{Q^{0.5}}\right)^{-B}$	V: predicted vibration level in mm/s R: distance from charge, in m Q: maximum instantaneous charge in kg K_g, B: constants related to site and rock properties	K_g: 1140 B: 1.6
Airblast overpressure resulting from blasting	$P = K_a \left(\frac{R}{Q^{\frac{1}{3}}}\right)^{-a}$	P: predicted pressure in kPa Q: explosive charge mass, in kg R: distance from charge, in m K_a: site constant a: site exponent	K_a: 100 a: -1.5

Table notes:

kg = kilograms, kPa = kilopascals

The chainages at which blasting has the potential to occur are listed in Table 5.5.

Table 5.5 Potential blasting locations

Chainage start (km)	Chainage end (km)	Anticipated geology
12.37	12.77	Koukandowie Formation
13.15	14.04	Koukandowie Formation/Colluvium
17.56	17.82	Gatton Sandstone
19.41	19.67	Gatton Sandstone

Blasting along the Project will be confirmed following the detailed geotechnical investigations by the construction contractor.

5.4 Vibration assessment methodology

5.4.1 Ground-borne vibration – construction

BS 5228-2 Table E.1 provides formulae to predict vibration levels from compaction activities. These formulae have been used to predict the vibration impacts and acceptable setback distances and are summarised in Table 5.6. The parameters used are based on the combination of the highest or lowest parameter values (provided in BS 5228-2) which result in the highest vibration impact.

Table 5.6 Extract from BS 5228-2 Table E.1

Operation	Formula	Parameters	Parameters used
Percussive (impact) piling – structures construction activity	$v_{res} \leq k_p \left[\frac{\sqrt{W}}{r^{1.3}}\right]$	V_{res}: predicted vibration level in mm/s K_p: scaling factor W: nominal hammer energy in joules x: distance measured along ground surface L: pile toe depth in metres r: slope distance from pile toe $(\sqrt{L^2 + x^2})$ in metres	K_p: 5 (worst-case) W: 85 000 joules L: 27 m
Vibratory Piling – structures construction activity	$V_{res} = \frac{k_v}{x^{\delta}}$	V_{res}: predicted vibration level in mm/s k_v: Scaling factor x: distance measured along ground surface in metres δ: 1.3 (all operations), 1.2 (Start up and run down), 1.4 (steady state operation)	k_v: 266 (5% probability of predicted value being exceeded) δ: 1.2 (worst-case)
Vibratory Compaction (start up and run down) – earthworks, road civil works and earthworks construction activities	$V_{res} = k_t\sqrt{n_d}\left[\frac{A^{1.5}}{(x + L_d)^{1.3}}\right]$	V_{res}: predicted vibration level in mm/s k_t: Scaling factor n_d: number of drums A: maximum amplitude of drum vibration in mm x: distance measured along ground surface in metres L_d: vibrating drum width in metres	k_t: 276 (5% probability of predicted value being exceeded) L_d: 2.2 m A: 1.72 mm n_d: 2
Vibratory compactor (Steady-state) – earthworks, road civil works and earthworks construction activities	$V_{res} = k_s\sqrt{n_d}\left[\frac{A}{x + L_d}\right]^{1.5}$	V_{res}: predicted vibration level k_s: Scaling factor n_d: number of drums A: maximum amplitude of drum vibration x: distance measured along ground surface L_d: vibrating drum width	k_s: 177 (5% probability of predicted value being exceeded) L_d: 0.75 m A: 1.72 mm n_d: 2

Therefore, the highest potential vibration impacts from construction activities at any given location will depend on its proximity to each of the construction activities. As with the modelling of airborne noise, vibratory plant was assumed to potentially operate anywhere within the relevant construction activity footprint.

5.4.2 Tunnel boring machine – tunnel construction

The TBM source vibration spectrum has been derived from the Melbourne Metro Rail project[1], which provides peak vibration velocity levels per octave (10 Hz – 500 Hz) at a distance of 5 m. As vibration propagates differently via different substrates, vibration levels were back-calculated to a distance of close proximity to the source, and repropagated through the ground type relevant to the Toowoomba Range tunnel. The following equation (based on Amick (1999)) was used to predict propagation of vibration through the ground:

$$PPV_x = PPV_{ref}\left(\frac{d_{ref}}{d_x}\right)^n e^{-\alpha(d_x - d_{ref})}$$

[1] Melbourne Metro Rail Project Environment Effects Statement Inquiry and Advisory Committee – MMRA Technical Note #042, 19 August 2016.

where PPV is the peak particle velocity (mm/s) at distance x or reference distance ref (m), n is the geometric damping coefficient, and α is the material damping coefficient, which is frequency dependant;

$$\alpha = \frac{\pi \eta f}{c}$$

The values used in the above equations are provided in Table 5.7.

Table 5.7 Variables used in the tunnel boring machine calculation

Symbol	Parameter	Value used (in rock)
PPV_{ref}	PPV at a refence distance	5.6
d_{ref}	Reference distance of PPV	5
n	Geometric damping coefficient	1
η	Material loss factor	0.01
c	Longitudinal speed in the ground material	3500

Table note:

1 Ground conditions derived from Ungar and Bender (1975)

It has been assumed that the peak particle velocity values at each frequency all occur simultaneously resulting in a conservative PPV sum for the purpose of assessment against the nominated criteria.

The geological units that the Toowoomba Range tunnel traverses, include Koukandowie Formation, Main Range Volcanics and Walloon Coal Measures, which are all rock. Based on this, it is assumed that vibration propagation through rock will apply to this assessment. For TBM use in rock, it is assumed that the PPV will be 5.6 mm/s at 5 m, as per the Melbourne Metro Rail project. The predicted vibration propagation profile is shown in Figure 5.1 based on rock between the tunnel and the nearest sensitive receptors.

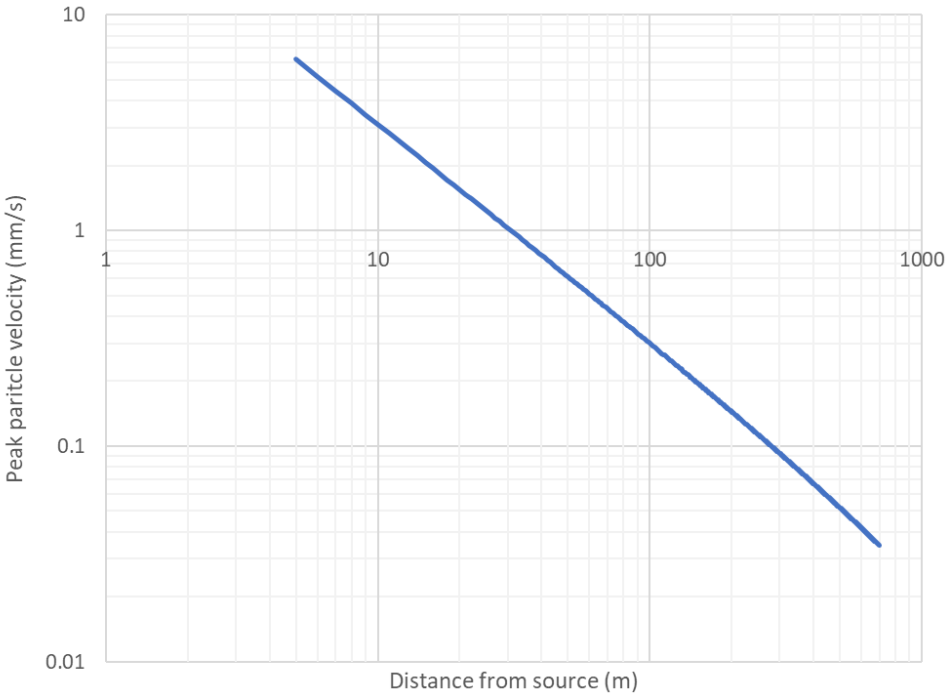

Figure 5.1 Propagation of tunnel boring machine peak particle velocity levels through rock

The (diagonal) distance between the source (at the tunnel edge) and the building foundation of each sensitive receptor is based on the following horizontal and vertical data for the tunnel:

- LiDAR elevation terrain contours at the sensitive receptor
- TBM diameter (~12 m)

- Rail centreline (vertical and horizontal profile)
- Shortest horizontal distance between the sensitive receptor and rail centreline (typically perpendicular, with the exception of houses near the portals).

The TBM has been used as the worst-case vibration intensive plant equipment for tunnelling works.

5.4.3 Ground-borne noise

Once the vibration velocity levels were predicted inside the building, the levels were converted to internal A-weighted noise levels (in dBA), the reradiated ground-borne noise levels. As the peak vibration values of the TBM have been used as the source rather than root mean square values, it is assumed that the predicted ground-borne noise levels are a reasonable approximation of the L_{ASMax} levels.

5.4.4 Building losses and corrections

Vibration velocity levels have been predicted at the foundation of each sensitive receptor using the methodology outlined in Section 5.3. Losses and corrections have then been applied based on the Federal Transit Authority Transit Noise and Vibration Impact Assessment Manual[2] (US Federal Transit Authority 2018) and Melbourne Metro Rail Project[3] – Noise and Vibration, Appendix E: Operation: Vibration and ground-borne Noise from Rail. These are provided in Table 5.8. A minus 5 dB radiation correction was applied when converting vibration levels on a floor to ground-borne noise[2].

Table 5.8 Correction and losses due to buildings

Situation	Octave band centre frequencies, Hz Correction per octave, dBV					
	8	16	31.5	63	125	250
Building floor amplification [1]	6	6	6	5	4	3
Typical residential foundation loss [2]	0	- 4	- 5	- 5	- 4	- 3

Table notes:

1 As per Melbourne Metro Rail Project, note that the actual amplification will vary depending on the type of construction
2 As per Transit Noise and Vibration Impact Assessment Manual, pg. 10-11, corresponding with wood frame houses which may be a conservative approach. The general rule is the heavier the building construction, the greater the coupling loss, therefore masonry construction will reduce vibration levels further.

5.5 Predicted impacts

5.5.1 Airborne construction noise impacts

A summary of the predicted construction noise impacts associated with each stage of construction, in terms of the number of sensitive receptors predicted to exceed relevant criteria, are provided in Table 5.9

As per Section 4.1.1, standard and non-standard hours refer to the hours at which various CoP Vol 2 criteria are applicable and do not indicate planned hours of works. Non-standard hours work has been conservatively assessed against the more stringent night-time criteria. Appendix D presents the L_{Aeq} noise level contours for the construction activities throughout the noise and vibration study area.

[2] Transit Noise and Vibration Impact Assessment Manual – U.S. Department of Transportation (Federal Transit Administration), September 2018
[3] Melbourne Metro Rail Project – Noise and Vibration, Appendix E: Operation: Vibration and ground-borne Noise from Rail. Doc. Number: MMR-AJM-PWAA-RP-NN-008020

It is important to note that this assessment is representative of the worst case 15-minute period of construction activity, while the construction equipment is at the nearest potential location within the Project disturbance footprint to each sensitive receptor location. The assessed scenario does not represent the ongoing day to day noise impact at noise sensitive receptors for an extended period. This approach is in accordance with the CoP Vol 2, which is included in the ToR requirements.

Particularly noisy activities, such as piling, are likely to persist for only a short duration of the overall construction period. In addition, the predictions use the shortest separation distance to each sensitive receptor, however distances will vary between plant and sensitive receptors. For works that move along the rail alignment, rather than works located at a construction compound, noise exposure at each receptor would reduce due to increases in distance loss as the works progress along the alignment.

The construction staging is indicative and is subject to change during detailed design.

Table 5.9 Predicted construction noise impacts – number of sensitive receptors exceedances

NCA	Standard hours limits		Non-standard hours lower and upper limit	Standard hours exceedances		Non-standard hours exceedances
	Upper limit	Lower limit		Exceeding upper limit	Exceeding lower limit	
Drainage						
NCA_01	65	50	45	61	326	483
NCA_02	65	50	45	2	131	457
NCA_03	65	50	45	0	6	43
NCA_04	70	56	50	0	3	4
NCA_05	70	51	46	0	6	9
NCA_06	65	50	45	12	120	177
NCA_07	65	50	45	1	25	56
NCA_08	65	50	45	6	19	25
NCA_09	65	50	45	12	79	129
TOTAL				**94**	**715**	**1,383**
Earthworks						
NCA_01	65	50	45	116	502	574
NCA_02	65	50	45	5	482	586
NCA_03	65	50	45	0	59	128
NCA_04	70	56	50	0	4	6
NCA_05	70	51	46	0	20	57
NCA_06	65	50	45	30	212	417
NCA_07	65	50	45	4	59	69
NCA_08	65	50	45	14	28	29
NCA_09	65	50	45	23	153	265
TOTAL				**192**	**1,519**	**2,131**
Site setup/laydown						
NCA_01	65	50	45	35	342	497
NCA_02	65	50	45	1	26	453
NCA_03	65	50	45	0	0	32
NCA_04	70	56	50	0	3	5
NCA_05	70	51	46	0	0	16
NCA_06	65	50	45	4	13	108
NCA_07	65	50	45	0	29	57

NCA	Standard hours limits		Non-standard hours lower and upper limit	Standard hours exceedances		Non-standard hours exceedances
	Upper limit	Lower limit		Exceeding upper limit	Exceeding lower limit	
NCA_08	65	50	45	6	20	29
NCA_09	65	50	45	10	59	159
TOTAL				**56**	**492**	**1,356**
Rail civil works						
NCA_01	65	50	45	74	406	554
NCA_02	65	50	45	2	377	581
NCA_03	65	50	45	0	21	116
NCA_04	70	56	50	0	3	6
NCA_05	70	51	46	0	7	46
NCA_06	65	50	45	12	141	346
NCA_07	65	50	45	2	45	69
NCA_08	65	50	45	9	22	29
NCA_09	65	50	45	12	110	234
TOTAL				**111**	**1,132**	**1,981**
Road civil works						
NCA_01	65	50	45	59	349	460
NCA_02	65	50	45	0	0	5
NCA_03	65	50	45	0	0	65
NCA_04	70	56	50	0	0	0
NCA_05	70	51	46	0	0	0
NCA_06	65	50	45	2	6	44
NCA_07	65	50	45	0	6	17
NCA_08	65	50	45	0	1	3
NCA_09	65	50	45	3	68	169
TOTAL				**64**	**430**	**763**
Structures						
NCA_01	65	50	45	31	354	496
NCA_02	65	50	45	0	3	28
NCA_03	65	50	45	0	0	61
NCA_04	70	56	50	0	0	0
NCA_05	70	51	46	0	0	0
NCA_06	65	50	45	5	14	149
NCA_07	65	50	45	0	49	69
NCA_08	65	50	45	5	23	30
NCA_09	65	50	45	7	66	184
TOTAL				**48**	**509**	**1,017**
Concrete batching						
NCA_01	65	50	45	3	11	16
NCA_02	65	50	45	0	0	2
NCA_03	65	50	45	0	0	0
NCA_04	70	56	50	0	0	0

NCA	Standard hours limits		Non-standard hours lower and upper limit	Standard hours exceedances		Non-standard hours exceedances
	Upper limit	Lower limit		Exceeding upper limit	Exceeding lower limit	
NCA_05	70	51	46	0	0	0
NCA_06	65	50	45	0	0	0
NCA_07	65	50	45	0	0	0
NCA_08	65	50	45	0	0	0
NCA_09	65	50	45	0	0	0
TOTAL				**3**	**11**	**18**
Flash-butt welding						
NCA_01	65	50	45	0	1	1
NCA_02	65	50	45	0	0	0
NCA_03	65	50	45	0	0	0
NCA_04	70	56	50	0	0	0
NCA_05	70	51	46	0	0	0
NCA_06	65	50	45	0	0	0
NCA_07	65	50	45	0	0	0
NCA_08	65	50	45	0	0	0
NCA_09	65	50	45	0	0	0
TOTAL				**0**	**1**	**1**

Table 5.10 quantifies the level of exceedances during the earthworks construction activity against the upper standard hours noise limit.

Table 5.10 Level of exceedance of upper limit external construction noise limit for earthworks

NCA	Earthworks: level of exceedance above upper limit (standard hours), dB(A) – non-critical facilities			
	1-2	2-5	5-10	> 10
NCA_01	24	23	24	45
NCA_02	2	1	1	1
NCA_03	0	0	0	0
NCA_04	0	0	0	0
NCA_05	0	0	0	0
NCA_06	17	1	1	11
NCA_07	2	0	1	1
NCA_08	2	4	3	5
NCA_09	7	4	5	7
TOTAL	**54**	**33**	**35**	**70**

An overview of the number of exceedances for critical facilities for each construction activity is shown in Table 5.11. Each critical facility has a specific internal construction noise limit discussed in Section 4.2.2. An assumed attenuation of 7 dB(A) through the building envelope has been applied to the predicted noise level and is supported by AS 3671-1989 – Acoustics – Road traffic noise intrusion – Building siting and construction (Australian standards 1989). The 23 medical facilities listed are all buildings within the Baillie Henderson Hospital complex. Construction noise impacts are mapped in Appendix D.

Table 5.11 Predicted construction noise impacts – number of critical facilities exceeding criterion

Critical facility		Community buildings	Educational facilities	Medical facilities
Limit: Internal $L_{A,eq(15min)}$		45 dB(A)	45 dB(A)	40 dB(A)
Number of sensitive receptors exceeding criterion	Drainage	0	1	20
	Earthworks	1	1	23
	Site setup/laydown	0	1	19
	Rail civil works	0	1	23
	Road civil works	0	1	0
	Structures	0	1	0
	Concrete batching	0	0	0
	Flash-butt welding	0	0	0

For some construction activities, up to six noise sensitive receptors fall within the construction activity footprint. It is anticipated that land within the Project disturbance footprint will be acquired for the Project, and therefore the number of noise sensitive receptors exceeding a criterion does not include these receptors.

Measurements taken of the existing environment highlight the low background levels and have resulted in stringent noise criteria. The number of exceedances drops significantly between the lower and upper limit. A detailed breakdown of all sensitive receptors and their airborne noise impacts is shown in Appendix E.

It is important to note that the construction noise impacts are conservative and based on worst-case scenarios. The construction works will be temporary in nature and the number of sensitive receptors affected at any one time will vary depending on the location of activities and progress of works along the alignment for each construction stage.

Proposed measures to mitigate construction noise impacts have been provided in Section 8.1.2.

Fugitive sources such as unapproved or unexcepted construction techniques, poorly maintained or fitted equipment (such as selecting an inappropriate engine muffler) have not been assessed. These fugitive sources would be dealt with through the application of mitigation measures outlined in the Noise and Vibration Management Sub-plan which will form part of the CEMP.

5.5.2 Construction road traffic noise impacts

Construction vehicle movements and existing traffic flows have been based on information derived from EIS Appendix U: Traffic Impact Assessment. Construction traffic movements in this document were used to assess the noise impacts resulting from construction traffic against the base traffic volumes. The traffic volumes used for the basis of this assessment is the relevant peak hour traffic flows for both base volumes and additional construction traffic as part of the Project. Where traffic speeds were not known, 100 km/h was used for highways and motorways, otherwise 60 km/h was used. Increases in road traffic noise due to both additional vehicles and higher proportions of heavy vehicles were considered.

The $L_{A10(1hr)}$ for each year from 2022 to 2026 was predicted both with and without the expected construction traffic. The difference between the noise levels with construction traffic and without construction traffic is the noise impact of the construction traffic.

As per the CoP Vol 2, the calculation of road traffic noise was conducted using the 1-hour basic noise level algorithm contained in the United Kingdom's Department of Transport (Welsh Office) *Calculation of Road Traffic Noise* (CoRTN) (Department of Transport, 1988). It was assumed that the traffic speeds, road surface pavement types, gradients, surrounding ground types and distances to nearby receptors will not change as a result of the Project. Therefore, the corrections for these factors were omitted and the difference between the basic noise level $L_{A10\ (1hr)}$ with and without the development were calculated solely based on predicted changes in hourly traffic volumes, and the percentages of heavy vehicles.

The construction traffic noise is predicted to exceed the criteria for five road sections within the noise and vibration study area, with a maximum predicted increase of 6 dB(A). Table 5.12 presents the roads where the increase in the $L_{A10(1hr)}$ due to construction traffic exceeds the 3 dB(A) criterion. The predicted increase in $L_{A10(1hr)}$ for all roads is presented in Appendix E. The $L_{A10(1hr)}$ stated are not predictions of impacts at receptors but are instead measures of road traffic noise emissions at a reference distance of 10 m from the road, corrected only for speed and percentage of heavy vehicles. Construction traffic may vary throughout the day and the results of this assessment will be confirmed during detailed design, based on detailed construction scheduling.

Exceedance of the construction road traffic noise criterion does not necessarily result in perceptibly elevated noise levels at sensitive receptors.

It is noted that the Traffic Impact Assessment for the Project (refer EIS Appendix U) currently assumes that all water will be sourced from Lake Cooby and distributed along the Project. However, the Project has identified a number of alternative water sources, including within the Project disturbance footprint which may reduce impacts on Cooby Dam Road and Pipeline Road.

The maximum predicted increase in noise emissions from five roads is greater than the 3 dB(A) criterion. These roads are primarily in rural locations and the existing base traffic volumes quantities are low. As such the initial airborne road traffic noise levels are low before the addition of construction traffic and the criteria for these roads is therefore stringent.

Table 5.12 Additional airborne noise levels due to construction traffic per year

Road name	Locality	Road authority	Road section	Number of construction vehicles (vehicles per day)					$L_{A, (1\ hr)}$, dB(A)									
									Sound level without Project					Increase in sound level caused by Project				
				2022	2023	2024	2025	2026	2022	2023	2024	2025	2026	2022	2023	2024	2025	2026
Cooby Dam Road	Meringandan	TRC	Between Klein Road and Pipeline Road	77	89	65	8	8	59	60	60	60	60	4	4	4	1	1
Pipeline Road	Meringandan	TRC	Full extent	77	89	65	8	8	57	57	57	57	57	6	6	5	1	1
Gittins Road	Withcott	LVRC	Between McNamaras Road and Stevens Road	802	754	37	28	28	65	65	65	65	65	5	5	0	0	0
McNamaras Road	Withcott	LVRC	Between Gittins Road and unnamed road	830	779	60	78	56	63	63	63	64	64	6	6	0	0	0
Unnamed road	Withcott	LVRC	Between Jones Road and unnamed road	56	342	72	28	28	63	63	63	64	64	0	4	1	0	0

Table note:

* The section of Pipeline Road north of Paton Road that is proposed to be used in the Project is a private road and may be subject to a separate access agreement.

5.5.3 Construction vibration impacts

Vibration impacts have been assessed against various criteria for various times of day. Standard hours and non-standard hours refer to the times at which various criteria apply as per the CoP Vol 2 and do not indicate planned hours of works.

The setback distances at which the construction vibration criteria are predicted to be achieved (discussed in Section 4.2) are provided in Table 5.13. These are based on the formulae discussed in Section 5.3.

Table 5.13 Recommended minimum working distances for vibration intensive equipment

Plant Item	Predicted setback distance (m)				
	Human Comfort			Building damage	
	Lower limit – non-standard hours	Lower limit – standard hours Upper limit – non-standard hours	Upper limit – standard hours	Historical heritage building	Dwellings and similar buildings
	0.3 mm/s PPV	1.0 mm/s PPV	2.0 mm/s PPV	3 mm/s PPV	5.0 mm/s PPV
Vibratory roller – steady state	200	90	60	40	30
Vibratory roller – Vibration start Up/Run down	330	130	80	55	40
Vibratory piling	290	110	60	40	30
Percussive piling	690	275	160	115	80

The lower night time vibration human comfort limit of 0.3 mm/s is predicted to be exceeded at up to 175 sensitive receptors adjacent to the Project due to their proximity to construction works. However, it is expected that vibration intensive equipment will only rarely be operated during the night period defined by the CoP Vol 2.

In this instance, the CoP Vol 2 recommends the use of practicable and reasonable mitigation to minimise vibration impacts. These mitigation measures are discussed in Section 8.1.2. The prediction vibration limit to individual sensitive receptors has also been calculated and detailed results included in Appendix E. A summary of the total exceedances for each construction activity is shown in Table 5.14.

Table 5.14 Construction vibration exceedances against human comfort and structural limit criteria

Activity	Number of exceedances				
	Human comfort limit – standard hours		Human comfort limit – non-standard hours		Structural limit
	Lower	Upper	Lower	Upper	
Site setup/laydown areas					
Vibratory roller – Steady state vibration	19	5	40	18	2
Vibratory roller – Vibration start-up/run down	25	13	64	24	2
Structures					
Vibratory piling – Vibration start-up/run down	6	2	34	5	1
Percussive piling	33	13	175	31	2
Earthworks/drainage/rail civil works					
Vibratory roller – Steady state vibration	45	32	71	41	14
Vibratory roller – Vibration start-up/run down	53	41	109	48	17

Activity	Number of exceedances				
	Human comfort limit – standard hours		Human comfort limit – non-standard hours		Structural limit
	Lower	Upper	Lower	Upper	
Road civil works					
Vibratory roller – Steady state vibration	23	18	33	20	9
Vibratory roller – Vibration start-up/run down	27	21	60	23	12

For some construction activities, up to seven non-heritage vibration sensitive receptors fall within the construction activity footprint. It is anticipated that land within the Project disturbance footprint will either be gazetted as rail corridor or will be temporarily utilised to accommodate construction activities. As a consequence, the number of receptors exceeding a criterion does not include these receptors.

Twelve receptors were identified as being buildings of special value or significance as part of the cultural heritage assessment. The number of these receptors predicted to exceed the heritage building criteria outlined in Section 4.2.2 is given in Table 5.19. Predictions for each heritage receptor are provided in Appendix E.

Table 5.15 Construction vibration heritage exceedances against structural limit criterion

Activity	Number of heritage receptors exceeding 3 mm/s PPV
Site setup/laydown areas	
Vibratory roller – Steady state vibration	0
Vibratory roller – Vibration start-up/run down	1
Structures	
Vibratory piling – Vibration start-up/run down	1
Percussive piling	1
Earthworks/drainage/rail civil works	
Vibratory roller – Steady state vibration	2
Vibratory roller – Vibration start-up/run down	2
Road civil works	
Vibratory roller – Steady state vibration	1
Vibratory roller – Vibration start-up/run down	1

The vibration predictions in Table 5.14 and Table 5.15 are based on several coarse assumptions (discussed below) in the absence of final details on the construction equipment/processes, and as such are likely to be conservative:

- The most conservative parameters and scaling factors have been used in the prediction formulae
- The more conservative building damage criterion has been adopted:
  - The criterion is dependent on the dominant frequency of the vibration impact, and some compaction activities generally have higher dominant frequencies resulting in more lenient criteria
  - A 5 mm/s vibration criterion at sensitive receptors has been adopted for this assessment, excluding heritage receptors at which a 3 mm/s vibration criterion has been adopted (refer Section 4.2.2)
- Changes in the terrain which can reduce the propagation of ground vibration impacts, such as drains, are not accounted for in the formula
- It was assumed that construction works may occur up to the edge of each construction activity footprint
- At this stage, a detailed construction methodology has not been developed. Planned hours of construction are yet to be confirmed and as such the construction vibration impacts have been assessed against CoP Vol 2 vibration criteria for all times of day.

5.5.3.1 Underground infrastructure

It is proposed that the vibration setback distances given in Table 5.16 to underground infrastructure will be adopted during construction to meet the limits summarised in Table 4.13 and Table 4.14.

Table 5.16 Recommended vibration setback distances for buried pipework

Plant Item	Predicted setback distance (m)			
	Roma Brisbane Gas Pipeline criteria		General buried pipework criteria	
	Coal tar enamel coating, Poorly coated	Other	Masonry, plastic or metal construction	Steel construction
	10 mm/s PPV	20 mm/s PPV	50 mm/s PPV	100 mm/s PPV
Vibratory roller – Vibration start Up/Run down	15	< 5	< 5	< 5
Vibratory roller – steady state	25	< 5	< 5	< 5
Vibratory piling	10	< 5	< 5	< 5
Percussive piling	40	< 5	< 5	< 5

A list of approximate chainages at which the Roma Brisbane Gas Pipeline is located within 40 m of construction works is given in Table 5.17.

Table 5.17 Roma Brisbane Gas Pipeline locations of proximity to the Project

Approximate chainage (km)	Pipeline type	Nearby construction works
3.60	Transmission, distribution	Earthworks
6.70	Transmission, distribution	Access tracks
7.70	Transmission	Tunnel construction
10.60 – 11.10	Transmission	Rail civil works, earthworks, drainage, laydown, blasting, access tracks
11.80 – 12.40	Transmission	Laydown areas, access tracks
14.20	Transmission	Access tracks
24.20 – 25.00	Transmission	Access tracks, laydown areas, structures, road civil works, drainage, rail civil works, earthworks

ARTC have been in contact with APA regarding potential interfaces and required treatments at the locations outlined in Table 5.17. An interaction report has been developed by APA and provided to ARTC to inform the management of the works in these areas (i.e. design and treatments options, specialist studies required etc).

5.5.4 Construction blasting impacts

Specific locations requiring blasting throughout the Project disturbance footprint are to be confirmed during detailed design. Potential locations requiring blasting throughout the Project disturbance footprint have been identified from the design. The maximum permissible charge weight to meet the sensitive structure criteria outlined in Section 4.3 has been calculated for indicative setback distances in Table 5.18 and for each receptor in Appendix E. A detailed blasting assessment will be completed once blasting locations have been finalised through detailed design. The below information is based on a worst-case assumption of a confined blast and geotechnical parameters for good vibration transmission.

Table 5.18 Charge mass ranges for set distances for sensitive structures

Distance to receptor	Total number of receptors for the Project in proximity to one or more blast locations	Maximum permissible charge weight (kg)			
		Ground vibration - human comfort	Ground vibration - structural damage	Airblast overpressure - human comfort	Airblast overpressure - structural damage
0 to 200 m	0	N/A – Specific blast design required or blasting not feasible at these distances.			
200 to 400 m	1	45	175	<1	<5
400 to 800 m	5	180	710	<1	30
800 to 1,600 m	29	720	>2,000	<5	250

Twelve receptors were identified as being buildings of special value or significance as part of the cultural heritage assessment conducted as part of the EIS. The maximum permissible charge weight to meet the heritage building criteria outlined in Section 4.3 has been calculated for indicative setback distances in Table 5.19 and for each receptor in Appendix E. A detailed blasting assessment will be completed once blasting locations have been finalised through detailed design. The below information is based on a worst-case assumption of a confined blast and geotechnical parameters for good vibration transmission.

Table 5.19 Charge mass ranges for set distances for heritage buildings

Distance to receptor	Total number of receptors for the Project in proximity to one or more blast locations	Maximum permissible charge weight (kg)
0 to 200 m	0	N/A – Specific blast design required or blasting not feasible at these distances.
200 to 400 m	1	14
400 to 800 m	2	57
800 to 1,600 m	1	230

5.5.5 Tunnel boring machine vibration predictions

Vibration and ground-borne noise due to the operation of the TBM have been calculated using the methodology summarised in Section 5.3. The predicted PPV (mm/s) vibration levels at the sensitive receptors in the vicinity of the tunnel have been assessed against the nominated criteria for structural damage and human comfort presented in Section 4.2.1.

5.5.5.1 Building damage

Vibration levels predicted at the foundations of all sensitive receptors are below the applicable criteria including the heritage and sensitive buildings criterion (2.5 mm/s) for damage due to vibration.

The Toowoomba Range tunnel passes beneath Toowoomba Bypass at three locations. The shallowest of these locations is near the western tunnel portal where the tunnel passes beneath the Boundary Street Bridge. At this location there is approximately 30 m between the top of the tunnel and the bypass shoulder and the tunnel is located in basalt. Assuming that the bridge foundations are no more than 10 m deep there is still approximately 20 m clearance between the tunnel and any foundations. The TBM excavation will induce vibrations into the surrounding ground however this is not expected to be result in structural damage to the Boundary Street bridge. This will be reviewed as part of a vibration impact assessment undertaken during detailed design, including consultation with DTMR. A settlement impact assessment has been done as part of the feasibility design at this location and the predicted impacts are negligible.

5.5.5.2 Amenity

Vibration levels predicted on the ground floor slab or floors of buildings were found to comply with the CoP Vol 2 human comfort lower limit for dwellings during non-standard hours criterion (0.3 mm/s, Table 4.9).

5.5.5.3 Underground infrastructure

Vibration on the existing Roma Brisbane Gas Pipeline due to use of the TBM has been assessed. The minimum distance between the TBM and the Roma Brisbane Gas Pipeline is predicted to be approximately 114 m. APA advises a notification distance of 100 m. Assuming that the pipeline is located in rock, approximately 600 mm below the ground surface, a maximum PPV of 0.3 mm/s has been predicted at the pipeline. This is compliant with the minimum APA pipeline limit of 10 mm/s and is below the 80% alarm threshold specified by APA

As recommended by APA a more detailed ground-borne vibration assessment will be undertaken once the construction contractor is appointed, with consideration to detailed geotechnical data for the area and the type and size of the TBM. Depending on the outcomes of this modelling, vibration modelling and coating survey may also be required. The modelling will also consider the other interfaces identified in Table 5.17.

It is currently not known if other utility owners have specific vibration limits which apply to underground infrastructure, such as the TRC trunk sewer main. Vibration limits specific to particular underground infrastructure, along with monitoring requirements and notification distances are being sought in consultation with stakeholders. Consequently, the DIN 4150-3 *Long-term vibration guideline values for velocity measured on the pipe – Masonry, plastic* criteria of 25 mm/s has been applied. Compliance with this criterion is predicted when the TBM is at least 5 m from the pipework. Vibration measurements will be undertaken on site to confirm that these predictions are representative of the vibration levels on site.

The results of vibration predictions are less accurate when construction equipment is within 5 m of a vibration-sensitive item. Consequently, the construction team will need to undertake vibration monitoring when working within 5 m of infrastructure to assess whether the vibration from the works meet the criteria.

It is proposed that the minimum setback distance of 5 m will be observed between the TBM and all buried services. No underground infrastructure has been identified within this set back distance.

5.5.5.4 Ground-borne construction noise impacts

The predictions undertaken are based on conservative assumptions i.e. propagation through rock, no impedance changes at below-ground formation change, foundation types and use of peak velocity values to determine L_{ASMax} noise levels. The 3D vector distance from the tunnel edge to the sensitive receptor foundation (diagonal distance) has been used to calculate predicted ground-borne noise levels.

Ground-borne noise due to the TBM has been predicted to exceed the ground-borne noise criteria defined in the CoP Vol 2 for residential receptors only. Each receptor predicted to exceed the ground-borne noise criteria has been presented in Appendix E with their respective predicted level labelled. It was found that:

- Properties within an approximate diagonal distance of 260 m from cutting face of the TBM will exceed the Dwellings – Standard hours criterion of 40 $dBL_{ASMax.}$ There are 22 residential sensitive receptors predicted to exceed this criterion.
- Properties within an approximate diagonal distance of 390 m from the cutting face of the TBM will exceed the Dwellings – Non-standard hours criterion of 35 dBL_{ASMax}. There are 72 residential sensitive receptors predicted to exceed this criterion. This includes the above 22 residential sensitive receptors.

These exceedances are not predicted to persist for the duration of the tunnel construction. Exceedances of the standard hours criterion are only predicted for the period during which the TBM is within a 260 m diagonal distance of the receptors. Similarly, exceedances of the non-standard hours criterion are only predicted while the TBM is within a 390 m diagonal distance of the receptors. These impacts will be revisited and updated during detailed design, and following detailed geotechnical investigations. The duration of these impacts is dependent on the specific properties of the geology surrounding the tunnel. For example, tunnelling entirely through rock, as was conservatively modelled, is both slower and propagates vibration further than tunnelling through other geotechnical conditions.

Mitigation measures to manage ground-borne construction noise exceedances are included in Section 8.1.

6 Operational noise assessment

6.1 Operational fixed infrastructure

Noise impacts of the operational fixed infrastructure included in the design of the Project have been assessed under EPP (Noise). The following operational fixed infrastructure has been identified based on the design:

- Tunnel ventilation fans for purging, emergency, and maintenance operations
- Pumps, pump stations and water treatment plants associated with the tunnel
- Transformers, substations and generators associated with the tunnel
- Operable tunnel portal doors.

No fixed infrastructure that is likely to generate noise has been identified in the open route (non-tunnel sections) of the Project as part of the design. Should any additional fixed infrastructure be identified during detailed design, operational noise impacts will be assessed, and mitigation designed to meet the EPP (Noise) acoustic quality objectives.

Safety systems have not been assessed as operational fixed infrastructure and are assessed in EIS Appendix P: Operational noise and vibration technical report. These noise sources include train horns and alarms.

6.1.1 Methodology

6.1.1.1 Assessment approach

A desktop study has been undertaken to predict the airborne noise levels at the closest noise sensitive receptors due to the operation of fixed infrastructure associated with the Toowoomba Range tunnel. The assessment methodology consists of:

- Identification of operational fixed infrastructure noise sources
- Identification of closest sensitive receptor and occupancy type
- Determination of objectives for airborne noise at nearby sensitive receptors
- Review of fan specifications and determination of indicative source sound power levels
- Prediction of airborne noise levels at the sensitive receptors
- Comparison of the predicted internal airborne noise levels with the acoustic quality objectives
- Development of acoustic mitigation options to meet the environmental noise objectives.

Ancillary fixed infrastructure noise sources other than tunnel ventilation fans, such as pumps and transformers will be located at the eastern and western tunnel portals for the Project. During detailed design, this infrastructure will be selected and designed, and the need for noise mitigation determined. While noise from these sources are not yet known, nominal mitigation strategies (such as attenuators, solid barriers, enclosures etc) will be implemented as necessary and will be designed to meet the EPP (Noise) acoustic quality objectives at noise sensitive receptors.

Tunnel portal doors are expected to be operated at both tunnel portals. Potential impacts include noise resulting from the operation of the doors, noise generated by air moving past the doors, and noise generated by safety alarms associated with the doors. These noise sources will be assessed during detailed design once this infrastructure is selected and designed. This infrastructure will be mitigated as necessary to meet the EPP (Noise) acoustic quality objectives at all noise sensitive receptors. This infrastructure is understood to be located within structures, and it is therefore expected that physical mitigation at the noise source will be the most practicable and reasonable form of mitigation.

There are three ventilation stations associated with the tunnel. These are mapped in Appendix F. The ventilation stations are located at each of the two portals and there is also a mid-tunnel ventilation station. The ventilation system will include purging, maintenance and emergency operations. These operations are as follows:

- Purging operations, which remove the already-passed train exhaust emissions from the tunnel:
  - Fourteen purge fans are to operate at the intermediate ventilation station. These fans will operate for up to six minutes per purge, which may occur three times in the space of an hour (worst-case scenario).
  - The Longitudinal Egress Passage (LEP) pressurisation system can operate for 100 per cent of the time during an hour period. LEP fans are located at each ventilation station.
- Maintenance operations, which will provide fresh air to maintenance workers within the tunnel:
  - One purge fan to operate in the intermediate ventilation station. This fan can operate for 100 per cent of the time during an hour period, depending on the maintenance works.
  - The LEP pressurisation system can operate for 100 per cent of the time during an hour period. LEP fans are located at each ventilation station.
- Emergency operations, which will provide fresh air to maintenance workers within the tunnel:
  - Two smoke fans to operate in the intermediate ventilation station. These fans can operate 100 per cent of the time during an hour period.
  - The LEP pressurisation system can operate for 100 per cent of the time during an hour period. LEP fans are located at each ventilation station.

6.1.1.2 Operational scenarios

Noise levels associated with the following three operational scenarios have been assessed:

- Purging operations:
  - Fourteen purge fans at the intermediate ventilation station in operation up to three times, for six minutes per cycle, within an hour period (a total of 18 minutes)
  - LEP fan to operate in each ventilation station (a total of three fans), in operation for a one-hour period
- Maintenance operations:
  - One purge fan at the intermediate ventilation station in operation for a one-hour period
  - LEP fan in each ventilation station (a total of three fans) in operation for a one-hour period
- Emergency operations:
  - Two smoke fans at each ventilation station (a total of six fans) in operation for a one-hour period and LEP fan in each ventilation station (a total of three fans) in operation for a one-hour period.

The operational scenarios are summarised in Table 6.1.

Table 6.1 Summary of fans for each operational scenario

Operational scenario	Purge fans	Lep fans	Smoke fans
Purging	14 fans at mid-tunnel ventilation station	One in each ventilation station (a total of three fans)	-
Maintenance	1 fan at mid-tunnel ventilation station		-
Emergency	-		2 fans at each ventilation station (a total of six fans)

6.1.1.3 Identification of receptors

For the tunnel section of the Project, the following five noise sensitive receptors (NSRs) were identified as the closest receptors to each ventilation station (eastern, western and intermediate). The sensitive receptors are shown in Appendix F and are at the following distances from each ventilation station:

- NSR at eastern tunnel portal: NSR is approximately 700 m from the indicative ventilation station (residential)
  - Receptor ID: RES2573
- NSR at eastern tunnel portal: NSR is approximately 550 m from the indicative ventilation station (commercial/industrial)
  - Receptor ID: RES3611
- NSR at western tunnel portal: NSR is approximately 360 m from the indicative ventilation station (residential)
  - Receptor ID: RES0697
- NSR at intermediate ventilation station: NSR is approximately 500 m from the indicative ventilation point (residential)
  - Receptor ID: RES1848
- Intermediate ventilation station: NSR is approximately 220 m from the indicative ventilation point (commercial/industrial)
  - Receptor ID: RES3530.

Other receptors in the vicinity of these noise sources have also been predicted with respect to the EPP (Noise) acoustic quality objectives.

6.1.1.4 Prediction methodology

Calculations of fan noise emissions were undertaken using the computational software SoundPLAN (v8.0) using the propagation methodology in ISO 9613-2[4]. Terrain data (in increments of 2-5 m elevation contours) was used in the assessment methodology.

6.1.1.5 Limitations and assumptions

The following limitations and assumptions apply:

- 50% ground factor was used in the tunnel ventilation assessment due to the vegetation/porous ground between the portals and the receptors
- As fans are yet to be selected, fan sound power levels have been empirically derived and may vary from final plant selection noise levels. Noise associated with the final fan selections will be assessed for compliance with the EPP (Noise) acoustic quality objectives (and mitigation may need to be reconsidered).
- Attenuators will be custom made and data is not readily available. Indicative insertion loss and pressure drops have therefore been derived based on extrapolation of “off-the-shelf” attenuator data. The custom-made attenuators will need to be tested to ensure that they comply with the final silencer specification.
- As specific ductwork is not finalised, the locations of fan exhaust/intake locations in the tunnel have been assessed at the portal. This is a conservative approach as additional ductwork is expected to provide some attenuation.
- Fans are assumed to be non-tonal, and therefore it is assumed that “beating” will not occur

[4] ISO 9613-2: Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation

- At the time of this assessment, plant equipment for the proposed water treatment plant(s) and transformers at the tunnel portals is not yet known. Noise impact from these items of plant, will be selected to be less than 10 dBA below the predicted noise level of the ventilation equipment at the properties to ensure that these items of plant do not materially increase the predicted operational noise impacts.
- It is assumed that the façade noise breakout is below that of the ventilation exhaust locations, and therefore negligible
- No buildings, aside from the ventilation station, were included in the model.

6.1.2 Predictions

Fan specifications have been provided by the tunnel design, and indicative fan sound power levels have been adopted from the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Handbook[5]based on these specifications. It has been assumed that ventilation fans will be selected to operate within the tunnel design specifications such that noise emissions are steady-state and free of tonality. These SWLs are provided in Table 6.2.

Table 6.2 Sound Power Levels of indicative fans

Fan	Octave Band Centre Frequency, Hz Sound Power Level, dB								Total SWL dBA
	63	125	250	500	1,000	2,000	4,000	8,000	
Purge fans	125	130	127	123	122	120	117	117	128
Smoke fans	122	122	126	123	119	117	114	114	125
LEP (west/east ventilation stations)	111	111	115	112	108	106	103	103	115
LEP (intermediate ventilation station)	94	94	98	95	91	89	86	86	97

Indicative mitigation (attenuators) to achieve compliance with the noise criteria has been determined and where applicable informs the design. The minimum insertion losses of these attenuators to mitigate fan noise are presented in Table 6.3.

Table 6.3 Minimum insertion losses of attenuators for Project tunnel ventilation

Fan	Attenuator location in reference to fan	Location of fan	Octave Band Centre Frequency, Hz Insertion Loss, dB							
			63	125	250	500	1 k	2 k	4 k	8 k
Purge	Ambient-side	Intermediate	14	25	47	55	56	45	30	22
	Tunnel-side		22	37	72	79	76	76	60	40
Smoke	Ambient-side	Intermediate	12	19	36	43	47	28	18	16
	Tunnel-side		23	39	77	84	80	81	64	43
LEP	Ambient-side	Intermediate	12	19	36	43	47	28	18	16
	Tunnel-side		19	31	57	64	64	61	48	33
	Ambient-side	East/west	12	19	36	43	47	28	18	16
	Tunnel-side		24	41	82	89	84	86	68	45

Table notes:

1 Silencers will be sized so that regenerated noise is negligible compared to the actual noise level
2 Ambient side refers to attenuators located between the fan and the ventilation station emission point
3 Tunnel side refers to attenuators located between the fan and the tunnel. This is to control noise within the tunnel and thus noise emission from the portal
4 In the absence of custom-built attenuator data, attenuator octave band insertion loss is based on extrapolation of readily-available attenuator data.

[5] ASHRAE Handbook – HVAC Applications (2019), Chapter 49

A 3D computational model was created in SoundPLAN version 8.0 for each operational scenario. This includes portal dimensions and ventilation building heights, and elevation contours associated with the Project's groundworks. Noise impacts including the mitigation measures in Table 6.3 are presented in Table 6.4.

Table 6.4 Predicted noise level at the closest noise sensitive receptor with mitigation (attenuators) included

Scenario	Receptor location with respect to the tunnel		External noise criterion	Predicted noise level	External noise criterion	Predicted noise level
			$L_{Aeq,1hr}$, dB(A)		$L_{A10,1hr}$, dB(A)	
Purging	Eastern tunnel portal	Residential	37	19	47	24
		Commercial	52	16	No L_{A10} criteria applicable to commercial buildings	
	Intermediate	Residential	37	36	47	42
		Commercial	52	39	No L_{A10} criteria applicable to commercial buildings	
		Medical	37	31	No L_{A10} criteria applicable to hospitals	
	Western tunnel portal	Residential	37	21	47	24
Maintenance	Eastern tunnel portal	Residential	37	16	47	16
		Commercial	52	13	No L_{A10} criteria applicable to commercial buildings	
	Intermediate	Residential	37	33	47	33
		Commercial	52	35	No L_{A10} criteria applicable to commercial buildings	
		Medical	37	27	No L_{A10} criteria applicable to hospitals	
	Western tunnel portal	Residential	37	19	47	19
Emergency	Eastern tunnel portal	Residential	37	24	47	24
		Commercial	52	27	No L_{A10} criteria applicable to commercial buildings	
	Intermediate	Residential	37	27	47	27
		Commercial	52	31	No L_{A10} criteria applicable to commercial buildings	
		Medical	37	21	No L_{A10} criteria applicable to hospitals	
	Western tunnel portal	Residential	37	32	47	32

With the mitigation proposed, it is predicted that the EPP (Noise) acoustic quality objectives will be met at all noise sensitive receptors. It should be stated that the above mitigation is indicative, and other mitigation options will be explored during detailed design, such as;

- Installation of acoustic louvres on the ventilation station façade
- Internal acoustic lining within the tunnel and/or ventilation system
- Use of quieter plant equipment, including the "best technology available".

Once fans are selected, if the sound power levels differ from those in Table 6.2, then mitigation will be reassessed. Selected fans will need to be free of tonality, and if not, a tonality penalty will be applied, and mitigation revised.

Ancillary fixed infrastructure noise sources other than tunnel ventilation fans, such as pumps and transformers, will be located at the eastern and western tunnel portals for the Project. While noise from these sources are not yet known, nominal mitigation strategies (such as attenuators, solid barriers, enclosures etc) are expected to be implemented as part of the final design in such that operational fixed infrastructure noise impacts meet the EPP (Noise) acoustic quality objectives at noise sensitive receptors.

6.2 Operational road traffic noise assessment

A desktop assessment has been implemented to assess the road traffic noise impacts from the operation of roads changed as part of the Project. The required setback distance in metres from the road to comply with the relevant CoP Vol 1 criterion has been calculated for each road. The quantity of sensitive receptors that are within this setback distance and predicted to exceed the criteria are included in Table 6.5. The assessment year used for these predictions is 10 years after opening.

Table 6.5 Predicted operational road traffic noise

Road name	Posted speed (km/h)	CoP Vol 1 Category	Criterion $L_{A10\ (18h)}$ (dB(A))	Surface	AADT[1] 2037[2]	Predicted L_{A10} at nearest receptor in 2037 (dB(A))	Approximate chainage (km)	Minimum setback distance (m)[3]	Number of sensitive receptors within setback distance
Ganzer Road	80	New road	60	Unsealed	331	56	1.80	22	0
Morris Road	60	New road	60	Unsealed	787	62	1.80	54	3
Gowrie Junction Road	60	New road	60	Sealed	5,934	69	2.00	158	18
Old Homebush Road	60	New road	60	Sealed	1,120	57	2.20	50	0
East Paulsens Road	60	Existing road	68	Unsealed	1,143	59	2.40	9	0
Jones Road	60	New road	60	Unsealed	408	49	11.20	41	0
McNamaras Road	40	New road	60	Sealed	1,143	48	15.40	43	0
Cattos Road	50	Existing road	68	Unsealed	836	57	24.80	6	0

Table notes:

1 AADT = Annual Average Daily Traffic
2 2037 Annual Average Daily Traffic estimated based on annual growth factor of 2% from 2017 traffic volumes.
3 Minimum setback distance is based on distance to achieve the criteria for road traffic noise levels for proposed new roads of 60 $L_{A10\ (18h)}$.

The new roads, Morris Road and Gowrie Junction Road will result in exceedance of the 60 $L_{A10\ (18hr)}$ road traffic noise criteria for new roads. Predicted road traffic noise impacts from these road segments will be assessed during detailed design to confirm these exceedances and identify mitigation where necessary. Measures to mitigate operational road traffic noise impacts are proposed in Section 8.1.2.

The receptors which fall within the setback distances from Gowrie Junction Road and Morris Road are listed in Table 6.6 and Appendix B.

Table 6.6 Sensitive receptors impacted by operational road traffic noise

Road name	Morris Road	Gowrie Junction Road
Sensitive receptors within setback distance	RES0271	RES0283
	RES0277	RES0271
	RES0345	RES0282
		RES0285
		RES0277
		RES0289
		RES0291
		RES0288
		RES0295
		RES0302
		RES0315
		RES0305
		RES0290
		RES0330
		RES0326
		RES0310
		RES0264
		RET0001

7 Cumulative impacts

Table 7.1 details other projects which may be constructed simultaneously with the Project and close enough to contribute to cumulative noise levels at sensitive receptors potentially affected by the Project. Other projects identified and assessed in the EIS Chapter 22: Cumulative impacts have not been considered for noise and vibration due to their distances from the Project.

Table 7.1 Summary of cumulative impacts to be addressed

Project and Proponent	Location	Description	Project status	Relationship to G2H
NSW/QLD Border to Gowrie (B2G) – Inland Rail (ARTC)	Rail alignment from NSW/QLD Border to Gowrie	216.2 km single-track freight railway	Draft EIS being prepared by ARTC	Potential overlap of construction of B2G and construction of the Project
Helidon to Calvert (H2C) – Inland Rail (ARTC)	Rail alignment from Helidon to Calvert	47 km single-track dual-gauge freight railway	Draft EIS being prepared by ARTC	Potential overlap of construction of the Project and construction of H2C
InterLinkSQ	13 km west of Toowoomba	200 hectares (ha) of new transport, logistics and business hubs. Located on the narrow-gauge regional rail network and interstate network. Located at the junction of the Gore, Warrego and New England Highways.	Currently in development phase	Potential overlap of construction of the Project and construction of InterLinkSQ
Asterion Medicinal Cannabis Facility	Wellcamp, Queensland Adjoins the Project disturbance footprint 1 km south of Toowoomba-Cecil Plains Road	A high-tech medicinal cannabis cultivation, research and manufacturing facility. The project involves construction of a 40 ha glasshouse to produce 20,000 plants per day at full capacity. Medicinal-grade cannabis grown at the facility will be manufactured into a range of medicinal products, including single patient packs, cannabis oils, gels, salts and related products, destined solely for the medicinal market. This facility is anticipated to be the largest facility of its kind in the world.	Under construction	There may be a brief overlap in 2021 between the conclusion of construction for the Asterion Medicinal Cannabis Facility and the commencement of early works activities for the Project

Simultaneous noise from construction works of B2G or H2C sections of the Inland Rail Program has the potential to increase noise levels at nearby noise sensitive receptors also impacted by construction noise associated with the Project. The likelihood of cumulative impacts from other sections of the Inland Rail Program are reduced by the linear progression of construction along the alignments. The current modelling methodology however already simulates simultaneous construction works, by assuming that as a worst-case all activities could occur at any time within a defined area, including up to the Project boundary with B2G and H2C. In reality, construction crews for both projects would not be able to work as close as what was modelled if both projects were constructed at the same time in close proximity. As a result, the noise levels due to cumulative impacts are not expected to significantly increase the predicted levels at sensitive receptors.

Simultaneous noise from construction works of InterLinkSQ has the potential to increase noise levels at a limited number of sensitive receptors. InterLinkSQ is located south of and adjacent to the Project at the tie-in to B2G at Charlton. It is anticipated that the Project and InterLinkSQ will utilise similar construction equipment and produce construction noise emissions of similar intensity. In the case of simultaneous works, the worst-case construction noise impacts at sensitive receptors to the south of InterLinkSQ are expected to be dominated by InterLinkSQ noise emissions. Noise impacts of Project construction at these receptors is predicted to be low. If simultaneous construction works occur, residential sensitive receptors to the west of Gowrie have the potential to be impacted by construction noise from both projects. In this instance, the maximum increase in worst-case construction noise impacts above those predicted in Section 5.5.1 is 3 dB(A). Such an increase is not expected to significantly increase the number or magnitude of exceedances of the CoP Vol 2 criteria. It should be noted that the predicted construction noise impacts at most of these residential receptors is below the CoP Vol 2 criteria. It is proposed that these cumulative impacts will be managed through:

- Informing nearby receptors of potential construction noise impacts
- Minimising the construction works which occur outside CoP Vol 2 standard hours (refer Table 4.2)
- Consultation with InterLinkSQ, to minimise the overlap of construction works and to maximise separation distances between cumulative construction works.

Concurrent construction of the Asterion Medicinal Cannabis Facility and the Project is expected to be brief and is unlikely to result in construction noise impacts at sensitive receptors significantly greater than those predicted to result from either project in isolation. Project construction noise impacts during earthworks are predicted to be up to 7 dB(A) greater than those during earlier project works such as site setup. The scenario in which cumulative impacts increase early works noise impacts by, at worst, 3 dB(A) results in noise levels 4 dB(A) less than those predicted during earthworks of the Project alone.

The cumulative impact of noise is to be managed as far as possible through the Noise and Vibration Management Sub-plan to ensure that the potential for adverse impacts at sensitive receptors is minimised. In addition, any overlap of construction works is likely to be for a limited period due to the linear nature of rail project construction.

8 Mitigation measures

8.1 Initial mitigation

8.1.1 Construction noise and vibration initial mitigation

The construction noise and vibration mitigation measures listed in Table 8.1 have been applied prior to the prediction of construction noise and vibration impacts detailed in Section 5.5.

Table 8.1 Initial construction noise and vibration mitigation measures

Action	Mitigation measure
Project design	The Project has been designed with the aim of achieving construction noise and vibration criteria adapted from the CoP Vol 2 and summarised in Section 4.
	The design of the Lockyer Creek viaduct has been undertaken to ensure there are no supporting structures or piers with the Roma Brisbane Gas Pipeline easement.
Construction noise and vibration assessment	Where it is found that standard mitigation measures are not sufficient to reduce noise and vibration impacts to acceptable levels, additional mitigation measures have been investigated.
Communication	Local residents/stakeholders will be provided with sufficient information to enable them to better understand the likely nature, extent and duration of noise and vibration impacts during construction.
	The ARTC Community Engagement Team or service provider will provide a community liaison phone number and permanent site contact so that noise and/or vibration related complaints or inquiries can be received and addressed in a timely manner.

8.1.2 Operational noise and vibration initial mitigation

The mitigation measures and controls presented in Table 8.2 have been factored into the design for the Project. They have been applied prior to the prediction of operational noise and vibration impacts detailed in Section 6.1.2.

Table 8.2 Operational noise initial mitigation measures

Aspect	Mitigation measure
Project design	The Project will be designed and constructed with the aim of achieving the operational noise criteria adopted from the CoP Vol 1 in the case of operational road traffic noise and acoustic quality objectives adopted from EPP (Noise). Indicative mitigation for ventilation systems have been included as part of the Project design to achieve the EPP (Noise) acoustic quality objectives at all sensitive receptors.
Operational noise assessment	Where it is found that standard mitigation measures are not sufficient to reduce operational noise impacts to acceptable levels, additional mitigation measures will be investigated and implemented, where practicable.
Communication	Local residents/stakeholders will be provided with sufficient information to enable them to better understand the likely nature, extent and duration of operational noise impacts during construction.
	The ARTC Community Engagement Team or service provider will provide a community liaison phone number and permanent site contact so that noise related complaints or inquiries can be received and addressed in a timely manner.

8.2 Impact assessment

As detailed in Section 5.5, construction noise and vibration impacts are expected to exceed the limits established in Section 4. To mitigate the predicted construction noise and vibration impacts, the additional construction mitigation measures in Table 8.3 are proposed. Specific construction noise and vibration mitigation measures and associated residual impacts are to be determined during detailed design.

The operational road traffic assessment in Section 6.1 predicts that the following two roads near Gowrie are expected to exceed the operational road traffic criteria for roads specified by the CoP Vol 1 and listed in Section 4.4.1.

These segments are not close to built-up areas with many noise sensitive receptors. As such, noise barriers constructed to mitigate operational road traffic noise impacts are likely to be impractical and unreasonable. However, this conclusion will be reviewed during the detailed design of the Project. Mitigation measures in Table 8.3 are proposed to mitigate noise impacts from:

- Gowrie Junction Road
- Morris Road.

With the application of the silencers described in Section 6.1.2, no operational fixed infrastructure noise impacts are expected to exceed the EPP (Noise) acoustic quality objectives. These silencers are indicative mitigation measures, and other mitigation options will be explored, such as:

- Installation of acoustic louvres on the ventilation station façade
- Internal acoustic lining within the tunnel and/or ventilation system
- Use of quieter plant equipment.
- Selection of mitigation measures will be confirmed during detailed design, once fan selections have been made.

Table 8.3 Proposed construction noise and vibration mitigation measures

Delivery phase	Potential impacts	Mitigation and management measures
Detailed design	Noise and vibration impacts on sensitive receptors	Update the construction noise and vibration assessment to reflect the construction service providers location of construction sites, construction activities and construction scheduling to inform the development of the Noise and Vibration Management Sub-plan to achieve the performance criteria. Consultation with APA to confirm design and construction methodology across the Roma Brisbane Gas Pipeline and the required interaction treatment options. This includes additional ground-borne vibration modelling for the Toowoomba Range tunnel and the TBM operations to confirm whether vibratory monitoring or a coating survey is required, workshopping the design and construction across the pipeline east of the eastern tunnel portal, external spanning the gas pipeline easement east of Lockyer Creek sufficiently mitigates the possibility of pipeline external loading (e.g. bored or cast in situ piles) and use of protection slabs and road crossings as per relevant standards. Similar works may also be undertaken for other public utility providers including TRC rising sewer main and the Wetalla Water Pipeline.
	Operational road traffic noise impacts on sensitive receptors	The following mitigation measures will be considered as part of detailed design where operational road traffic noise impacts are predicted to exceed the appropriate CoP Vol 1 road traffic noise limit based on the detailed design: ■ Realignment of road segments impacting nearby sensitive receptors ■ Pavement surface treatment ■ Provision of acoustic façade treatments to affected sensitive receptors ■ Noise barriers in the form of a landscaped earth mound and/or a noise fence.
	Operational fixed infrastructure noise impacts on sensitive receptors	Safety systems such as door alarms have not been assessed as operational fixed infrastructure but should be fit for purpose and meet safety system requirements. Where possible, the contractor will select systems with the aim of achieving the EPP (Noise) 35 dB(A) $L_{Aeq,\ 1\ hr}$ acoustic quality objective at all sensitive receptors
Pre-construction	Noise and vibration impacts on sensitive receptors	Develop and implement the Noise and Vibration Sub-plan. The Noise and Vibration Management Sub-plan will include: ■ Location of sensitive receptors in proximity to the disturbance footprint ■ Requirements for pre-construction dilapidation surveys and/or vibration monitoring at vibration sensitive receptors, including heritage receptors and near underground infrastructure, during construction ■ Specific management measures for activities that could exceed the construction noise and vibration criteria at a sensitive receptor ■ Noise and vibration criteria, trigger or alarm levels and distances for above and underground infrastructure ■ Notification process within the community engagement plan (including who to contact in the event of a complaint) to advise of significant works with potential for noise nuisance or vibration at sensitive receptors ■ Noise management measures including controlling noise and vibration at the source, controlling noise and vibration on the source to receptor transmission path and controlling noise and vibration at the sensitive receptor ■ Practicable and reasonable measures to minimise the noise and vibration impacts of construction activities on sensitive receptors ■ Any other measures necessary to comply with conditions of approval or regulatory requirements.

Delivery phase	Potential impacts	Mitigation and management measures
		Where it is found that existing mitigation measures are not sufficient to reduce noise and vibration impacts to acceptable levels, additional mitigation measures will be investigated and implemented. Where construction noise and vibration impacts are unavoidable and predicted to exceed relevant criteria after all reasonable and practicable mitigation measures are implemented, residual impact mitigation should be considered in consultation with the community and affected residents. Residual impact mitigation measures, such as construction respite periods, temporary relocation of affected occupants, and provision of architectural treatments are discussed in Section 8.3.
	Noise and vibration impacts on sensitive receptors from tunnelling	▪ Prior to commencement of tunnelling, site tests are proposed to determine a more representative model of the ground surrounding the tunnel. This will include: – Conducting transfer mobility tests along the alignment during bore-holing or other deep ground intrusive activities to determine site propagation – Conducting vibration monitoring during the TBM launch and during preliminary TBM operations to confirm TBM source vibration levels and propagation characteristics specific to the TBM. ▪ Vibration monitoring and transfer mobility test locations will be nominated in the Noise and Vibration Management Sub-plan. ▪ Results of vibration monitoring and transfer mobility test locations will be used to refine ground-borne noise impact predictions, and will inform where mitigation measures need to be applied. ▪ Residents within at least 390 m of the Toowoomba Range tunnel will be consulted regarding ground-borne noise impacts of the TBM. ▪ Residual impacts of tunnelling, expected at sensitive receptors within a 390 m diagonal distance of the tunnel, are most likely to be managed through temporary relocation of affected residents, as detailed in Section 8.3. ▪ For the small industrial areas in proximity to the Project alignment (including receptors RET0002, IND0009 and RET0004) the owners/tenants will be consulted to identify if any office spaces are on the site. If so, a mitigation plan will be prepared to minimise disruption.
Construction and commissioning	Noise and vibration impacts on sensitive receptors	▪ Sensitive receptors identified in the Noise and Vibration Management Sub-plan, as well as residents within at least 2 km of the Project disturbance footprint and other relevant stakeholders will be provided with sufficient information to enable them to better understand the likely nature, extent and duration of noise and vibration impacts during construction. ▪ Sensitive receptors with the potential to be affected by noise will be notified prior to the commencement of relevant works. ▪ Construction progress and upcoming activities will be regularly communicated to local residents/stakeholders, particularly when noisy or vibration generating activities are planned, such as vibratory compaction and piling. ▪ Implementation of the Social Impact Management Plan. ▪ Additional vibration modelling to assess vibration impacts on Roma Brisbane Gas Pipeline
	Damage to buildings and structures	▪ Building condition/dilapidation surveys will be undertaken for buildings/structures in close proximity to the activities and at vibration sensitive receptors, including buildings of heritage value identified as potentially impacted by the Project during the detailed design phase modelling and assessment. Building surveys will also be undertaken at vibration sensitive receptors which are expected to exceed the structural damage vibration limits given by DIN 4150.3 and recommended by the CoP Vol 2. Surveys will take place prior to commencement and on completion of vibration generating works (such as pile-driving). Following such surveys, more accurate data will be used to assess the impacts to vibration sensitive receptors. ▪ If, during detailed design and construction methodology assessments, vibration impacts are predicted to exceed the criteria at a heritage sensitive receptor, the following mitigation will be undertaken: – Consultation with the owner of the structure to determine the sensitivity of the structure to construction vibration. A more appropriate criteria to apply at the location may be agreed upon as a result

Delivery phase	Potential impacts	Mitigation and management measures
		– Baseline vibration monitoring will be undertaken prior to the activity commencing and monitored throughout the activity to assess compliance with vibration limits set as part of the sub-plan for the relevant receptor. Vibration monitoring results will be assessed and used to refine vibration predictions and management measures as applicable, such as developing and enforcing exclusion zones around the sensitive structure. ■ Where feasible, the construction methodology will be modified to reduce the predicted vibration impacts. This could include: – Using smaller equipment, such as a handheld jackhammer instead of a rockbreaker – Changing the construction methodology.
	Damage to buildings and structures	Construction vibration predictions will be revised following detailed geotechnical investigations and the development of a detailed construction methodology. Predictions will identify sensitive receptors and underground infrastructure with the potential to be exposed to vibration levels exceeding the relevant criteria identified in Section 4.2, and any criteria specific to particular infrastructure adopted through consultation with stakeholders. Vibration monitoring will be undertaken at locations where the potential for building/structural damage risk to sensitive receptors or underground infrastructure has been identified during the detailed design and is warranted. This includes vibration sensitive receptors where vibration impacts are expected to exceed the structural damage criteria recommended by DIN 4150.3 and recommended by the CoP Vol 2. Vibration monitoring will be undertaken by a suitably qualified professional, in accordance with the CoP Vol 2.
	Noise impacts on sensitive receptors	■ Where practicable and reasonable, noise monitoring will be undertaken at noise sensitive receptors where the potential for noise impacts to exceed relevant criteria has been identified. ■ Noise and/or vibration monitoring will also be undertaken in response to noise or vibration complaints.
	Noise impacts on sensitive receptors – hours of work	■ Construction works will be undertaken in accordance with the nominated hours of work within the Noise and Vibration Management Sub-plan and as per community consultation with sensitive receptors regarding permitted out of hours activities. ■ Where feasible, construction works will be undertaken during CoP Vol 2 standard hours, to minimise impacts to nearby sensitive receptors.
	Noise impacts on sensitive receptors – staff	■ Staff training will be undertaken so that unnecessary sources of noise are avoided. Training will direct that: – Unnecessary shouting or loud stereos/radios on site will not be tolerated – Materials are not to be dropped from height – Metal items are not to be thrown – Doors/gates are not to be slammed – Vehicle radios and engines are to be turned off or volume lowered wherever possible.
	Noise and vibration impacts on sensitive receptors – selection of construction equipment near sensitive receptors	■ Quieter and non-vibratory construction equipment will be selected for use near sensitive receptors, where reasonable and practicable. This is particularly important for any non-standard/out of hours construction activities where sensitive receptors are nearby. This is also particularly important for loud and/or vibration-intensive plant such as mulchers and piling rigs. ■ Appropriately sized equipment will be selected for the task, such as vibratory compactors and rock excavation equipment. For example, a 22 t excavator is expected to operate 8 dB(A) quieter than a 40 t excavator, based on equipment noise emissions given by BS5228.1.

Delivery phase	Potential impacts	Mitigation and management measures
	Noise and vibration impacts on sensitive receptors – selection of construction methods near sensitive receptors	Where practicable, alternative construction methods will be adopted to reduce the noise and vibration impacts, such as: ■ Using damped tips on rock-breakers where appropriate ■ Using rock saws instead of blasting ■ During clearing, using excavators with grabs and rake attachments instead of chainsaws ■ Mulching cleared material at locations away from sensitive receptors ■ Avoiding onsite fabrication work where possible ■ Using alternatives to impact pile driving where possible, such as continuous flight auger injected piles, pressed-in preformed piles, auger bored piles, impact bored piles or vibratory piles ■ When piling, avoiding dynamic compaction using large tamping weights near sensitive and critical receptors where possible ■ Reducing energy per blow when piling (consider first whether this may result in prolonged exposure with no realised reduction in community disturbance).
	Noise and vibration impacts on sensitive receptors – blasting	Where blasting impacts are expected to exceed the vibration limits adopted from the CoP Vol 2, the following measures are proposed where practicable: ■ Reducing the charge size by use of delays and reduced charge masses ■ Ensuring adequate blast confinement to minimise the amount of overpressure ■ Avoiding secondary blasting where possible; the use of rock breakers or drop hammers may be an acceptable alternative ■ Avoiding blasting during heavy cloud cover or during strong winds blowing towards sensitive receptors ■ Establishing a blasting timetable through community consultation for example, blasts times negotiated with surrounding sensitive receptors.
	Noise and vibration impacts on sensitive receptors – during hours of construction	■ Where practicable and reasonable, the duration of simultaneous operation of noise or vibration-intensive plant will be minimised. Plant and equipment used intermittently or no longer in use will be throttled or shut down ■ Vibration-intensive stationary plant located near sensitive receptors will be isolated with resilient mounts ■ Noise-emitting plant and equipment, construction compounds laydown areas will be orientated away from sensitive receptors where practicable and reasonable ■ Equipment will be operated in the correct manner and correctly maintained including replacement of engine covers, repair of defective silencing equipment, tightening of rattling components and repair of leakages in compressed air lines. Construction plant, vehicles and machinery will be maintained and operated in accordance with manufacturer's instructions to minimise noise and vibration emissions. ■ When piling, the pile and rig will be carefully aligned, and cable slap and chain clink minimised.
	Noise and vibration impacts on sensitive receptors – mechanical plant management	■ All mechanical plant near sensitive receptors will be modified to reduce noise by best practical means, such as: – Internal combustion engines fitted with a suitable muffler in good repair, operating as per the manufacturer's specifications, as a minimum – Pneumatic tools fitted with an effective silencer on their air exhaust port, where reasonable and practicable – Aggregate bins and chutes lined with a rubber material, to dampen the vibration of the structure – When piling, acoustic damping provided to sheet steel piles to reduce vibration and resonance – When piling, resilient pads used between pile and hammerhead. Care to be taken when selecting a resilient pad as energy is transferred to the pad in the form of heat.

Delivery phase	Potential impacts	Mitigation and management measures
		■ Based on manufacturer data, between 4 and 11 dB(A) of attenuation can be achieved by engine mufflers. Various other equipment treatments such as dozer track plate dampers can provide between 6 and 10 dB(A) of attenuation, based on manufacturer data.
	Noise impacts on sensitive receptors – stationary noise sources	■ Stationary noise sources near noise sensitive receptors will be shielded or enclosed where practicable and reasonable. Acoustic shielding will also be considered where works are expected to occur close to sensitive receptors for lengthy periods. Temporary noise barriers or enclosures can provide between 5 and 10 dB(A) of attenuation, based on preliminary calculations.
	Noise and vibration impacts on sensitive receptors – shielding of noise emitting plant	■ Where feasible, structures and noise-emitting plant will be located such that the structures provide some shielding to any nearby receptors. Structures include: – Temporary site buildings such as sheds – Materials stockpiles, including the spoil stockpile at the western tunnel portal – Fencing – Storage/shipping containers. ■ Attenuation by a single row of standard shipping containers of between 5 and 10 dB(A) is achievable based on preliminary calculations provided that: – Four containers are located side-by-side between the noise source and the sensitive receptor, and 5 metres from the noise source – Gaps are overlaid with mass loaded vinyl. ■ Where vibration impacts at sensitive receptors are expected to exceed the structural damage limits adopted from the CoP Vol 2 and summarised in Section 4.2.2, and where practicable, reasonable and safe to do so, cut-off trenches to interrupt the direct transmission path of vibrations between source and receptors will be provided. Sensitive receptors which are expected to exceed these limits are listed in Appendix E and mapped in Appendix B.
	Noise impacts on sensitive receptors	■ Non-tonal reversing beepers (or an equivalent mechanism) will be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work.
	Noise impacts on sensitive receptors – delivery of materials	■ Site access points and roads will be sited as far as is practicable from sensitive receptors ■ Acoustic shielding will be considered if loading/unloading areas are close to sensitive receptors ■ Delivery vehicles will be fitted with straps rather than chains where feasible ■ Off-site truck parking areas, if required, will be located away from residences and will be nominated where practicable ■ The drop height of materials will be minimised, for example, while loading and unloading vehicles or in storage areas ■ Reversing movements of vehicles will be minimised to reduce the use of reversing alarms. Where practicable, sites are to be designed such that delivery vehicles are able to drive through the site and not be required to reverse.
	Noise impacts on sensitive receptors – construction traffic	■ Where reasonable, unsealed areas will be regularly graded and potholes filled in sealed access roads and hardstand areas to reduce noise from construction vehicles. ■ Where reasonable, construction traffic will be kept to a minimum. For example, trucks will be fully loaded so that the volume of each delivery is maximised. Where practicable, night-time construction traffic will be redirected away from noise sensitive receptors. ■ The speed of construction traffic will be minimised near noise sensitive receptors. ■ Selection of construction traffic routes will consider noise impacts to sensitive receptors

8.3 Residual impact mitigation

Across all construction activities, 64 per cent of exceedances of the upper standard hours noise limit under the CoP Vol 2 are within 10 dB(A) of the limit, as are 68 per cent of exceedances of the evening non-standard hours noise limit. Of the construction noise mitigation measures proposed in Section 8.1, those which can be quantified can be expected to provide between 4 and 11 dB(A) of attenuation. The remaining approximate 46 per cent of exceedances are not expected to be feasibly mitigated to below the appropriate limit by physical attenuation alone. Where further mitigation is also similarly unreasonable or impractical, residual exceedances will be considered in consultation with the community and affected residents.

Specific management of residual impacts will be determined during detailed design and included within the Noise and Vibration Management Sub-plan. As with the application of mitigation, management of residual impacts will be considered in consultation with affected occupants.

Residual exceedances can be expected where noise and vibration impacts are unavoidable and above relevant criteria after all reasonable and practicable mitigation measures are implemented. Currently these residual impacts would be addressed through respite, temporary relocation of affected occupants and the provision of architectural treatments.

Respite periods involve scheduling work periods when people are least affected, such as by:

- Scheduling work for when premises are not in operation or occupied
- Restricting the works to occur within standard hours as defined by CoP Vol 2
- Restricting the number of nights per week that works are undertaken near sensitive receptors.

Temporary relocation involves the voluntary relocation of impacted occupants for short periods of time where all reasonable and practicable measures and respite periods are implemented and further mitigation is impractical. Examples of temporary relocation may involve the offer of an alternative activity or accommodation.

Architectural treatments may involve the provision of alternative ventilation where the windows are to remain closed. However, the performance of the building envelope may be limited by specific elements (for example, windows and doors) and architectural treatments would primarily focus on those elements.

Residual impacts are reduced for construction activities as these are not permanent sources and will cease once nearby construction is complete.

Operational noise impacts will persist and will be mitigated in accordance with relevant legislation and policy to meet the relevant criteria. Residual operational noise levels may result in minor increases in background noise levels for a limited number of receptors and are considered acceptable.

9 Conclusion

9.1 Construction noise

A construction noise impact assessment has been carried out in accordance with the CoP Vol 2 and the ToR. Reasonable worst-case construction scenarios have been assessed for each of the main construction activities.

The assessment of noise associated with the construction of the Project indicates exceedances of both the lower and upper external noise limits within the noise and vibration study area. The number of exceedances varies with the time of day and the construction activity. The greatest construction noise impact is that of earthworks occurring during non-standard hours, which is predicted to result in 2131 exceedances at sensitive receptors within the noise and vibration study area. The magnitude and number of exceedances are detailed in Section 5.5.

The earthworks and rail civil works construction activities are predicted to have the greatest impact from construction noise, however, other construction activities may have greater overall impact depending on actual timing and duration of each construction stage.

Prior to relevant works commencing, a Noise and Vibration Management Sub-plan will be developed (as detailed in the draft Outline EMP) as part of the CEMP, developed in response to detailed construction planning and detailed design. Where it is predicted that noise or vibration impacts will exceed noise and vibration criteria, then practicable and reasonable mitigation measures will be developed in consultation with adversely affected sensitive receptors.

The final number, degree and nature of these measures would be selected by the construction contractor and be largely dependent on the construction strategy and work carried out.

9.1.1 Construction road traffic noise

The CoP Vol 2 specifies that construction traffic should not increase the pre-construction traffic noise level by more than 3 dB(A). The maximum predicted increase in noise level from five roads is greater than this criterion. Details of these exceedances are given in Section 5.5.2. These roads are primarily in rural locations and the existing base traffic volumes quantities are low. As such the initial airborne road traffic noise levels are low before the addition of construction traffic. Relevant mitigation measures outlined in Section 8.1.2 will be applied to these five roads expected to exceed the criteria.

9.2 Construction vibration

Minimum working distances for vibration intensive construction work have been predicted for human comfort and structural damage limits in Section 5.5.3, including for heritage structures. Exceedances of the construction vibration criteria adopted from CoP Vol 2 have been predicted at up to 175 vibration sensitive receptors. Specific measures to mitigate these vibration impacts have been outlined in Section 8.1.2.

9.3 Blasting

Maximum blasting charge masses based on indicative setback distances of sensitive structures and heritage buildings are presented in Section 5.5.4, including heritage structures. This type of assessment has been completed in the absence of detailed information surrounding the blasting works required as part of the Project. Additional assessments incorporating site conditions will be completed during future stages of the Project to ensure safe charge mass amounts are used. Measures to mitigate these impacts of blasting are detailed in Section 8.1.2.

9.4 Operational road traffic noise

A desktop assessment of road traffic noise impacts from road segments changed by the Project was undertaken to predict the potential noise impacts associated with each road alteration. These roads were assessed against relevant criteria from the CoP Vol 1. The desktop assessment considered the increase in traffic flows and relative distance to the nearest sensitive receptors for each road. Influence from other dominant noise sources has not been considered.

Two roads near Gowrie Junction which are categorised under the CoP Vol 1 as new roads are predicted to exceed the appropriate operational road traffic noise criterion, as shown in Section 6.1. Measures to mitigate the noise impacts of these road sections are detailed in Section 8.

9.5 Operational fixed infrastructure noise

An assessment of the noise impacts of operational fixed infrastructure such as the tunnel ventilation system has been carried out. Impacts were assessed against the EPP (Noise) acoustic quality objectives at nearby sensitive receptors.

Attenuation of the tunnel ventilation plant has been included in the design of the tunnel to meet the acoustic quality objectives at all noise sensitive receptors during all ventilation operational scenarios Nominal mitigation strategies (such as attenuators, solid barriers, enclosures etc.) would typically be implemented, and if required, will be designed to meet appropriate noise level emissions.

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APPENDIX

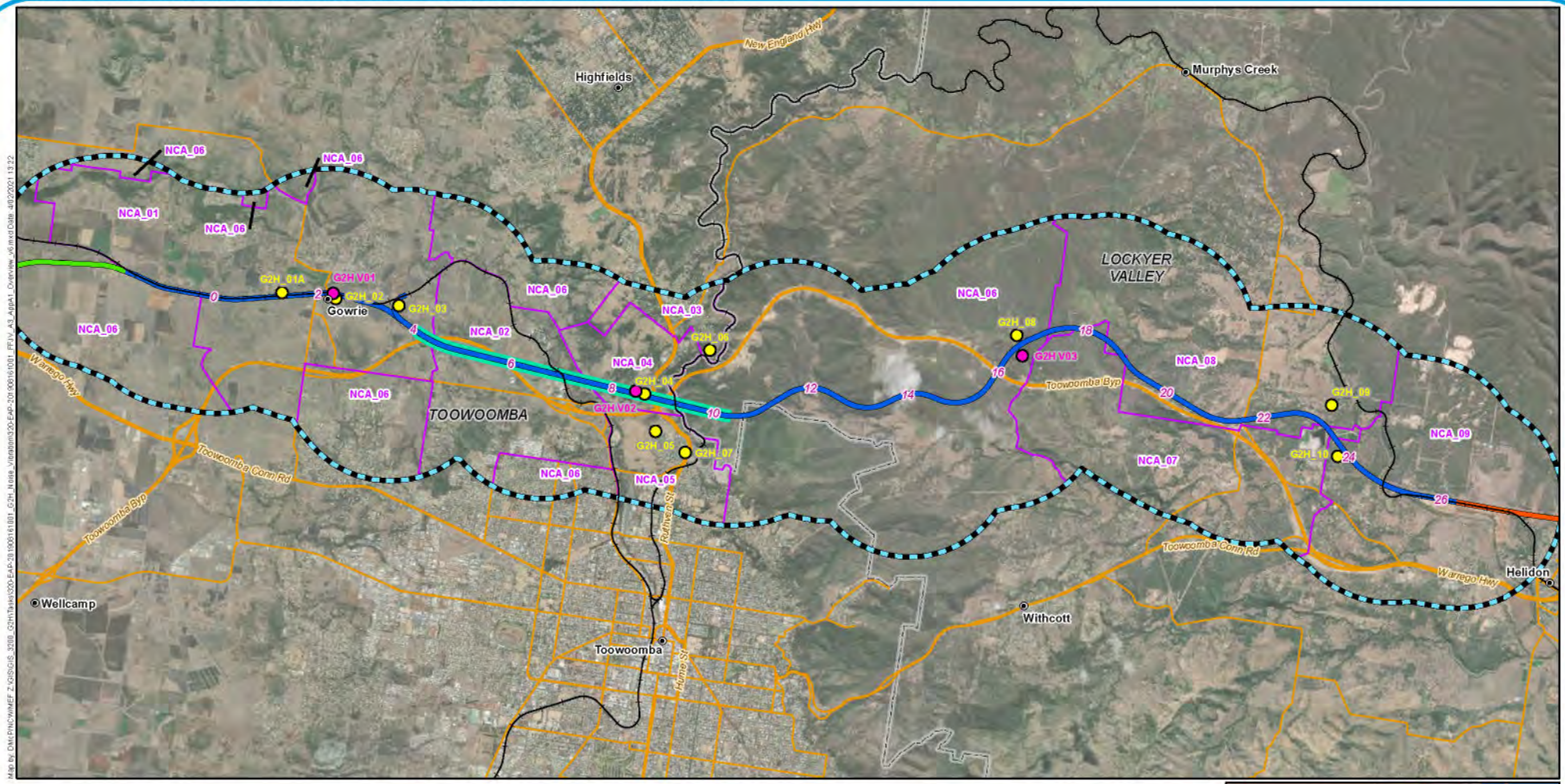
0

Construction Noise and Vibration

Appendix A Site overview

GOWRIE TO HELIDON ENVIRONMENTAL IMPACT STATEMENT

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Legend

- 5 Chainage (km)
- Localities
- Vibration monitoring locations
- Noise monitoring locations
- Noise and vibration study area
- NCA
- B2G project alignment
- G2H project alignment
- H2C project alignment
- Existing rail
- Tunnel
- Major roads
- Minor roads
- Local Government Areas

A3 scale: 1:80,000

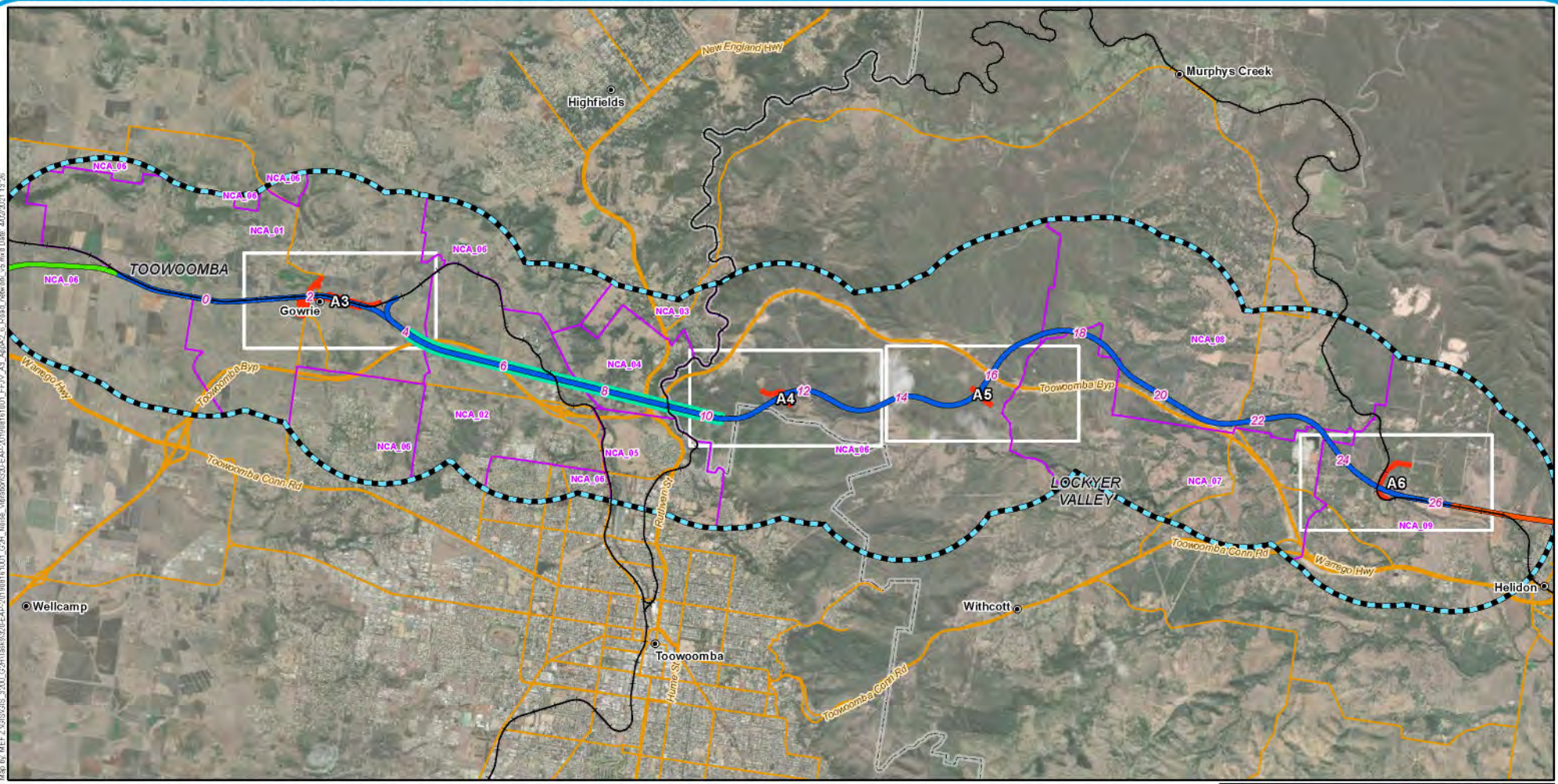
0 0.6 1.2 1.8 2.4 3km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 4/02/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix A1: Site overview

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Legend

- 5 Chainage (km)
- Localities
- Noise and vibration study area
- NCA
- B2G project alignment
- G2H project alignment
- H2C project alignment
- Existing rail
- Tunnel
- Major roads
- Minor roads
- Proposed road design
- Local Government Areas

A3 scale: 1:80,000

0 0.6 1.2 1.8 2.4 3km

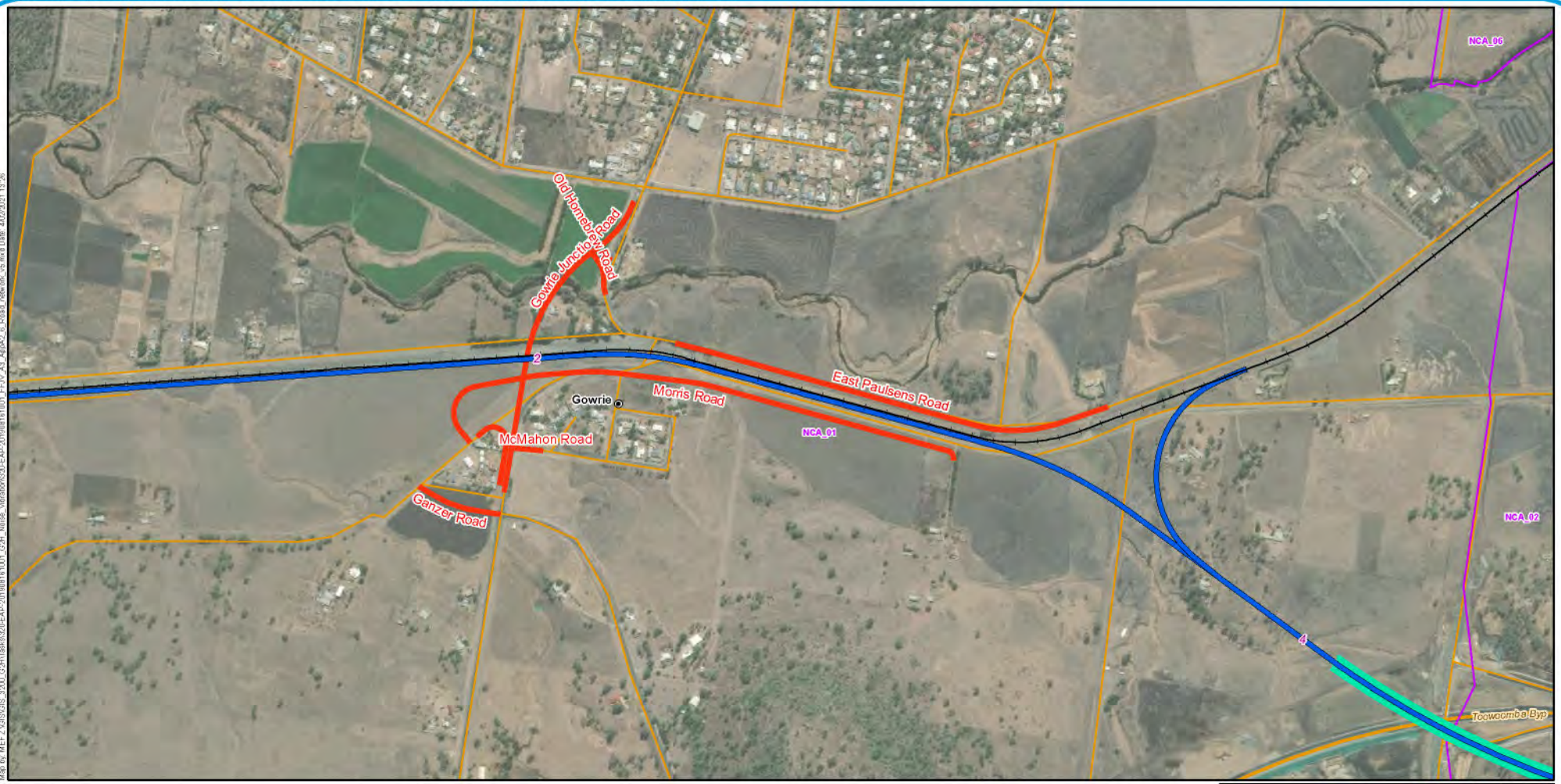
Future Freight
Integrating Community, Environment and Engineering

Issue date: 4/02/2021 Version: 5
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix A2: Road network changes overview

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Legend

- 5 Chainage (km)
- Localities
- Noise and vibration study area
- NCA
- G2H project alignment
- Existing rail
- Tunnel
- Major roads
- Minor roads
- Proposed road design

A3 scale: 1:10,000

0 0.07 0.14 0.21 0.28 0.35km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 4/02/2021 Version: 5
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix A3: Road network changes overview

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Map by: MEFZ:\GIS\GIS_3200_G2H\Tasks\3200-EAP-20190816-1001_G2H_Noise_Vibration\3200-EAP-20190816-1001_FFJV_A3_Appx2_6_Road_network_v5.mxd Date: 4/02/2021 13:26

Legend

- 5 Chainage (km)
- Localities
- Noise and vibration study area
- NCA
- G2H project alignment
- Existing rail
- Tunnel
- Major roads
- Minor roads
- Proposed road design

A3 scale: 1:10,000

0 0.07 0.14 0.21 0.28 0.35km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 4/02/2021 Version: 5
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix A4: Road network changes overview

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Map by: MEF Z:\GIS\GIS_3200_G2H\Tasks\3201-EAP-20190816 1001_G2H_Noise_Vibration\3201-EAP-20190816 1001_FFJV_A3_Appx2_6_Road_network_v5.mxd Date: 4/02/2021 13:26

Legend

- 5 Chainage (km)
- Localities
- Noise and vibration study area
- NCA
- G2H project alignment
- Tunnel
- Major roads
- Minor roads
- Proposed road design

A3 scale: 1:10,000

0 0.07 0.14 0.21 0.28 0.35km

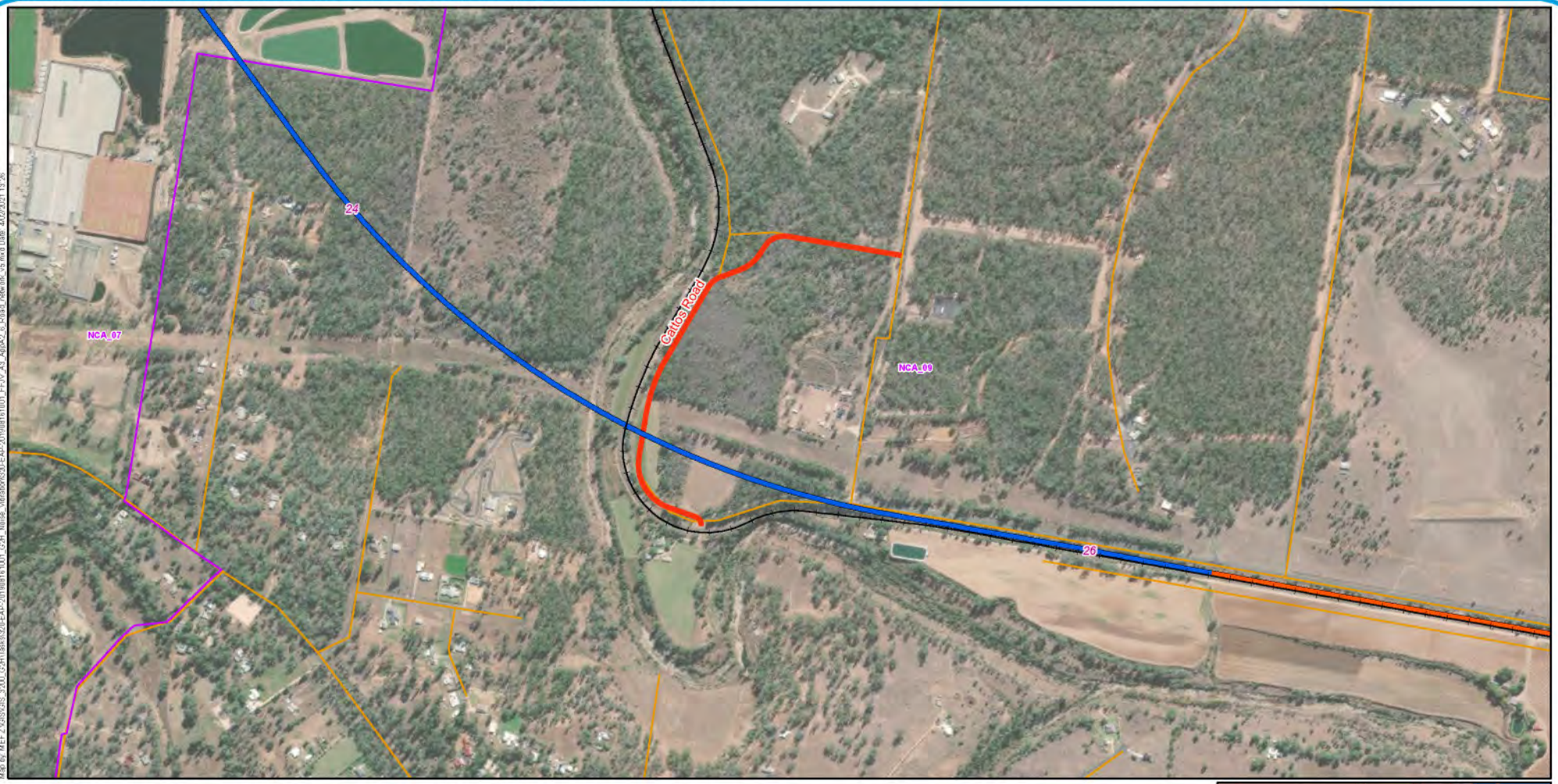
Future Freight
Integrating Community, Environment and Engineering

Issue date: 4/02/2021 Version: 5
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix A5: Road network changes overview

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Legend

- 5 Chainage (km)
- Localities
- Noise and vibration study area
- NCA
- G2H project alignment
- H2C project alignment
- Existing rail
- Tunnel
- Major roads
- Minor roads
- Proposed road design

A3 scale: 1:10,000

0 0.07 0.14 0.21 0.28 0.35km

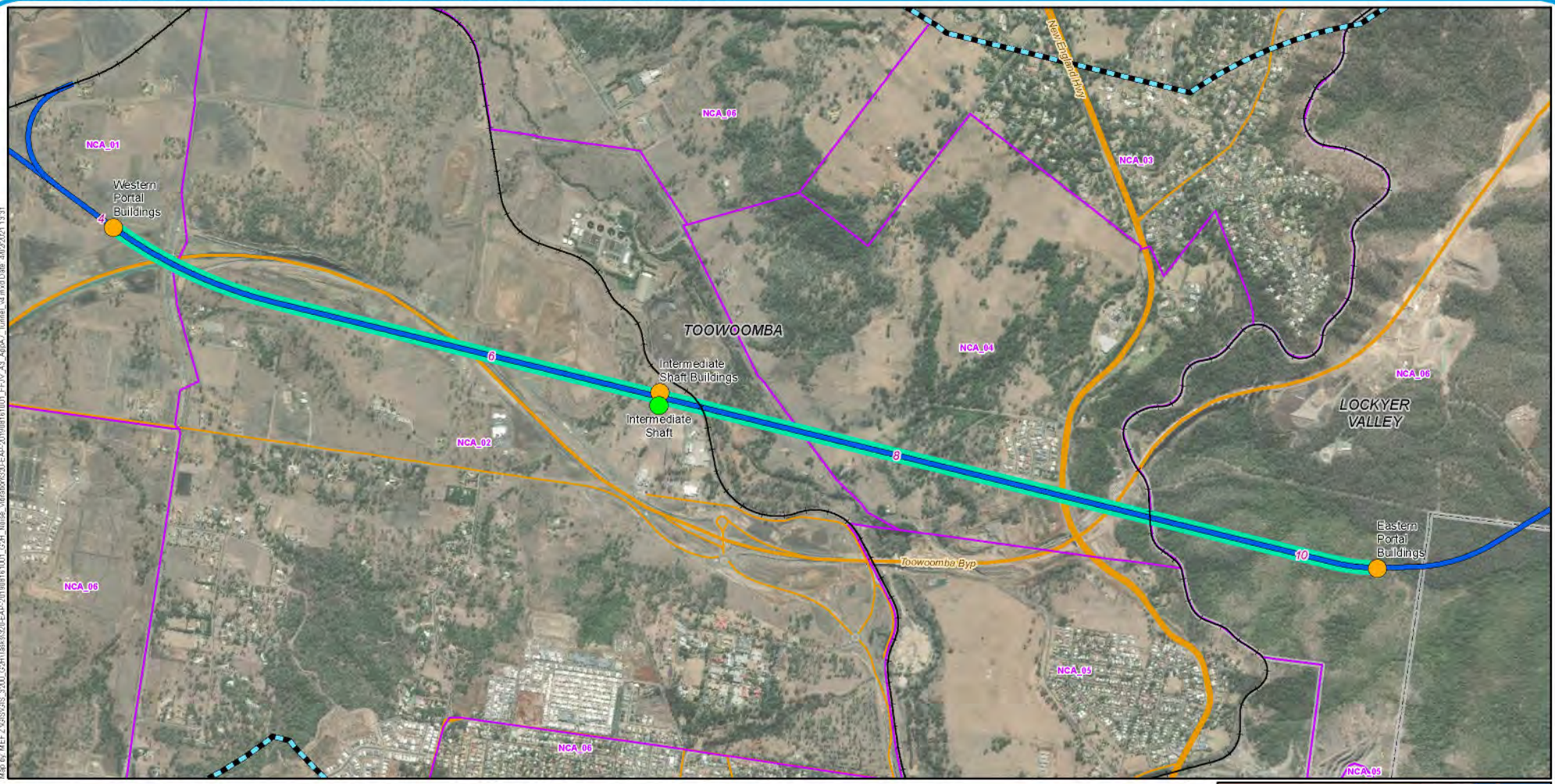
Future Freight
Integrating Community, Environment and Engineering

Issue date: 4/02/2021 Version: 5
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix A6: Road network changes overview

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Legend

- 5 Chainage (km)
- Localities
- Noise and vibration study area
- NCA
- G2H project alignment
- Existing rail
- Intermediate ventilation shaft
- Buildings
- Tunnel
- Major roads
- Minor roads
- Local Government Areas

A3 scale: 1:20,000

0 0.15 0.3 0.45 0.6 0.75km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 4/02/2021 Version: 4
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix A7: Tunnel overview

APPENDIX

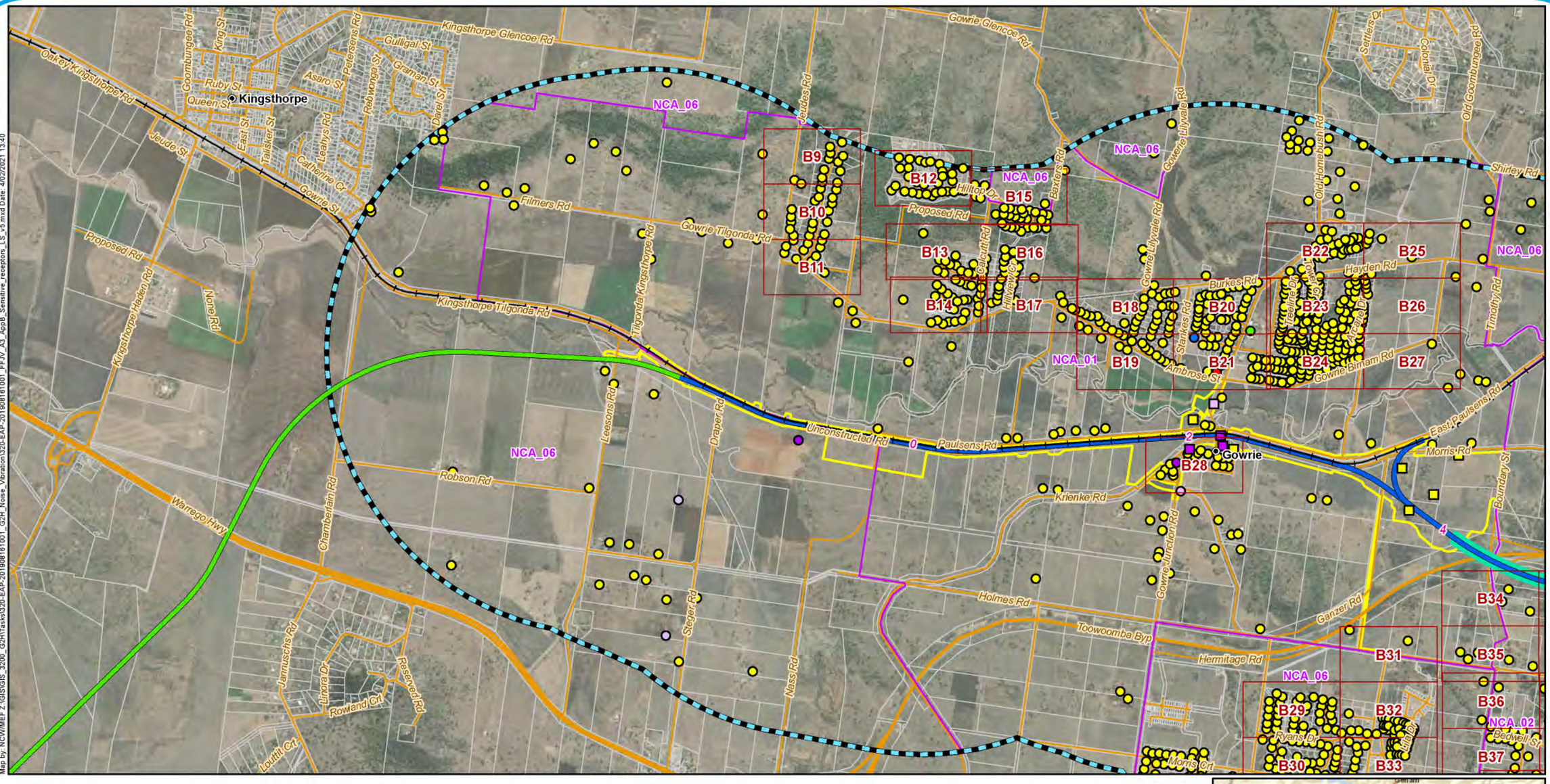
O

Construction Noise and Vibration

Appendix B Noise and vibration sensitive receptors

GOWRIE TO HELIDON ENVIRONMENTAL IMPACT STATEMENT

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Map by: NCW/MEF Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\1001_G2H_Noise_Vibration\320-EAP-20190816\1001_FFJV_A3_AppB_Sensitive_receptors_LS_v5.mxd Date: 4/02/2021 13:40

Legend

- 5 Chainage (km)
- Localities
- B2G project alignment
- G2H project alignment
- Existing rail
- Tunnel
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre
- Areas mapped seperately

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:30,000
0 0.2 0.4 0.6 0.8 1km

Future Freight
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Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B1: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816001_G2H_Noise_Vibration\320-EAP-20190816001_FFJV_A3_AppB_Sensitive_receptors_LS_v5.mxd Date: 4/02/2021 13:40

Legend

- 5 Chainage (km)
- Localities
- G2H project alignment
- Existing rail
- Tunnel
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre
- Areas mapped seperately

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:30,000
0 0.2 0.4 0.6 0.8 1km

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Integrating Community, Environment and Engineering

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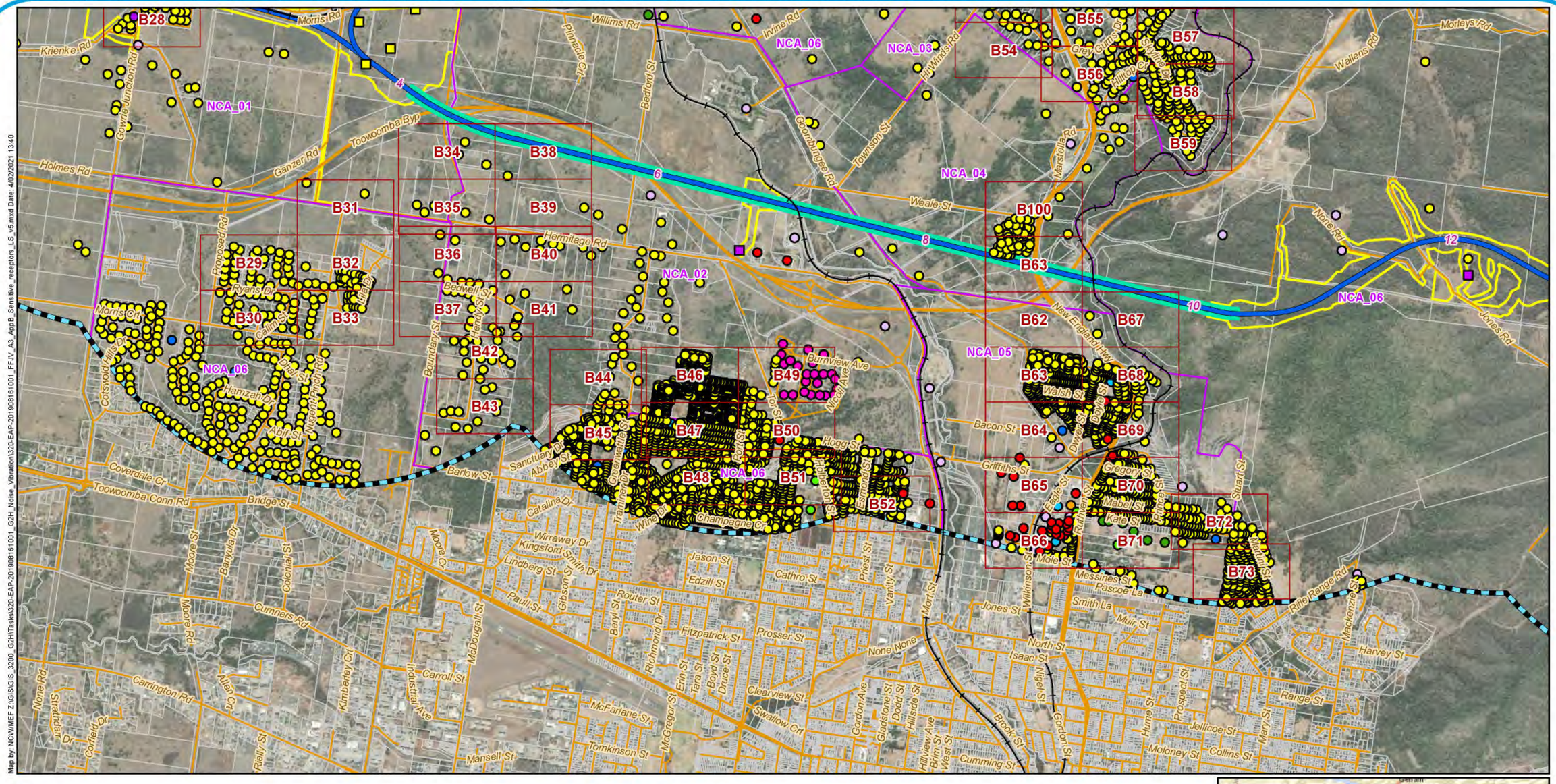
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B2: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Map by: NCW/MEF Z:\GIS\GIS_3200_G2HTasks\320-EAP-20190816101_G2H_Noise_Vibration\320-EAP-20190816101_FFJV_A3_AppB_Sensitive_receptors_LS_v5.mxd Date: 4/02/2021 13:40

Legend

- 5 Chainage (km)
- Localities
- G2H project alignment
- Existing rail
- Tunnel
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre
- Areas mapped seperately

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:30,000
0 0.2 0.4 0.6 0.8 1km

Future Freight
Integrating Community, Environment and Engineering

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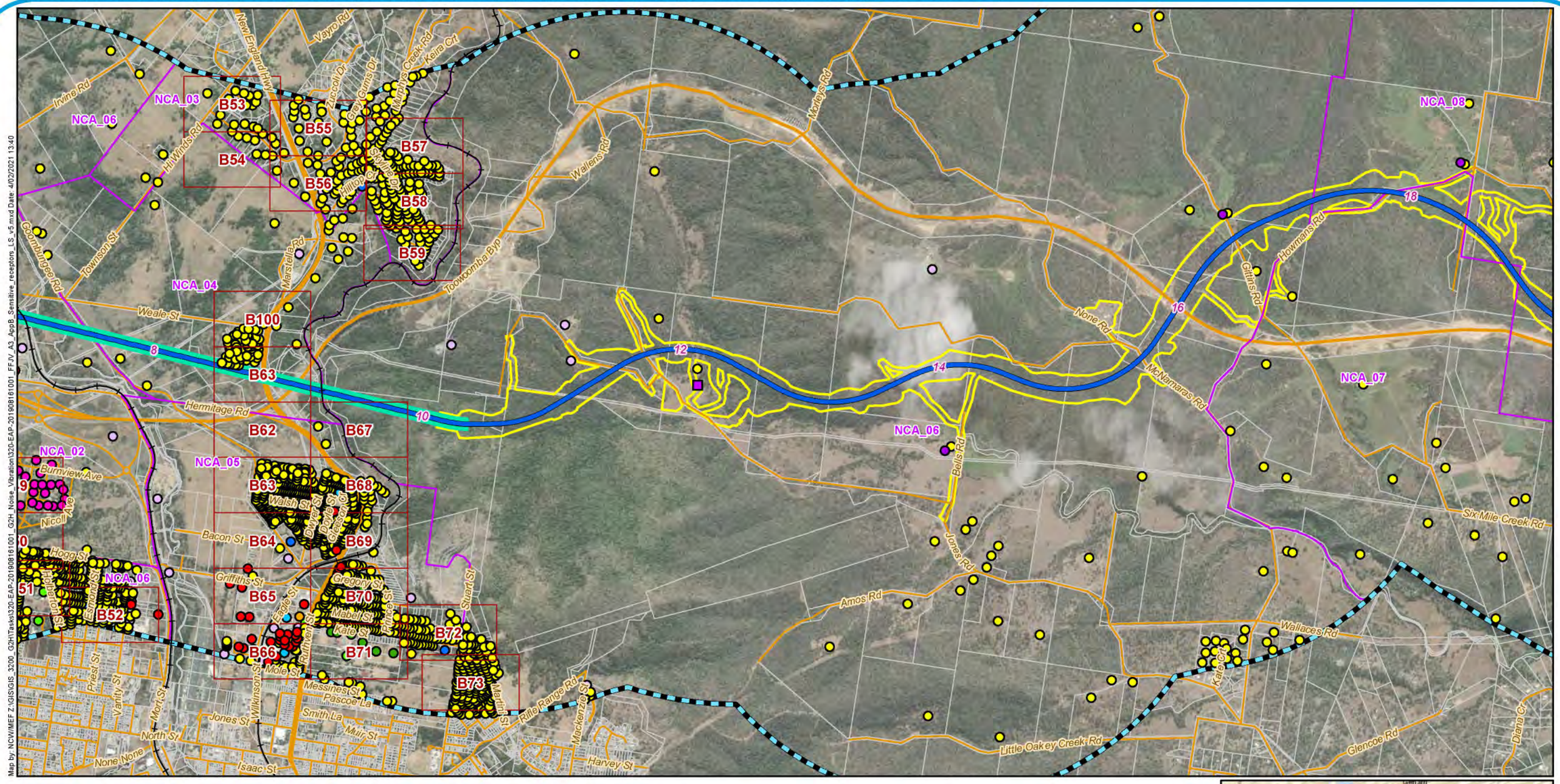
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B3: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Map by: NCW/MEF Z:\GIS\GIS_3200_G2HTasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_LS_v5.mxd Date: 4/02/2021 13:40

Legend

- 5 Chainage (km)
- Localities
- G2H project alignment
- Existing rail
- Tunnel
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre
- Areas mapped seperately

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:30,000
0 0.2 0.4 0.6 0.8 1km

Future Freight
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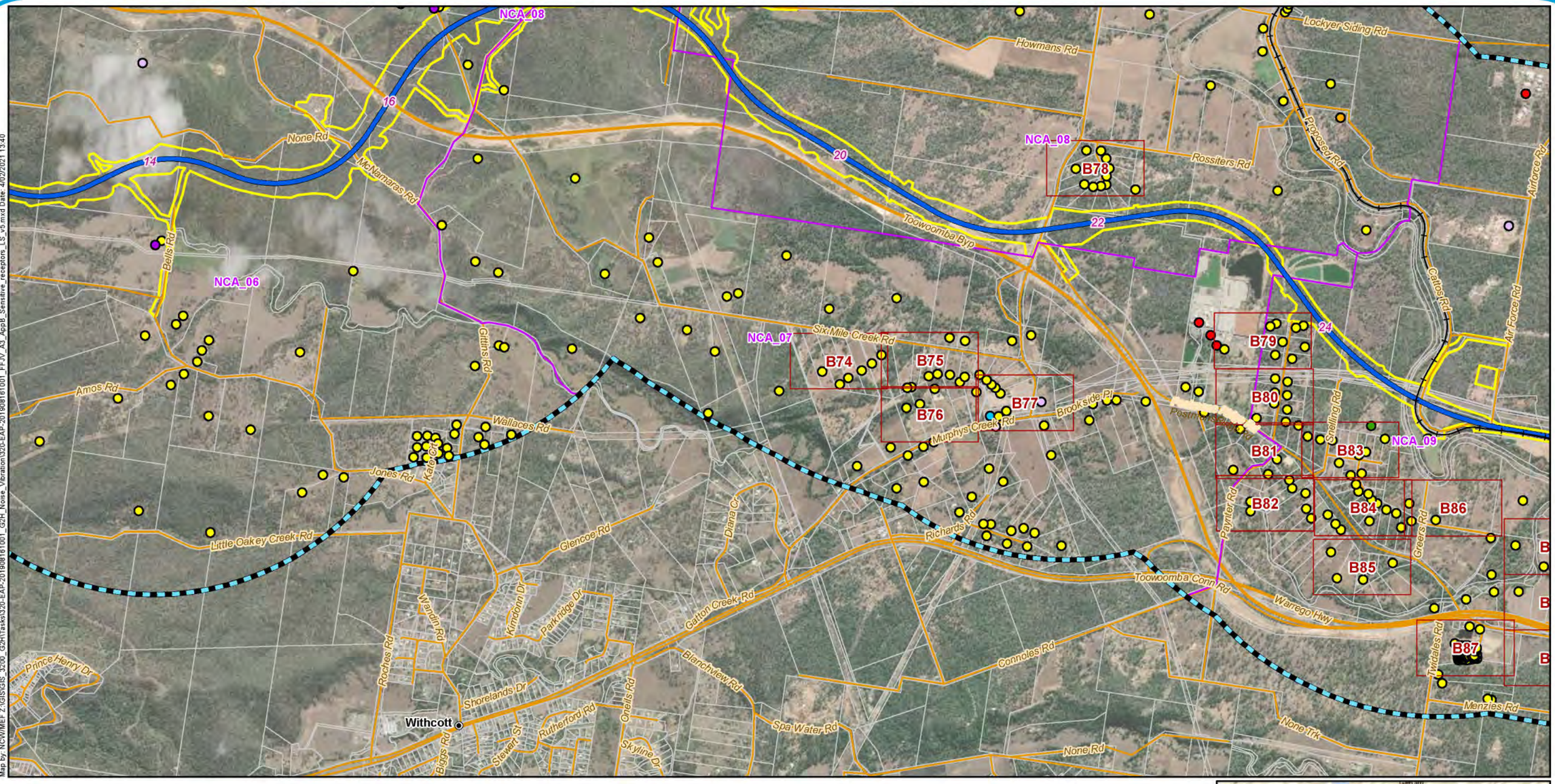
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B4: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Map by: NCW/MEF Z:\GIS\GIS_3200_G2HTasks\320-EAP-20190816100 1_FFJV_A3_AppB_Sensitive_receptors_LS_v5.mxd Date: 4/02/2021 13:40

Legend

- 5 Chainage (km)
- Localities
- G2H project alignment
- Existing rail
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre
- Areas mapped seperately

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:30,000
0 0.2 0.4 0.6 0.8 1km

Future Freight
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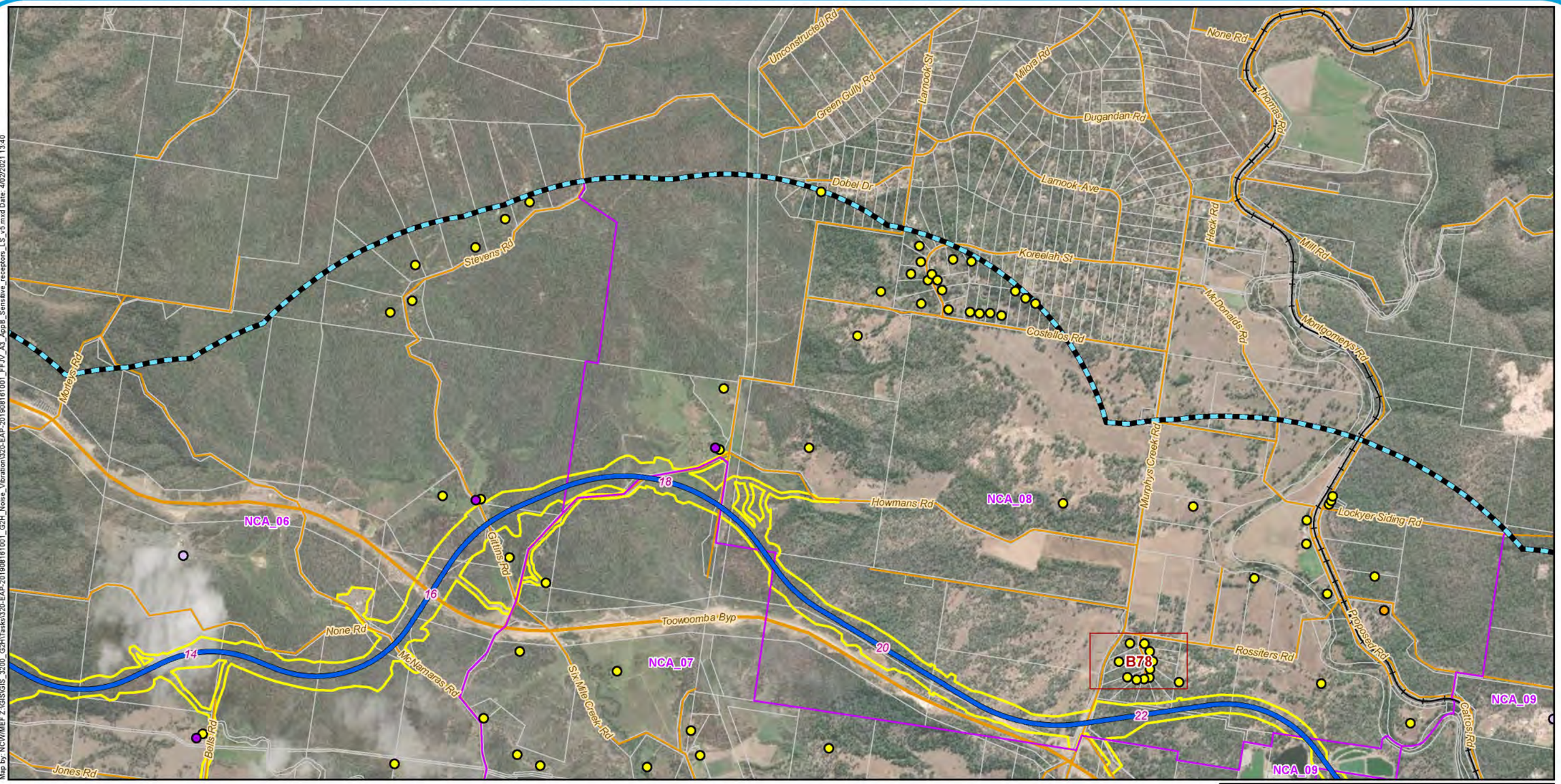
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B5: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



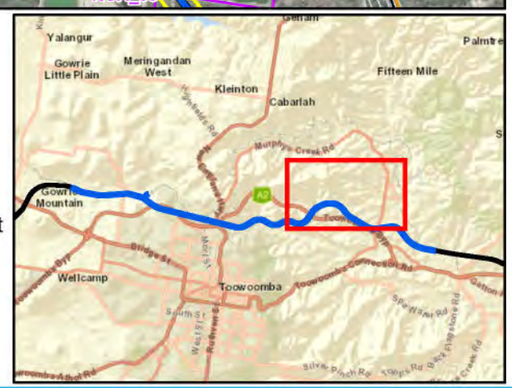
Map by: NCW/MEF Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_LS_v5.mxd Date: 4/02/2021 13:40

Legend

- 5 Chainage (km)
- Localities
- G2H project alignment
- Existing rail
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre
- Areas mapped seperately

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint



A3 scale: 1:30,000

0 0.2 0.4 0.6 0.8 1km

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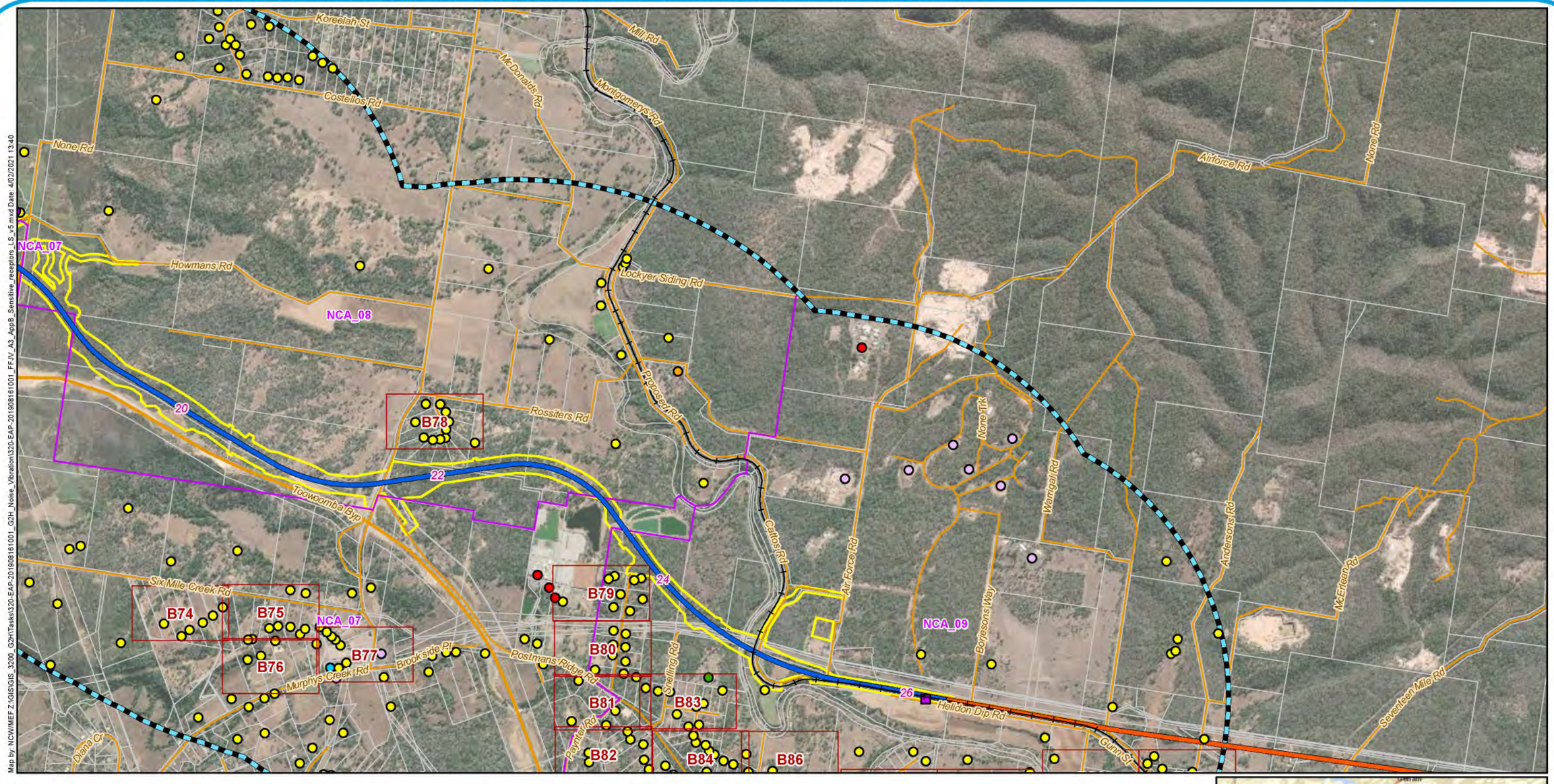
Issue date: 4/02/2021 Version: 5
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B6: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Legend

- 5 Chainage (km)
- Localities
- G2H project alignment
- H2C project alignment
- Existing rail
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre
- Areas mapped seperately

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:30,000

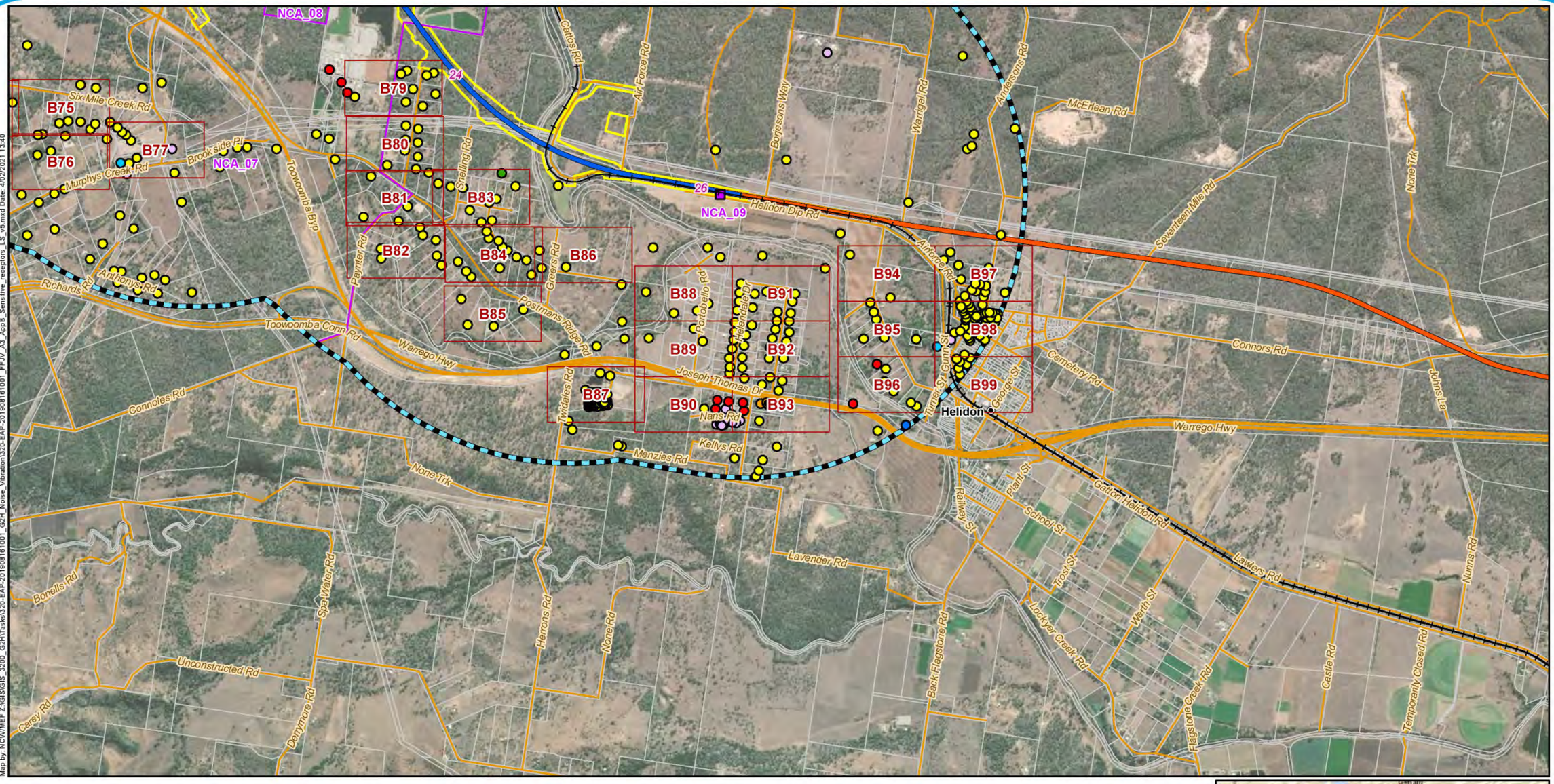
0 0.2 0.4 0.6 0.8 1km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 4/02/2021 Version: 5
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B7: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Map by: NCW/MEF Z:\GIS\GIS_3200_G2HTasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_LS_v5.mxd Date: 4/02/2021 13:40

Legend

- 5 Chainage (km)
- Localities
- G2H project alignment
- H2C project alignment
- Existing rail
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre
- Areas mapped seperately

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:30,000
0 0.2 0.4 0.6 0.8 1km

Future Freight
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Issue date: 4/02/2021 Version: 5
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B8: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\1001_G2H_Noise_Vibration\320-EAP-20190816\1001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
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Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B9: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEP/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\1001_G2H_Noise_Vibration\320-EAP-20190816\1001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075 km

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Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B10: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\1001_G2H_Noise_Vibration\320-EAP-20190816\1001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

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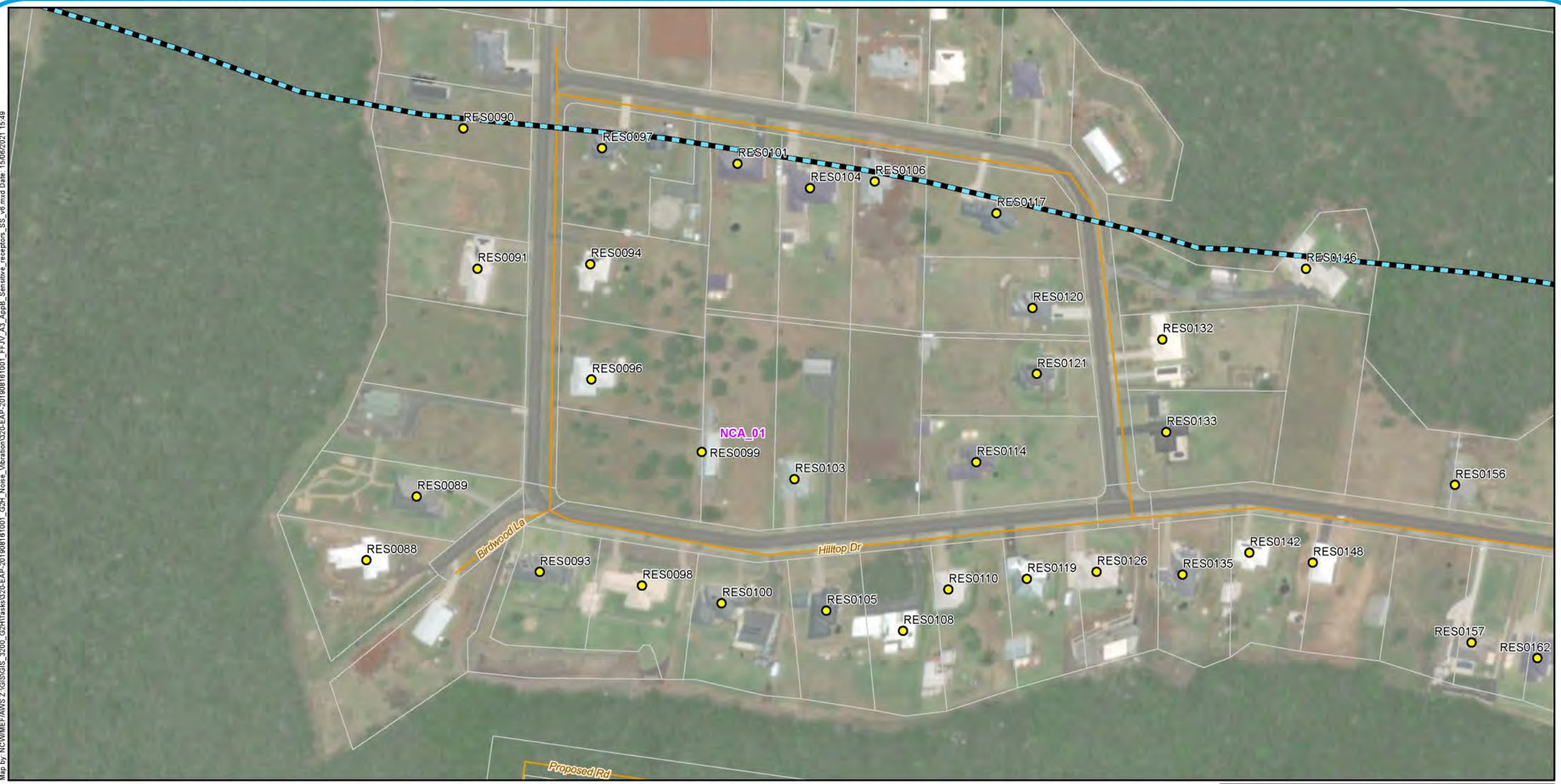
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B11: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\1001_G2H_Noise_Vibration\320-EAP-20190816\1001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

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Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B12: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\1001_G2H_Noise_Vibration\320-EAP-20190816\1001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075 km

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Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B13: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\1001_G2H_Noise_Vibration\320-EAP-20190816\1001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

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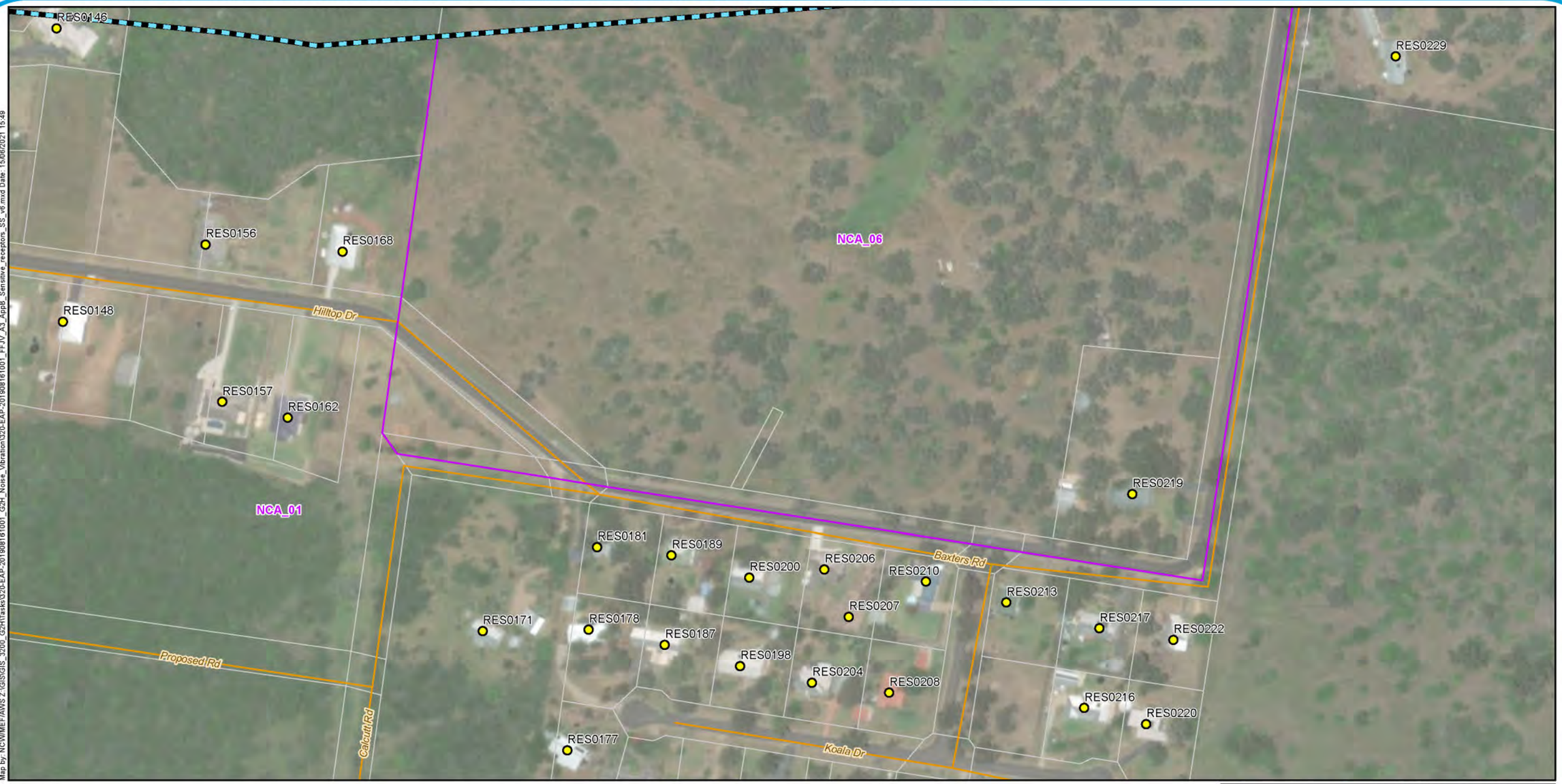
Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B14: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
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Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B15: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2HTasks\320-EAP-20190816\1001_G2H_Noise_Vibration\320-EAP-20190816\1001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:48

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

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Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B16: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B17: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\1001_G2H_Noise_Vibration\320-EAP-20190816\1001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:48

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

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Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B18: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\1001_G2H_Noise_Vibration\320-EAP-20190816\1001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:48

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

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Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B19: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\1001_G2H_Noise_Vibration\320-EAP-20190816\1001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:48

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075 km

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Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B20: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\3220-EAP-20190816\1001_G2H_Noise_Vibration\3220-EAP-20190816\1001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075 km

Future Freight
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Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B21: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\1001_G2H_Noise_Vibration\320-EAP-20190816\1001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

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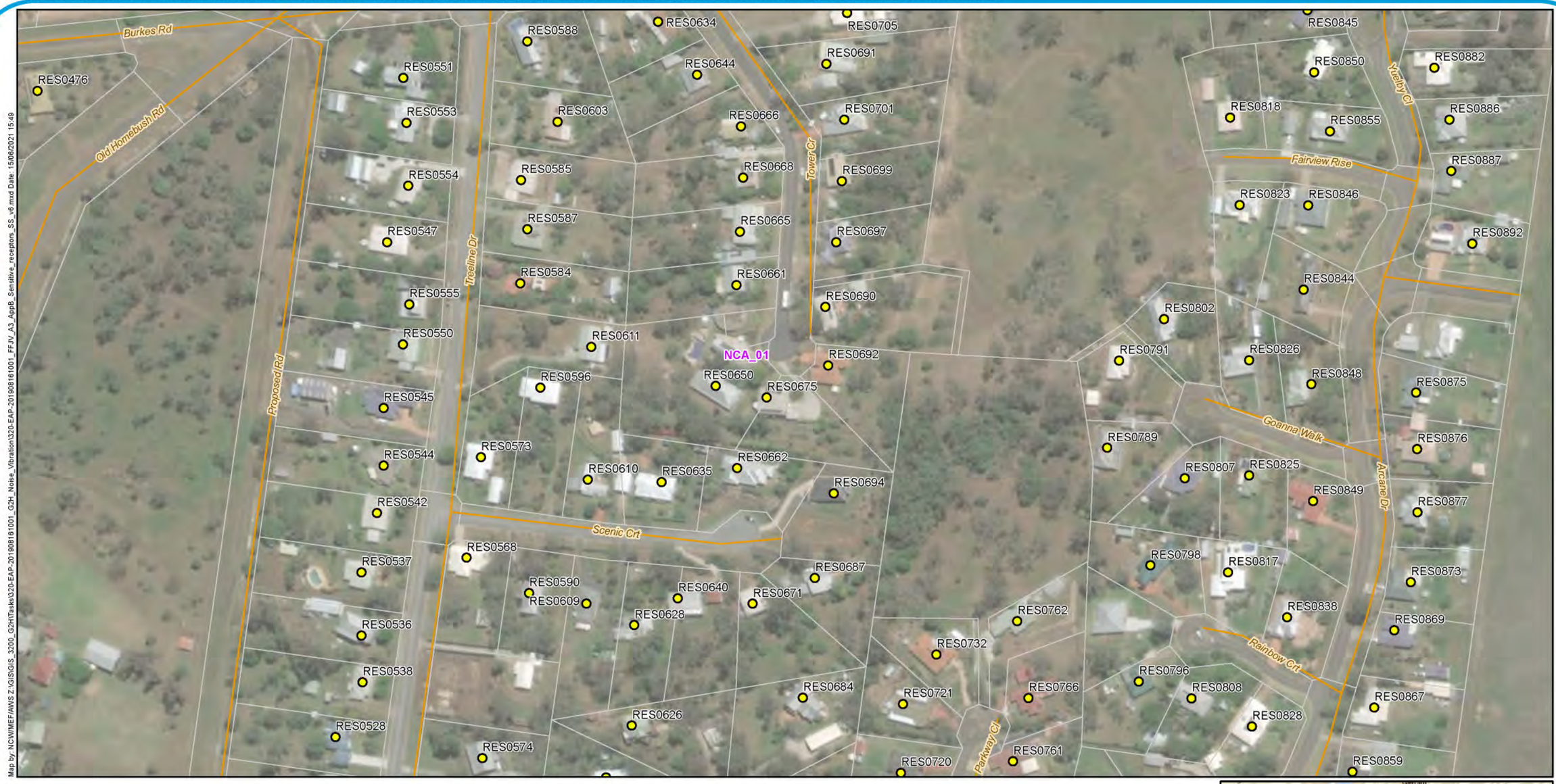
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B22: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

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Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B23: Noise and Vibration Sensitive Receptors

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2HTasks\320-EAP-20190816100_G2H_Noise_Vibration\320-EAP-20190816100_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:48

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-201908161001_G2H_Noise_Vibration\320-EAP-201908161001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:48

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075 km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B24: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
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Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B25: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075 km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B26: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\1001_G2H_Noise_Vibration\320-EAP-20190816\1001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

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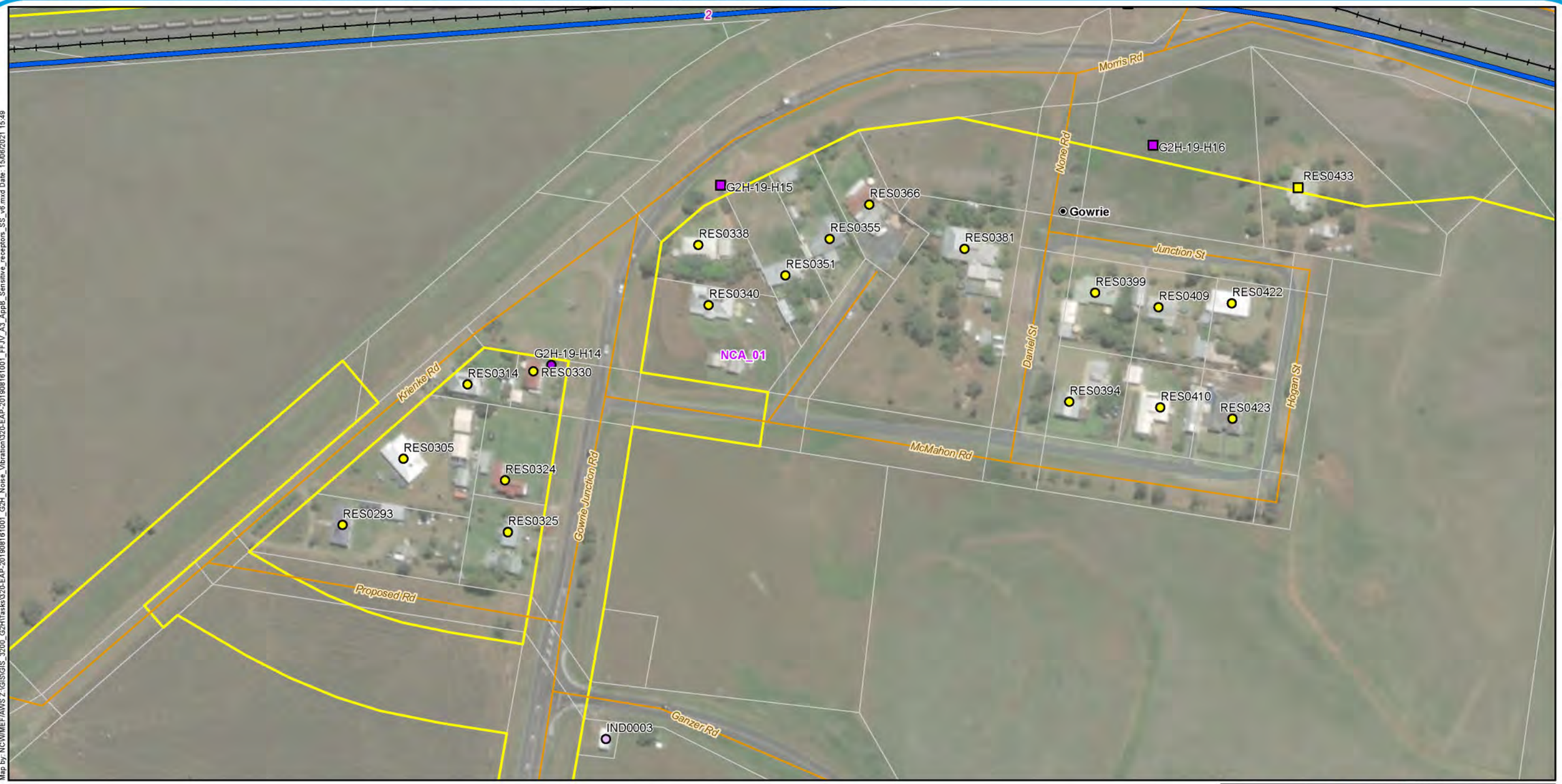
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B27: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\1001_G2H_Noise_Vibration\320-EAP-20190816\1001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- G2H project alignment
- Existing rail
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075 km

Future Freight
Integrating Community, Environment and Engineering

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Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B28: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCV/MEF/AWS Z:\GIS\GIS_3200_G2HTasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

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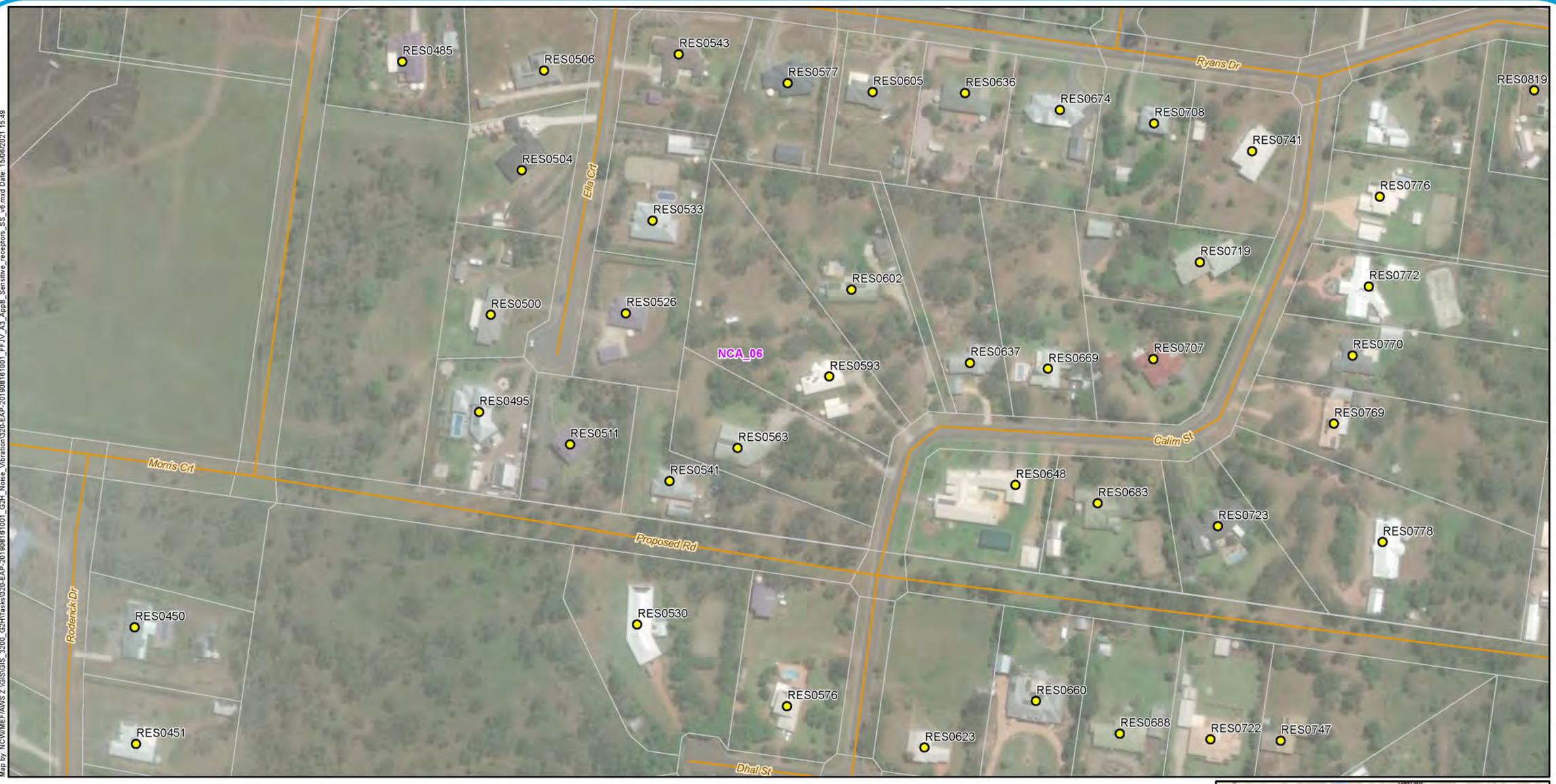
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B29: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:48

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

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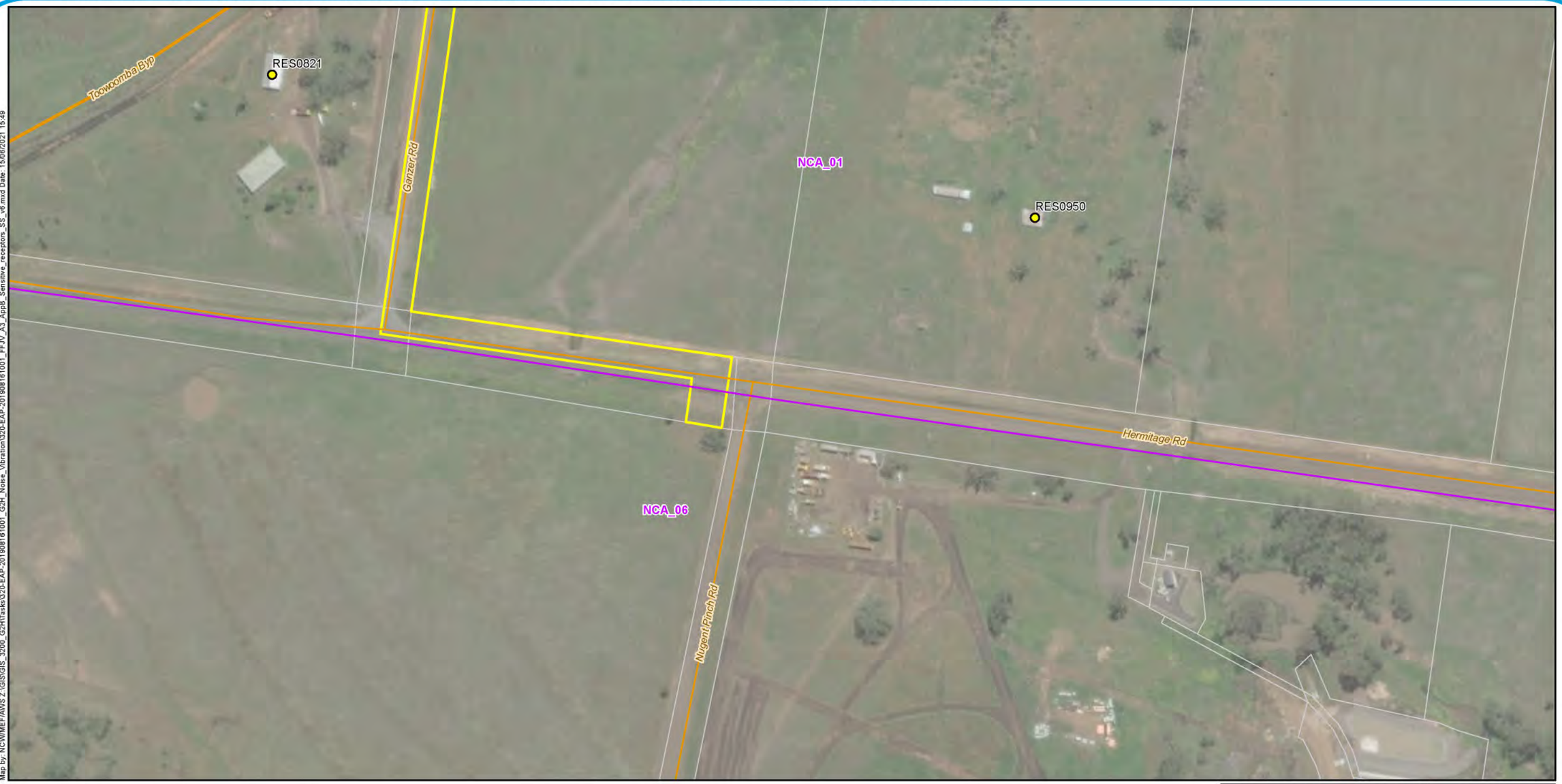
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B30: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



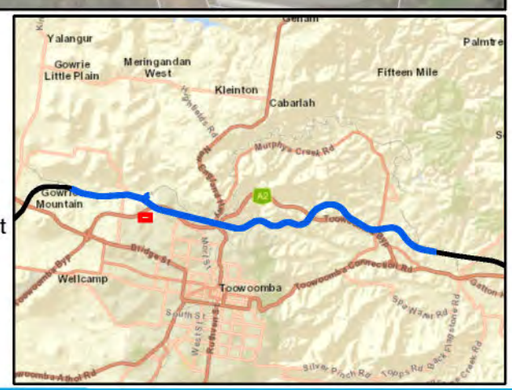
Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint



A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075 km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B31: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075 km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B32: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\1001_G2H_Noise_Vibration\320-EAP-20190816\1001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:48

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

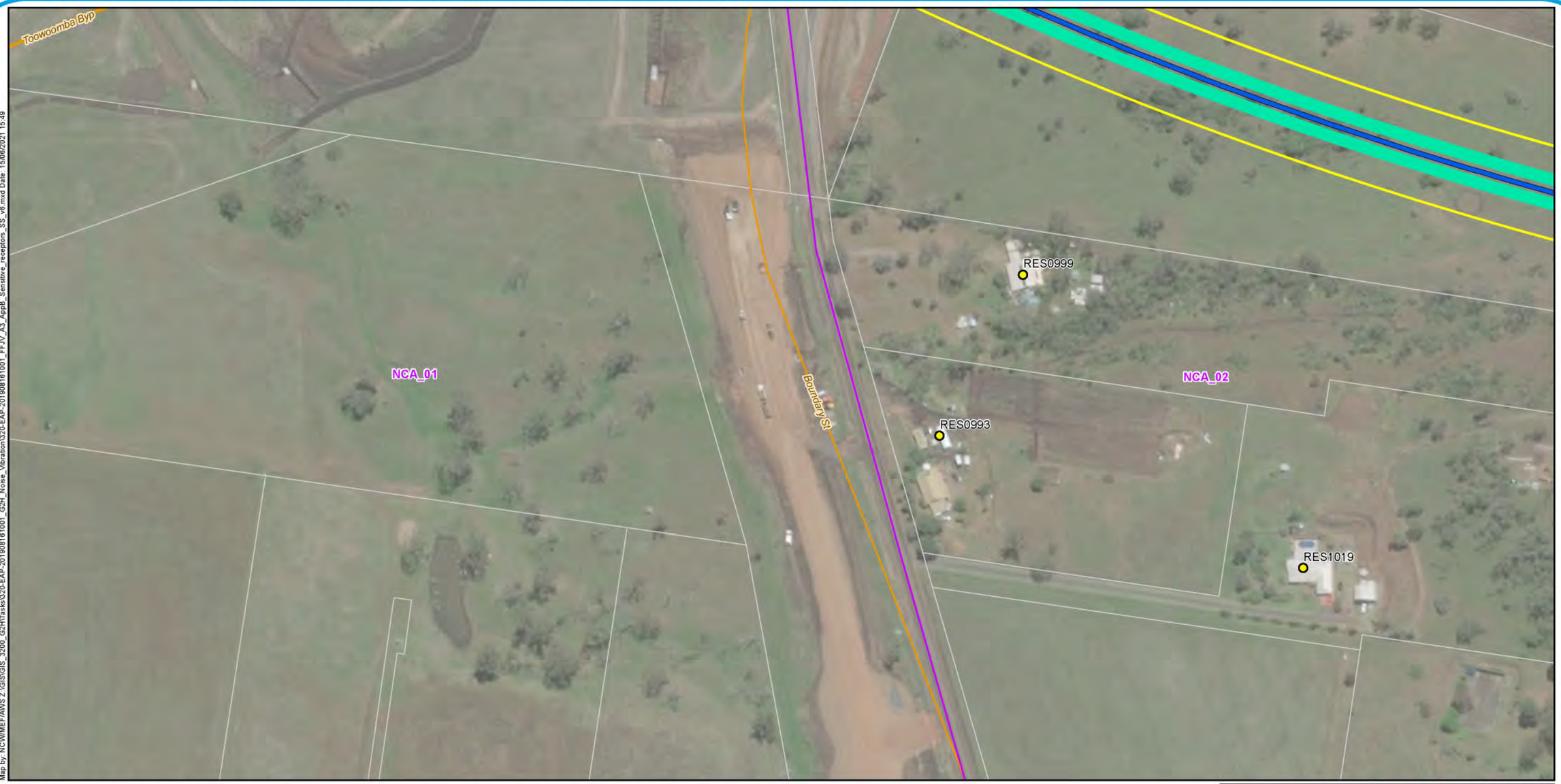
Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B33: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2HTasks\320-EAP-20190816\1001_G2H_Noise_Vibration\320-EAP-20190816\1001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- G2H project alignment
- Tunnel
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B34: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2HTasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

Future Freight
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Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B35: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

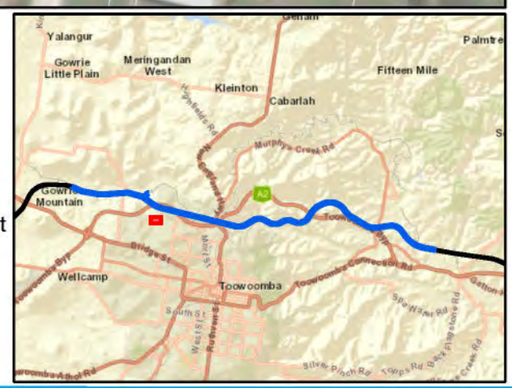
Map by: NCW/MEEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\1001_G2H_Noise_Vibration\320-EAP-20190816\1001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint



A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B36: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2HTasks\320-EAP-20190816\1001_G2H_Noise_Vibration\320-EAP-20190816\1001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
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Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B37: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW\MEF\AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\1001_G2H_Noise_Vibration\320-EAP-20190816\1001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- G2H project alignment
- Tunnel
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B38: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2HTasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075 km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B39: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW\MEF\AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\1001_G2H_Noise_Vibration\320-EAP-20190816\1001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B40: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\1001_G2H_Noise_Vibration\320-EAP-20190816\1001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B41: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\1001_G2H_Noise_Vibration\320-EAP-20190816\1001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B42: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2HTasks\320-EAP-20190816\1001_G2H_Noise_Vibration\320-EAP-20190816\1001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

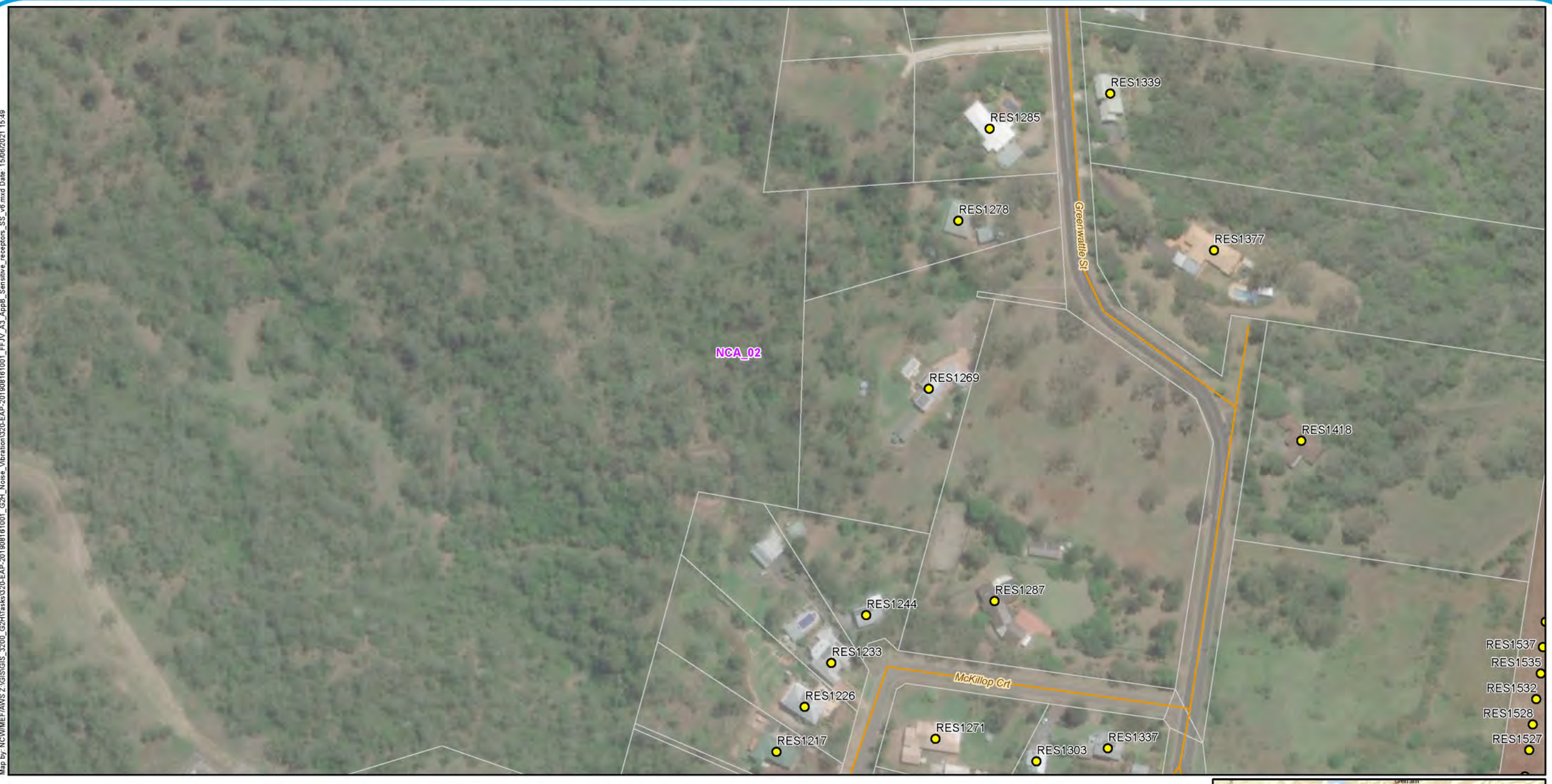
A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B43: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\1001_G2H_Noise_Vibration\320-EAP-20190816\1001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

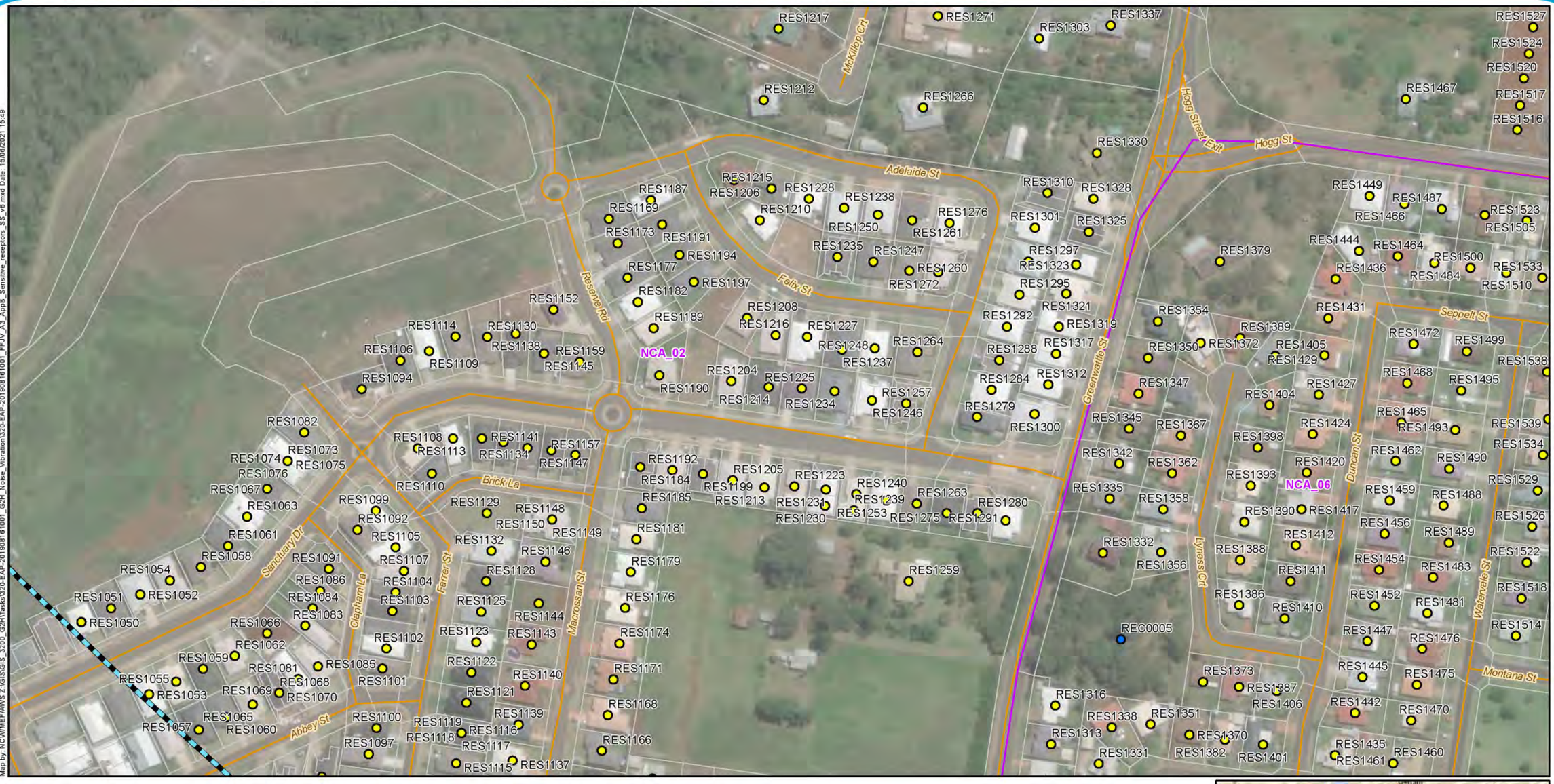
A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B44: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:48

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

Future Freight
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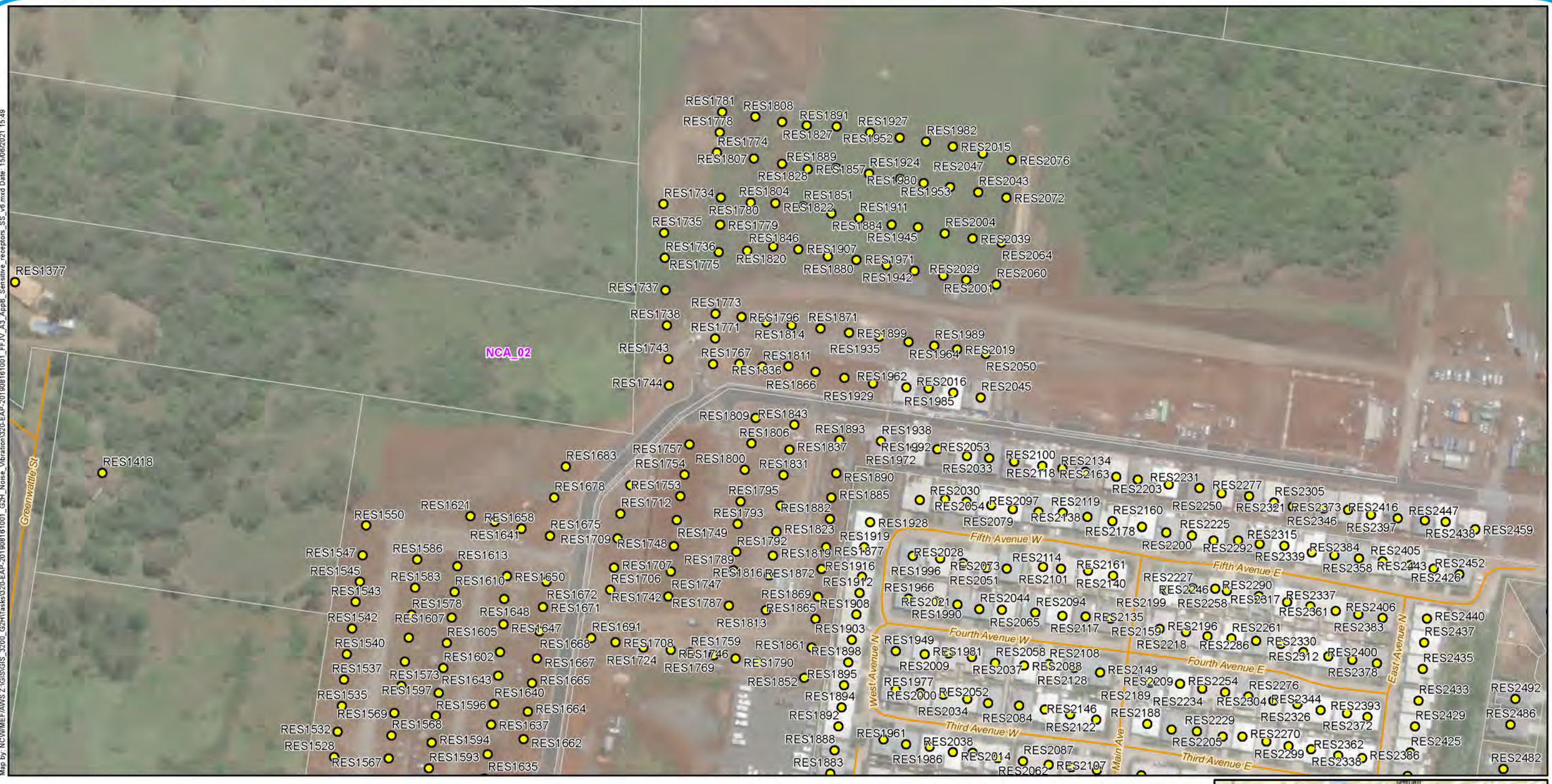
Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B45: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community


NCA_02
Greenwattle St
Fifth Avenue W
Fifth Avenue E
Fourth Avenue W
Fourth Avenue E
Third Avenue W
Third Avenue E
West Avenue N
East Avenue N
Main Ave
RES1377
RES1418
RES1550
RES1547
RES1545
RES1543
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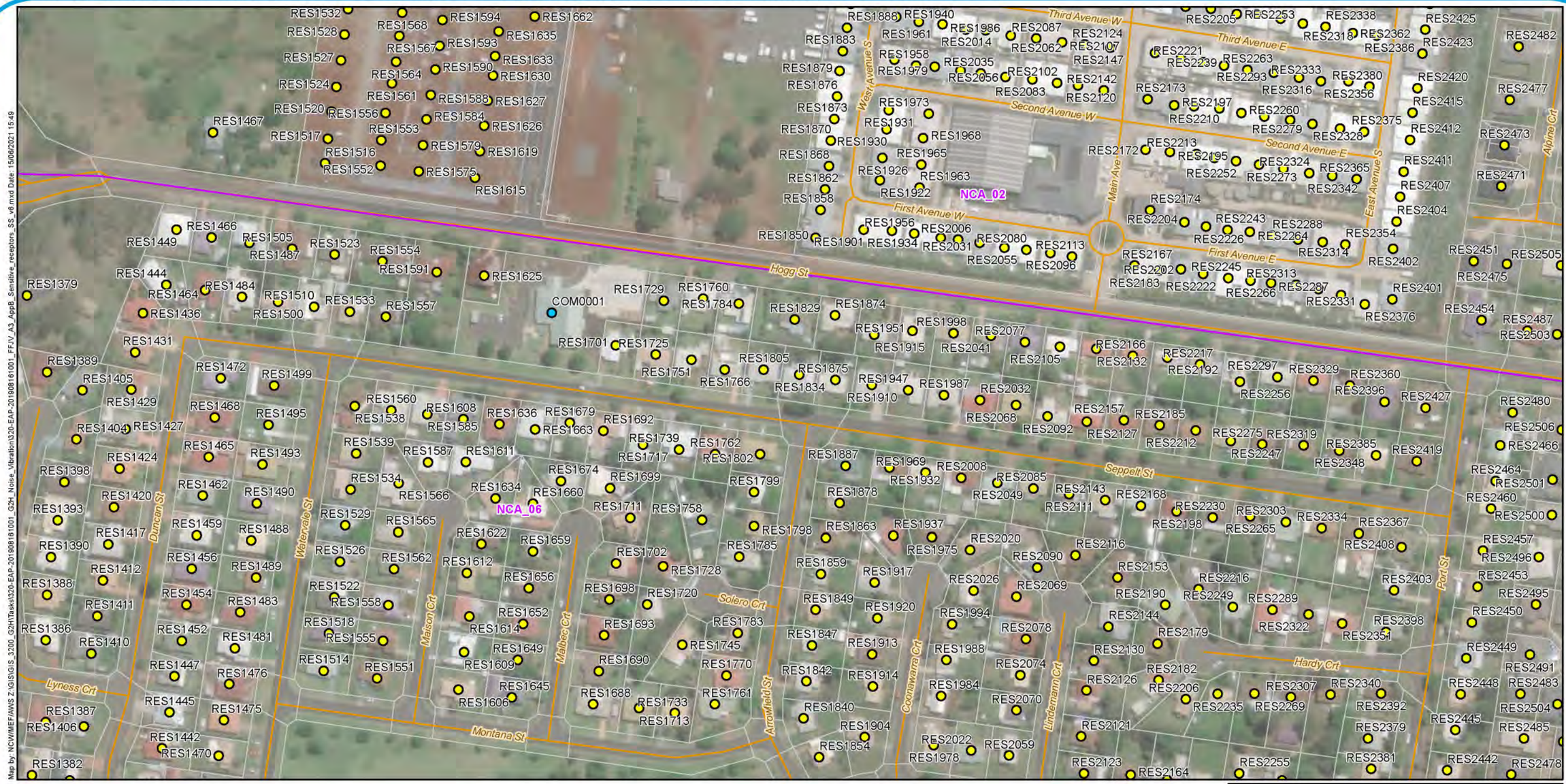
Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Task\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_App8_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

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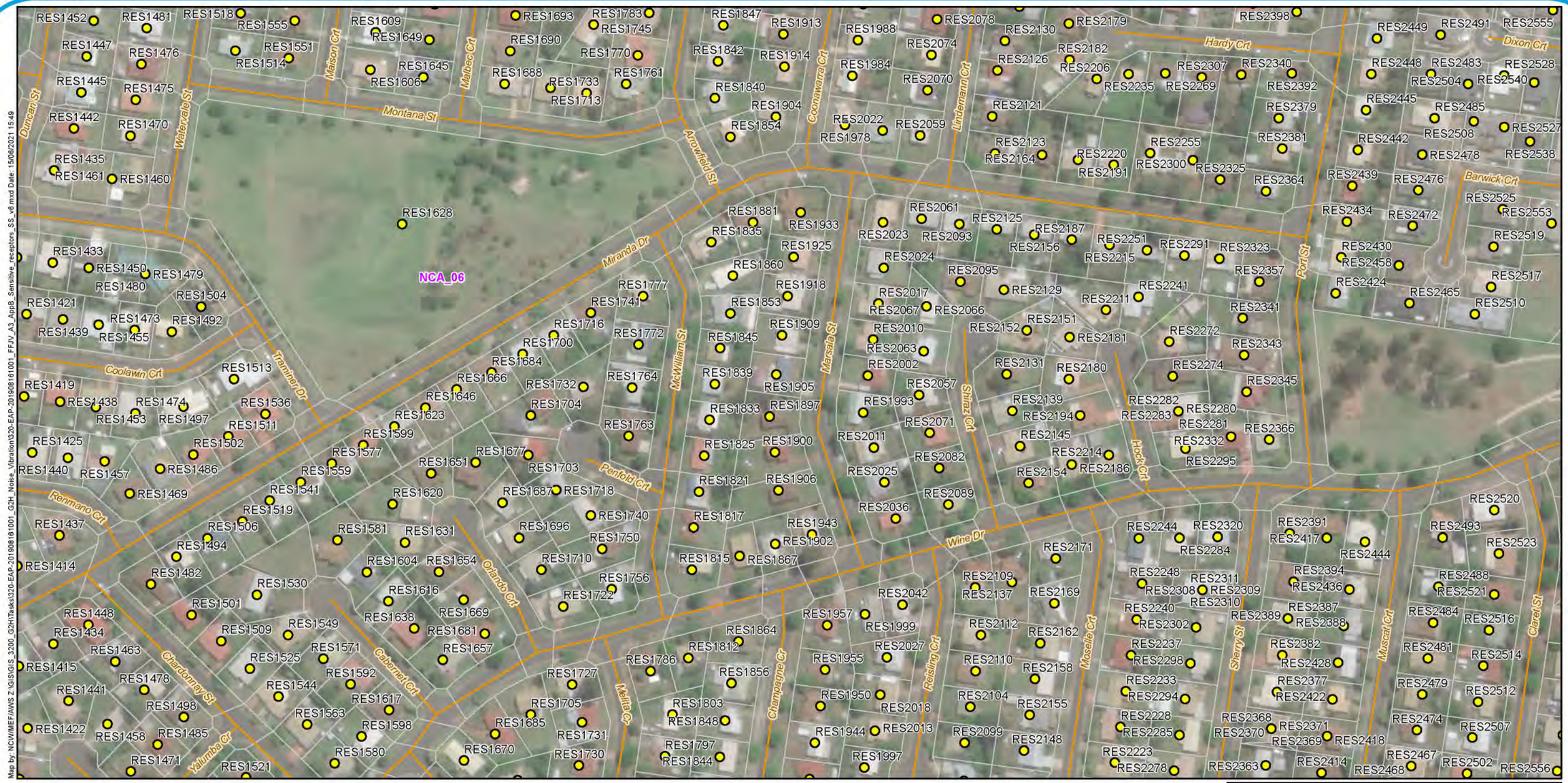
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B47: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

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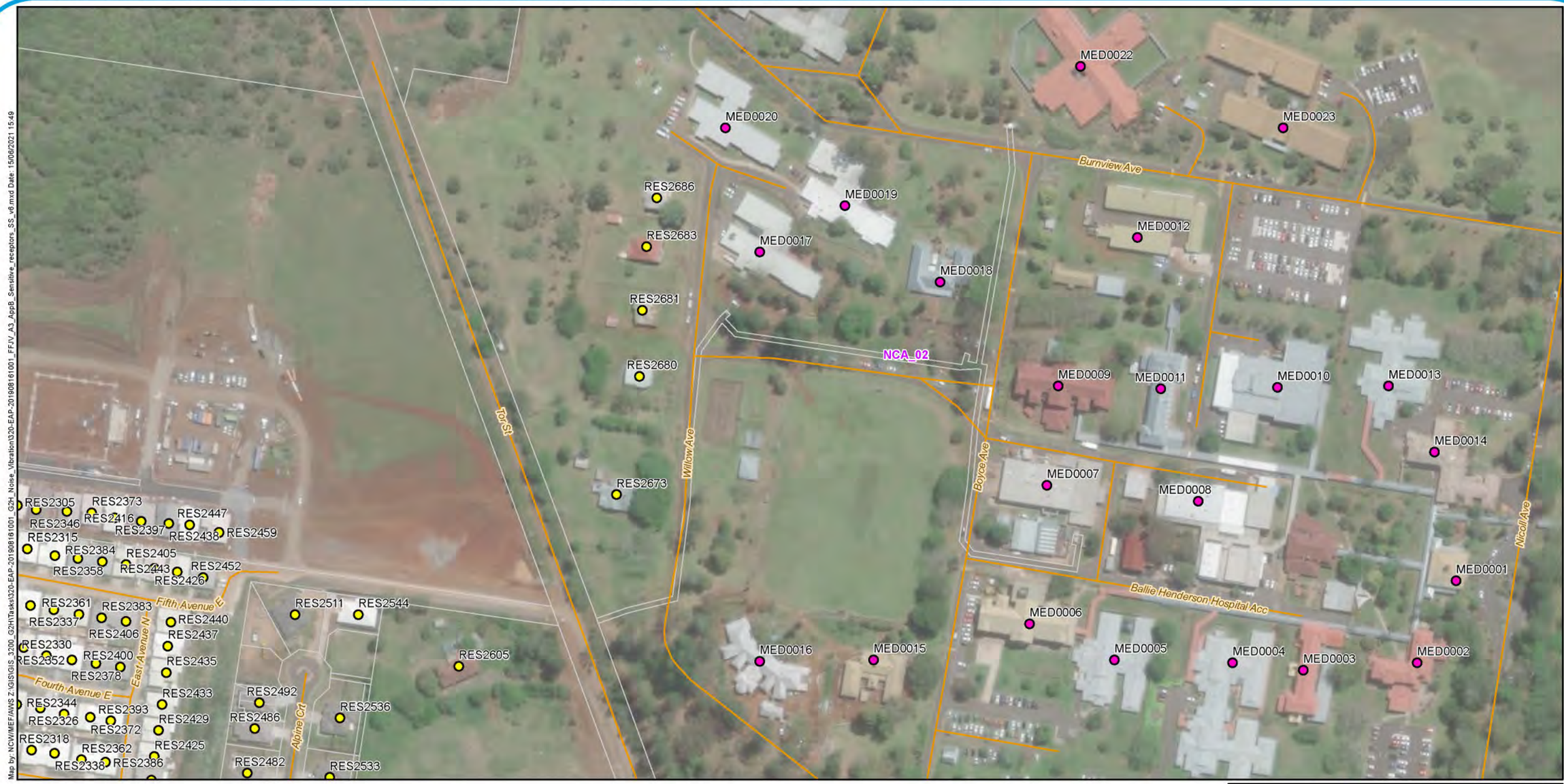
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B48: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

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Gowrie to Helidon
Appendix B49: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

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Appendix B50: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

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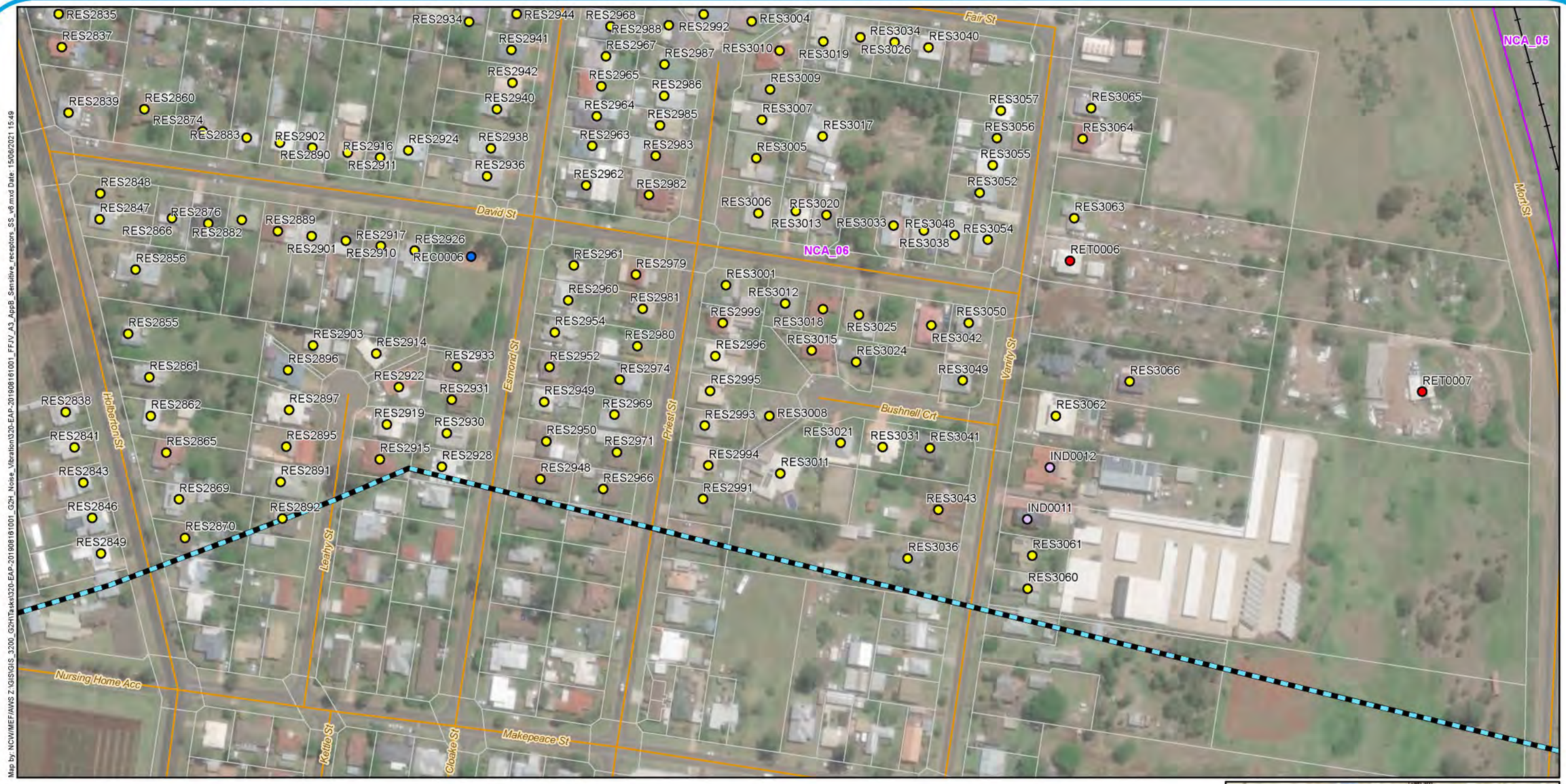
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B51: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

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Appendix B52: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

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Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B53: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

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Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B54: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
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Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B55: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816100l_G2H_Noise_Vibration\320-EAP-20190816100l_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

Future Freight
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Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B56: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v8.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
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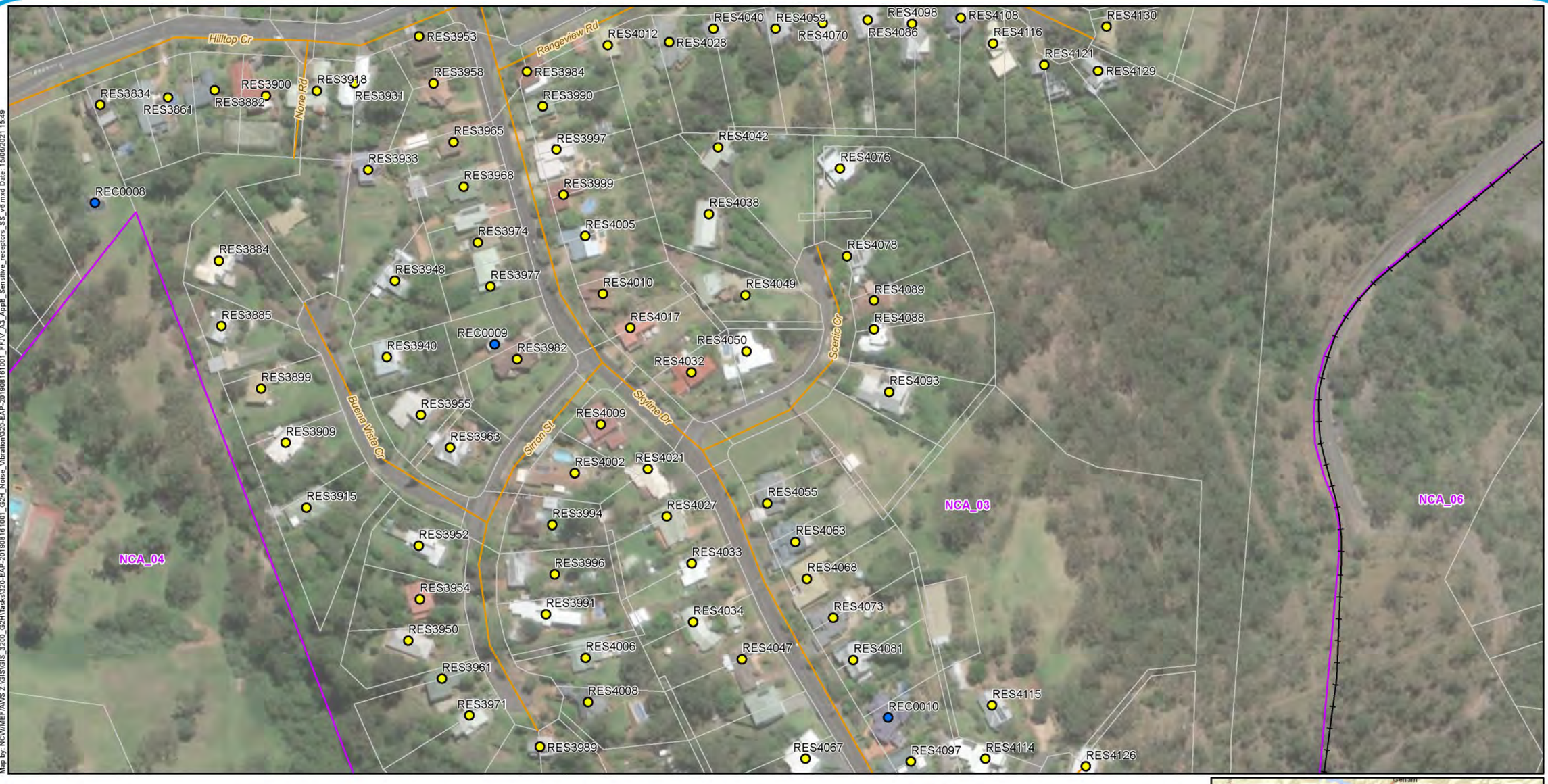
Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B57: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B58: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B59: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v8.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

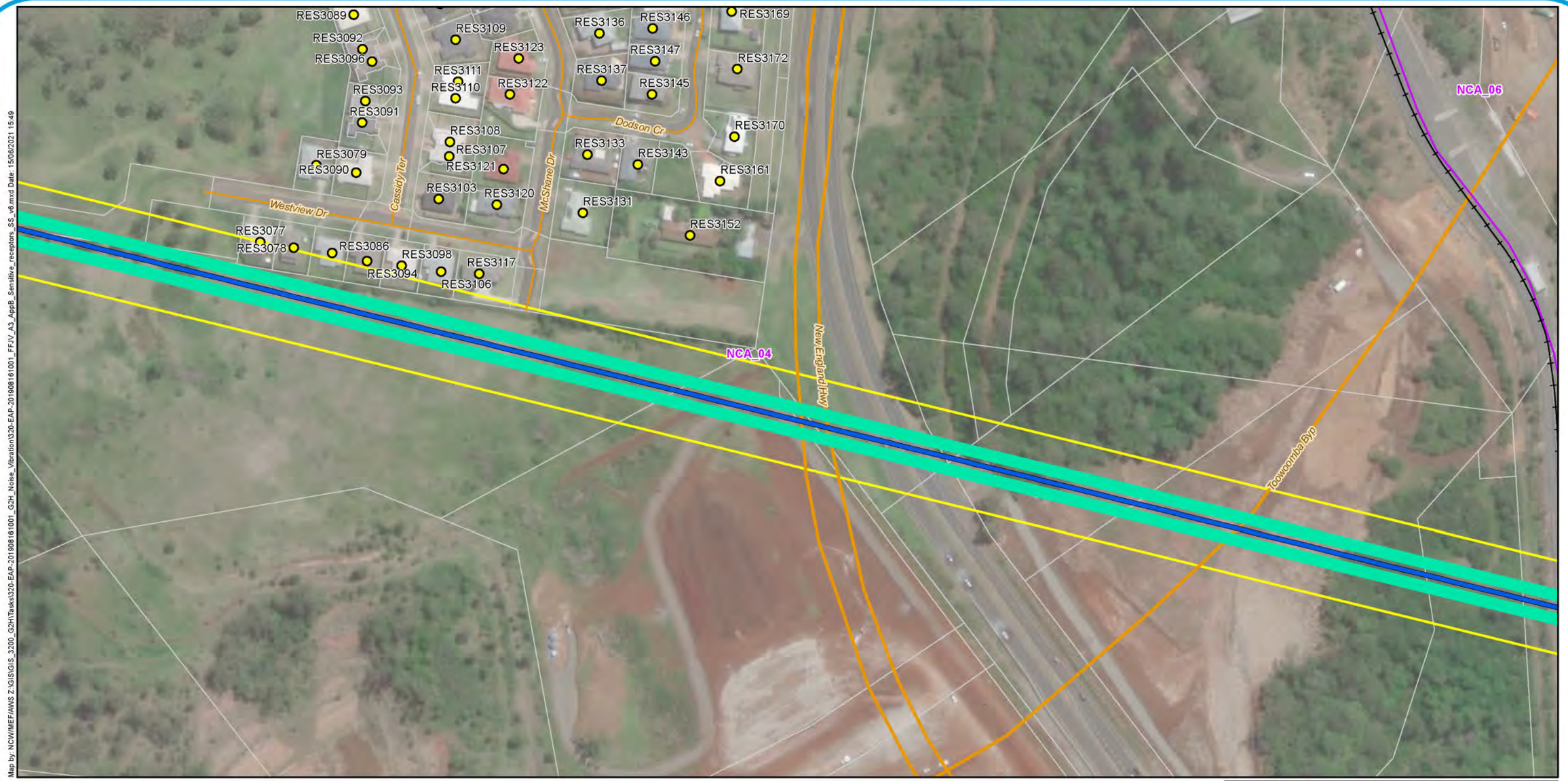
0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B60: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- G2H project alignment
- Existing rail
- Tunnel
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

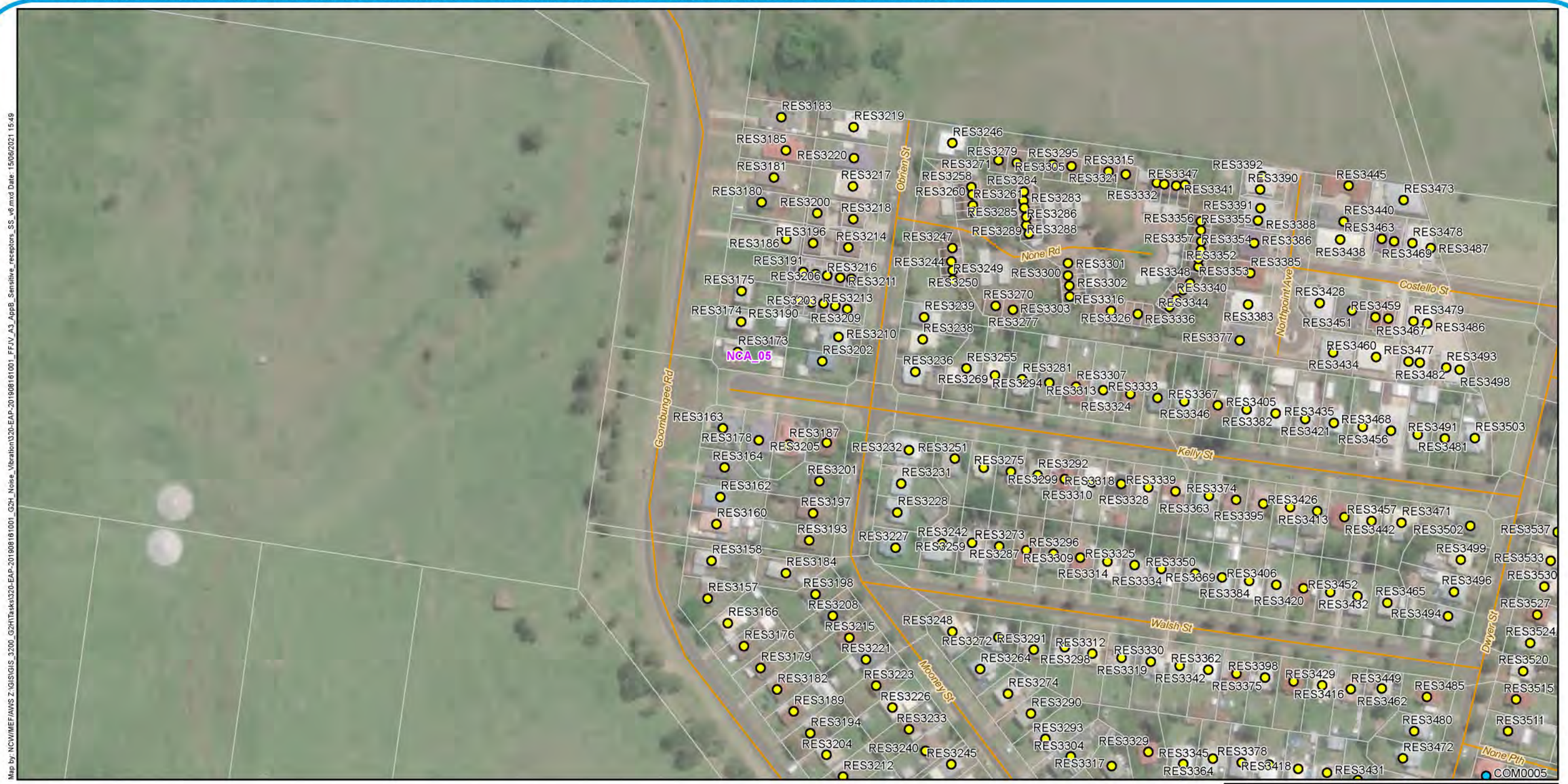
A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075 km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B61: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B62: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075 km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B63: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

Future Freight
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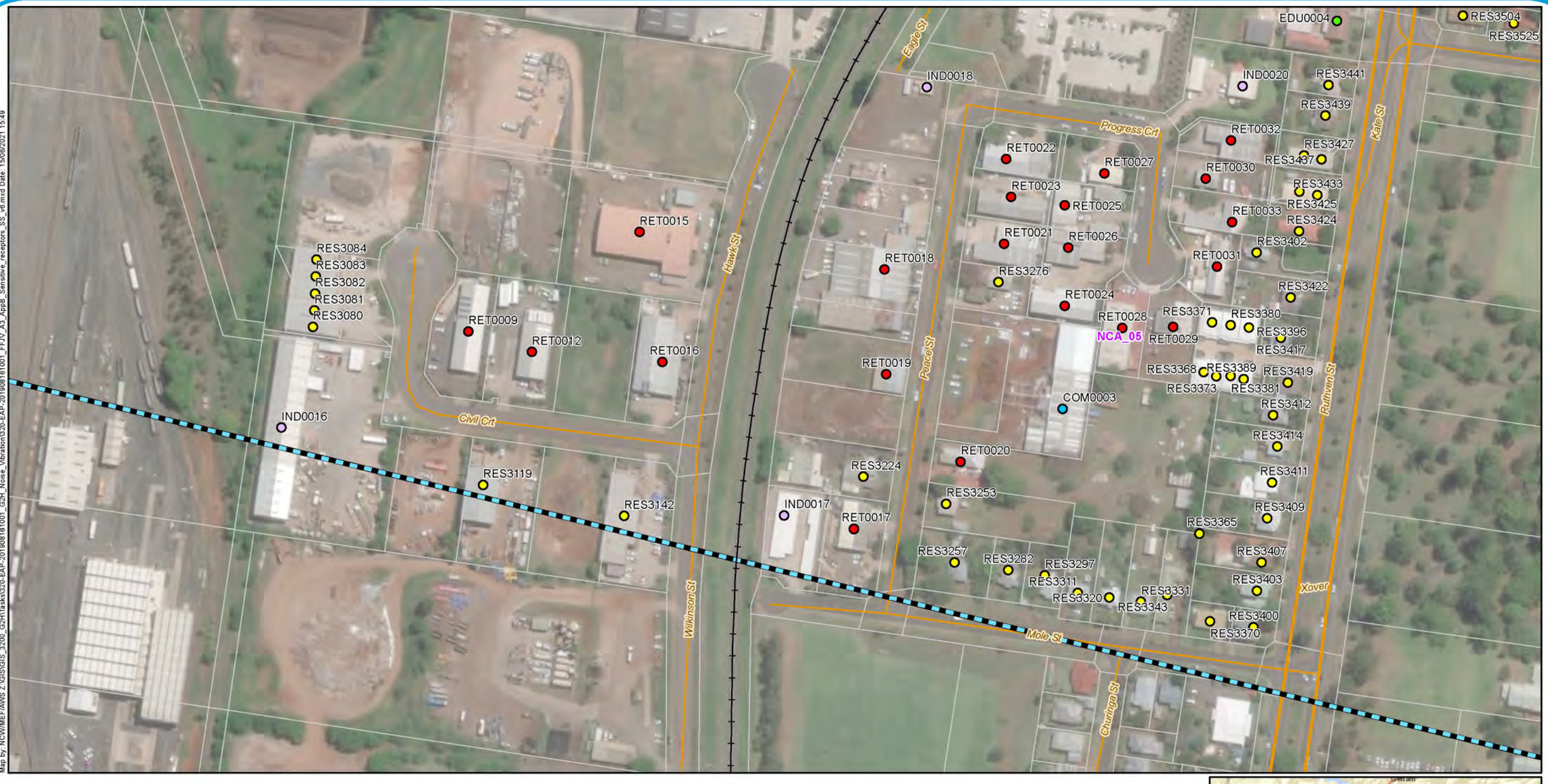
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B64: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



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Legend

- 5 Chainage (km)
- Localities
- Existing rail
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B65: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2HTasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- G2H project alignment
- Existing rail
- Tunnel
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

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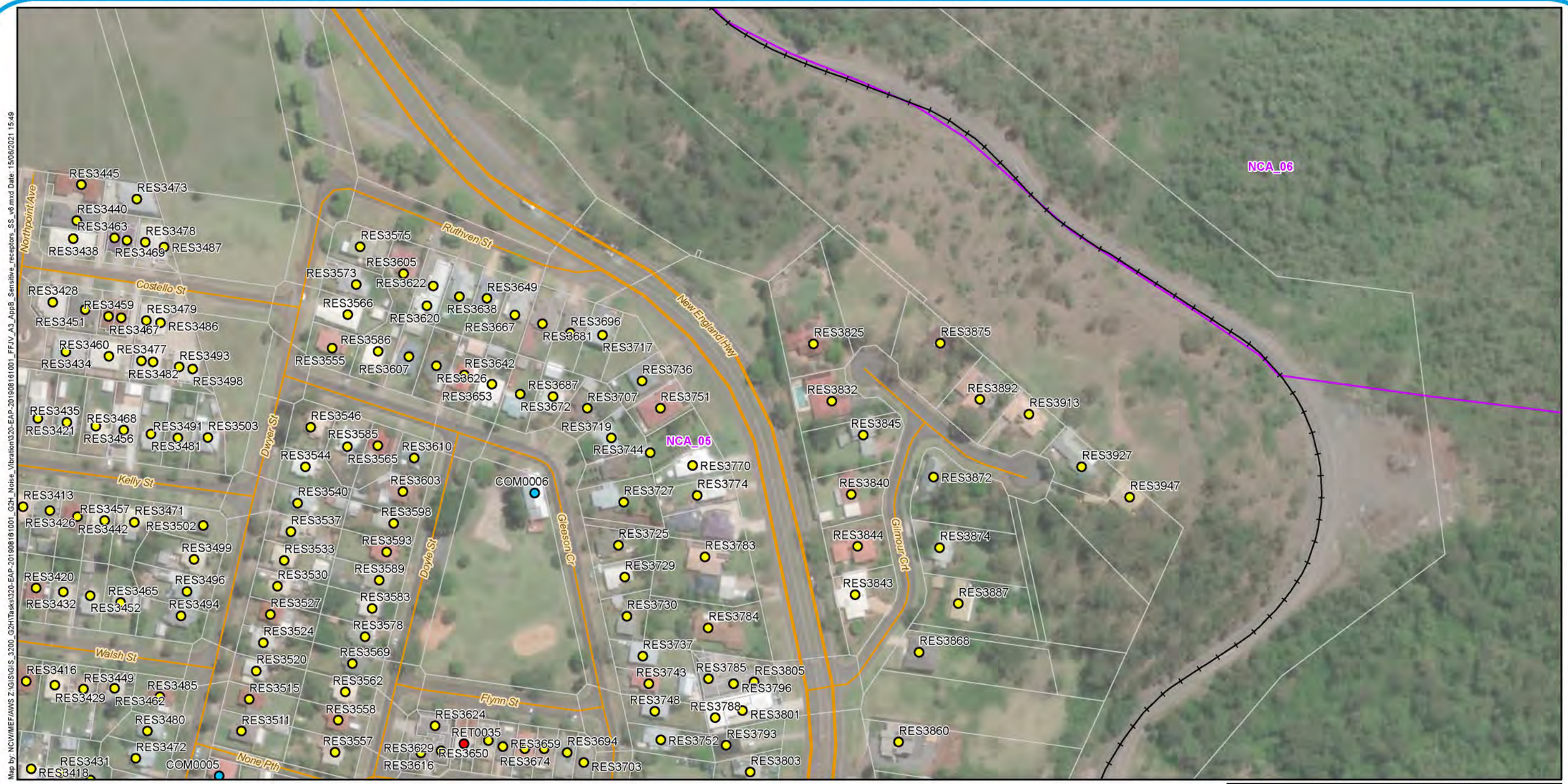
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B66: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816001_G2H_Noise_Vibration\320-EAP-20190816001_FFJV_A3_App8_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

Future Freight
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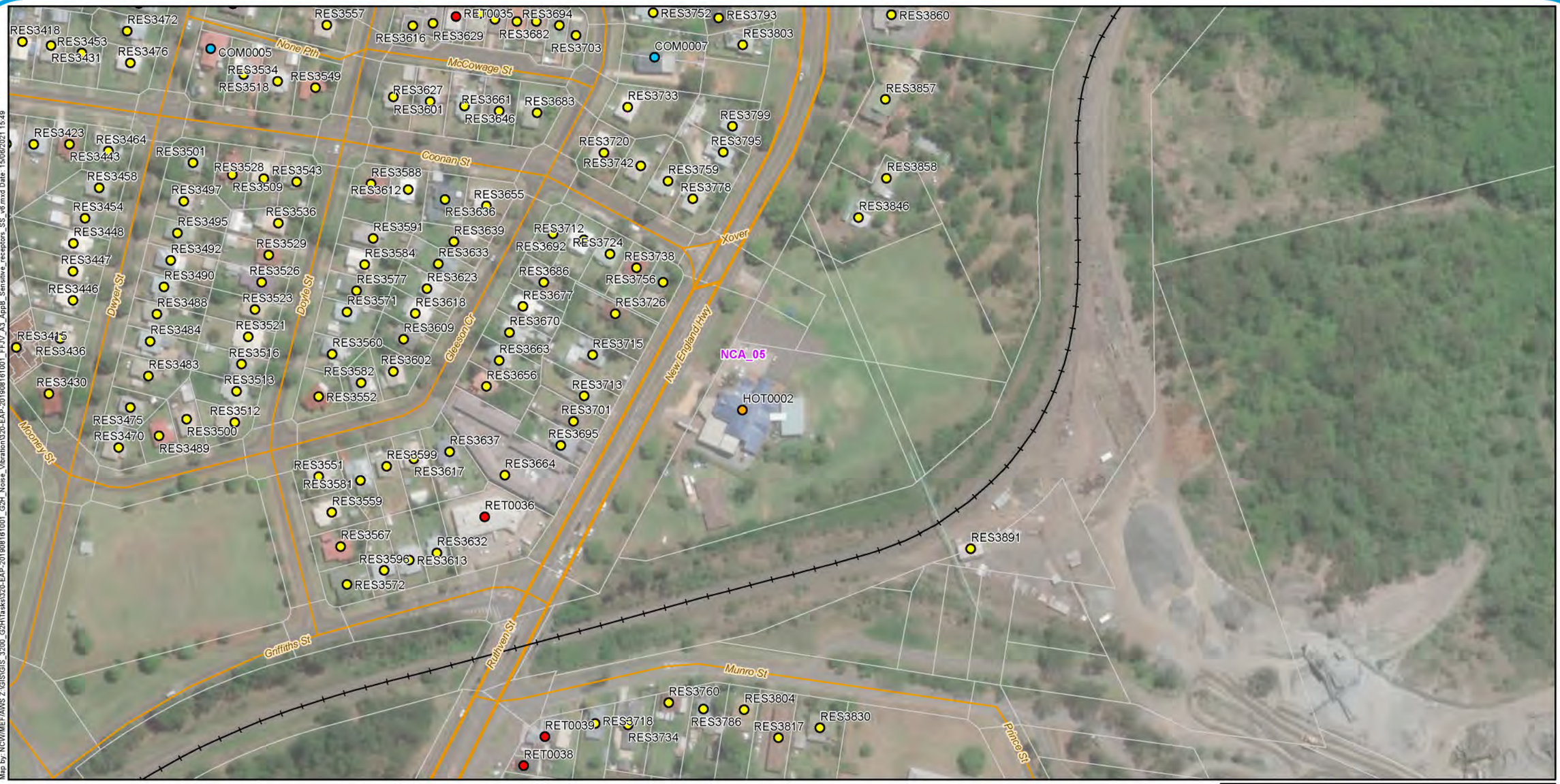
Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B67: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_App8_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

Future Freight
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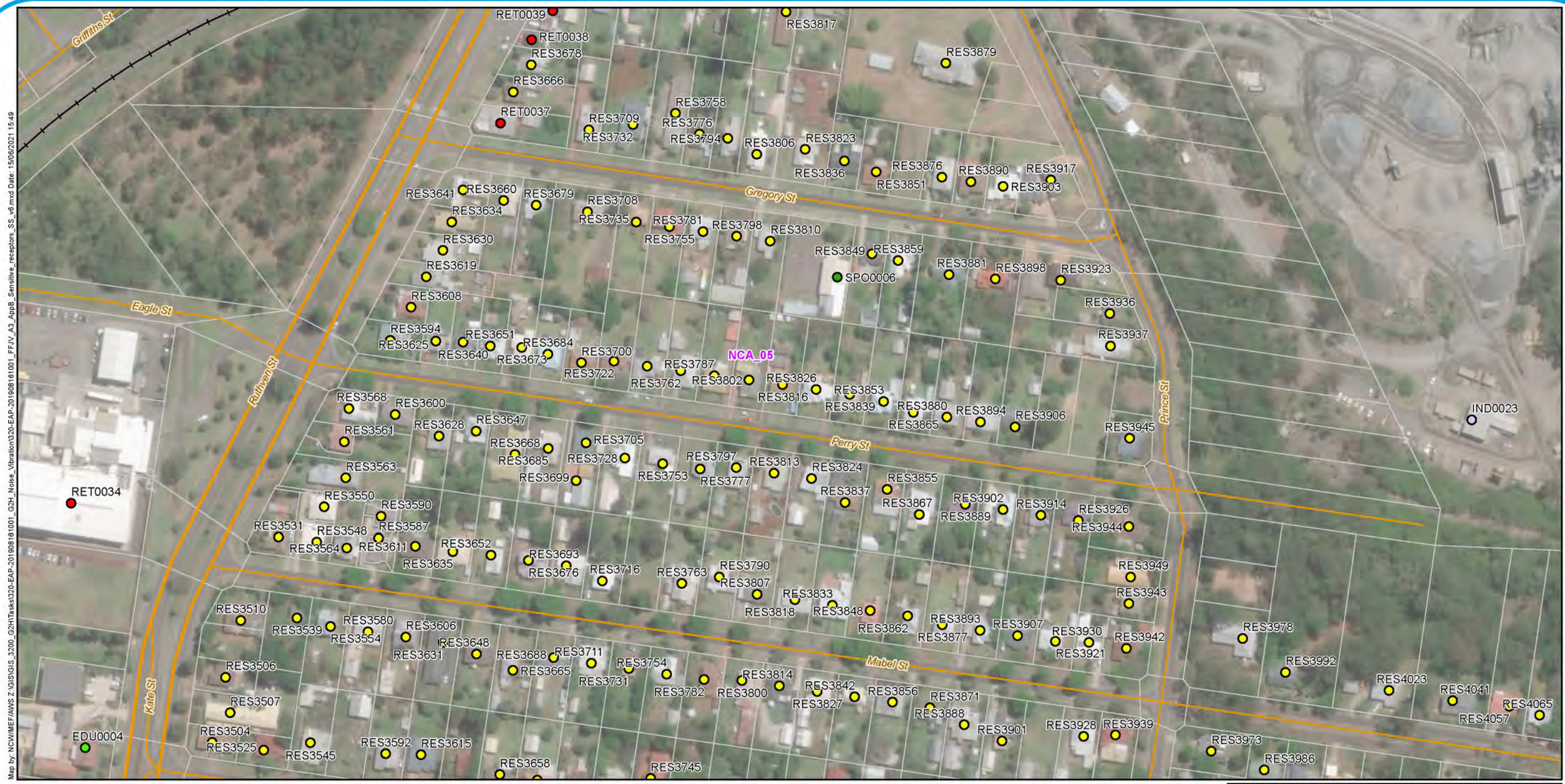
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B68: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Legend

- 5 Chainage (km)
- Localities
- Existing rail
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
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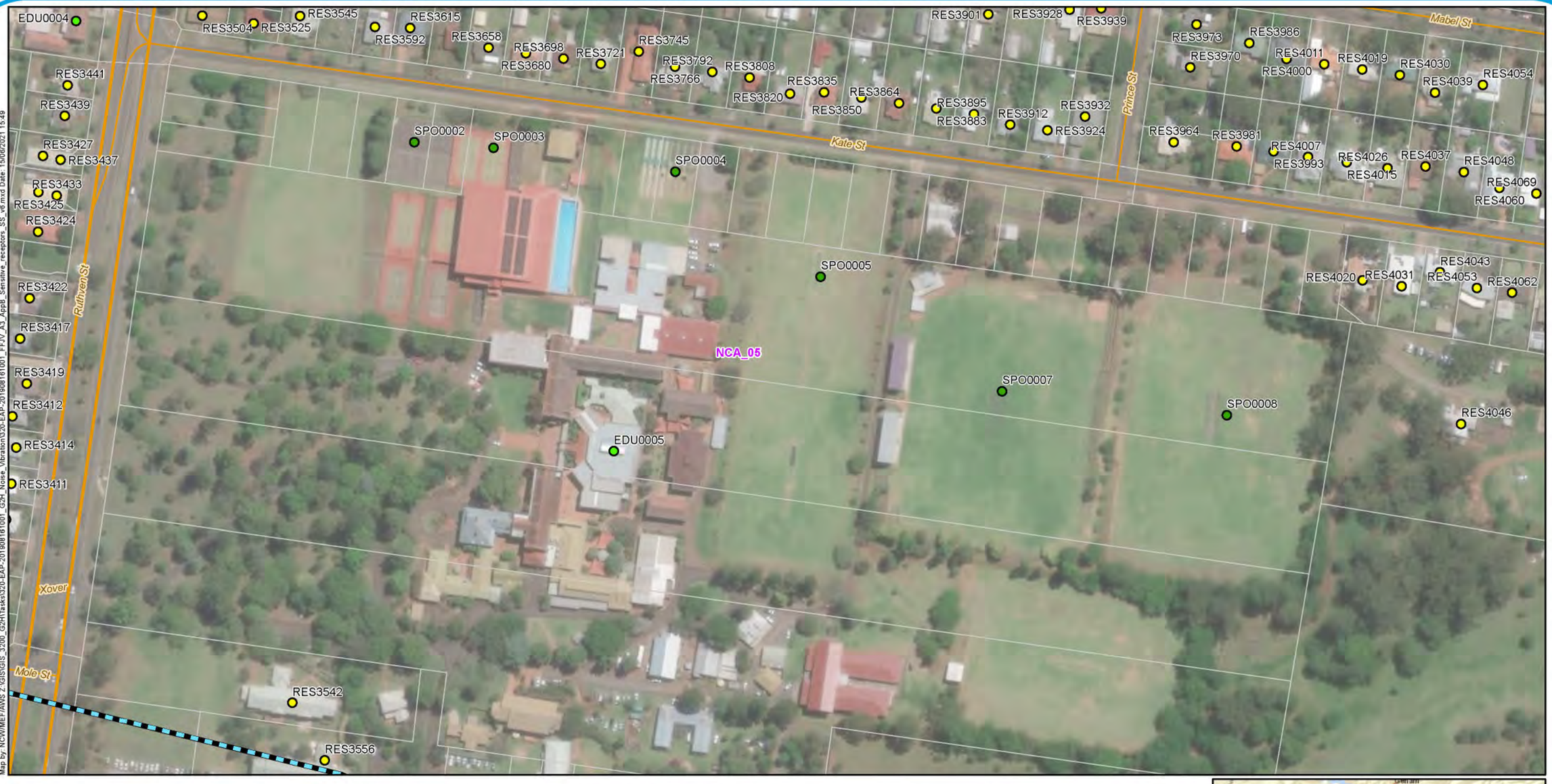
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B69: Noise and Vibration Sensitive Receptors

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Task\3320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2HTasks\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B70: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_App8_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075 km

Future Freight
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Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B71: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Task\320-EAP-20190816100l_G2H_Noise_Vibration\320-EAP-20190816100l_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B72: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_App8_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

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Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B73: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

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Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B74: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW\MEF\AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v8.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
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Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B75: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075 km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B76: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
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Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B77: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- G2H project alignment
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

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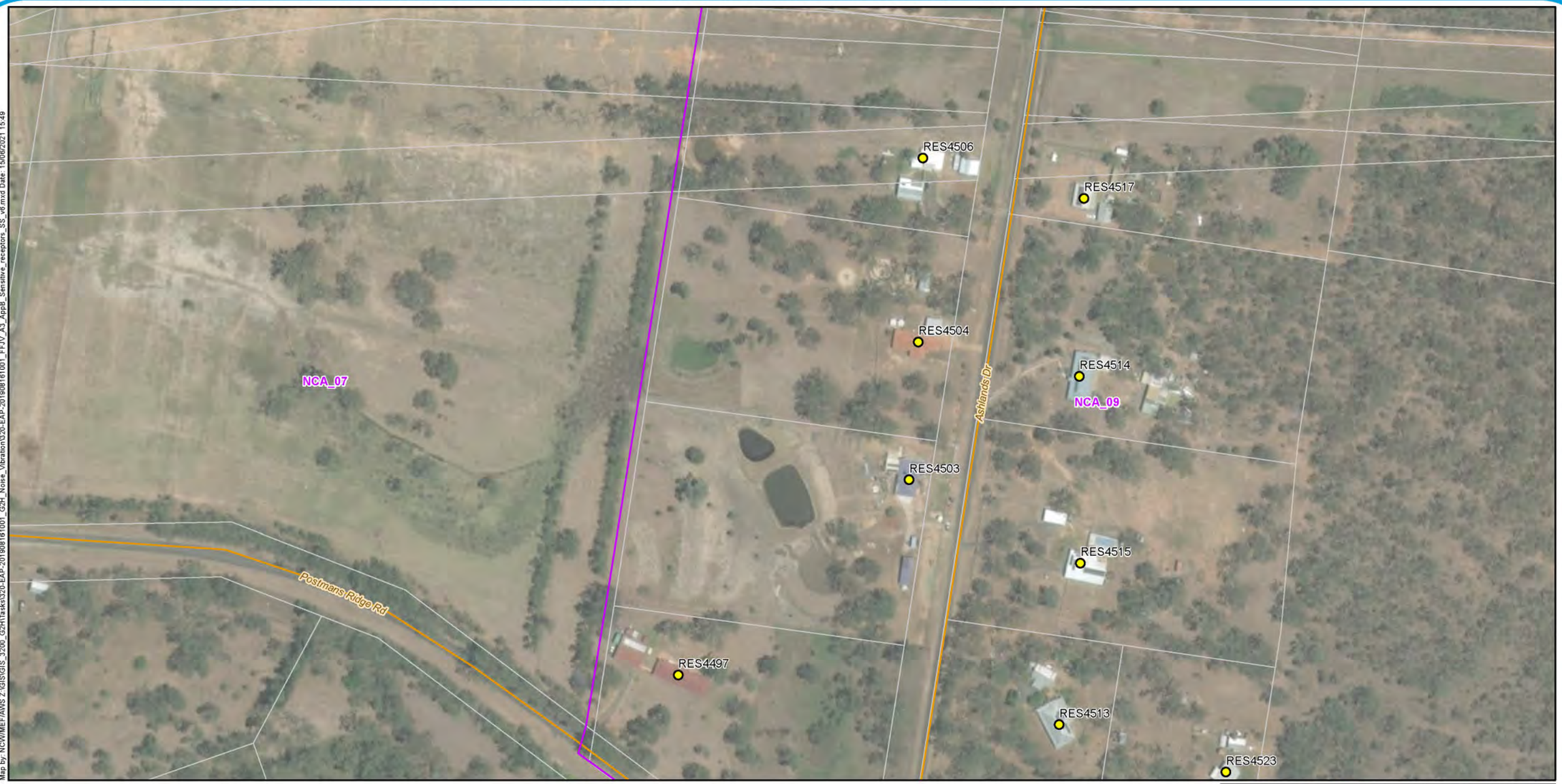
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B78: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

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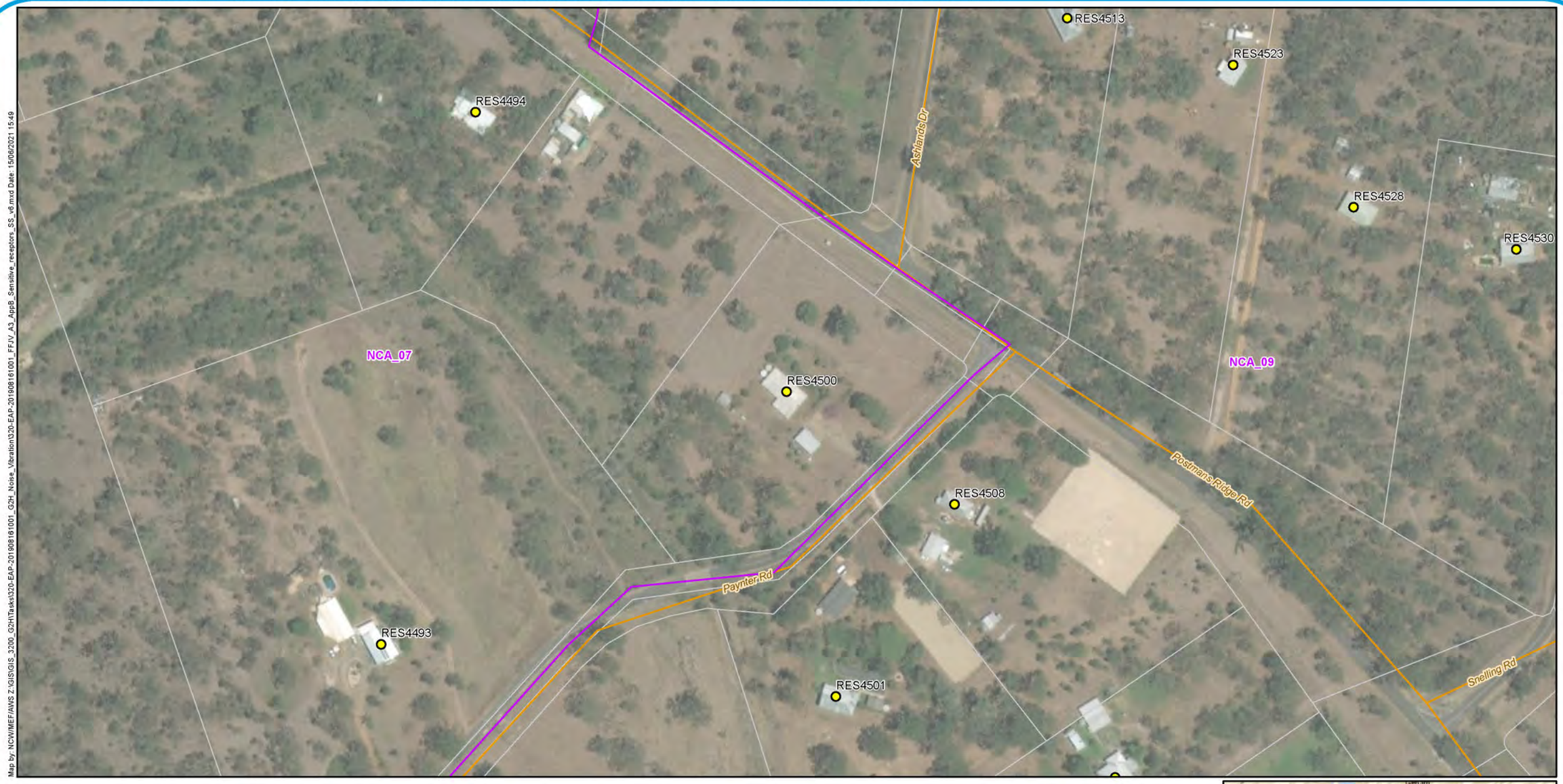
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B79: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_App8_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
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Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B80: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

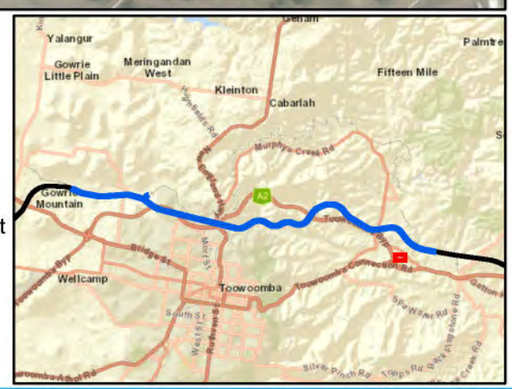
Map by: NCW/MEEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\3320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint



A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075 km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B81: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

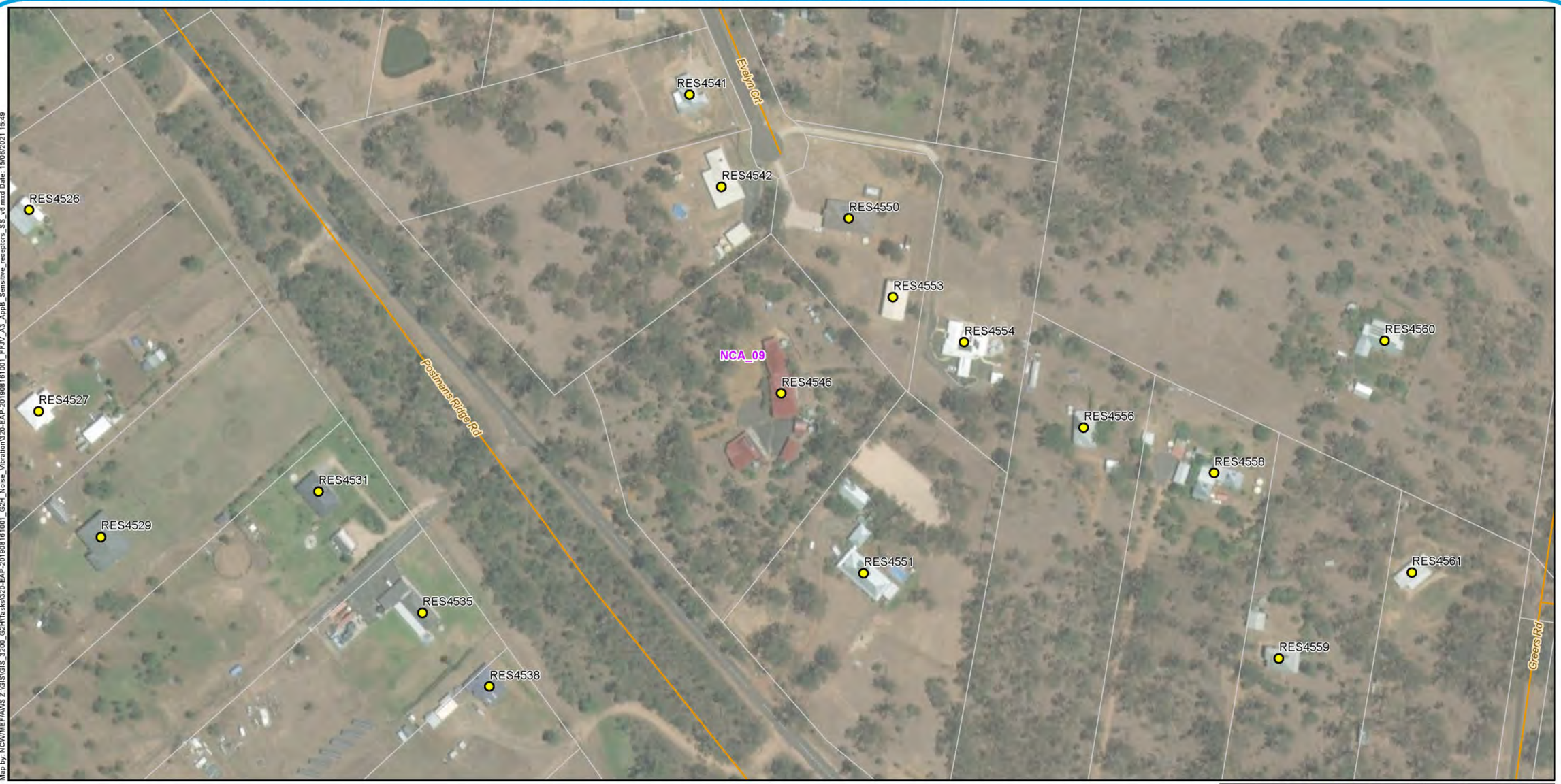
0 0.015 0.03 0.045 0.06 0.075 km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B82: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075 km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B83: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v8.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075 km

Future Freight
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Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B84: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_App8_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075 km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B85: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816101_G2H_Noise_Vibration\320-EAP-20190816101_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:1,300

0 0.0095 0.019 0.0285 0.038 0.0475 km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B86: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v8.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B87: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW\MEF\AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v8.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B88: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2HTasks\320-EAP-20190816100_G2H_Noise_Vibration\320-EAP-20190816100_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B89: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v8.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B90: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_App8_Sensitive_receptors_SS_v8.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

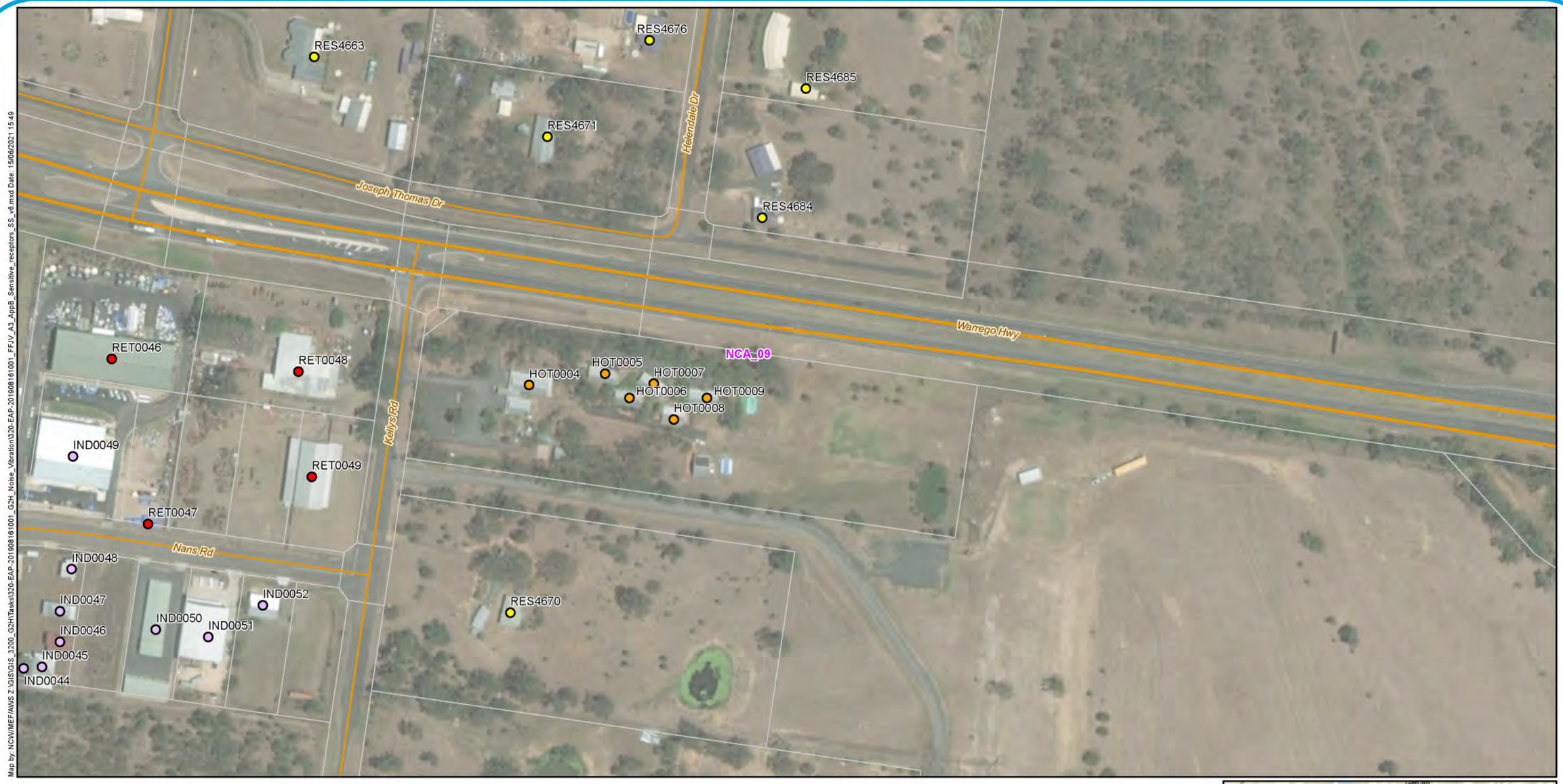
0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B91: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B92: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

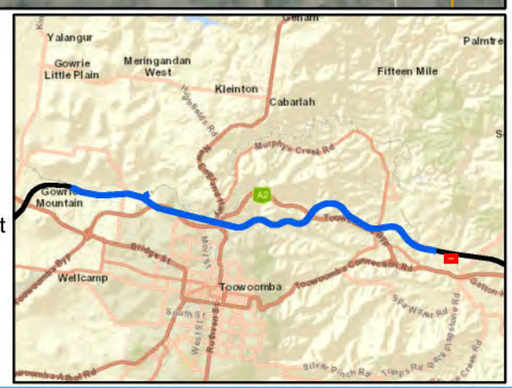
Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint



A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075 km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B93: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B94: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

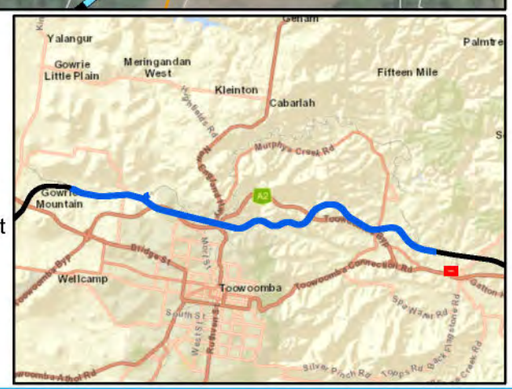
Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint



A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075 km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B95: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- H2C project alignment
- Existing rail
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

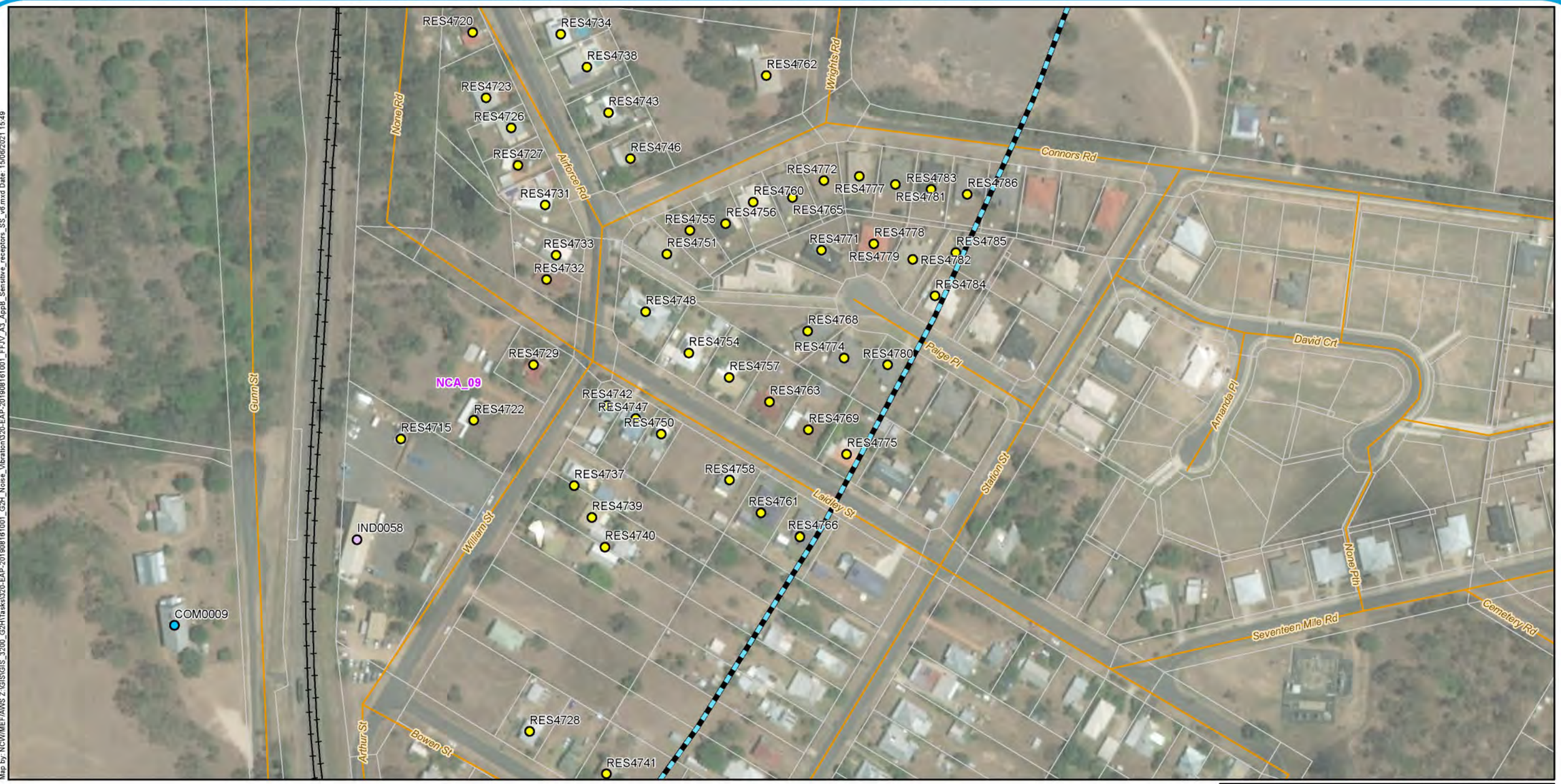
Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B96: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



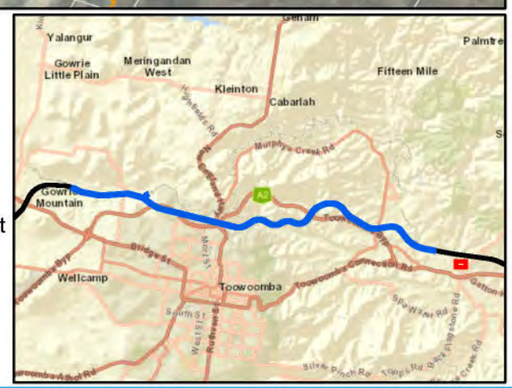
Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_G2H_Noise_Vibration\320-EAP-20190816\001_FFJV_A3_App8_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint



A3 scale: 1:2,300
0 0.015 0.03 0.045 0.06 0.075 km

Future Freight
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Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B97: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816\001_FFJV_A3_App8_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
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Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon

Appendix B98: Noise and Vibration Sensitive Receptors

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Map by: NCW/MEF/AWS Z:\GIS\GIS_3200_G2H\Tasks\320-EAP-20190816100_G2H_Noise_Vibration\320-EAP-20190816100_FFJV_A3_AppB_Sensitive_receptors_SS_v6.mxd Date: 15/06/2021 15:49

Legend

- 5 Chainage (km)
- Localities
- Existing rail
- Major roads
- Minor roads
- EIS disturbance footprint
- NCA
- Noise and vibration study area
- Cadastre

Sensitive Receptors

- Sporting Facility Outside Footprint
- Retail Outside Footprint
- Residential Inside Footprint
- Residential Outside Footprint
- Recreational Facility Outside Footprint
- Medical Facility Outside Footprint
- Industrial Inside Footprint
- Industrial Outside Footprint
- Hotel/Motel Outside Footprint
- Educational Facility Outside Footprint
- Commercial (Offices) Outside Footprint
- Heritage Inside Footprint
- Heritage Outside Footprint

A3 scale: 1:2,300

0 0.015 0.03 0.045 0.06 0.075km

Future Freight
Integrating Community, Environment and Engineering

Issue date: 15/06/2021 Version: 6
Coordinate System: GDA 1994 MGA Zone 56

Gowrie to Helidon
Appendix B99: Noise and Vibration Sensitive Receptors

APPENDIX

O

Construction Noise and Vibration

Appendix C Noise and vibration monitoring

GOWRIE TO HELIDON ENVIRONMENTAL IMPACT STATEMENT

Noise Monitoring Data Sheet

Inland Rail

SITE ID

G2H-1

From	Tuesday 11/12/2018 11:00	Meas. Type	Free Field	Package	Gowrie to Helidon
To	Wednesday 19/12/2018 11:15	Mic. Height (m)	1.8	Address	92 Paulsens Road
Instrument Type	01 dB DUO	Weather Station	No	Suburb	Gowrie Junction
Instrument Serial #	12608	Operator	JR/BR	Land Use	Residential
Inst. Cal. Date	11/12/2018	Sample Int.	15 min	Latitude	27°29'53.81"S
Pre Calibration	94.4	RP Lot#	453-A34873	Longitude	151°52'49.31"E
Post Calibration	94				

Daytime

RBL **35.8 dB(A)**

ABLs Day (Mon-Fri 7am - 6 pm)

ABLs Day (Sat 8 am - 1 pm)

Tuesday 11/12/2018	36.1	dB(A)
Wednesday 12/12/2018	34.2	dB(A)
Thursday 13/12/2018	32.0	dB(A)
Friday 14/12/2018	32.2	dB(A)
Saturday 15/12/2018	36.6	dB(A)
Monday 17/12/2018	37.4	dB(A)
Tuesday 18/12/2018	37.7	dB(A)
Wednesday 19/12/2018	35.6	dB(A)

Evening

RBL **36.5 dB(A)**

ABLs Evening (Mon-Fri 6 pm - 10 pm)

ABLs Evening (Sat 1 pm - 10 pm)

ABLs Evening (Sun 7 am - 10 pm)

Tuesday 11/12/2018	36.5	dB(A)
Wednesday 12/12/2018	38.6	dB(A)
Thursday 13/12/2018	33.4	dB(A)
Friday 14/12/2018	39.6	dB(A)
Saturday 15/12/2018	36.3	dB(A)
Sunday 16/12/2018	34.2	dB(A)
Monday 17/12/2018	37.7	dB(A)
Tuesday 18/12/2018	36.6	dB(A)

Night

RBL **31.0 dB(A)**

ABLs Night (Mon - Thu, Sat - Sun 6pm - 7am)

ABLs Night (Fri 6pm - 8am)

Tuesday 11/12/2018	24.7	dB(A)
Wednesday 12/12/2018	27.3	dB(A)
Thursday 13/12/2018	27.7	dB(A)
Friday 14/12/2018	31.4	dB(A)
Saturday 15/12/2018	32.1	dB(A)
Sunday 16/12/2018	33.7	dB(A)
Monday 17/12/2018	34.1	dB(A)
Tuesday 18/12/2018	30.5	dB(A)

Site Diagram - Diagram

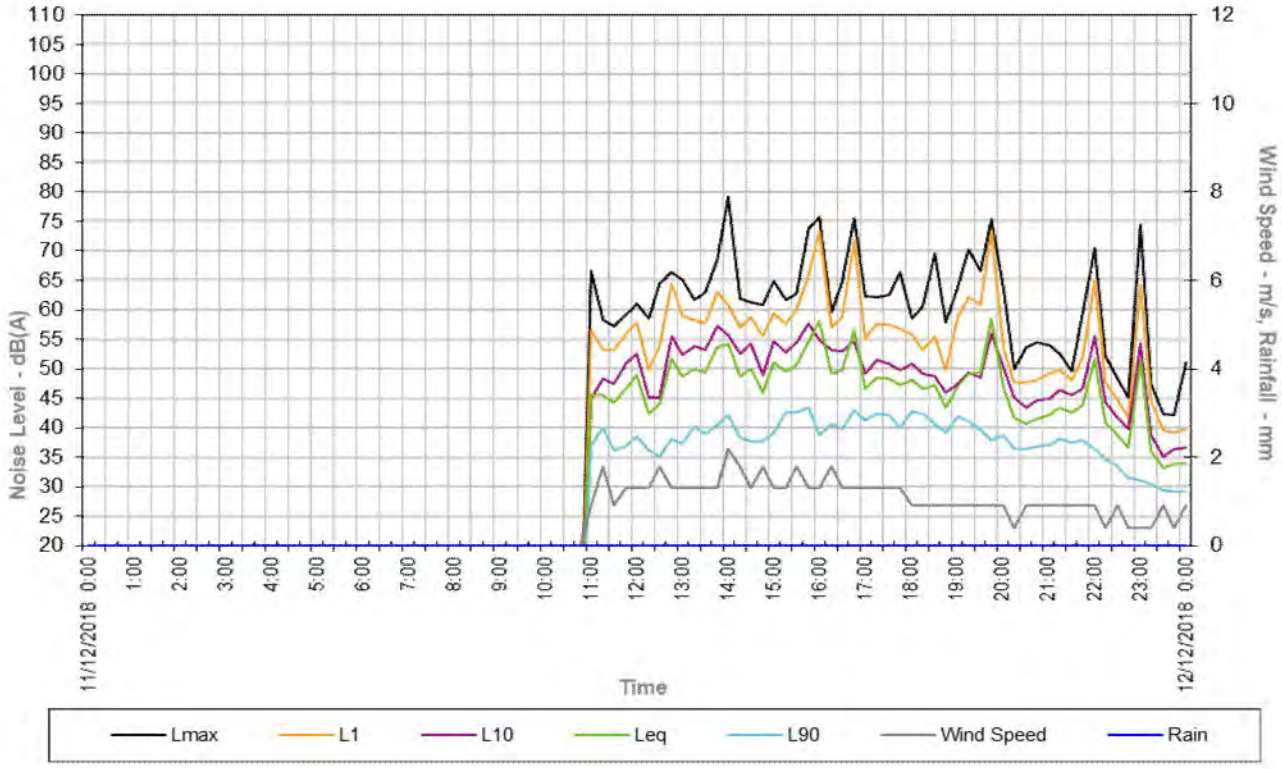
Site Attended Measurements Summary

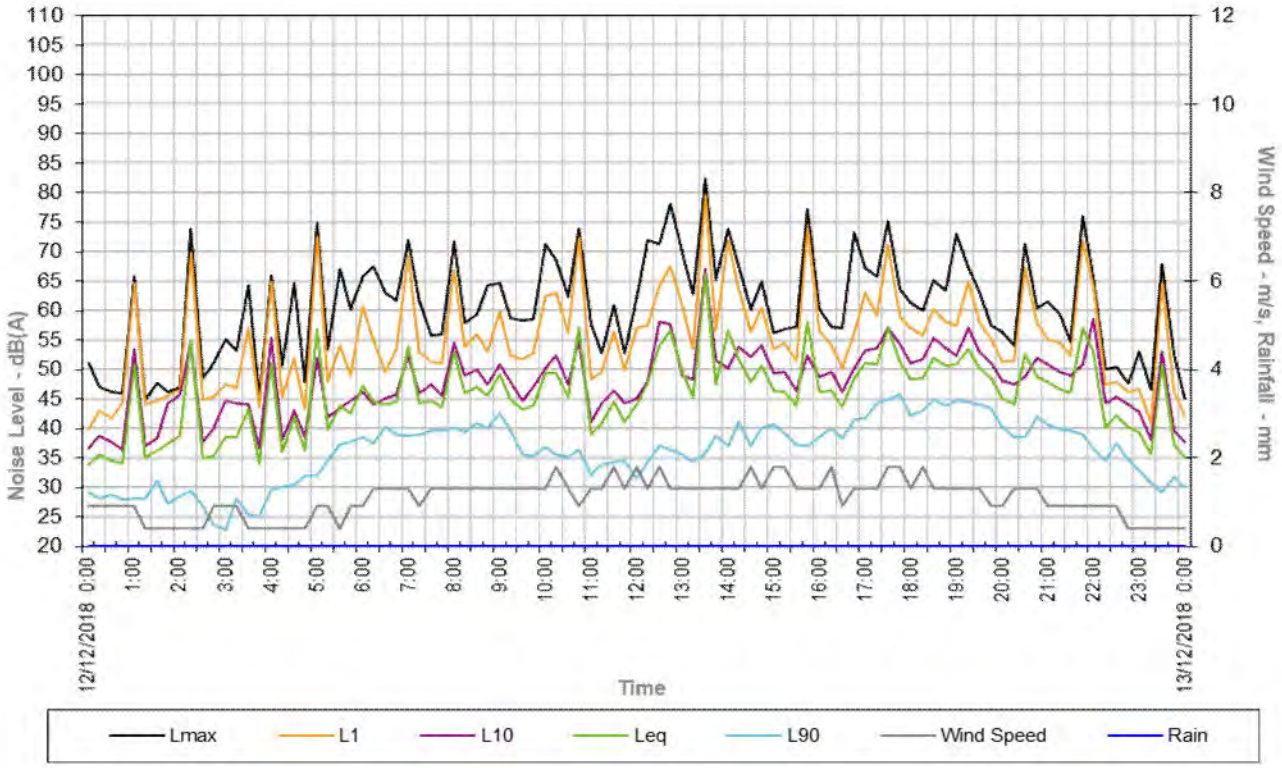
Date	Start	Measurement Type	Lmax	L1	L10	L90	Leq	Weather Conditions Comply	End
11/12/2018	10:45 AM	Attended	79.0	49.9	42.6	33.0	46.3	Pass	11:00 AM
		Logged	-	-	-	-	-		
		Difference	-	-	-	-	-		
Comments	Data Logger: SVAN 957 (S/N: 27551).Attended measurement taken before the start of the logging time. Train pass by at 75dB(A) train horn in distance at 68dB(A). Noise environment typically dominated by bird and insect noise at 35-38dB(A). Faint indistinguishable noise from inside house, barely audible. Cicada at 41dB(A).								
19/12/2018	11:15 AM	Attended	63.4	54.6	45.4	35.3	43.3	Pass	11:30 AM
		Logged	61.3	53.2	46.4	35.7	43.6		
		Difference	2.1	1.4	-1.0	-0.4	-0.3		
Comments	Data Logger: NTI-XL2 (S/N: A2A-09320-E0). Birds at 40 - 63dB(A), wind with distant birds 34-40dB(A), wind gusts at 46dB(A), insects at 34 - 41dB(A), distant train at 37-39dB(A), plane audible at 37dB(A) however, natural sources dominate background. Operator fault caused +2.1dB(A) difference in Lmax value.								

Photos

Site Noise and Weather Graphical Analysis

92 Paulsens Road





Future Freight
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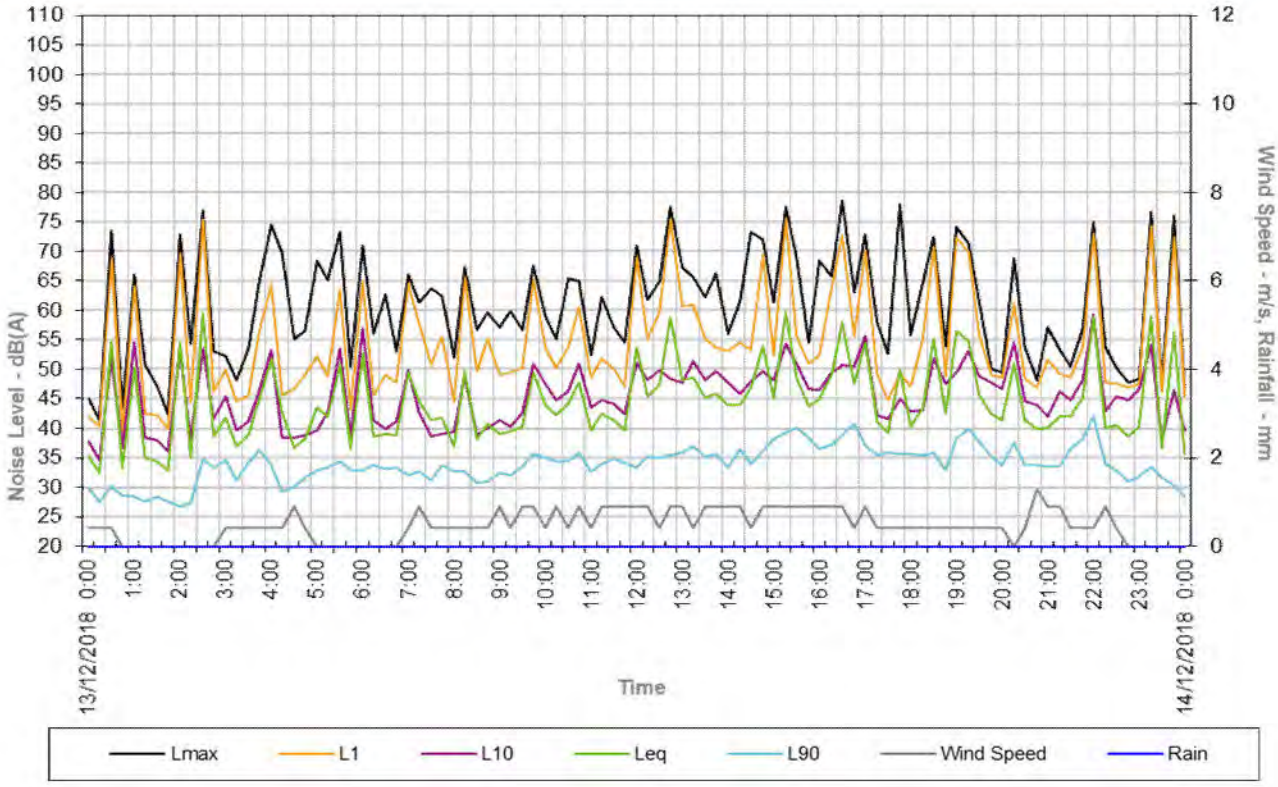
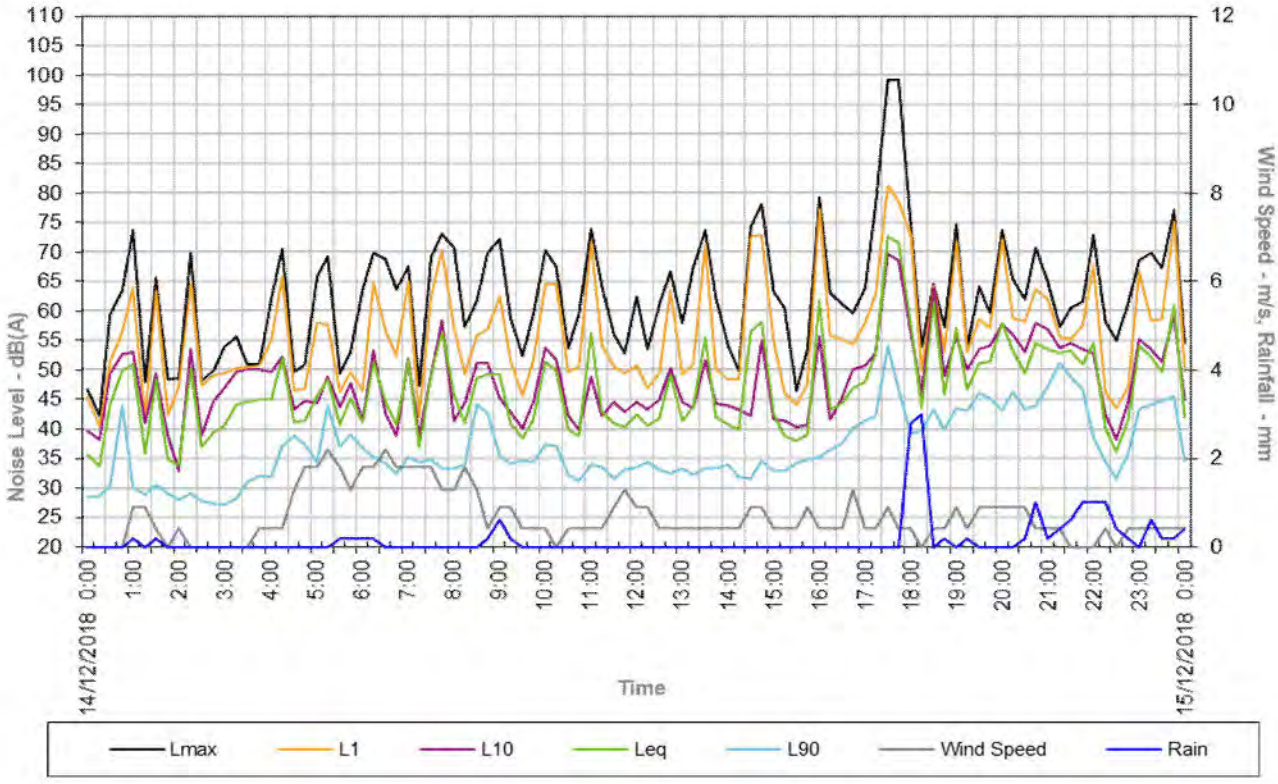
Site Noise and Weather Graphical Analysis

92 Paulsens Road

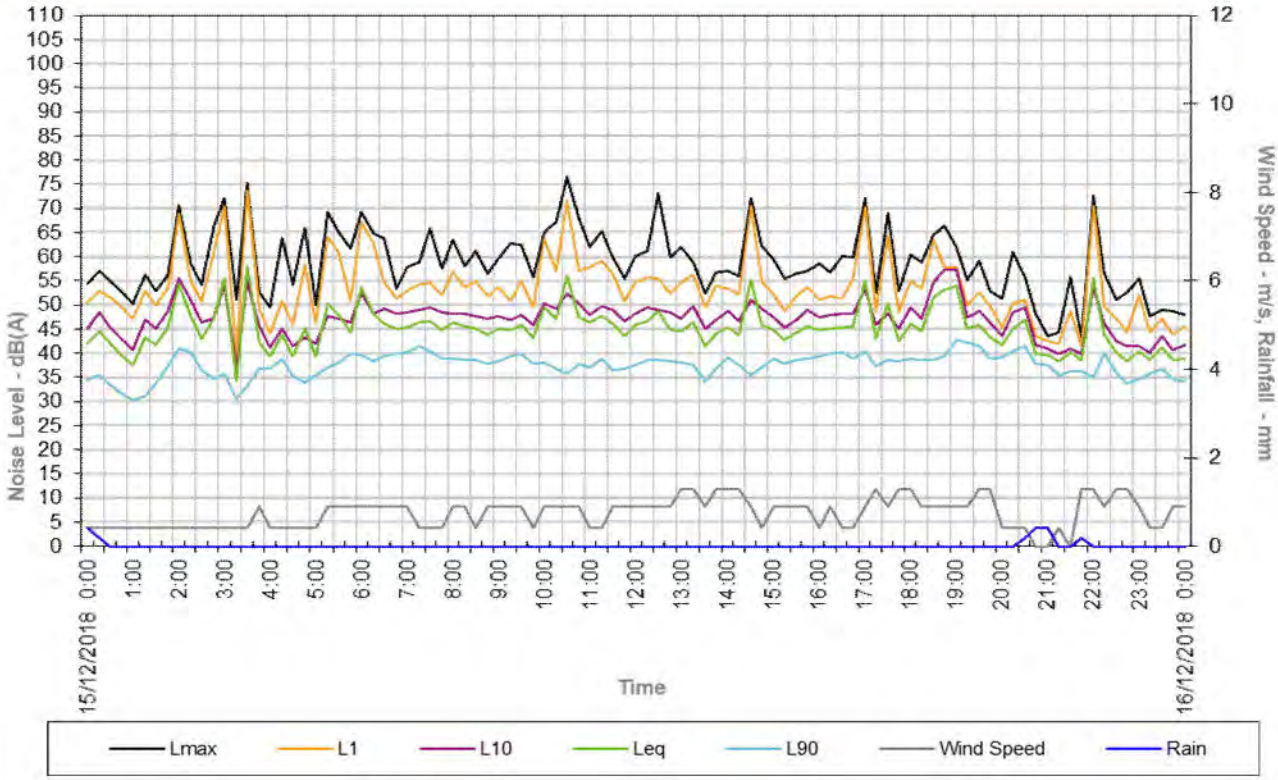


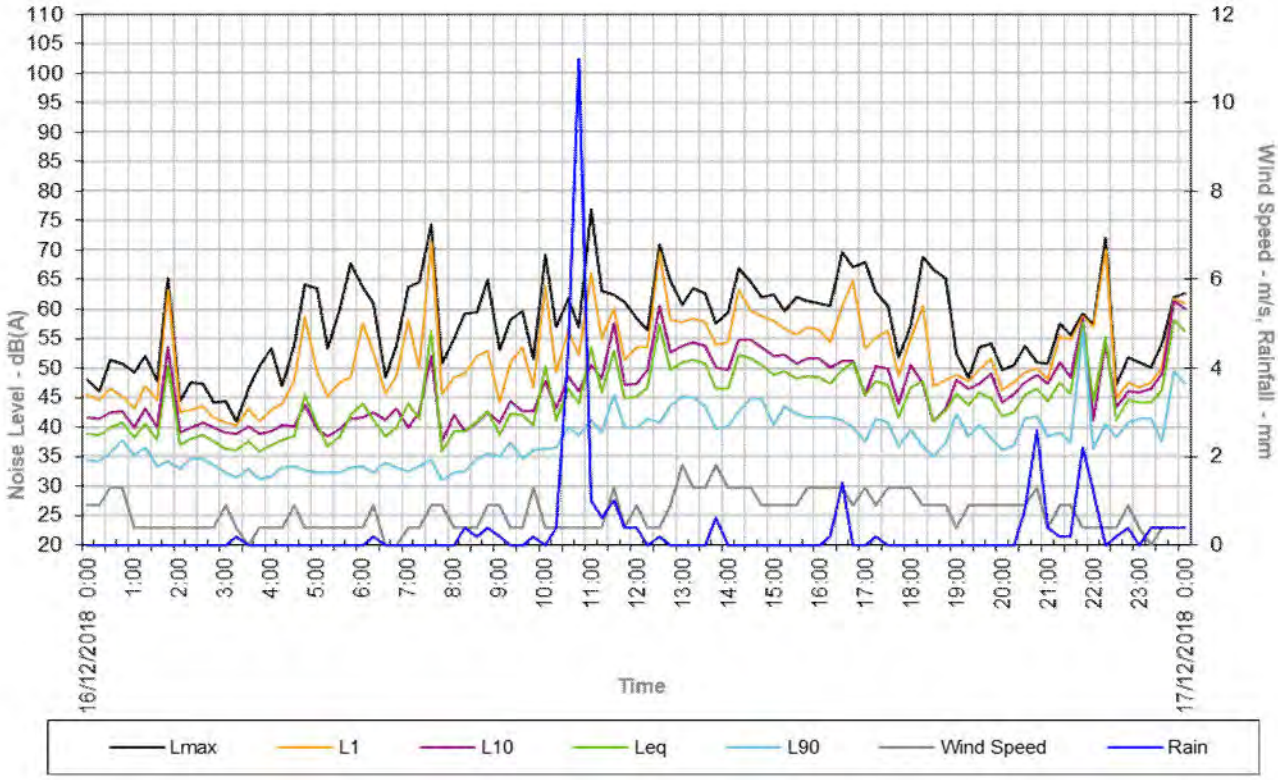


Future Freight
Integrating Community, Environment and Engineering

Site Noise and Weather Graphical Analysis

92 Paulsens Road

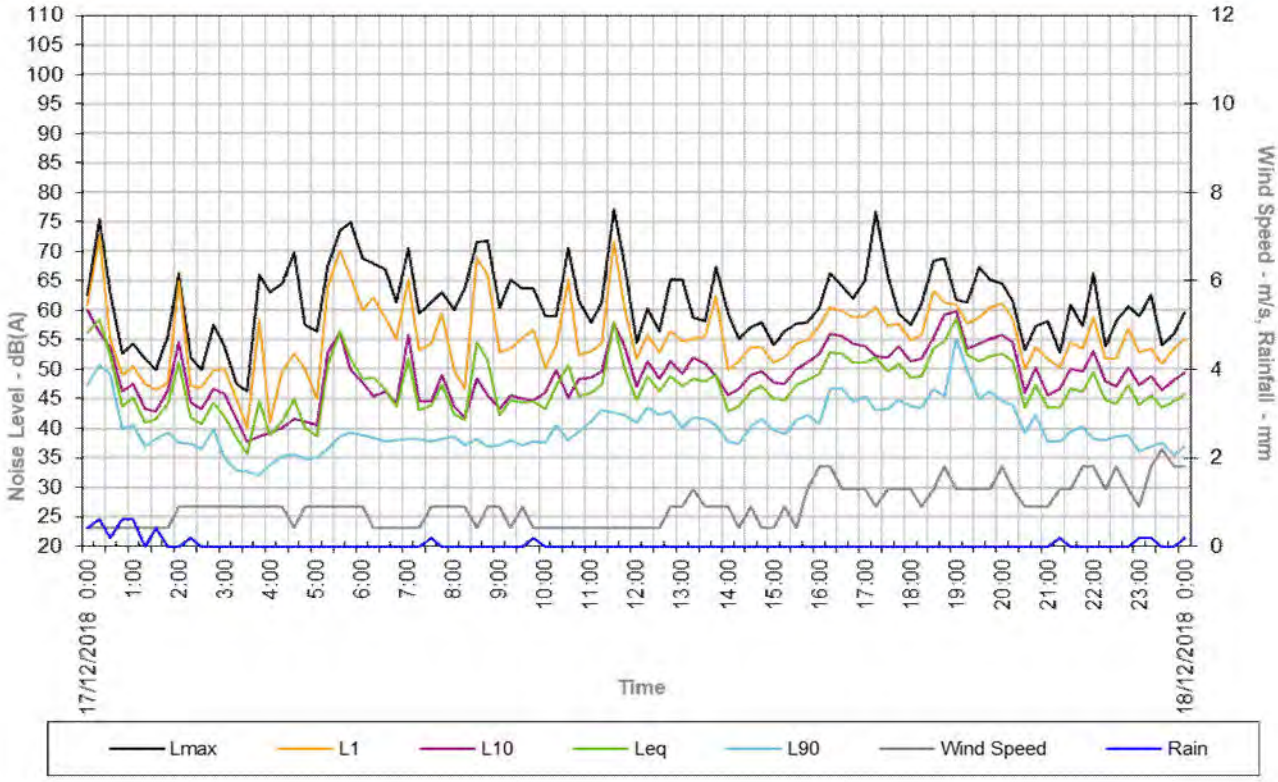


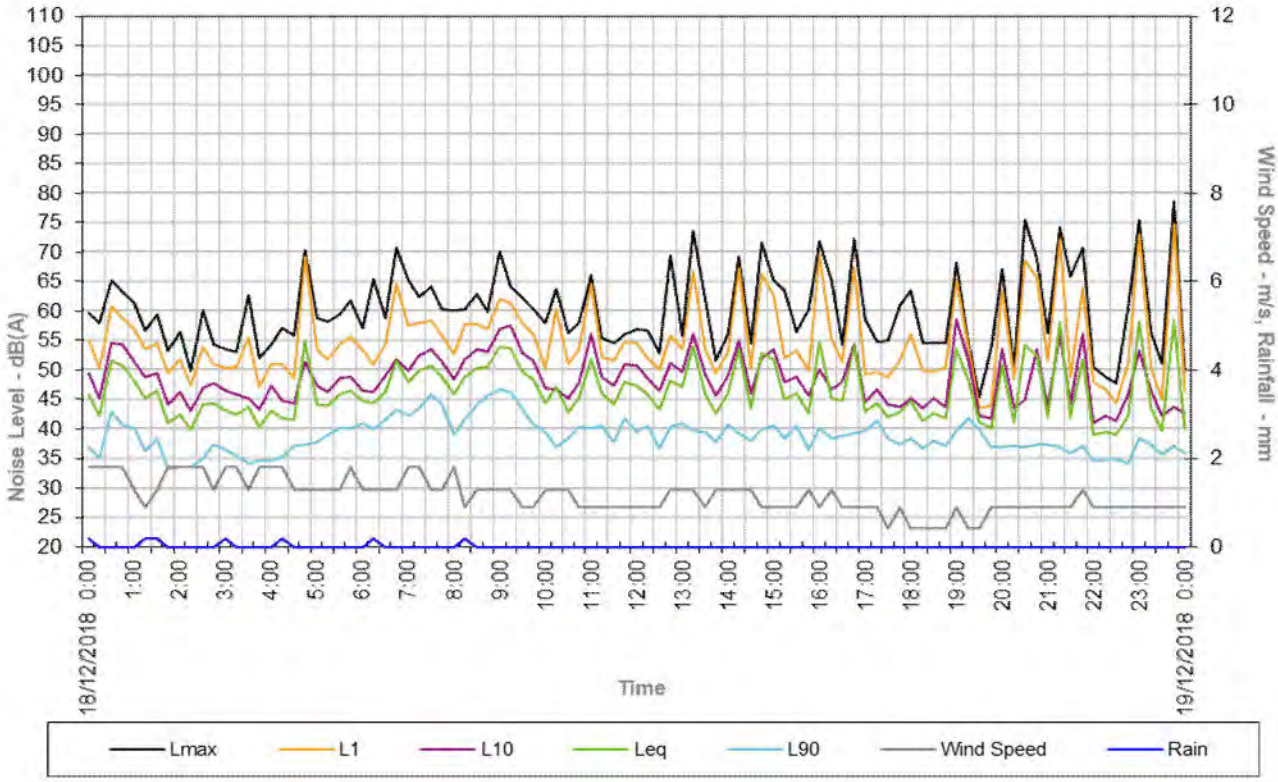


Future Freight
Integrating Community, Environment and Engineering

Site Noise and Weather Graphical Analysis

92 Paulsens Road

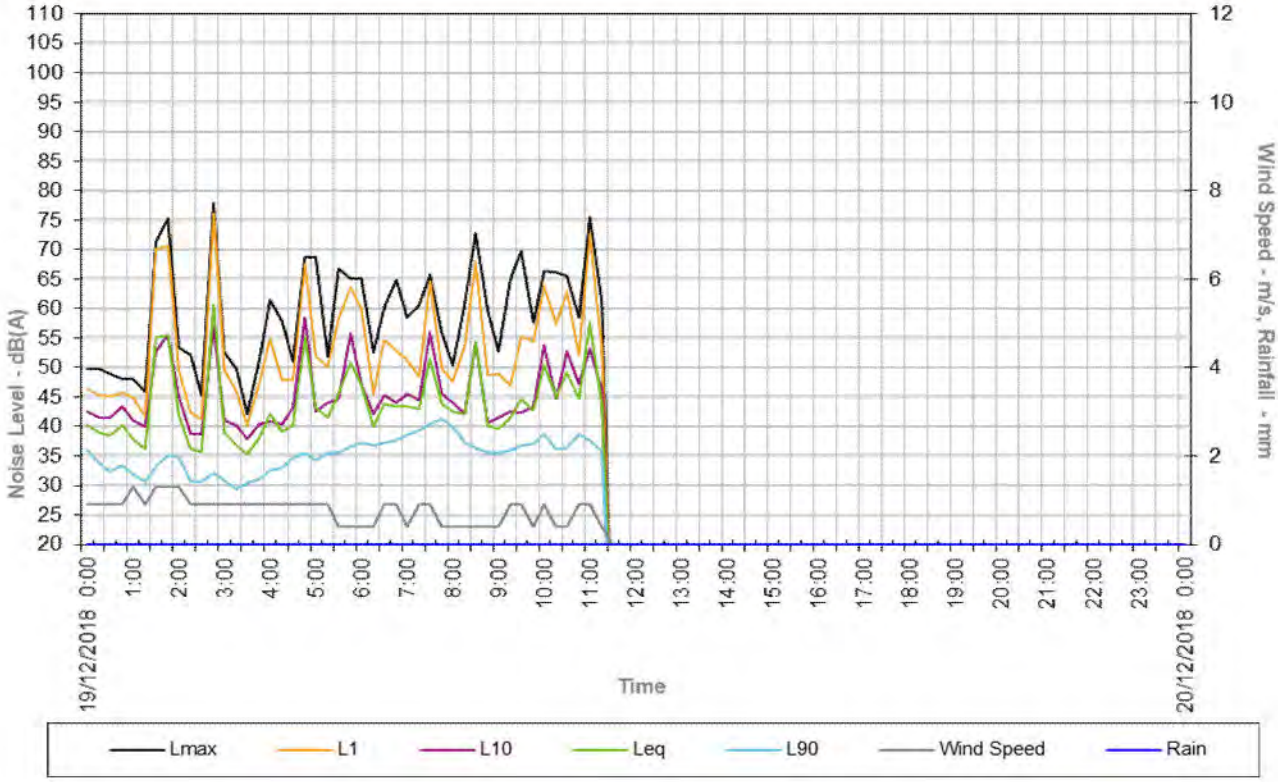




Future Freight
Integrating Community, Environment and Engineering

Site Noise and Weather Graphical Analysis

92 Paulsens Road



Logged Noise and Weather Data

Date	Start Time	LAeq	LAMax	LA1	LA10	LA90	Rain (mm)	Av. Wind speed (m/s)	Max Wind speed (m/s)	Wind Dir (°) North=0°	Temp (°C)	Hum. (%)	Air Pres. (Hpa)
11/12/2018	11:00	46	67	57	45	37	0.0	0.9	4.5	90	25	53	713
11/12/2018	11:15	46	58	53	48	40	0.0	1.8	4.0	135	25	51	713
11/12/2018	11:30	44	57	53	48	36	0.0	0.9	3.6	90	25	50	713
11/12/2018	11:45	47	59	56	51	37	0.0	1.3	4.9	90	26	48	713
11/12/2018	12:00	49	61	58	53	39	0.0	1.3	4.0	90	26	47	713
11/12/2018	12:15	42	58	50	45	36	0.0	1.3	4.9	90	26	48	712
11/12/2018	12:30	44	65	54	45	35	0.0	1.8	4.0	90	26	47	712
11/12/2018	12:45	52	66	64	56	38	0.0	1.3	4.5	113	27	46	712
11/12/2018	13:00	49	65	59	52	37	0.0	1.3	5.4	113	27	45	712
11/12/2018	13:15	50	62	58	54	40	0.0	1.3	4.5	90	27	45	712
11/12/2018	13:30	49	63	58	53	39	0.0	1.3	4.5	90	27	44	712
11/12/2018	13:45	54	69	63	57	41	0.0	1.3	5.4	90	28	44	712
11/12/2018	14:00	54	79	61	56	42	0.0	2.2	6.7	135	28	42	712
11/12/2018	14:15	49	62	57	53	38	0.0	1.8	4.9	113	28	43	711
11/12/2018	14:30	50	61	59	54	38	0.0	1.3	4.9	90	28	44	711
11/12/2018	14:45	46	61	56	49	38	0.0	1.8	5.4	90	28	43	711
11/12/2018	15:00	51	65	59	55	39	0.0	1.3	4.9	113	28	42	711
11/12/2018	15:15	50	62	58	53	43	0.0	1.3	5.8	90	28	42	711
11/12/2018	15:30	51	63	60	55	43	0.0	1.8	5.4	90	28	43	711
11/12/2018	15:45	55	74	66	58	44	0.0	1.3	4.0	90	28	42	711
11/12/2018	16:00	58	76	73	55	39	0.0	1.3	5.8	90	28	43	711
11/12/2018	16:15	49	60	57	53	41	0.0	1.8	4.9	113	28	43	711
11/12/2018	16:30	50	65	59	53	40	0.0	1.3	5.4	90	27	44	711
11/12/2018	16:45	57	76	72	55	43	0.0	1.3	3.6	90	27	45	711
11/12/2018	17:00	47	62	55	49	41	0.0	1.3	4.5	113	27	47	711
11/12/2018	17:15	49	62	58	52	42	0.0	1.3	4.0	135	27	48	711
11/12/2018	17:30	48	62	57	51	42	0.0	1.3	6.3	68	26	50	711
11/12/2018	17:45	47	66	57	50	40	0.0	1.3	3.6	90	26	52	711
11/12/2018	18:00	48	59	56	51	43	0.0	0.9	2.7	90	25	54	711
11/12/2018	18:15	47	61	53	49	42	0.0	0.9	3.6	68	24	56	711
11/12/2018	18:30	47	70	56	49	41	0.0	0.9	3.1	68	24	59	711
11/12/2018	18:45	43	58	50	46	39	0.0	0.9	4.5	90	23	61	712
11/12/2018	19:00	47	64	59	48	42	0.0	0.9	3.1	90	23	62	712
11/12/2018	19:15	49	70	62	49	41	0.0	0.9	5.4	113	22	64	712
11/12/2018	19:30	49	67	61	49	40	0.0	0.9	3.6	90	22	65	712
11/12/2018	19:45	58	75	73	58	38	0.0	0.9	3.1	90	21	66	712
11/12/2018	20:00	47	64	54	50	39	0.0	0.9	2.7	90	21	66	712
11/12/2018	20:15	42	50	48	45	36	0.0	0.4	2.7	90	21	68	713
11/12/2018	20:30	41	54	48	43	37	0.0	0.9	5.8	135	20	69	713
11/12/2018	20:45	42	54	48	45	37	0.0	0.9	4.0	90	20	71	713
11/12/2018	21:00	42	54	49	45	37	0.0	0.9	5.8	90	20	74	713
11/12/2018	21:15	43	53	50	47	38	0.0	0.9	2.7	90	19	76	713
11/12/2018	21:30	42	50	48	46	37	0.0	0.9	2.7	90	19	78	713
11/12/2018	21:45	44	59	52	47	38	0.0	0.9	2.2	68	19	79	713
11/12/2018	22:00	52	71	65	56	36	0.0	0.9	2.7	90	19	81	713
11/12/2018	22:15	41	52	48	44	35	0.0	0.4	2.7	90	19	82	713
11/12/2018	22:30	39	48	45	42	34	0.0	0.9	3.1	90	18	83	713
11/12/2018	22:45	37	45	42	40	32	0.0	0.4	2.7	90	18	84	713
11/12/2018	23:00	51	74	64	54	31	0.0	0.4	2.2	113	18	84	713
11/12/2018	23:15	36	48	44	39	31	0.0	0.4	2.7	113	18	85	713
11/12/2018	23:30	33	42	40	35	29	0.0	0.9	2.7	113	18	85	713
11/12/2018	23:45	34	42	39	37	29	0.0	0.4	2.2	90	18	85	713
12/12/2018	0:00	34	51	40	37	29	0.0	0.9	2.2	90	18	86	712
12/12/2018	0:15	35	47	43	39	28	0.0	0.9	4.0	90	18	87	712
12/12/2018	0:30	35	46	42	38	29	0.0	0.9	4.0	90	18	88	712
12/12/2018	0:45	34	46	44	37	28	0.0	0.9	4.0	90	18	89	712
12/12/2018	1:00	51	66	65	54	28	0.0	0.9	3.1	90	18	89	712
12/12/2018	1:15	35	45	44	37	28	0.0	0.4	2.7	90	18	89	712
12/12/2018	1:30	36	48	45	38	31	0.0	0.4	2.7	113	18	89	712
12/12/2018	1:45	37	46	46	44	27	0.0	0.4	2.2	90	18	89	711
12/12/2018	2:00	39	47	47	46	29	0.0	0.4	2.7	113	18	90	712
12/12/2018	2:15	55	74	70	55	30	0.0	0.4	1.8	90	17	90	712
12/12/2018	2:30	35	48	45	38	27	0.0	0.4	1.8	113	17	91	711
12/12/2018	2:45	35	51	45	40	24	0.0	0.9	1.8	90	17	91	711
12/12/2018	3:00	39	55	47	45	23	0.0	0.9	3.1	90	17	92	711
12/12/2018	3:15	39	53	47	44	28	0.0	0.9	2.7	90	17	92	711
12/12/2018	3:30	43	64	57	44	25	0.0	0.4	2.2	90	17	93	711
12/12/2018	3:45	34	45	44	37	25	0.0	0.4	1.8	90	17	93	711
12/12/2018	4:00	51	66	65	55	30	0.0	0.4	2.7	113	17	93	711
12/12/2018	4:15	36	51	45	38	30	0.0	0.4	0.9	90	17	93	711

Logged Noise and Weather Data

Date	Start Time	LAeq	LAMax	LA1	LA10	LA90	Rain (mm)	Av. Wind speed (m/s)	Max Wind speed (m/s)	Wind Dir (°) North=0°	Temp (°C)	Hum. (%)	Air Pres. (Hpa)
12/12/2018	4:30	42	65	52	43	30	0.0	0.4	1.8	90	17	94	711
12/12/2018	4:45	36	48	43	39	32	0.0	0.4	2.7	90	17	94	711
12/12/2018	5:00	57	75	73	52	32	0.0	0.9	2.2	90	17	94	711
12/12/2018	5:15	40	53	48	42	35	0.0	0.9	2.7	90	17	94	711
12/12/2018	5:30	44	67	54	44	37	0.0	0.4	3.1	90	17	94	711
12/12/2018	5:45	43	60	49	45	38	0.0	0.9	2.7	90	17	94	711
12/12/2018	6:00	47	66	61	46	39	0.0	0.9	3.1	90	17	94	711
12/12/2018	6:15	44	67	55	44	37	0.0	1.3	3.6	90	17	94	711
12/12/2018	6:30	44	63	50	45	40	0.0	1.3	3.1	68	17	94	711
12/12/2018	6:45	44	62	54	46	39	0.0	1.3	2.7	90	17	94	711
12/12/2018	7:00	54	72	69	52	39	0.0	1.3	3.6	68	17	94	712
12/12/2018	7:15	44	62	53	46	39	0.0	0.9	3.6	90	17	94	712
12/12/2018	7:30	45	56	51	47	40	0.0	1.3	2.7	90	18	90	712
12/12/2018	7:45	44	56	51	46	40	0.0	1.3	4.9	90	19	83	712
12/12/2018	8:00	53	72	67	55	40	0.0	1.3	4.0	90	20	76	712
12/12/2018	8:15	46	58	54	49	39	0.0	1.3	6.3	90	21	72	712
12/12/2018	8:30	47	59	56	50	41	0.0	1.3	4.0	90	21	72	712
12/12/2018	8:45	46	64	53	48	40	0.0	1.3	4.0	90	22	68	712
12/12/2018	9:00	49	65	60	51	43	0.0	1.3	4.5	90	22	67	712
12/12/2018	9:15	45	59	52	48	40	0.0	1.3	4.5	113	22	65	712
12/12/2018	9:30	43	58	52	45	36	0.0	1.3	3.6	135	23	61	712
12/12/2018	9:45	44	59	53	47	35	0.0	1.3	5.8	113	23	61	712
12/12/2018	10:00	49	71	62	50	37	0.0	1.3	4.9	90	24	58	712
12/12/2018	10:15	49	68	63	52	36	0.0	1.8	4.0	113	24	55	712
12/12/2018	10:30	45	62	56	48	35	0.0	1.3	4.0	135	24	55	712
12/12/2018	10:45	57	74	72	55	37	0.0	0.9	4.5	113	25	55	711
12/12/2018	11:00	39	58	48	41	32	0.0	1.3	5.4	90	25	53	711
12/12/2018	11:15	41	53	50	44	34	0.0	1.3	3.6	113	26	52	711
12/12/2018	11:30	44	61	56	46	34	0.0	1.8	3.6	113	26	51	711
12/12/2018	11:45	41	53	50	44	35	0.0	1.3	4.0	90	26	50	711
12/12/2018	12:00	44	62	57	45	32	0.0	1.8	4.9	90	27	49	711
12/12/2018	12:15	48	72	58	48	34	0.0	1.3	3.6	113	27	48	710
12/12/2018	12:30	54	71	64	58	37	0.0	1.8	5.4	113	28	46	710
12/12/2018	12:45	57	78	67	58	37	0.0	1.3	4.0	113	28	45	710
12/12/2018	13:00	50	70	61	49	36	0.0	1.3	4.0	90	28	46	710
12/12/2018	13:15	45	63	54	48	34	0.0	1.3	6.3	113	28	45	710
12/12/2018	13:30	66	82	80	67	36	0.0	1.3	4.9	90	28	45	710
12/12/2018	13:45	48	65	57	52	39	0.0	1.3	5.4	135	29	44	709
12/12/2018	14:00	57	74	72	50	37	0.0	1.3	5.8	113	29	44	709
12/12/2018	14:15	52	67	64	54	41	0.0	1.3	5.4	113	29	43	709
12/12/2018	14:30	48	60	57	52	37	0.0	1.8	5.4	135	29	43	709
12/12/2018	14:45	51	65	60	54	40	0.0	1.3	5.4	113	29	42	709
12/12/2018	15:00	46	56	53	49	41	0.0	1.8	4.9	113	29	43	709
12/12/2018	15:15	46	57	55	50	39	0.0	1.8	5.8	113	29	43	709
12/12/2018	15:30	44	57	52	46	37	0.0	1.3	5.4	90	29	42	709
12/12/2018	15:45	58	77	74	52	37	0.0	1.3	3.6	90	29	43	709
12/12/2018	16:00	46	60	57	49	39	0.0	1.3	4.5	90	29	43	708
12/12/2018	16:15	46	57	54	50	40	0.0	1.8	5.8	113	29	43	708
12/12/2018	16:30	44	57	50	46	38	0.0	0.9	4.9	90	28	44	708
12/12/2018	16:45	49	73	56	50	42	0.0	1.3	4.0	135	28	45	708
12/12/2018	17:00	51	67	63	53	42	0.0	1.3	3.6	113	27	46	708
12/12/2018	17:15	51	66	59	54	44	0.0	1.3	4.9	113	27	48	709
12/12/2018	17:30	57	75	71	57	45	0.0	1.8	6.3	113	26	49	709
12/12/2018	17:45	51	64	59	54	46	0.0	1.8	6.7	90	26	51	709
12/12/2018	18:00	48	61	57	51	42	0.0	1.3	4.9	90	26	54	709
12/12/2018	18:15	48	60	56	52	43	0.0	1.8	4.9	113	25	56	709
12/12/2018	18:30	52	65	60	55	45	0.0	1.3	4.9	113	24	58	709
12/12/2018	18:45	51	63	58	54	44	0.0	1.3	4.9	90	24	60	709
12/12/2018	19:00	51	73	58	52	45	0.0	1.3	6.3	90	23	62	709
12/12/2018	19:15	53	67	65	57	44	0.0	1.3	6.3	90	23	64	710
12/12/2018	19:30	50	63	58	53	44	0.0	1.3	4.9	90	22	66	710
12/12/2018	19:45	49	57	55	51	43	0.0	0.9	3.1	90	22	68	710
12/12/2018	20:00	45	56	51	48	40	0.0	0.9	3.6	90	22	68	709
12/12/2018	20:15	44	54	52	47	39	0.0	1.3	4.9	90	21	70	710
12/12/2018	20:30	53	71	67	49	39	0.0	1.3	6.7	113	21	72	710
12/12/2018	20:45	49	60	58	52	42	0.0	1.3	6.3	90	20	74	710
12/12/2018	21:00	48	62	55	51	41	0.0	0.9	6.3	90	20	76	710
12/12/2018	21:15	47	59	55	50	40	0.0	0.9	4.9	113	20	78	710
12/12/2018	21:30	46	55	52	49	40	0.0	0.9	3.1	90	20	80	710
12/12/2018	21:45	57	76	72	51	39	0.0	0.9	4.0	90	19	80	710

Logged Noise and Weather Data														
Date	Start Time	LAeq	LAMax	LA1	LA10	LA90	Rain (mm)	Av. Wind speed (m/s)	Max Wind speed (m/s)	Wind Dir (°) North=0°	Temp (°C)	Hum. (%)	Air Pres. (Hpa)
12/12/2018	22:00	53	65	64	59	37	0.0	0.9	3.1	90	19	82	710
12/12/2018	22:15	40	50	48	44	35	0.0	0.9	3.1	90	19	83	710
12/12/2018	22:30	42	50	48	45	37	0.0	0.9	3.1	113	19	84	710
12/12/2018	22:45	40	48	46	44	35	0.0	0.4	2.2	113	19	85	710
12/12/2018	23:00	39	53	47	43	33	0.0	0.4	2.2	113	19	85	710
12/12/2018	23:15	36	47	41	38	31	0.0	0.4	2.7	135	18	86	710
12/12/2018	23:30	51	68	65	53	29	0.0	0.4	2.2	113	18	86	710
12/12/2018	23:45	37	53	47	40	32	0.0	0.4	2.2	90	18	86	710
13/12/2018	0:00	35	45	42	38	30	0.0	0.4	1.8	90	18	86	710
13/12/2018	0:15	32	41	40	35	28	0.0	0.4	2.2	90	18	86	709
13/12/2018	0:30	55	74	69	52	30	0.0	0.4	0.9	90	18	87	709
13/12/2018	0:45	33	43	39	37	29	0.0	0.0	1.3	90	18	87	709
13/12/2018	1:00	50	66	64	55	28	0.0	0.0	0.9	90	18	87	709
13/12/2018	1:15	35	51	42	38	28	0.0	0.0	0.4	90	18	87	709
13/12/2018	1:30	34	47	42	38	28	0.0	0.0	0.4	90	18	87	709
13/12/2018	1:45	33	43	40	36	28	0.0	0.0	0.9	90	18	87	709
13/12/2018	2:00	55	73	70	53	27	0.0	0.0	0.4	90	18	87	709
13/12/2018	2:15	35	54	44	38	27	0.0	0.0	0.9	90	18	87	709
13/12/2018	2:30	59	77	76	53	35	0.0	0.0	0.4	90	18	87	709
13/12/2018	2:45	39	53	46	42	33	0.0	0.0	0.4	90	18	87	708
13/12/2018	3:00	42	52	50	46	35	0.0	0.4	1.3	90	18	88	708
13/12/2018	3:15	37	48	45	40	31	0.0	0.4	1.3	90	18	89	708
13/12/2018	3:30	39	54	46	41	34	0.0	0.4	1.3	90	17	89	708
13/12/2018	3:45	45	65	57	46	36	0.0	0.4	1.3	90	17	90	708
13/12/2018	4:00	52	75	64	53	34	0.0	0.4	1.8	90	17	90	708
13/12/2018	4:15	43	70	46	38	29	0.0	0.4	3.1	90	17	91	708
13/12/2018	4:30	37	55	47	39	30	0.0	0.9	2.2	90	17	91	708
13/12/2018	4:45	38	57	49	39	32	0.0	0.4	1.3	90	17	92	708
13/12/2018	5:00	44	68	52	40	33	0.0	0.0	1.3	90	17	92	708
13/12/2018	5:15	42	65	49	43	33	0.0	0.0	0.4	90	17	92	709
13/12/2018	5:30	51	73	63	54	34	0.0	0.0	0.4	90	17	92	709
13/12/2018	5:45	37	51	43	39	33	0.0	0.0	0.9	90	17	92	709
13/12/2018	6:00	53	71	65	57	33	0.0	0.0	0.9	90	18	91	709
13/12/2018	6:15	39	56	46	41	34	0.0	0.0	0.4	90	18	90	709
13/12/2018	6:30	39	63	49	40	33	0.0	0.0	0.4	90	18	89	709
13/12/2018	6:45	39	53	48	41	33	0.0	0.0	1.3	90	18	86	709
13/12/2018	7:00	50	66	65	50	32	0.0	0.4	1.8	90	19	81	709
13/12/2018	7:15	45	61	58	43	33	0.0	0.9	3.6	338	20	77	709
13/12/2018	7:30	41	64	51	39	31	0.0	0.4	1.8	315	20	75	709
13/12/2018	7:45	42	62	56	39	34	0.0	0.4	2.2	0	21	72	709
13/12/2018	8:00	37	52	45	39	33	0.0	0.4	2.2	338	21	70	709
13/12/2018	8:15	50	67	66	49	33	0.0	0.4	2.7	0	22	67	709
13/12/2018	8:30	38	57	50	39	31	0.0	0.4	2.7	0	22	68	709
13/12/2018	8:45	41	60	55	40	31	0.0	0.4	2.7	0	22	65	709
13/12/2018	9:00	39	57	49	41	32	0.0	0.9	2.7	0	23	63	709
13/12/2018	9:15	39	60	50	40	32	0.0	0.4	2.7	90	23	61	709
13/12/2018	9:30	40	57	50	43	34	0.0	0.9	3.6	23	23	61	709
13/12/2018	9:45	50	67	65	51	36	0.0	0.9	4.0	338	24	60	708
13/12/2018	10:00	44	59	54	48	35	0.0	0.4	2.2	0	24	60	708
13/12/2018	10:15	42	55	50	45	34	0.0	0.9	2.7	0	25	57	708
13/12/2018	10:30	44	65	54	46	34	0.0	0.4	2.2	0	26	54	708
13/12/2018	10:45	48	65	61	51	36	0.0	0.9	4.0	113	26	50	708
13/12/2018	11:00	40	52	49	44	33	0.0	0.4	2.2	45	27	51	708
13/12/2018	11:15	43	62	52	45	34	0.0	0.9	3.1	23	28	46	708
13/12/2018	11:30	41	57	50	44	35	0.0	0.9	2.7	0	28	46	707
13/12/2018	11:45	40	54	47	43	34	0.0	0.9	3.6	0	29	44	707
13/12/2018	12:00	54	71	69	51	33	0.0	0.9	2.7	0	30	43	707
13/12/2018	12:15	45	62	55	48	35	0.0	0.9	2.7	0	30	42	707
13/12/2018	12:30	47	65	60	50	35	0.0	0.4	2.7	90	30	42	706
13/12/2018	12:45	59	77	75	49	36	0.0	0.9	2.7	45	30	42	706
13/12/2018	13:00	48	67	61	48	36	0.0	0.9	3.6	23	30	42	706
13/12/2018	13:15	49	66	61	51	37	0.0	0.4	2.7	23	30	41	706
13/12/2018	13:30	45	62	55	48	35	0.0	0.9	2.2	293	31	37	706
13/12/2018	13:45	46	66	54	50	36	0.0	0.9	3.1	45	32	36	705
13/12/2018	14:00	44	56	53	48	33	0.0	0.9	2.7	90	32	36	705
13/12/2018	14:15	44	62	55	46	36	0.0	0.9	2.7	0	32	36	705
13/12/2018	14:30	47	73	53	48	34	0.0	0.4	2.7	0	32	37	705
13/12/2018	14:45	54	72	70	50	36	0.0	0.9	3.1	338	32	34	704
13/12/2018	15:00	45	61	52	48	38	0.0	0.9	3.1	135	33	34	704
13/12/2018	15:15	60	77	76	54	39	0.0	0.9	3.6	0	33	32	704

Logged Noise and Weather Data														
Date	Start Time	LAeq	LAMax	LA1	LA10	LA90	Rain (mm)	Av. Wind speed (m/s)	Max Wind speed (m/s)	Wind Dir (°) North=0°	Temp (°C)	Hum. (%)	Air Pres. (Hpa)
13/12/2018	15:30	49	69	56	51	40	0.0	0.9	4.5	23	33	34	704
13/12/2018	15:45	44	55	51	47	39	0.0	0.9	2.2	23	32	35	704
13/12/2018	16:00	45	68	52	47	37	0.0	0.9	2.7	0	32	36	704
13/12/2018	16:15	49	66	64	49	37	0.0	0.9	3.1	0	31	38	704
13/12/2018	16:30	58	79	73	51	39	0.0	0.9	2.7	68	30	41	704
13/12/2018	16:45	48	63	56	51	41	0.0	0.4	2.7	135	29	41	704
13/12/2018	17:00	55	73	70	56	37	0.0	0.9	2.7	23	28	43	704
13/12/2018	17:15	41	58	49	42	36	0.0	0.4	2.2	23	28	45	705
13/12/2018	17:30	39	53	45	42	36	0.0	0.4	2.7	23	27	46	705
13/12/2018	17:45	50	78	49	45	36	0.0	0.4	2.2	23	27	47	705
13/12/2018	18:00	40	56	47	43	36	0.0	0.4	2.7	45	26	48	705
13/12/2018	18:15	43	65	55	43	36	0.0	0.4	2.7	0	26	49	706
13/12/2018	18:30	55	73	71	52	36	0.0	0.4	2.2	338	26	51	706
13/12/2018	18:45	42	54	49	48	33	0.0	0.4	2.7	0	26	53	706
13/12/2018	19:00	57	74	73	49	38	0.0	0.4	1.8	23	25	54	706
13/12/2018	19:15	55	71	70	53	40	0.0	0.4	3.1	90	25	56	706
13/12/2018	19:30	46	61	56	49	38	0.0	0.4	2.2	90	25	57	706
13/12/2018	19:45	42	50	49	48	35	0.0	0.4	1.3	23	25	58	706
13/12/2018	20:00	41	49	49	47	34	0.0	0.4	1.8	23	25	58	706
13/12/2018	20:15	51	69	61	55	38	0.0	0.0	1.8	0	24	57	706
13/12/2018	20:30	41	54	48	45	34	0.0	0.4	2.2	23	24	57	706
13/12/2018	20:45	40	48	47	44	34	0.0	1.3	4.9	225	24	70	707
13/12/2018	21:00	40	57	52	42	34	0.0	0.9	3.1	225	23	75	707
13/12/2018	21:15	42	53	49	46	34	0.0	0.9	2.2	248	22	78	706
13/12/2018	21:30	42	51	49	45	36	0.0	0.4	1.3	248	22	78	706
13/12/2018	21:45	45	57	54	48	38	0.0	0.4	1.8	225	22	78	705
13/12/2018	22:00	59	75	73	59	42	0.0	0.4	3.1	90	21	78	705
13/12/2018	22:15	40	54	48	43	34	0.0	0.9	2.7	113	21	79	705
13/12/2018	22:30	41	50	48	46	33	0.0	0.4	2.2	135	21	81	706
13/12/2018	22:45	39	48	47	45	31	0.0	0.0	0.9	113	21	82	706
13/12/2018	23:00	40	48	48	47	32	0.0	0.0	0.9	68	21	82	706
13/12/2018	23:15	59	77	74	54	34	0.0	0.0	0.9	68	21	82	706
13/12/2018	23:30	37	47	46	38	32	0.0	0.0	0.9	68	21	83	706
13/12/2018	23:45	56	76	73	46	30	0.0	0.0	0.9	68	21	84	706
14/12/2018	0:00	36	47	46	40	28	0.0	0.0	0.9	68	21	84	706
14/12/2018	0:15	34	42	41	38	29	0.0	0.0	0.4	68	21	84	706
14/12/2018	0:30	44	60	51	49	30	0.0	0.0	0.9	68	21	84	706
14/12/2018	0:45	50	64	56	53	44	0.0	0.0	0.9	68	21	85	705
14/12/2018	1:00	51	74	64	53	30	0.2	0.9	2.7	68	20	86	705
14/12/2018	1:15	36	48	42	41	29	0.0	0.9	4.9	68	20	89	705
14/12/2018	1:30	48	66	63	49	31	0.2	0.4	1.8	113	20	89	705
14/12/2018	1:45	35	48	42	39	29	0.0	0.0	0.9	113	20	89	705
14/12/2018	2:00	34	49	47	33	28	0.0	0.4	1.8	90	20	88	705
14/12/2018	2:15	50	70	65	54	29	0.0	0.0	2.2	225	20	87	705
14/12/2018	2:30	37	48	47	39	28	0.0	0.0	1.3	248	20	87	705
14/12/2018	2:45	39	50	49	45	27	0.0	0.0	0.4	248	20	87	705
14/12/2018	3:00	41	54	50	47	27	0.0	0.0	0.9	248	20	87	705
14/12/2018	3:15	44	56	50	50	28	0.0	0.0	1.8	248	20	87	705
14/12/2018	3:30	45	51	51	50	31	0.0	0.0	0.4	270	20	88	705
14/12/2018	3:45	45	51	51	50	32	0.0	0.4	2.2	293	20	88	705
14/12/2018	4:00	45	62	55	50	32	0.0	0.4	3.1	293	20	88	705
14/12/2018	4:15	52	71	66	52	37	0.0	0.4	3.1	293	20	89	706
14/12/2018	4:30	41	50	46	43	39	0.0	1.3	4.0	293	20	89	705
14/12/2018	4:45	41	51	47	45	37	0.0	1.8	5.4	293	20	89	705
14/12/2018	5:00	46	66	58	44	34	0.0	1.8	5.8	293	20	90	705
14/12/2018	5:15	48	69	58	49	44	0.0	2.2	5.8	293	20	90	705
14/12/2018	5:30	41	50	46	44	37	0.2	1.8	4.9	293	20	91	706
14/12/2018	5:45	45	53	50	48	39	0.2	1.3	3.6	293	19	90	706
14/12/2018	6:00	41	64	47	41	37	0.2	1.8	3.6	293	19	91	706
14/12/2018	6:15	51	70	65	53	35	0.2	1.8	5.8	293	19	90	706
14/12/2018	6:30	45	69	57	43	34	0.0	2.2	5.4	293	19	92	706
14/12/2018	6:45	41	64	52	39	32	0.0	1.8	4.9	293	19	91	706
14/12/2018	7:00	52	68	65	52	35	0.0	1.8	4.0	270	19	92	706
14/12/2018	7:15	37	47	42	39	34	0.0	1.8	3.6	270	19	92	706
14/12/2018	7:30	49	69	63	49	35	0.0	1.8	3.6	293	19	92	706
14/12/2018	7:45	56	73	70	58	33	0.0	1.3	2.7	270	19	91	706
14/12/2018	8:00	46	71	57	41	33	0.0	1.3	3.6	270	19	90	705
14/12/2018	8:15	41	57	49	44	34	0.0	1.8	4.9	293	19	90	706
14/12/2018	8:30	49	62	56	51	44	0.0	1.3	4.9	270	20	89	706
14/12/2018	8:45	49	70	57	51	43	0.2	0.4	2.2	90	20	85	706

Logged Noise and Weather Data														
Date	Start Time	LAeq	LAMax	LA1	LA10	LA90	Rain (mm)	Av. Wind speed (m/s)	Max Wind speed (m/s)	Wind Dir (°) North=0°	Temp (°C)	Hum. (%)	Air Pres. (Hpa)
14/12/2018	9:00	49	72	63	45	36	0.6	0.9	1.8	90	19	87	705
14/12/2018	9:15	41	59	52	43	34	0.2	0.9	1.8	90	19	90	705
14/12/2018	9:30	38	52	46	40	35	0.0	0.4	1.8	225	20	89	706
14/12/2018	9:45	42	60	52	45	34	0.0	0.4	1.8	113	20	87	706
14/12/2018	10:00	51	70	65	54	37	0.0	0.4	1.8	315	21	83	706
14/12/2018	10:15	50	67	65	52	37	0.0	0.0	1.8	315	23	81	706
14/12/2018	10:30	40	54	50	42	32	0.0	0.4	2.2	135	24	74	705
14/12/2018	10:45	39	59	51	40	31	0.0	0.4	1.8	113	24	73	705
14/12/2018	11:00	56	74	72	49	34	0.0	0.4	2.2	23	25	69	705
14/12/2018	11:15	43	64	54	42	34	0.0	0.4	2.2	23	26	66	705
14/12/2018	11:30	41	56	51	45	32	0.0	0.9	2.7	23	27	64	705
14/12/2018	11:45	40	53	49	43	33	0.0	1.3	3.6	23	28	61	705
14/12/2018	12:00	42	62	51	45	34	0.0	0.9	3.1	0	29	60	705
14/12/2018	12:15	41	54	47	43	34	0.0	0.9	3.1	23	30	59	705
14/12/2018	12:30	42	61	50	45	33	0.0	0.4	3.1	23	29	57	705
14/12/2018	12:45	49	67	64	50	33	0.0	0.4	2.2	338	30	57	704
14/12/2018	13:00	41	58	49	45	33	0.0	0.4	3.1	135	29	60	704
14/12/2018	13:15	44	67	51	44	32	0.0	0.4	3.1	135	28	60	704
14/12/2018	13:30	55	74	71	52	33	0.0	0.4	2.2	0	28	60	704
14/12/2018	13:45	42	62	50	44	33	0.0	0.4	3.6	113	28	60	704
14/12/2018	14:00	41	54	48	44	34	0.0	0.4	2.2	113	29	58	704
14/12/2018	14:15	40	50	48	43	32	0.0	0.4	2.7	113	29	58	704
14/12/2018	14:30	56	74	73	42	32	0.0	0.9	3.1	113	29	52	704
14/12/2018	14:45	58	78	73	55	35	0.0	0.9	3.1	113	31	48	703
14/12/2018	15:00	42	63	55	42	33	0.0	0.4	2.2	45	31	48	703
14/12/2018	15:15	39	60	46	41	33	0.0	0.4	2.7	113	31	52	703
14/12/2018	15:30	38	46	44	40	34	0.0	0.4	2.2	135	29	57	703
14/12/2018	15:45	39	53	48	41	35	0.0	0.9	2.2	113	28	61	703
14/12/2018	16:00	62	79	77	56	35	0.0	0.4	2.7	90	27	64	703
14/12/2018	16:15	43	63	56	42	36	0.0	0.4	1.8	113	26	68	703
14/12/2018	16:30	44	61	55	45	38	0.0	0.4	2.7	113	26	70	704
14/12/2018	16:45	47	60	54	50	40	0.0	1.3	3.6	90	25	73	704
14/12/2018	17:00	48	64	58	51	41	0.0	0.4	2.7	90	24	77	705
14/12/2018	17:15	53	78	63	53	42	0.0	0.4	2.2	90	23	77	704
14/12/2018	17:30	73	99	81	70	54	0.0	0.9	3.1	90	22	79	704
14/12/2018	17:45	71	99	79	69	47	0.0	0.4	3.1	68	21	82	706
14/12/2018	18:00	58	75	73	57	39	2.8	0.4	1.8	225	21	85	705
14/12/2018	18:15	43	54	50	46	40	3.0	0.0	0.9	0	21	87	706
14/12/2018	18:30	62	65	64	64	43	0.0	0.4	2.2	23	20	89	706
14/12/2018	18:45	46	57	53	49	40	0.2	0.4	1.8	90	20	91	706
14/12/2018	19:00	57	75	72	56	44	0.0	0.9	3.1	113	20	92	706
14/12/2018	19:15	47	54	53	50	43	0.2	0.4	3.6	135	20	93	706
14/12/2018	19:30	51	64	59	54	46	0.0	0.9	3.6	135	20	92	706
14/12/2018	19:45	51	60	57	54	45	0.0	0.9	5.4	113	20	92	706
14/12/2018	20:00	58	74	72	58	43	0.0	0.9	2.7	90	20	91	706
14/12/2018	20:15	53	65	59	56	46	0.0	0.9	3.6	113	20	92	707
14/12/2018	20:30	49	62	58	53	43	0.2	0.9	3.6	90	20	93	707
14/12/2018	20:45	54	71	64	58	44	1.0	0.4	1.8	90	20	93	707
14/12/2018	21:00	54	65	62	57	47	0.2	0.4	3.6	68	20	93	707
14/12/2018	21:15	53	57	56	54	51	0.4	0.4	2.2	113	20	93	707
14/12/2018	21:30	53	61	55	55	49	0.6	0.0	0.9	90	19	94	708
14/12/2018	21:45	51	62	58	53	47	1.0	0.0	0.9	90	19	94	708
14/12/2018	22:00	55	73	68	53	39	1.0	0.0	0.9	90	19	94	708
14/12/2018	22:15	40	58	46	42	34	1.0	0.4	2.2	113	19	94	707
14/12/2018	22:30	36	55	44	38	32	0.4	0.0	2.2	113	19	94	708
14/12/2018	22:45	42	61	47	45	36	0.2	0.4	2.2	113	20	94	707
14/12/2018	23:00	54	69	67	55	43	0.0	0.4	3.6	135	20	94	708
14/12/2018	23:15	52	70	58	54	44	0.6	0.4	0.9	135	20	94	708
14/12/2018	23:30	50	67	59	51	45	0.2	0.4	2.2	135	20	94	708
14/12/2018	23:45	61	77	75	59	46	0.2	0.4	2.2	113	20	94	708
15/12/2018	0:00	42	55	51	45	35	0.4	0.4	1.8	113	19	94	708
15/12/2018	0:15	45	57	53	48	35	0.2	0.4	1.8	113	19	94	707
15/12/2018	0:30	42	55	52	45	33	0.0	0.4	1.8	90	19	94	707
15/12/2018	0:45	39	53	49	43	32	0.0	0.4	2.2	90	19	94	706
15/12/2018	1:00	38	50	47	41	30	0.0	0.4	1.3	90	18	94	706
15/12/2018	1:15	43	56	53	47	31	0.0	0.4	1.3	90	18	94	706
15/12/2018	1:30	42	53	50	45	34	0.0	0.4	1.3	90	19	94	706
15/12/2018	1:45	45	56	54	49	37	0.0	0.4	2.2	90	19	95	706
15/12/2018	2:00	55	71	69	56	41	0.0	0.4	0.9	113	19	95	706
15/12/2018	2:15	48	59	55	51	40	0.0	0.4	1.8	113	19	95	705

Logged Noise and Weather Data														
Date	Start Time	LAeq	LAMax	LA1	LA10	LA90	Rain (mm)	Av. Wind speed (m/s)	Max Wind speed (m/s)	Wind Dir (°) North=0°	Temp (°C)	Hum. (%)	Air Pres. (Hpa)
15/12/2018	2:30	43	54	51	47	37	0.0	0.4	0.9	113	19	95	705
15/12/2018	2:45	47	66	61	47	35	0.0	0.4	2.2	113	19	95	705
15/12/2018	3:00	55	72	70	54	36	0.0	0.4	1.8	113	19	95	706
15/12/2018	3:15	34	51	39	37	31	0.0	0.4	1.8	113	19	95	706
15/12/2018	3:30	58	75	74	55	33	0.0	0.4	2.2	113	19	95	706
15/12/2018	3:45	42	53	49	46	37	0.0	0.9	2.2	68	19	95	706
15/12/2018	4:00	39	50	44	41	37	0.0	0.4	1.8	90	18	95	706
15/12/2018	4:15	44	64	51	45	39	0.0	0.4	2.2	90	18	95	706
15/12/2018	4:30	40	54	46	42	35	0.0	0.4	2.2	90	18	95	706
15/12/2018	4:45	45	66	58	43	34	0.0	0.4	2.7	90	18	95	707
15/12/2018	5:00	39	50	46	42	35	0.0	0.4	2.2	113	18	95	707
15/12/2018	5:15	50	69	64	48	37	0.0	0.9	3.6	90	18	95	707
15/12/2018	5:30	48	65	61	47	38	0.0	0.9	2.2	90	18	95	707
15/12/2018	5:45	44	62	51	46	40	0.0	0.9	2.7	90	18	95	706
15/12/2018	6:00	54	69	67	53	40	0.0	0.9	2.2	68	18	95	708
15/12/2018	6:15	48	65	63	48	38	0.0	0.9	2.7	90	18	95	708
15/12/2018	6:30	46	64	55	49	39	0.0	0.9	2.2	90	18	95	708
15/12/2018	6:45	45	54	51	48	40	0.0	0.9	4.0	90	18	95	708
15/12/2018	7:00	45	58	53	48	40	0.0	0.9	3.1	90	18	95	708
15/12/2018	7:15	46	59	54	49	42	0.0	0.4	1.8	68	19	95	708
15/12/2018	7:30	47	66	55	50	41	0.0	0.4	1.8	90	19	95	708
15/12/2018	7:45	45	58	52	48	39	0.0	0.4	3.1	113	19	95	708
15/12/2018	8:00	46	64	57	48	39	0.0	0.9	1.8	90	20	95	708
15/12/2018	8:15	46	58	54	48	39	0.0	0.9	2.7	90	20	95	709
15/12/2018	8:30	45	61	55	48	39	0.0	0.4	3.1	90	20	95	708
15/12/2018	8:45	44	57	52	47	38	0.0	0.9	2.7	90	21	95	708
15/12/2018	9:00	45	60	54	48	38	0.0	0.9	3.1	90	21	94	708
15/12/2018	9:15	45	63	51	47	39	0.0	0.9	2.7	90	22	91	708
15/12/2018	9:30	46	62	55	48	40	0.0	0.9	2.2	90	22	89	708
15/12/2018	9:45	43	56	49	46	38	0.0	0.4	2.2	68	23	87	708
15/12/2018	10:00	50	65	64	50	38	0.0	0.9	3.1	68	24	84	709
15/12/2018	10:15	47	67	57	49	37	0.0	0.9	2.2	90	24	79	708
15/12/2018	10:30	56	77	72	52	36	0.0	0.9	2.7	90	25	74	708
15/12/2018	10:45	47	68	57	50	38	0.0	0.9	3.6	90	26	74	708
15/12/2018	11:00	46	62	58	48	37	0.0	0.4	3.1	113	26	70	708
15/12/2018	11:15	48	65	59	50	39	0.0	0.4	2.7	113	26	69	708
15/12/2018	11:30	46	60	57	49	37	0.0	0.9	2.2	90	26	69	708
15/12/2018	11:45	44	55	51	47	37	0.0	0.9	2.7	90	26	69	708
15/12/2018	12:00	46	60	55	48	38	0.0	0.9	2.7	68	27	67	708
15/12/2018	12:15	47	61	56	50	39	0.0	0.9	3.1	90	27	66	708
15/12/2018	12:30	49	73	56	49	39	0.0	0.9	3.6	90	28	65	707
15/12/2018	12:45	45	60	52	48	38	0.0	0.9	3.1	90	28	62	707
15/12/2018	13:00	45	62	55	47	38	0.0	1.3	3.1	68	28	63	707
15/12/2018	13:15	46	59	56	50	38	0.0	1.3	3.6	68	28	63	707
15/12/2018	13:30	42	52	50	45	34	0.0	0.9	3.1	113	29	61	707
15/12/2018	13:45	44	57	54	47	37	0.0	1.3	4.0	68	29	61	707
15/12/2018	14:00	45	57	53	49	39	0.0	1.3	4.0	113	29	62	707
15/12/2018	14:15	44	56	52	47	38	0.0	1.3	4.0	113	29	62	707
15/12/2018	14:30	55	72	71	51	36	0.0	0.9	4.0	135	29	60	706
15/12/2018	14:45	46	62	55	49	37	0.0	0.4	2.2	113	29	60	707
15/12/2018	15:00	45	59	52	47	39	0.0	0.9	3.1	90	29	60	706
15/12/2018	15:15	43	55	49	45	38	0.0	0.9	3.6	113	29	59	706
15/12/2018	15:30	44	57	52	47	39	0.0	0.9	3.6	113	29	60	706
15/12/2018	15:45	46	57	54	49	39	0.0	0.9	3.6	90	29	59	706
15/12/2018	16:00	45	59	51	47	40	0.0	0.4	2.7	90	29	57	706
15/12/2018	16:15	45	57	52	48	40	0.0	0.9	2.7	90	29	60	706
15/12/2018	16:30	45	60	51	48	40	0.0	0.4	2.7	90	29	62	706
15/12/2018	16:45	46	60	55	48	39	0.0	0.4	2.2	68	28	63	706
15/12/2018	17:00	55	72	70	53	41	0.0	0.9	3.1	68	28	67	706
15/12/2018	17:15	43	53	49	46	37	0.0	1.3	3.1	68	27	69	706
15/12/2018	17:30	50	69	64	48	39	0.0	0.9	3.1	68	26	71	707
15/12/2018	17:45	43	53	49	45	38	0.0	1.3	3.6	90	26	72	707
15/12/2018	18:00	46	61	55	49	39	0.0	1.3	4.0	68	25	73	707
15/12/2018	18:15	45	59	53	47	39	0.0	0.9	2.2	90	25	73	707
15/12/2018	18:30	52	65	64	55	39	0.0	0.9	2.7	90	25	74	707
15/12/2018	18:45	53	66	58	57	39	0.0	0.9	3.1	90	25	75	707
15/12/2018	19:00	54	62	58	57	43	0.0	0.9	2.2	68	24	76	708
15/12/2018	19:15	45	55	50	48	42	0.0	0.9	3.1	90	24	75	708
15/12/2018	19:30	46	59	53	49	42	0.0	1.3	3.6	68	24	74	708
15/12/2018	19:45	43	53	50	46	39	0.0	1.3	3.1	68	24	75	708

Logged Noise and Weather Data														
Date	Start Time	LAeq	LAMax	LA1	LA10	LA90	Rain (mm)	Av. Wind speed (m/s)	Max Wind speed (m/s)	Wind Dir (°) North=0°	Temp (°C)	Hum. (%)	Air Pres. (Hpa)
15/12/2018	20:00	42	51	45	44	39	0.0	0.4	2.7	90	23	77	708
15/12/2018	20:15	45	61	50	48	40	0.0	0.4	3.6	135	23	79	709
15/12/2018	20:30	47	56	51	49	42	0.2	0.4	2.2	113	23	82	709
15/12/2018	20:45	40	48	44	42	38	0.4	0.0	2.2	135	23	86	709
15/12/2018	21:00	40	44	42	41	38	0.4	0.0	2.2	135	22	88	709
15/12/2018	21:15	38	44	42	40	36	0.0	0.4	1.8	135	21	90	709
15/12/2018	21:30	40	56	49	41	36	0.0	0.0	1.8	135	21	91	709
15/12/2018	21:45	39	43	41	40	36	0.2	1.3	4.5	113	21	91	709
15/12/2018	22:00	56	73	71	54	35	0.0	1.3	4.0	113	21	92	709
15/12/2018	22:15	44	57	50	46	40	0.0	0.9	3.6	135	21	93	709
15/12/2018	22:30	40	51	47	42	36	0.0	1.3	4.9	113	21	93	709
15/12/2018	22:45	38	53	44	41	34	0.0	1.3	4.0	113	21	93	709
15/12/2018	23:00	40	56	52	41	35	0.0	0.9	4.9	113	21	93	709
15/12/2018	23:15	39	48	44	40	36	0.0	0.4	2.2	90	21	94	709
15/12/2018	23:30	41	49	47	44	37	0.0	0.4	2.2	135	21	94	709
15/12/2018	23:45	39	49	44	41	35	0.0	0.9	4.0	158	21	94	709
16/12/2018	0:00	39	48	46	42	34	0.0	0.9	4.0	90	21	94	708
16/12/2018	0:15	39	46	45	41	34	0.0	0.9	5.8	90	21	94	708
16/12/2018	0:30	40	51	47	42	36	0.0	1.3	4.9	90	21	94	708
16/12/2018	0:45	41	51	45	43	38	0.0	1.3	4.9	68	21	94	708
16/12/2018	1:00	38	49	43	40	35	0.0	0.4	2.2	90	21	94	708
16/12/2018	1:15	41	52	47	43	37	0.0	0.4	2.7	113	21	94	708
16/12/2018	1:30	38	48	45	40	33	0.0	0.4	2.2	113	21	94	708
16/12/2018	1:45	50	65	63	54	34	0.0	0.4	4.0	135	21	95	708
16/12/2018	2:00	37	44	43	39	33	0.0	0.4	3.6	113	21	95	708
16/12/2018	2:15	38	48	43	40	35	0.0	0.4	2.7	68	21	95	708
16/12/2018	2:30	39	47	44	41	35	0.0	0.4	2.2	90	21	95	708
16/12/2018	2:45	38	44	42	40	34	0.0	0.4	2.7	135	21	94	708
16/12/2018	3:00	36	44	41	39	32	0.0	0.9	4.9	113	20	95	708
16/12/2018	3:15	36	41	40	39	32	0.2	0.4	4.9	90	20	95	708
16/12/2018	3:30	38	47	43	40	33	0.0	0.0	1.8	113	20	95	708
16/12/2018	3:45	36	50	41	39	31	0.0	0.4	3.1	113	20	95	708
16/12/2018	4:00	37	53	43	39	32	0.0	0.4	2.2	113	20	95	708
16/12/2018	4:15	38	47	44	40	33	0.0	0.4	3.1	113	20	95	708
16/12/2018	4:30	38	54	48	40	33	0.0	0.9	3.6	113	20	95	708
16/12/2018	4:45	45	64	59	44	33	0.0	0.4	3.1	113	20	95	708
16/12/2018	5:00	40	64	49	40	32	0.0	0.4	2.7	113	20	95	708
16/12/2018	5:15	37	53	45	38	32	0.0	0.4	2.2	113	20	95	709
16/12/2018	5:30	38	60	48	40	32	0.0	0.4	3.1	113	20	95	709
16/12/2018	5:45	42	68	48	41	33	0.0	0.4	3.1	113	20	95	709
16/12/2018	6:00	44	64	58	42	33	0.0	0.4	3.1	113	20	95	709
16/12/2018	6:15	41	61	53	43	32	0.2	0.9	3.6	113	20	95	709
16/12/2018	6:30	38	48	46	41	34	0.0	0.0	1.8	90	21	95	709
16/12/2018	6:45	40	54	49	43	33	0.0	0.0	2.2	113	21	95	709
16/12/2018	7:00	44	64	58	40	33	0.0	0.4	2.7	135	21	95	709
16/12/2018	7:15	42	65	60	42	33	0.0	0.4	2.7	113	21	95	709
16/12/2018	7:30	56	74	71	52	34	0.0	0.9	3.6	113	21	95	709
16/12/2018	7:45	36	51	46	38	31	0.0	0.9	2.7	113	21	95	709
16/12/2018	8:00	39	55	48	42	32	0.0	0.4	2.7	113	21	95	709
16/12/2018	8:15	39	59	49	39	33	0.4	0.4	3.1	135	21	95	709
16/12/2018	8:30	41	59	52	41	35	0.2	0.4	2.2	113	21	95	709
16/12/2018	8:45	43	65	53	43	36	0.4	0.9	4.0	113	21	95	709
16/12/2018	9:00	39	53	44	41	35	0.2	0.9	4.9	113	21	95	709
16/12/2018	9:15	42	58	51	44	37	0.0	0.4	2.2	113	21	95	709
16/12/2018	9:30	42	60	54	43	35	0.0	0.4	2.7	135	21	95	709
16/12/2018	9:45	40	52	47	43	36	0.2	1.3	3.6	113	21	95	709
16/12/2018	10:00	50	69	64	48	36	0.0	0.4	2.7	135	21	95	709
16/12/2018	10:15	41	57	49	43	37	0.4	0.4	2.7	113	21	95	709
16/12/2018	10:30	46	62	56	49	40	4.4	0.4	3.1	135	21	95	709
16/12/2018	10:45	44	57	52	46	39	11.0	0.4	3.6	135	21	95	709
16/12/2018	11:00	54	77	66	51	41	1.0	0.4	1.3	45	21	95	709
16/12/2018	11:15	46	63	55	48	39	0.6	0.4	2.2	113	21	95	709
16/12/2018	11:30	53	62	60	58	46	1.0	1.3	3.6	113	21	95	709
16/12/2018	11:45	45	61	51	47	40	0.4	0.4	2.7	90	21	95	709
16/12/2018	12:00	45	58	54	47	40	0.4	0.9	2.7	135	21	95	709
16/12/2018	12:15	47	56	54	50	41	0.0	0.4	2.7	68	21	95	709
16/12/2018	12:30	57	71	70	61	41	0.2	0.4	3.1	135	21	95	708
16/12/2018	12:45	50	65	58	53	44	0.0	0.9	4.5	113	21	95	708
16/12/2018	13:00	51	61	58	54	45	0.0	1.8	7.2	90	21	95	708
16/12/2018	13:15	51	63	59	54	45	0.0	1.3	5.4	113	21	95	708

Logged Noise and Weather Data														
Date	Start Time	LAeq	LAMax	LA1	LA10	LA90	Rain (mm)	Av. Wind speed (m/s)	Max Wind speed (m/s)	Wind Dir (°) North=0°	Temp (°C)	Hum. (%)	Air Pres. (Hpa)
16/12/2018	13:30	51	63	58	54	44	0.0	1.3	4.0	113	21	95	708
16/12/2018	13:45	46	58	54	50	40	0.6	1.8	5.4	113	21	95	708
16/12/2018	14:00	46	60	54	50	40	0.0	1.3	4.9	113	21	95	707
16/12/2018	14:15	52	67	63	55	43	0.0	1.3	4.0	68	21	95	707
16/12/2018	14:30	52	65	60	55	45	0.0	1.3	6.3	90	21	95	707
16/12/2018	14:45	51	62	59	54	45	0.0	0.9	4.0	90	21	95	707
16/12/2018	15:00	49	63	58	52	40	0.0	0.9	3.6	68	21	95	707
16/12/2018	15:15	49	60	57	52	44	0.0	0.9	3.6	113	21	95	707
16/12/2018	15:30	48	62	56	51	42	0.0	0.9	3.1	68	21	95	707
16/12/2018	15:45	49	61	57	52	42	0.0	1.3	5.4	90	21	95	707
16/12/2018	16:00	48	61	57	52	42	0.0	1.3	3.6	90	21	95	707
16/12/2018	16:15	47	61	54	50	42	0.2	1.3	6.3	90	21	95	707
16/12/2018	16:30	50	70	61	51	41	1.4	1.3	5.4	90	20	95	707
16/12/2018	16:45	51	67	65	51	40	0.0	0.9	5.8	90	20	95	707
16/12/2018	17:00	45	68	53	45	38	0.0	1.3	4.0	113	21	95	707
16/12/2018	17:15	48	63	55	50	42	0.2	0.9	4.0	113	21	95	708
16/12/2018	17:30	47	61	56	50	41	0.0	1.3	4.9	113	20	95	707
16/12/2018	17:45	42	52	49	44	37	0.0	1.3	4.9	90	20	95	708
16/12/2018	18:00	47	57	55	51	40	0.0	1.3	3.6	113	20	95	708
16/12/2018	18:15	48	69	61	47	37	0.0	0.9	4.5	90	20	95	708
16/12/2018	18:30	41	67	47	41	35	0.0	0.9	2.2	90	20	96	708
16/12/2018	18:45	43	65	48	43	37	0.0	0.9	4.0	90	20	96	708
16/12/2018	19:00	46	52	49	48	42	0.0	0.4	3.6	45	20	96	708
16/12/2018	19:15	44	48	48	47	39	0.0	0.9	3.6	113	20	95	708
16/12/2018	19:30	46	54	50	47	40	0.0	0.9	3.6	113	20	95	708
16/12/2018	19:45	45	54	52	49	38	0.0	0.9	4.0	90	20	96	708
16/12/2018	20:00	42	50	46	44	36	0.0	0.9	3.6	135	20	95	709
16/12/2018	20:15	43	50	48	46	37	0.0	0.9	2.7	90	20	96	709
16/12/2018	20:30	46	54	49	48	42	0.8	0.9	4.9	135	20	95	709
16/12/2018	20:45	47	51	50	49	42	2.6	1.3	4.9	113	20	95	709
16/12/2018	21:00	44	51	48	47	39	0.4	0.4	2.2	113	20	96	709
16/12/2018	21:15	48	58	56	51	39	0.2	0.9	3.6	135	20	96	709
16/12/2018	21:30	46	56	55	49	37	0.2	0.9	2.7	135	20	96	709
16/12/2018	21:45	58	59	59	58	56	2.2	0.4	1.8	68	20	96	709
16/12/2018	22:00	44	57	57	41	36	1.2	0.4	3.1	113	20	96	709
16/12/2018	22:15	55	72	70	54	41	0.0	0.4	3.6	158	20	96	709
16/12/2018	22:30	41	47	45	43	38	0.2	0.4	3.1	135	20	96	709
16/12/2018	22:45	45	52	48	46	41	0.4	0.9	3.6	135	20	96	709
16/12/2018	23:00	44	51	47	46	41	0.0	0.4	3.1	158	20	96	709
16/12/2018	23:15	44	50	48	47	41	0.4	0.0	0.9	158	19	96	709
16/12/2018	23:30	46	54	50	49	38	0.4	0.4	1.8	113	19	96	709
16/12/2018	23:45	58	62	62	61	49	0.4	0.4	2.2	90	19	96	709
17/12/2018	0:00	56	63	61	60	47	0.4	0.4	3.1	90	19	96	708
17/12/2018	0:15	58	75	73	56	51	0.6	0.4	2.2	90	19	95	708
17/12/2018	0:30	52	63	55	54	49	0.2	0.4	1.8	90	19	96	708
17/12/2018	0:45	44	53	49	46	40	0.6	0.4	2.7	113	19	96	708
17/12/2018	1:00	45	54	51	48	41	0.6	0.4	1.8	90	19	96	708
17/12/2018	1:15	41	52	48	43	37	0.0	0.4	2.7	90	19	96	708
17/12/2018	1:30	42	50	46	43	38	0.4	0.4	2.2	90	19	96	708
17/12/2018	1:45	44	56	48	47	39	0.0	0.4	2.2	90	19	96	707
17/12/2018	2:00	51	66	65	55	38	0.0	0.9	3.6	90	19	96	707
17/12/2018	2:15	42	52	47	44	37	0.2	0.9	3.6	90	19	96	707
17/12/2018	2:30	41	50	47	43	36	0.0	0.9	3.1	135	19	96	707
17/12/2018	2:45	44	58	50	47	40	0.0	0.9	4.0	113	19	96	707
17/12/2018	3:00	42	54	50	46	35	0.0	0.9	3.6	90	19	96	707
17/12/2018	3:15	38	48	45	42	33	0.0	0.9	2.7	90	19	96	707
17/12/2018	3:30	36	46	40	38	33	0.0	0.9	3.6	90	19	96	707
17/12/2018	3:45	45	66	58	39	32	0.0	0.9	2.7	90	19	96	707
17/12/2018	4:00	39	63	41	39	34	0.0	0.9	4.9	68	19	96	708
17/12/2018	4:15	41	64	50	40	35	0.0	0.9	3.6	90	19	96	708
17/12/2018	4:30	45	70	53	42	36	0.0	0.4	3.1	113	19	96	708
17/12/2018	4:45	40	58	50	41	35	0.0	0.9	3.6	113	19	96	708
17/12/2018	5:00	39	56	45	41	35	0.0	0.9	3.1	113	19	96	708
17/12/2018	5:15	51	67	64	53	37	0.0	0.9	5.4	135	18	96	709
17/12/2018	5:30	57	74	70	56	39	0.0	0.9	4.0	113	18	96	708
17/12/2018	5:45	52	75	66	50	39	0.0	0.9	3.1	113	18	96	709
17/12/2018	6:00	48	69	60	48	39	0.0	0.9	3.6	90	18	96	709
17/12/2018	6:15	49	68	62	46	39	0.0	0.4	2.2	113	18	96	709
17/12/2018	6:30	46	67	59	46	38	0.0	0.4	2.2	90	19	96	709
17/12/2018	6:45	44	61	55	44	38	0.0	0.4	3.6	113	19	96	709

Logged Noise and Weather Data														
Date	Start Time	LAeq	LAMax	LA1	LA10	LA90	Rain (mm)	Av. Wind speed (m/s)	Max Wind speed (m/s)	Wind Dir (°) North=0°	Temp (°C)	Hum. (%)	Air Pres. (Hpa)
17/12/2018	7:00	52	70	65	56	38	0.0	0.4	1.8	135	19	96	709
17/12/2018	7:15	43	59	53	45	38	0.0	0.4	2.2	135	19	96	709
17/12/2018	7:30	44	61	54	45	38	0.2	0.9	3.1	135	19	96	710
17/12/2018	7:45	47	63	60	49	38	0.0	0.9	3.6	135	19	96	710
17/12/2018	8:00	43	60	50	44	39	0.0	0.9	3.6	135	19	96	710
17/12/2018	8:15	41	64	47	42	37	0.0	0.9	4.0	113	19	96	710
17/12/2018	8:30	55	72	69	49	38	0.0	0.4	3.6	113	19	96	710
17/12/2018	8:45	52	72	66	46	37	0.0	0.9	3.1	113	19	96	710
17/12/2018	9:00	42	60	53	43	37	0.0	0.9	3.1	113	19	96	710
17/12/2018	9:15	45	65	53	46	38	0.0	0.4	3.6	135	19	96	710
17/12/2018	9:30	44	64	56	45	37	0.0	0.9	3.1	135	20	96	710
17/12/2018	9:45	45	64	57	45	38	0.2	0.4	2.2	113	20	96	710
17/12/2018	10:00	43	59	50	46	38	0.0	0.4	2.7	113	20	96	710
17/12/2018	10:15	47	59	54	50	41	0.0	0.4	2.2	135	20	96	710
17/12/2018	10:30	51	71	65	45	38	0.0	0.4	2.7	135	20	96	709
17/12/2018	10:45	46	62	53	49	40	0.0	0.4	2.7	113	20	96	709
17/12/2018	11:00	46	58	53	49	41	0.0	0.4	2.2	113	20	96	709
17/12/2018	11:15	47	61	54	50	43	0.0	0.4	3.1	113	20	96	709
17/12/2018	11:30	58	77	72	58	43	0.0	0.4	2.7	135	20	96	709
17/12/2018	11:45	50	68	60	54	42	0.0	0.4	3.1	135	21	96	709
17/12/2018	12:00	45	55	52	47	41	0.0	0.4	2.7	135	21	95	709
17/12/2018	12:15	49	60	56	51	44	0.0	0.4	2.7	135	21	93	709
17/12/2018	12:30	46	56	53	49	42	0.0	0.4	1.8	113	21	92	709
17/12/2018	12:45	49	65	57	51	43	0.0	0.9	4.9	113	22	87	709
17/12/2018	13:00	47	65	55	49	40	0.0	0.9	3.6	90	23	85	709
17/12/2018	13:15	48	59	55	52	42	0.0	1.3	4.9	113	23	84	709
17/12/2018	13:30	48	58	56	51	42	0.0	0.9	3.1	113	24	81	708
17/12/2018	13:45	49	67	62	49	41	0.0	0.9	3.1	90	24	81	708
17/12/2018	14:00	43	59	50	46	38	0.0	0.9	2.7	90	24	78	708
17/12/2018	14:15	44	55	51	47	37	0.0	0.4	2.7	113	24	78	708
17/12/2018	14:30	46	57	54	49	40	0.0	0.9	3.6	113	25	77	708
17/12/2018	14:45	47	58	54	50	42	0.0	0.4	2.7	113	24	79	708
17/12/2018	15:00	45	54	51	48	40	0.0	0.4	3.6	113	23	80	708
17/12/2018	15:15	45	56	52	48	39	0.0	0.9	2.7	113	23	80	708
17/12/2018	15:30	47	58	54	50	41	0.0	0.4	2.7	113	24	75	708
17/12/2018	15:45	48	58	55	51	42	0.0	1.3	4.0	90	25	73	708
17/12/2018	16:00	49	60	57	53	41	0.0	1.8	5.4	90	25	74	708
17/12/2018	16:15	53	66	61	56	47	0.0	1.8	6.3	113	24	79	708
17/12/2018	16:30	53	64	60	56	47	0.0	1.3	5.4	113	24	80	708
17/12/2018	16:45	51	62	59	54	45	0.0	1.3	4.0	90	23	80	708
17/12/2018	17:00	51	65	59	54	46	0.0	1.3	5.8	90	23	81	708
17/12/2018	17:15	52	77	61	52	43	0.0	0.9	3.1	90	23	84	708
17/12/2018	17:30	50	66	57	52	43	0.0	1.3	4.0	90	22	87	709
17/12/2018	17:45	51	59	58	54	45	0.0	1.3	4.0	113	22	88	709
17/12/2018	18:00	49	57	55	51	44	0.0	1.3	6.7	113	21	89	709
17/12/2018	18:15	49	61	56	52	44	0.0	0.9	4.0	113	21	90	709
17/12/2018	18:30	54	68	63	56	47	0.0	1.3	4.9	113	21	92	709
17/12/2018	18:45	55	69	61	59	46	0.0	1.8	6.7	90	21	92	709
17/12/2018	19:00	59	62	61	60	55	0.0	1.3	6.3	68	20	92	709
17/12/2018	19:15	52	61	58	54	50	0.0	1.3	5.4	68	20	92	710
17/12/2018	19:30	51	67	59	54	45	0.0	1.3	4.9	90	20	92	710
17/12/2018	19:45	52	65	61	55	46	0.0	1.3	3.1	68	20	93	710
17/12/2018	20:00	53	65	61	56	45	0.0	1.8	6.3	113	20	93	710
17/12/2018	20:15	51	62	59	55	44	0.0	1.3	4.9	135	20	93	710
17/12/2018	20:30	44	53	50	46	39	0.0	0.9	4.9	90	20	94	710
17/12/2018	20:45	47	57	54	50	42	0.0	0.9	4.9	90	19	94	710
17/12/2018	21:00	43	58	52	46	38	0.0	0.9	3.6	90	19	94	710
17/12/2018	21:15	43	53	50	47	38	0.2	1.3	4.0	90	19	95	710
17/12/2018	21:30	47	61	55	50	39	0.0	1.3	5.4	68	19	95	710
17/12/2018	21:45	46	57	53	50	40	0.0	1.8	5.8	90	19	95	710
17/12/2018	22:00	50	66	59	53	38	0.0	1.8	5.8	90	19	95	710
17/12/2018	22:15	45	54	52	48	38	0.0	1.3	5.8	90	19	95	710
17/12/2018	22:30	44	58	52	47	39	0.0	1.8	5.4	90	19	95	710
17/12/2018	22:45	47	61	57	50	39	0.0	1.3	5.4	113	19	95	710
17/12/2018	23:00	44	59	53	47	36	0.2	0.9	2.7	135	19	95	710
17/12/2018	23:15	46	63	54	49	37	0.2	1.8	5.8	90	19	95	710
17/12/2018	23:30	44	54	51	48	38	0.0	2.2	6.7	113	19	95	710
17/12/2018	23:45	45	56	54	48	35	0.0	1.8	6.7	90	19	95	709
18/12/2018	0:00	46	60	55	50	37	0.2	1.8	6.7	90	19	95	709
18/12/2018	0:15	42	58	50	45	35	0.0	1.8	6.3	113	19	95	709

Logged Noise and Weather Data														
Date	Start Time	LAeq	LAMax	LA1	LA10	LA90	Rain (mm)	Av. Wind speed (m/s)	Max Wind speed (m/s)	Wind Dir (°) North=0°	Temp (°C)	Hum. (%)	Air Pres. (Hpa)
18/12/2018	0:30	51	65	61	55	43	0.0	1.8	6.3	90	19	95	709
18/12/2018	0:45	51	63	59	54	41	0.0	1.8	5.8	68	19	95	709
18/12/2018	1:00	48	61	57	51	40	0.0	1.3	4.0	113	19	96	709
18/12/2018	1:15	45	57	54	49	36	0.2	0.9	3.6	90	19	96	709
18/12/2018	1:30	46	60	55	50	39	0.2	1.3	6.7	90	19	95	709
18/12/2018	1:45	41	53	50	44	33	0.0	1.8	7.6	90	19	95	709
18/12/2018	2:00	43	57	52	46	34	0.0	1.8	4.9	90	19	95	709
18/12/2018	2:15	40	50	47	43	34	0.0	1.8	5.8	90	18	95	708
18/12/2018	2:30	44	60	54	47	35	0.0	1.8	5.4	90	18	96	709
18/12/2018	2:45	44	54	51	48	37	0.0	1.3	4.9	90	18	96	709
18/12/2018	3:00	43	54	50	47	37	0.2	1.8	4.9	90	18	96	709
18/12/2018	3:15	42	53	51	46	36	0.0	1.8	4.9	90	18	95	708
18/12/2018	3:30	44	63	56	45	34	0.0	1.3	5.4	90	18	96	709
18/12/2018	3:45	40	52	47	43	35	0.0	1.8	4.9	113	18	95	709
18/12/2018	4:00	43	54	51	47	35	0.0	1.8	5.4	113	18	96	709
18/12/2018	4:15	42	57	51	45	35	0.2	1.8	4.9	90	18	96	709
18/12/2018	4:30	42	56	49	44	37	0.0	1.3	4.5	90	18	96	709
18/12/2018	4:45	55	70	69	51	37	0.0	1.3	4.0	90	18	96	709
18/12/2018	5:00	44	59	54	47	38	0.0	1.3	4.0	68	18	96	709
18/12/2018	5:15	44	58	52	46	39	0.0	1.3	3.1	68	18	96	709
18/12/2018	5:30	46	60	54	49	40	0.0	1.3	4.0	90	18	96	709
18/12/2018	5:45	46	62	56	49	40	0.0	1.8	4.9	113	18	96	710
18/12/2018	6:00	45	57	53	47	41	0.0	1.3	6.3	113	19	96	710
18/12/2018	6:15	44	65	51	46	40	0.2	1.3	4.9	90	19	96	710
18/12/2018	6:30	46	59	54	49	42	0.0	1.3	5.8	113	19	96	710
18/12/2018	6:45	52	71	65	52	43	0.0	1.3	3.6	68	19	96	710
18/12/2018	7:00	48	65	58	50	42	0.0	1.8	4.5	90	19	96	710
18/12/2018	7:15	50	62	58	53	44	0.0	1.8	8.9	90	19	96	710
18/12/2018	7:30	51	64	58	53	46	0.0	1.3	4.0	90	19	96	710
18/12/2018	7:45	49	60	56	51	44	0.0	1.3	4.9	90	19	96	711
18/12/2018	8:00	46	60	53	49	39	0.0	1.8	5.8	113	19	96	711
18/12/2018	8:15	49	60	58	52	42	0.2	0.9	4.0	90	19	96	711
18/12/2018	8:30	50	63	58	53	44	0.0	1.3	4.9	113	19	96	711
18/12/2018	8:45	50	60	57	53	46	0.0	1.3	5.8	90	19	96	711
18/12/2018	9:00	54	70	62	57	47	0.0	1.3	5.4	90	20	96	711
18/12/2018	9:15	54	64	61	58	46	0.0	1.3	4.0	113	20	96	711
18/12/2018	9:30	50	62	58	53	43	0.0	0.9	3.6	90	20	96	711
18/12/2018	9:45	48	60	56	52	41	0.0	0.9	2.7	90	20	96	711
18/12/2018	10:00	44	58	50	47	39	0.0	1.3	4.0	90	20	96	711
18/12/2018	10:15	47	64	60	47	37	0.0	1.3	5.4	90	20	96	711
18/12/2018	10:30	43	56	51	45	39	0.0	1.3	5.8	113	20	95	711
18/12/2018	10:45	45	58	54	48	40	0.0	0.9	4.0	113	21	93	711
18/12/2018	11:00	52	66	65	56	40	0.0	0.9	4.5	113	21	92	711
18/12/2018	11:15	46	55	52	49	41	0.0	0.9	3.1	90	21	88	711
18/12/2018	11:30	44	55	52	47	38	0.0	0.9	3.1	113	22	86	711
18/12/2018	11:45	48	56	55	51	42	0.0	0.9	3.1	113	22	84	711
18/12/2018	12:00	47	57	55	51	40	0.0	0.9	3.6	135	23	84	711
18/12/2018	12:15	46	57	52	49	41	0.0	0.9	5.8	113	23	80	710
18/12/2018	12:30	43	53	50	46	37	0.0	0.9	4.5	90	23	79	710
18/12/2018	12:45	48	70	56	51	40	0.0	1.3	4.0	113	24	78	710
18/12/2018	13:00	47	56	53	50	41	0.0	1.3	4.0	90	24	78	710
18/12/2018	13:15	54	73	67	56	40	0.0	1.3	4.0	90	24	76	710
18/12/2018	13:30	46	62	54	49	39	0.0	0.9	2.7	90	24	76	710
18/12/2018	13:45	43	52	49	46	38	0.0	1.3	4.9	113	25	73	710
18/12/2018	14:00	46	56	53	49	41	0.0	1.3	3.6	90	25	73	710
18/12/2018	14:15	54	69	67	55	39	0.0	1.3	4.9	113	25	72	710
18/12/2018	14:30	43	55	50	46	38	0.0	1.3	4.9	113	25	71	710
18/12/2018	14:45	53	72	66	52	40	0.0	0.9	2.7	90	26	71	710
18/12/2018	15:00	52	65	63	53	41	0.0	0.9	2.7	90	26	71	710
18/12/2018	15:15	45	64	52	48	38	0.0	0.9	3.1	68	26	71	710
18/12/2018	15:30	46	57	53	49	41	0.0	0.9	3.6	90	26	71	710
18/12/2018	15:45	43	60	50	46	37	0.0	1.3	3.1	135	25	71	710
18/12/2018	16:00	55	72	70	50	40	0.0	0.9	3.6	113	25	71	710
18/12/2018	16:15	45	65	55	47	38	0.0	1.3	4.9	113	25	69	710
18/12/2018	16:30	45	54	51	48	39	0.0	0.9	4.0	90	26	67	710
18/12/2018	16:45	54	72	67	54	39	0.0	0.9	3.1	113	26	67	710
18/12/2018	17:00	43	59	49	45	40	0.0	0.9	4.0	113	26	68	710
18/12/2018	17:15	44	55	50	47	41	0.0	0.9	4.0	90	26	67	710
18/12/2018	17:30	42	55	49	44	38	0.0	0.4	3.1	90	25	70	710
18/12/2018	17:45	43	61	52	44	37	0.0	0.9	2.7	90	25	71	710

Logged Noise and Weather Data

Date	Start Time	LAeq	LAMax	LA1	LA10	LA90	Rain (mm)	Av. Wind speed (m/s)	Max Wind speed (m/s)	Wind Dir (°) North=0°	Temp (°C)	Hum. (%)	Air Pres. (Hpa)
18/12/2018	18:00	45	63	56	45	39	0.0	0.4	1.8	113	25	72	710
18/12/2018	18:15	41	55	50	44	37	0.0	0.4	2.2	113	24	73	710
18/12/2018	18:30	43	54	50	45	38	0.0	0.4	1.8	113	24	76	710
18/12/2018	18:45	42	55	51	44	37	0.0	0.4	2.2	113	23	78	710
18/12/2018	19:00	53	68	65	59	40	0.0	0.9	2.7	113	23	81	710
18/12/2018	19:15	48	54	54	52	42	0.0	0.4	2.7	113	22	82	711
18/12/2018	19:30	41	45	43	42	40	0.0	0.4	3.1	113	22	84	711
18/12/2018	19:45	40	54	44	42	37	0.0	0.9	3.1	113	22	84	711
18/12/2018	20:00	51	67	63	53	37	0.0	0.9	3.6	90	22	86	711
18/12/2018	20:15	41	50	48	44	37	0.0	0.9	3.1	113	21	87	711
18/12/2018	20:30	54	75	69	45	37	0.0	0.9	3.6	90	21	88	711
18/12/2018	20:45	52	69	66	53	37	0.0	0.9	3.1	113	21	89	712
18/12/2018	21:00	42	56	52	44	37	0.0	0.9	5.4	113	21	90	712
18/12/2018	21:15	58	74	72	56	37	0.0	0.9	5.8	113	21	91	711
18/12/2018	21:30	42	66	49	44	36	0.0	0.9	3.6	90	20	92	712
18/12/2018	21:45	52	71	64	56	37	0.0	1.3	4.0	90	20	92	712
18/12/2018	22:00	39	51	48	41	35	0.0	0.9	3.1	90	20	92	712
18/12/2018	22:15	39	49	47	42	35	0.0	0.9	3.1	113	20	93	712
18/12/2018	22:30	39	48	44	41	35	0.0	0.9	4.9	90	20	93	712
18/12/2018	22:45	42	61	51	46	34	0.0	0.9	4.0	90	20	94	712
18/12/2018	23:00	58	75	73	53	38	0.0	0.9	2.7	90	20	94	712
18/12/2018	23:15	44	56	50	46	37	0.0	0.9	2.7	90	19	94	711
18/12/2018	23:30	40	51	45	42	36	0.0	0.9	3.1	90	19	94	711
18/12/2018	23:45	58	79	75	44	37	0.0	0.9	3.6	90	19	94	711
19/12/2018	0:00	40	50	46	43	36	0.0	0.9	2.7	90	19	94	711
19/12/2018	0:15	39	50	45	42	34	0.0	0.9	3.6	90	19	95	711
19/12/2018	0:30	38	49	45	41	32	0.0	0.9	3.1	90	19	95	711
19/12/2018	0:45	40	48	46	43	34	0.0	0.9	4.9	90	19	95	711
19/12/2018	1:00	38	48	45	41	32	0.0	1.3	4.0	113	19	95	711
19/12/2018	1:15	36	46	42	40	31	0.0	0.9	3.6	113	19	95	710
19/12/2018	1:30	55	71	70	53	33	0.0	1.3	5.4	90	19	95	711
19/12/2018	1:45	55	75	71	56	35	0.0	1.3	3.6	90	19	95	710
19/12/2018	2:00	42	53	50	45	35	0.0	1.3	5.8	90	19	95	710
19/12/2018	2:15	36	52	42	39	31	0.0	0.9	4.0	113	19	95	710
19/12/2018	2:30	36	45	41	39	31	0.0	0.9	4.0	90	19	95	710
19/12/2018	2:45	61	78	76	57	32	0.0	0.9	4.0	113	19	95	710
19/12/2018	3:00	39	52	50	41	31	0.0	0.9	2.7	90	19	95	710
19/12/2018	3:15	37	50	46	40	29	0.0	0.9	3.1	68	19	95	710
19/12/2018	3:30	35	42	40	38	31	0.0	0.9	4.0	90	19	95	710
19/12/2018	3:45	38	51	47	41	31	0.0	0.9	3.1	90	19	95	710
19/12/2018	4:00	42	61	55	41	33	0.0	0.9	3.6	90	19	95	710
19/12/2018	4:15	39	58	48	41	33	0.0	0.9	2.7	90	19	95	710
19/12/2018	4:30	40	51	48	43	35	0.0	0.9	2.7	90	19	95	710
19/12/2018	4:45	55	69	68	58	36	0.0	0.9	2.7	90	19	95	710
19/12/2018	5:00	43	69	52	43	34	0.0	0.9	2.7	90	19	95	711
19/12/2018	5:15	41	52	50	44	36	0.0	0.9	2.2	90	19	95	711
19/12/2018	5:30	46	67	58	45	36	0.0	0.4	2.7	90	19	95	711
19/12/2018	5:45	51	65	64	56	37	0.0	0.4	2.7	68	19	95	711
19/12/2018	6:00	47	65	60	47	37	0.0	0.4	2.2	113	19	95	711
19/12/2018	6:15	40	53	46	42	37	0.0	0.4	2.2	90	19	95	711
19/12/2018	6:30	44	60	55	45	37	0.0	0.9	4.0	113	19	95	711
19/12/2018	6:45	43	65	53	44	38	0.0	0.9	4.0	113	19	95	711
19/12/2018	7:00	43	58	51	46	38	0.0	0.4	3.1	90	19	95	712
19/12/2018	7:15	43	61	48	45	39	0.0	0.9	3.1	68	19	96	712
19/12/2018	7:30	52	66	65	56	40	0.0	0.9	3.6	113	19	96	712
19/12/2018	7:45	44	56	50	46	41	0.0	0.4	2.2	90	19	96	712
19/12/2018	8:00	42	50	48	44	40	0.0	0.4	3.1	90	20	96	712
19/12/2018	8:15	42	61	54	42	37	0.0	0.4	4.0	113	20	96	712
19/12/2018	8:30	54	73	68	54	36	0.0	0.4	2.7	90	20	95	712
19/12/2018	8:45	40	60	49	41	36	0.0	0.4	2.7	113	20	94	712
19/12/2018	9:00	40	53	49	41	36	0.0	0.4	2.2	135	21	91	712
19/12/2018	9:15	41	65	47	43	36	0.0	0.9	3.1	113	21	88	712
19/12/2018	9:30	45	70	55	42	37	0.0	0.9	3.1	135	21	86	712
19/12/2018	9:45	43	58	54	44	37	0.0	0.4	3.1	113	22	84	712
19/12/2018	10:00	50	66	64	54	39	0.0	0.9	4.0	113	22	82	712
19/12/2018	10:15	45	66	57	45	36	0.0	0.4	2.7	135	23	81	713
19/12/2018	10:30	49	66	63	53	36	0.0	0.4	2.7	135	23	79	712
19/12/2018	10:45	45	58	52	47	39	0.0	0.9	3.1	135	24	75	712
19/12/2018	11:00	58	75	73	53	38	0.0	0.9	2.7	135	24	73	712
19/12/2018	11:15	44	61	53	46	36	0.0	0.4	2.7	135	25	73	712

Noise Monitoring Data Sheet

Inland Rail

SITE ID

G2H_02

From	Tuesday 11/12/2018 10:15	Meas. Type	Free Field	Package	Gowrie to Helidon
To	Wednesday 19/12/2018 9:15	Mic. Height (m)	1.8	Address	14 Junction Street
Instrument Type	01 dB DUO	Weather Station	No	Suburb	Gowrie Junction
Instrument Serial #	12605	Operator	JR/BR	Land Use	Residential
Inst. Cal. Date	11/12/2018	Sample Int.	15 min	Latitude	27°29'58.00"S
Pre Calibration	94	RP Lot#	42-AG1509	Longitude	151°53'26.61"E
Post Calibration	94				

Daytime

RBL **39.5 dB(A)**

ABLs Day (Mon-Fri 7am - 6 pm)

ABLs Day (Sat 8 am - 1 pm)

Tuesday 11/12/2018	37.9	dB(A)
Wednesday 12/12/2018	40.2	dB(A)
Thursday 13/12/2018	40.0	dB(A)
Friday 14/12/2018	38.4	dB(A)
Saturday 15/12/2018	40.3	dB(A)
Monday 17/12/2018	39.1	dB(A)
Tuesday 18/12/2018	42.6	dB(A)
Wednesday 19/12/2018	39.0	dB(A)

Evening

RBL **41.1 dB(A)**

ABLs Evening (Mon-Fri 6 pm - 10 pm)

ABLs Evening (Sat 1 pm - 10 pm)

ABLs Evening (Sun 7 am - 10 pm)

Tuesday 11/12/2018	41.1	dB(A)
Wednesday 12/12/2018	41.4	dB(A)
Thursday 13/12/2018	32.2	dB(A)
Friday 14/12/2018	42.9	dB(A)
Saturday 15/12/2018	36.9	dB(A)
Sunday 16/12/2018	35.2	dB(A)
Monday 17/12/2018	43.6	dB(A)
Tuesday 18/12/2018	41.1	dB(A)

Night

RBL **32.2 dB(A)**

ABLs Night (Mon - Thu, Sat - Sun 6pm - 7am)

ABLs Night (Fri 6pm - 8am)

Tuesday 11/12/2018	28.6	dB(A)
Wednesday 12/12/2018	27.6	dB(A)
Thursday 13/12/2018	27.3	dB(A)
Friday 14/12/2018	34.4	dB(A)
Saturday 15/12/2018	29.9	dB(A)
Sunday 16/12/2018	35.2	dB(A)
Monday 17/12/2018	38.8	dB(A)
Tuesday 18/12/2018	35.6	dB(A)

Site Diagram - Diagram

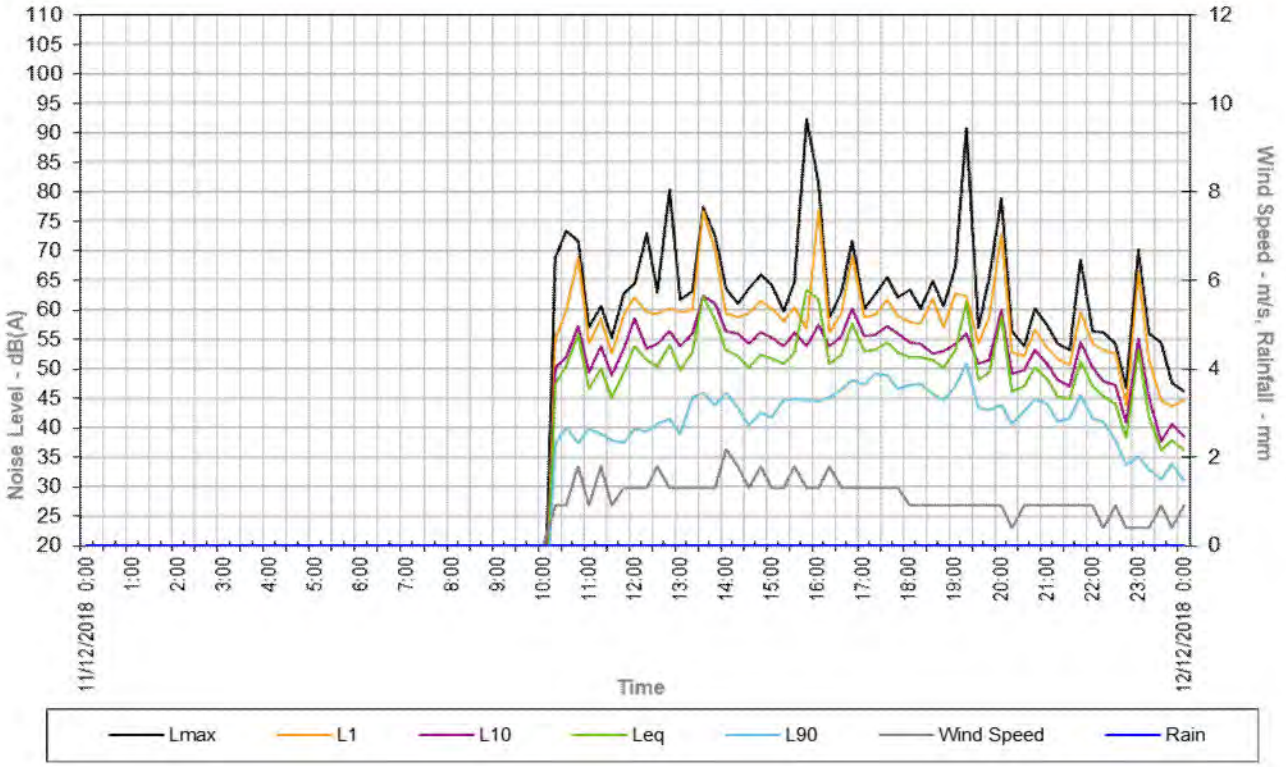
Site Attended Measurements Summary

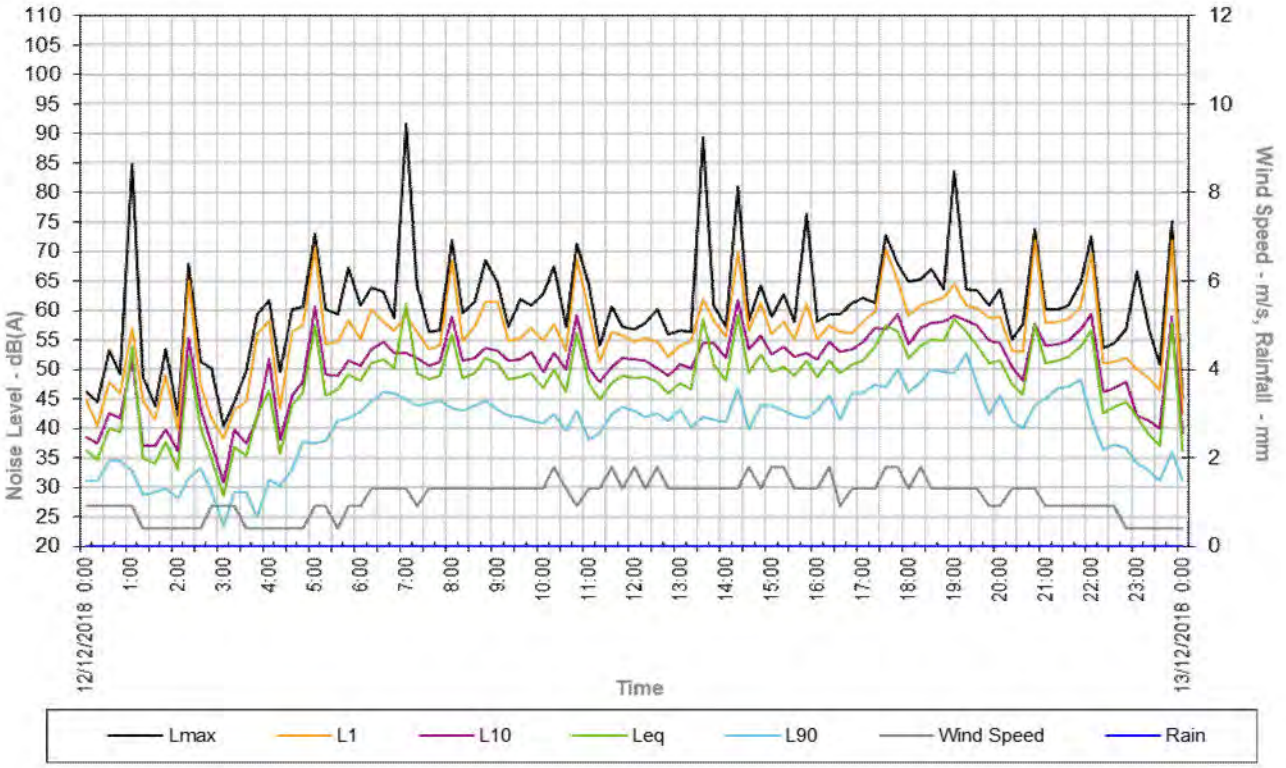
Date	Start	Measurement Type	Lmax	L1	L10	L90	Leq	Weather Conditions Comply	End
11/12/2018	9:15 AM	Attended	81.0	50.6	45.5	36.3	47.9	Pass	9:30 AM
		Logged	-	-	-	-	-		
		Difference	-	-	-	-	-		
Comments	Data Logger: SVAN 957 (S/N: 27551). Attended measurement taken before the start of the logging time. Noise environment dominated by light wind and bird noise at 38-40dB(A) as well as road traffic along dirt road at 45-49dB(A), car pass by. Distant road traffic along old Homebush Road at 42-43dB(A) clearly audible. Wind gust at 50dB(A).								
19/12/2018	10:15 AM	Attended	56.8	52.2	46.6	39.1	44.0	Pass	10:30 AM
		Logged	55.3	52.4	46.8	39.2	44.2		
		Difference	1.6	-0.2	-0.2	-0.1	-0.2		
Comments	Data Logger: NTI-XL2 (S/N: A2A-09320-E0). Birds and insects at 39 – 48dB(A). Trucks and cars at 45 – 52dB(A). Wind at 40 – 47dB(A). Frog at 48 – 54dB(A). Flag knocking at 47 – 48dB(A). Excavator squeaker at 44dB(A). Plane audible, with dominant background at 42dB(A).								

Photos

Site Noise and Weather Graphical Analysis

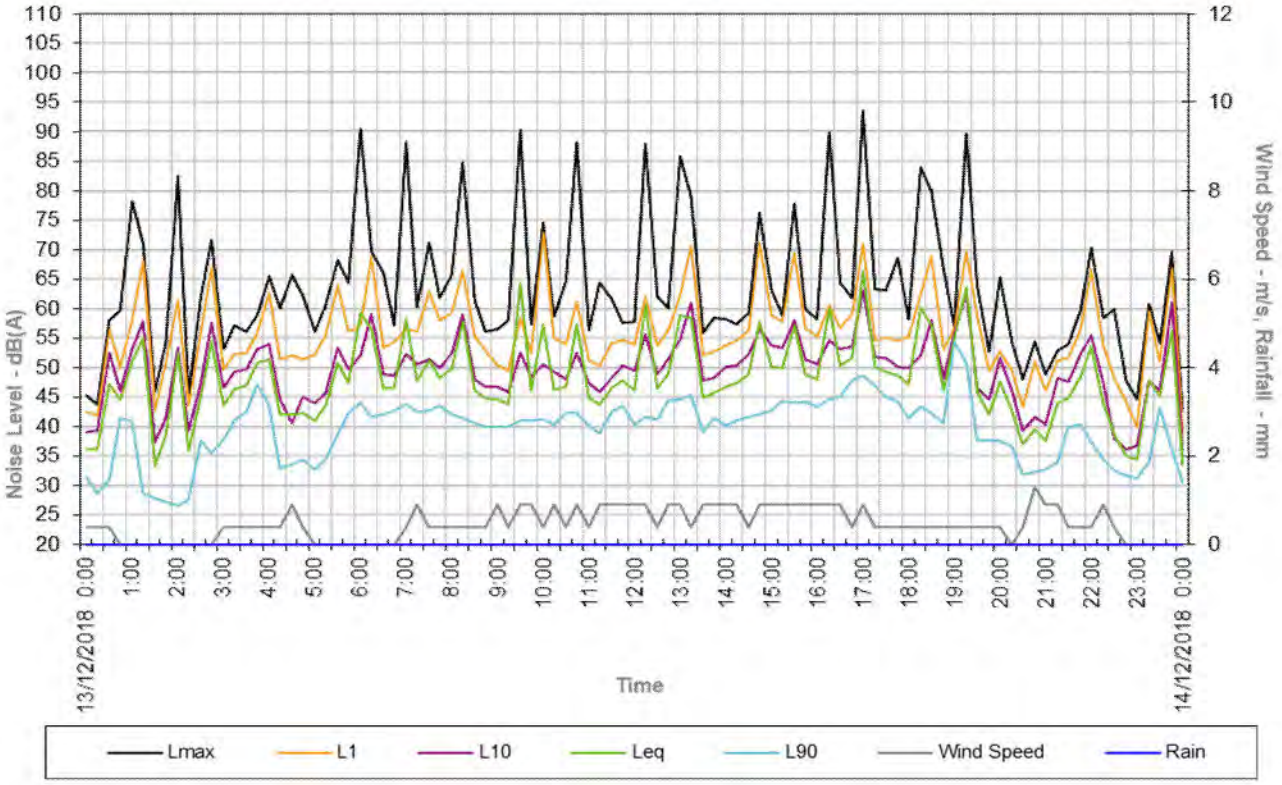
14 Junction Street

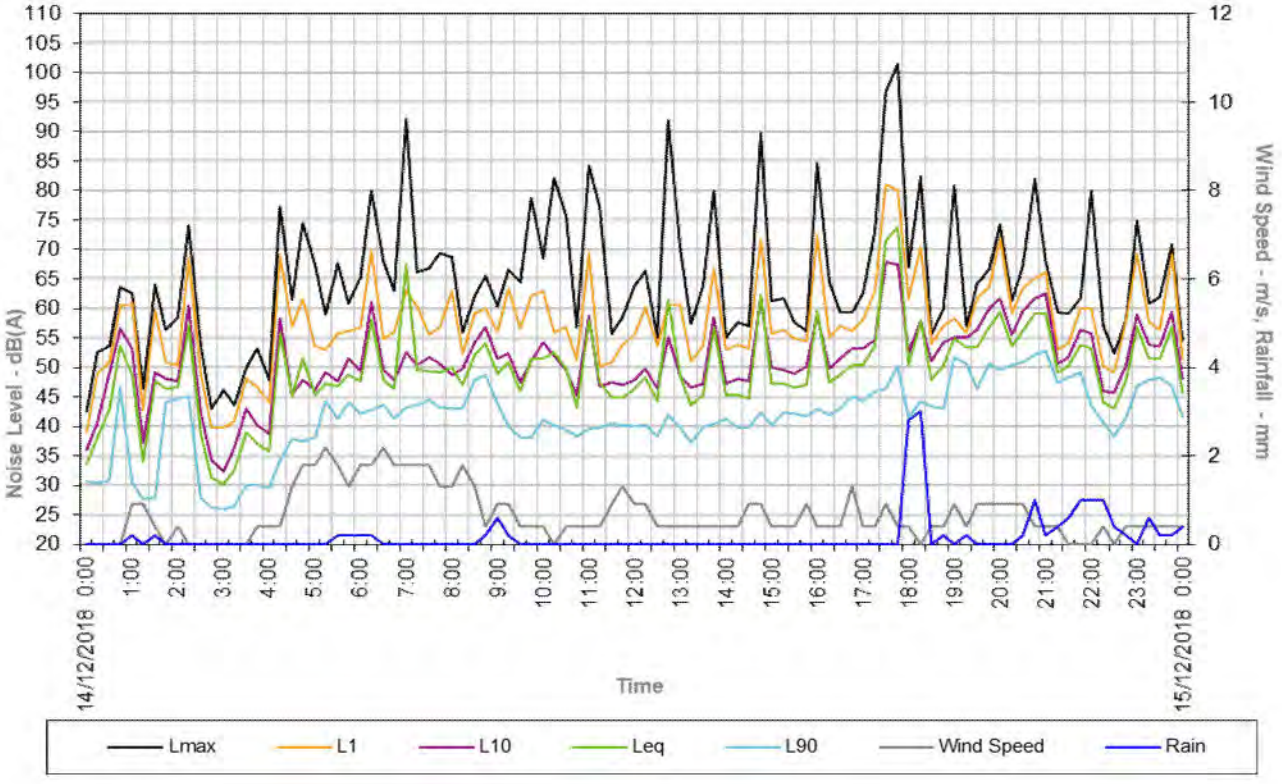




Site Noise and Weather Graphical Analysis

14 Junction Street

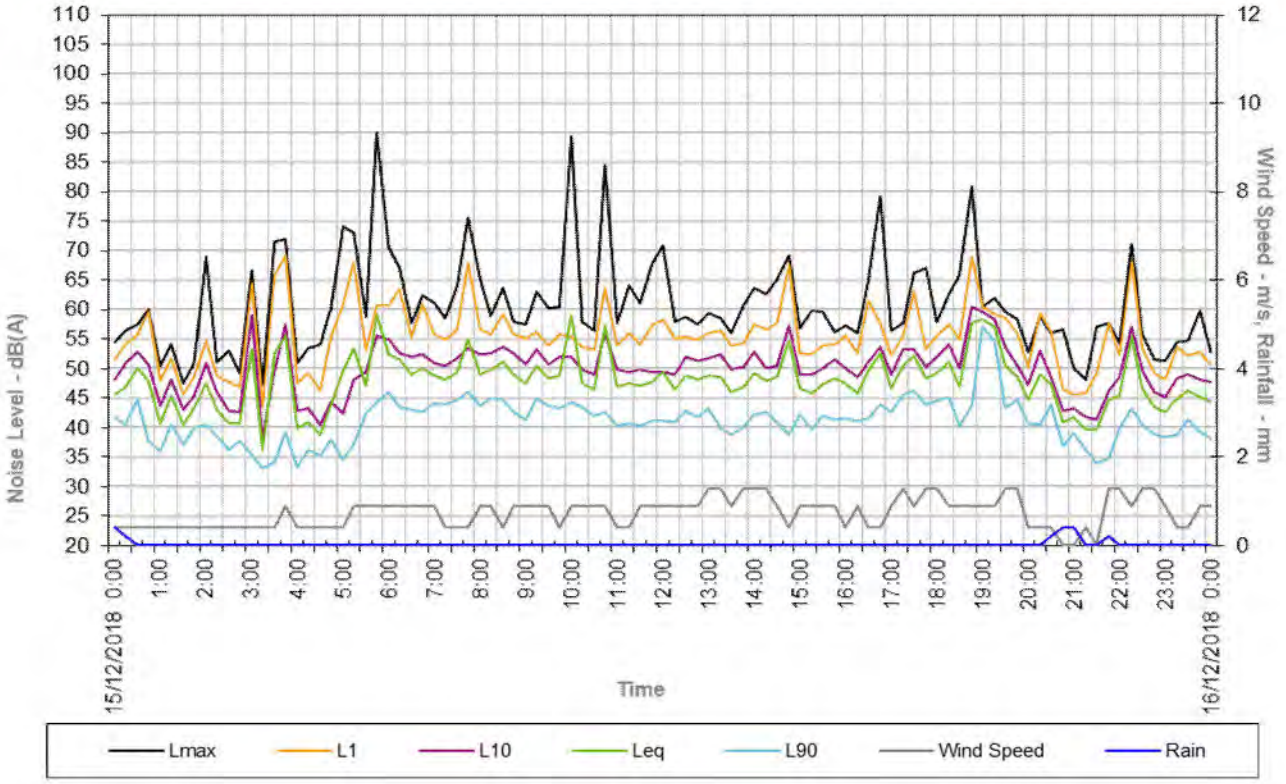


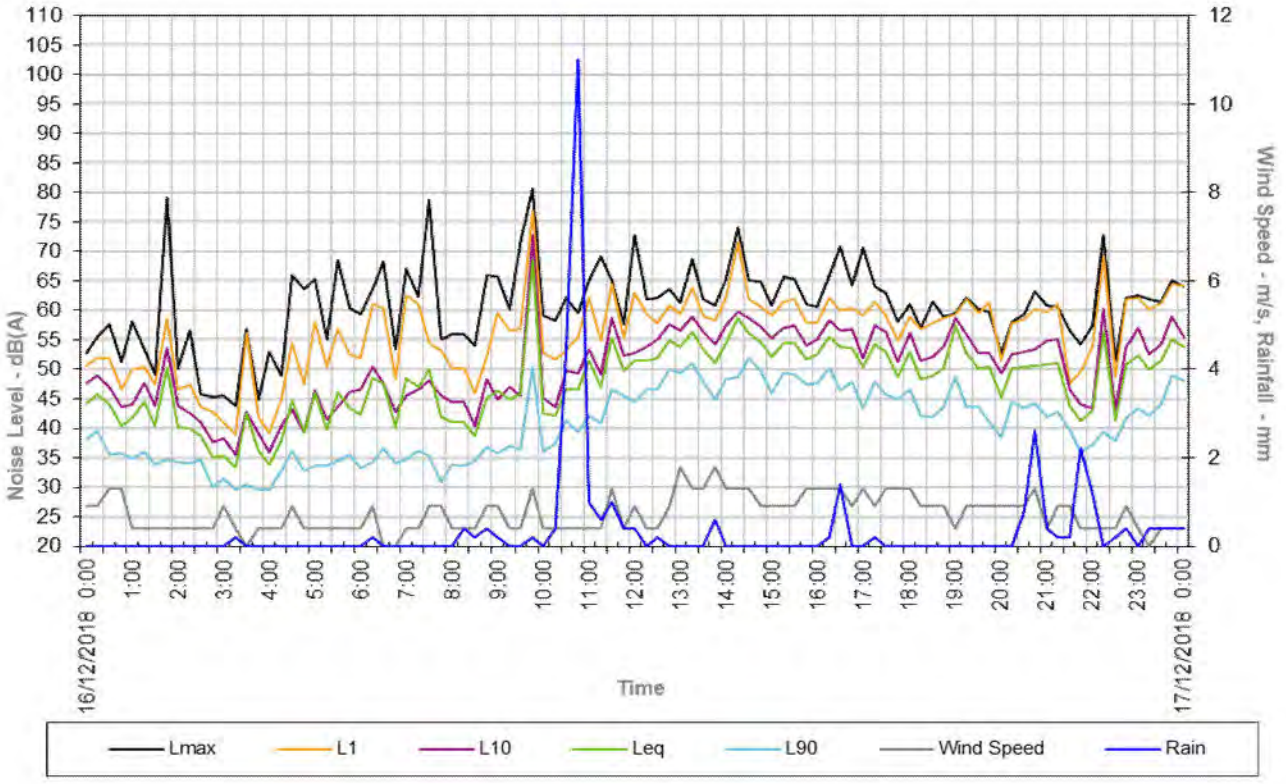


Future Freight
Integrating Community, Environment and Engineering

Site Noise and Weather Graphical Analysis

14 Junction Street

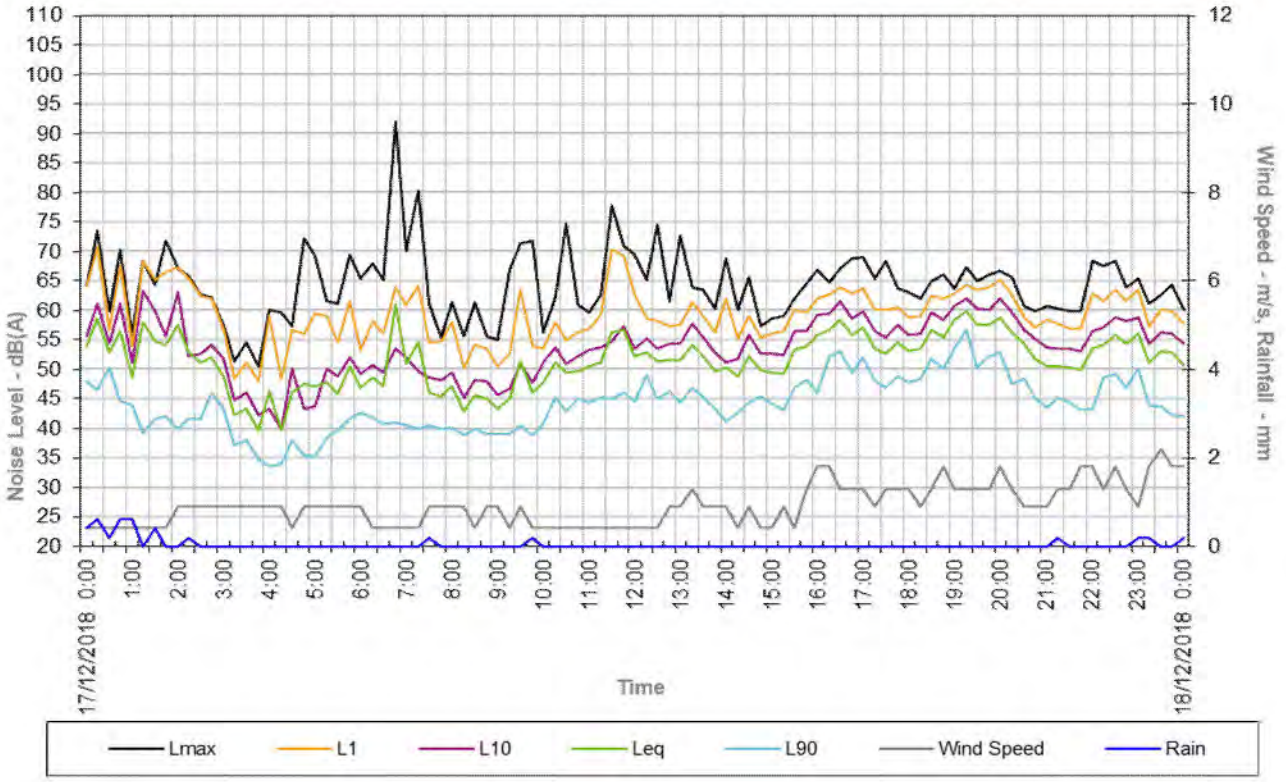


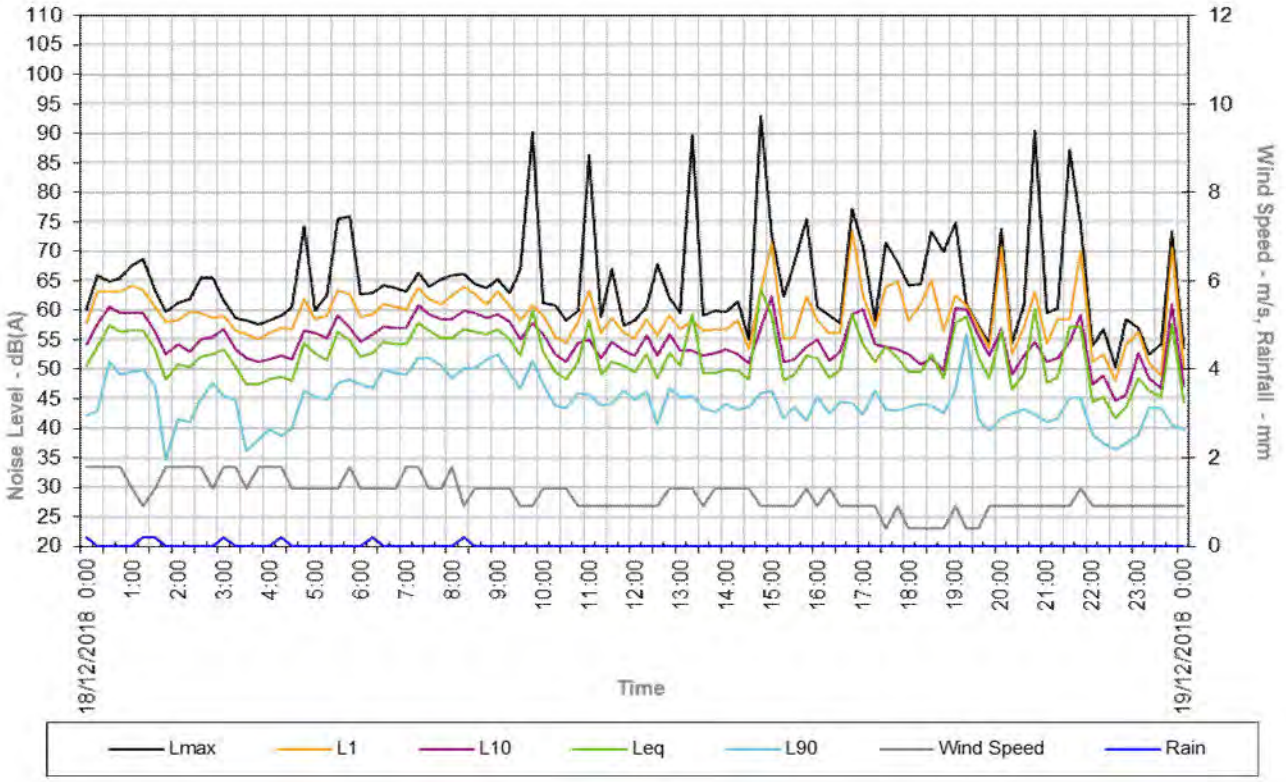


Future Freight
Integrating Community, Environment and Engineering

Site Noise and Weather Graphical Analysis

14 Junction Street

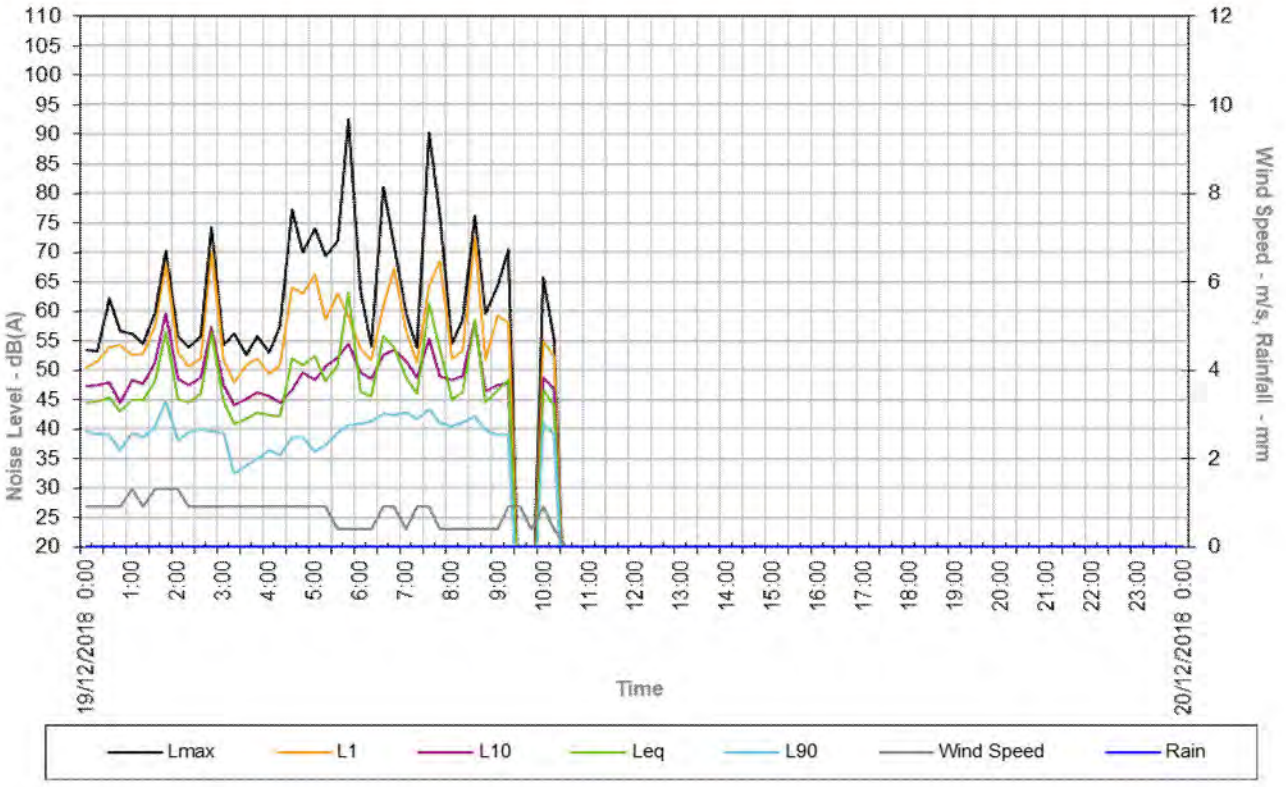




Future Freight
Integrating Community, Environment and Engineering

Site Noise and Weather Graphical Analysis

14 Junction Street



Logged Noise and Weather Data

Date	Start Time	LAeq	LAMax	LA1	LA10	LA90	Rain (mm)	Av. Wind speed (m/s)	Max Wind speed (m/s)	Wind Dir (°) North=0°	Temp (°C)	Hum. (%)	Air Pres. (Hpa)
11/12/2018	10:15	48	69	55	50	37	0.0	0.9	4.0	90	23	58	713
11/12/2018	10:30	50	73	60	52	40	0.0	0.9	5.4	90	24	54	713
11/12/2018	10:45	56	72	69	57	37	0.0	1.8	4.9	113	25	54	713
11/12/2018	11:00	47	57	54	49	40	0.0	0.9	4.5	90	25	53	713
11/12/2018	11:15	50	61	59	54	39	0.0	1.8	4.0	135	25	51	713
11/12/2018	11:30	45	55	53	49	38	0.0	0.9	3.6	90	25	50	713
11/12/2018	11:45	49	63	59	54	37	0.0	1.3	4.9	90	26	48	713
11/12/2018	12:00	54	64	62	59	40	0.0	1.3	4.0	90	26	47	713
11/12/2018	12:15	51	73	60	54	39	0.0	1.3	4.9	90	26	48	712
11/12/2018	12:30	50	63	59	54	41	0.0	1.8	4.0	90	26	47	712
11/12/2018	12:45	54	80	60	56	42	0.0	1.3	4.5	113	27	46	712
11/12/2018	13:00	50	62	60	54	39	0.0	1.3	5.4	113	27	45	712
11/12/2018	13:15	53	63	60	56	45	0.0	1.3	4.5	90	27	45	712
11/12/2018	13:30	62	77	77	62	46	0.0	1.3	4.5	90	27	44	712
11/12/2018	13:45	58	73	70	61	44	0.0	1.3	5.4	90	28	44	712
11/12/2018	14:00	53	64	59	56	46	0.0	2.2	6.7	135	28	42	712
11/12/2018	14:15	52	61	59	56	43	0.0	1.8	4.9	113	28	43	711
11/12/2018	14:30	50	64	59	54	41	0.0	1.3	4.9	90	28	44	711
11/12/2018	14:45	52	66	61	56	43	0.0	1.8	5.4	90	28	43	711
11/12/2018	15:00	52	64	60	55	42	0.0	1.3	4.9	113	28	42	711
11/12/2018	15:15	51	60	58	54	45	0.0	1.3	5.8	90	28	42	711
11/12/2018	15:30	53	65	61	56	45	0.0	1.8	5.4	90	28	43	711
11/12/2018	15:45	63	92	57	54	45	0.0	1.3	4.0	90	28	42	711
11/12/2018	16:00	62	81	77	57	45	0.0	1.3	5.8	90	28	43	711
11/12/2018	16:15	51	59	56	54	45	0.0	1.8	4.9	113	28	43	711
11/12/2018	16:30	52	63	59	56	46	0.0	1.3	5.4	90	27	44	711
11/12/2018	16:45	58	72	69	60	48	0.0	1.3	3.6	90	27	45	711
11/12/2018	17:00	53	60	59	56	47	0.0	1.3	4.5	113	27	47	711
11/12/2018	17:15	53	63	59	56	49	0.0	1.3	4.0	135	27	48	711
11/12/2018	17:30	54	66	62	57	49	0.0	1.3	6.3	68	26	50	711
11/12/2018	17:45	53	62	59	56	47	0.0	1.3	3.6	90	26	52	711
11/12/2018	18:00	52	63	58	54	47	0.0	0.9	2.7	90	25	54	711
11/12/2018	18:15	52	60	58	54	48	0.0	0.9	3.6	68	24	56	711
11/12/2018	18:30	51	65	62	53	46	0.0	0.9	3.1	68	24	58	711
11/12/2018	18:45	50	61	57	53	45	0.0	0.9	4.5	90	23	61	712
11/12/2018	19:00	53	68	63	54	47	0.0	0.9	3.1	90	23	62	712
11/12/2018	19:15	61	91	62	56	51	0.0	0.9	5.4	113	22	64	712
11/12/2018	19:30	48	57	54	51	44	0.0	0.9	3.6	90	22	65	712
11/12/2018	19:45	49	65	59	52	43	0.0	0.9	3.1	90	21	66	712
11/12/2018	20:00	59	79	73	60	44	0.0	0.9	2.7	90	21	66	712
11/12/2018	20:15	46	56	53	49	41	0.0	0.4	2.7	90	21	68	713
11/12/2018	20:30	47	54	52	50	43	0.0	0.9	5.8	135	20	69	713
11/12/2018	20:45	50	60	57	53	45	0.0	0.9	4.0	90	20	71	713
11/12/2018	21:00	48	57	54	51	44	0.0	0.9	5.8	90	20	74	713
11/12/2018	21:15	45	54	52	48	41	0.0	0.9	2.7	90	19	76	713
11/12/2018	21:30	45	53	51	47	42	0.0	0.9	2.7	90	19	78	713
11/12/2018	21:45	51	69	60	54	46	0.0	0.9	2.2	68	19	79	713
11/12/2018	22:00	47	56	54	50	42	0.0	0.9	2.7	90	19	81	713
11/12/2018	22:15	45	56	53	48	41	0.0	0.4	2.7	90	19	82	713
11/12/2018	22:30	44	54	53	47	38	0.0	0.9	3.1	90	18	83	713
11/12/2018	22:45	38	47	44	41	34	0.0	0.4	2.7	90	18	84	713
11/12/2018	23:00	53	70	66	55	35	0.0	0.4	2.2	113	18	84	713
11/12/2018	23:15	42	56	52	45	33	0.0	0.4	2.7	113	18	85	713
11/12/2018	23:30	36	55	45	38	31	0.0	0.9	2.7	113	18	85	713
11/12/2018	23:45	38	48	44	41	34	0.0	0.4	2.2	90	18	85	713
12/12/2018	0:00	36	46	45	39	31	0.0	0.9	2.2	90	18	86	712
12/12/2018	0:15	35	44	41	38	31	0.0	0.9	4.0	90	18	87	712
12/12/2018	0:30	40	53	48	43	35	0.0	0.9	4.0	90	18	88	712
12/12/2018	0:45	39	49	46	42	34	0.0	0.9	4.0	90	18	89	712
12/12/2018	1:00	54	85	57	52	33	0.0	0.9	3.1	90	18	89	712
12/12/2018	1:15	35	49	45	37	29	0.0	0.4	2.7	90	18	89	712
12/12/2018	1:30	34	44	42	37	29	0.0	0.4	2.7	113	18	89	712
12/12/2018	1:45	38	53	49	40	30	0.0	0.4	2.2	90	18	89	711
12/12/2018	2:00	33	42	40	36	28	0.0	0.4	2.7	113	18	90	712
12/12/2018	2:15	52	68	65	55	32	0.0	0.4	1.8	90	17	90	712
12/12/2018	2:30	40	51	47	43	33	0.0	0.4	1.8	113	17	91	711
12/12/2018	2:45	35	50	42	38	30	0.0	0.9	1.8	90	17	91	711
12/12/2018	3:00	28	41	38	31	23	0.0	0.9	3.1	90	17	92	711
12/12/2018	3:15	37	45	43	40	29	0.0	0.9	2.7	90	17	92	711
12/12/2018	3:30	35	50	45	38	29	0.0	0.4	2.2	90	17	93	711

Logged Noise and Weather Data

Date	Start Time	LAeq	LAMax	LA1	LA10	LA90	Rain (mm)	Av. Wind speed (m/s)	Max Wind speed (m/s)	Wind Dir (°) North=0°	Temp (°C)	Hum. (%)	Air Pres. (Hpa)
12/12/2018	3:45	42	59	56	42	25	0.0	0.4	1.8	90	17	93	711
12/12/2018	4:00	46	62	58	52	31	0.0	0.4	2.7	113	17	93	711
12/12/2018	4:15	36	50	43	38	30	0.0	0.4	0.9	90	17	93	711
12/12/2018	4:30	44	60	56	46	33	0.0	0.4	1.8	90	17	94	711
12/12/2018	4:45	46	61	57	48	38	0.0	0.4	2.7	90	17	94	711
12/12/2018	5:00	57	73	71	61	37	0.0	0.9	2.2	90	17	94	711
12/12/2018	5:15	46	60	54	49	38	0.0	0.9	2.7	90	17	94	711
12/12/2018	5:30	47	59	55	49	41	0.0	0.4	3.1	90	17	94	711
12/12/2018	5:45	49	67	58	52	42	0.0	0.9	2.7	90	17	94	711
12/12/2018	6:00	48	61	55	51	43	0.0	0.9	3.1	90	17	94	711
12/12/2018	6:15	51	64	60	54	44	0.0	1.3	3.6	90	17	94	711
12/12/2018	6:30	52	63	58	55	46	0.0	1.3	3.1	68	17	94	711
12/12/2018	6:45	50	59	57	53	46	0.0	1.3	2.7	90	17	94	711
12/12/2018	7:00	61	92	59	53	45	0.0	1.3	3.6	68	17	94	712
12/12/2018	7:15	49	64	56	52	44	0.0	0.9	3.6	90	17	94	712
12/12/2018	7:30	48	56	53	51	44	0.0	1.3	2.7	90	18	90	712
12/12/2018	7:45	49	57	54	51	45	0.0	1.3	4.9	90	19	83	712
12/12/2018	8:00	56	72	69	59	43	0.0	1.3	4.0	90	20	76	712
12/12/2018	8:15	48	60	55	52	43	0.0	1.3	6.3	90	21	72	712
12/12/2018	8:30	49	61	57	52	44	0.0	1.3	4.0	90	21	72	712
12/12/2018	8:45	52	69	62	54	45	0.0	1.3	4.0	90	22	68	712
12/12/2018	9:00	51	65	62	53	43	0.0	1.3	4.5	90	22	67	712
12/12/2018	9:15	48	57	55	52	42	0.0	1.3	4.5	113	22	65	712
12/12/2018	9:30	49	62	55	52	42	0.0	1.3	3.6	135	23	61	712
12/12/2018	9:45	49	61	57	53	41	0.0	1.3	5.8	113	23	61	712
12/12/2018	10:00	47	63	55	50	41	0.0	1.3	4.9	90	24	58	712
12/12/2018	10:15	50	68	58	53	42	0.0	1.8	4.0	113	24	55	712
12/12/2018	10:30	46	57	53	50	40	0.0	1.3	4.0	135	24	55	712
12/12/2018	10:45	56	71	69	59	43	0.0	0.9	4.5	113	25	55	711
12/12/2018	11:00	48	64	60	50	38	0.0	1.3	5.4	90	25	53	711
12/12/2018	11:15	45	54	51	48	39	0.0	1.3	3.6	113	26	52	711
12/12/2018	11:30	48	61	56	50	42	0.0	1.8	3.6	113	26	51	711
12/12/2018	11:45	49	57	56	52	44	0.0	1.3	4.0	90	26	50	711
12/12/2018	12:00	49	57	55	52	43	0.0	1.8	4.9	90	27	49	711
12/12/2018	12:15	49	58	55	52	42	0.0	1.3	3.6	113	27	48	710
12/12/2018	12:30	48	60	55	50	43	0.0	1.8	5.4	113	28	46	710
12/12/2018	12:45	46	56	52	49	41	0.0	1.3	4.0	113	28	45	710
12/12/2018	13:00	48	57	54	51	43	0.0	1.3	4.0	90	28	46	710
12/12/2018	13:15	47	56	55	50	40	0.0	1.3	6.3	113	28	45	710
12/12/2018	13:30	58	89	62	54	42	0.0	1.3	4.9	90	28	45	710
12/12/2018	13:45	51	61	58	54	42	0.0	1.3	5.4	135	29	44	709
12/12/2018	14:00	48	57	56	52	41	0.0	1.3	5.8	113	29	44	709
12/12/2018	14:15	59	81	70	62	47	0.0	1.3	5.4	113	29	43	709
12/12/2018	14:30	49	58	57	54	40	0.0	1.8	5.4	135	29	43	709
12/12/2018	14:45	53	64	61	56	44	0.0	1.3	5.4	113	29	42	709
12/12/2018	15:00	50	59	56	53	44	0.0	1.8	4.9	113	29	43	709
12/12/2018	15:15	50	63	58	54	43	0.0	1.8	5.8	113	29	43	709
12/12/2018	15:30	49	58	55	52	42	0.0	1.3	5.4	90	29	42	709
12/12/2018	15:45	51	76	61	53	42	0.0	1.3	3.6	90	29	43	709
12/12/2018	16:00	49	58	55	52	43	0.0	1.3	4.5	90	29	43	708
12/12/2018	16:15	52	59	58	55	46	0.0	1.8	5.8	113	29	43	708
12/12/2018	16:30	49	59	56	53	42	0.0	0.9	4.9	90	28	44	708
12/12/2018	16:45	51	61	56	54	46	0.0	1.3	4.0	135	28	45	708
12/12/2018	17:00	52	62	58	55	46	0.0	1.3	3.6	113	27	46	708
12/12/2018	17:15	54	61	60	57	47	0.0	1.3	4.9	113	27	48	709
12/12/2018	17:30	57	73	70	57	47	0.0	1.8	6.3	113	26	49	709
12/12/2018	17:45	56	68	65	59	50	0.0	1.8	6.7	90	26	51	709
12/12/2018	18:00	52	65	59	54	46	0.0	1.3	4.9	90	26	54	709
12/12/2018	18:15	54	65	61	57	48	0.0	1.8	4.9	113	25	56	709
12/12/2018	18:30	55	67	61	58	50	0.0	1.3	4.9	113	24	58	709
12/12/2018	18:45	55	64	62	58	50	0.0	1.3	4.9	90	24	60	709
12/12/2018	19:00	58	84	65	59	49	0.0	1.3	6.3	90	23	62	709
12/12/2018	19:15	56	64	61	58	53	0.0	1.3	6.3	90	23	64	710
12/12/2018	19:30	54	63	61	57	48	0.0	1.3	4.9	90	22	66	710
12/12/2018	19:45	51	61	59	55	42	0.0	0.9	3.1	90	22	68	710
12/12/2018	20:00	52	64	59	54	46	0.0	0.9	3.6	90	22	68	709
12/12/2018	20:15	47	55	53	51	41	0.0	1.3	4.9	90	21	70	710
12/12/2018	20:30	46	58	53	48	40	0.0	1.3	6.7	113	21	72	710
12/12/2018	20:45	58	74	72	58	44	0.0	1.3	6.3	90	20	74	710
12/12/2018	21:00	51	60	58	54	45	0.0	0.9	6.3	90	20	76	710

Logged Noise and Weather Data														
Date	Start Time	LAeq	LAMax	LA1	LA10	LA90	Rain (mm)	Av. Wind speed (m/s)	Max Wind speed (m/s)	Wind Dir (°) North=0°	Temp (°C)	Hum. (%)	Air Pres. (Hpa)
12/12/2018	21:15	52	60	58	54	47	0.0	0.9	4.9	113	20	78	710
12/12/2018	21:30	52	61	59	55	47	0.0	0.9	3.1	90	20	80	710
12/12/2018	21:45	54	65	61	57	48	0.0	0.9	4.0	90	19	80	710
12/12/2018	22:00	57	72	70	59	42	0.0	0.9	3.1	90	19	82	710
12/12/2018	22:15	43	54	51	46	36	0.0	0.9	3.1	90	19	83	710
12/12/2018	22:30	44	54	51	47	37	0.0	0.9	3.1	113	19	84	710
12/12/2018	22:45	45	57	52	48	37	0.0	0.4	2.2	113	19	85	710
12/12/2018	23:00	42	67	50	42	34	0.0	0.4	2.2	113	19	85	710
12/12/2018	23:15	39	57	49	41	33	0.0	0.4	2.7	135	18	86	710
12/12/2018	23:30	37	51	46	40	31	0.0	0.4	2.2	113	18	86	710
12/12/2018	23:45	58	75	72	59	36	0.0	0.4	2.2	90	18	86	710
13/12/2018	0:00	36	45	43	39	31	0.0	0.4	1.8	90	18	86	710
13/12/2018	0:15	36	44	42	39	29	0.0	0.4	2.2	90	18	86	709
13/12/2018	0:30	47	58	57	53	31	0.0	0.4	0.9	90	18	87	709
13/12/2018	0:45	45	60	50	46	42	0.0	0.0	1.3	90	18	87	709
13/12/2018	1:00	51	78	58	53	41	0.0	0.0	0.9	90	18	87	709
13/12/2018	1:15	55	71	68	58	29	0.0	0.0	0.4	90	18	87	709
13/12/2018	1:30	33	46	43	37	28	0.0	0.0	0.4	90	18	87	709
13/12/2018	1:45	39	54	51	42	27	0.0	0.0	0.9	90	18	87	709
13/12/2018	2:00	53	82	62	53	27	0.0	0.0	0.4	90	18	87	709
13/12/2018	2:15	36	45	44	39	28	0.0	0.0	0.9	90	18	87	709
13/12/2018	2:30	45	62	56	47	38	0.0	0.0	0.4	90	18	87	709
13/12/2018	2:45	54	72	67	58	35	0.0	0.0	0.4	90	18	87	708
13/12/2018	3:00	43	53	50	47	38	0.0	0.4	1.3	90	18	88	708
13/12/2018	3:15	46	57	52	49	41	0.0	0.4	1.3	90	18	89	708
13/12/2018	3:30	47	56	52	50	42	0.0	0.4	1.3	90	17	89	708
13/12/2018	3:45	51	59	56	53	47	0.0	0.4	1.3	90	17	90	708
13/12/2018	4:00	51	65	63	54	44	0.0	0.4	1.8	90	17	90	708
13/12/2018	4:15	42	60	51	45	33	0.0	0.4	3.1	90	17	91	708
13/12/2018	4:30	42	66	52	41	34	0.0	0.9	2.2	90	17	91	708
13/12/2018	4:45	42	62	51	45	35	0.0	0.4	1.3	90	17	92	708
13/12/2018	5:00	41	56	52	44	33	0.0	0.0	1.3	90	17	92	708
13/12/2018	5:15	44	61	55	46	35	0.0	0.0	0.4	90	17	92	709
13/12/2018	5:30	51	68	64	53	39	0.0	0.0	0.4	90	17	92	709
13/12/2018	5:45	47	64	56	50	42	0.0	0.0	0.9	90	17	92	709
13/12/2018	6:00	59	91	57	52	44	0.0	0.0	0.9	90	18	91	709
13/12/2018	6:15	57	70	69	59	42	0.0	0.0	0.4	90	18	90	709
13/12/2018	6:30	47	66	53	49	42	0.0	0.0	0.4	90	18	89	709
13/12/2018	6:45	47	57	54	49	43	0.0	0.0	1.3	90	18	86	709
13/12/2018	7:00	58	88	57	52	44	0.0	0.4	1.8	90	19	81	709
13/12/2018	7:15	48	60	56	51	42	0.0	0.9	3.6	338	20	77	709
13/12/2018	7:30	51	71	63	52	43	0.0	0.4	1.8	315	20	75	709
13/12/2018	7:45	48	62	58	50	44	0.0	0.4	2.2	0	21	72	709
13/12/2018	8:00	50	66	59	52	42	0.0	0.4	2.2	338	21	70	709
13/12/2018	8:15	58	85	67	59	41	0.0	0.4	2.7	0	22	67	709
13/12/2018	8:30	46	61	55	48	41	0.0	0.4	2.7	0	22	68	709
13/12/2018	8:45	45	58	53	47	40	0.0	0.4	2.7	0	22	65	709
13/12/2018	9:00	45	57	50	47	40	0.0	0.9	2.7	0	23	63	709
13/12/2018	9:15	44	58	50	46	40	0.0	0.4	2.7	90	23	61	709
13/12/2018	9:30	64	90	59	53	41	0.0	0.9	3.6	23	23	61	709
13/12/2018	9:45	46	57	53	49	41	0.0	0.9	4.0	338	24	60	708
13/12/2018	10:00	57	74	73	51	41	0.0	0.4	2.2	0	24	60	708
13/12/2018	10:15	46	59	55	49	40	0.0	0.9	2.7	0	25	57	708
13/12/2018	10:30	47	65	54	48	42	0.0	0.4	2.2	0	26	54	708
13/12/2018	10:45	57	88	61	53	42	0.0	0.9	4.0	113	26	50	708
13/12/2018	11:00	45	56	51	47	40	0.0	0.4	2.2	45	27	51	708
13/12/2018	11:15	44	64	50	46	39	0.0	0.9	3.1	23	28	46	708
13/12/2018	11:30	46	62	54	48	42	0.0	0.9	2.7	0	28	46	707
13/12/2018	11:45	48	58	55	50	44	0.0	0.9	3.6	0	29	44	707
13/12/2018	12:00	46	58	54	49	40	0.0	0.9	2.7	0	30	43	707
13/12/2018	12:15	61	88	62	56	42	0.0	0.9	2.7	0	30	42	707
13/12/2018	12:30	47	62	54	49	41	0.0	0.4	2.7	90	30	42	706
13/12/2018	12:45	49	60	56	51	44	0.0	0.9	2.7	45	30	42	706
13/12/2018	13:00	59	86	62	55	45	0.0	0.9	3.6	23	30	42	706
13/12/2018	13:15	58	79	71	61	45	0.0	0.4	2.7	23	30	41	706
13/12/2018	13:30	45	56	52	48	39	0.0	0.9	2.2	293	31	37	706
13/12/2018	13:45	46	58	53	48	41	0.0	0.9	3.1	45	32	36	705
13/12/2018	14:00	47	58	54	50	40	0.0	0.9	2.7	90	32	36	705
13/12/2018	14:15	47	57	55	50	41	0.0	0.9	2.7	0	32	36	705
13/12/2018	14:30	49	59	56	52	42	0.0	0.4	2.7	0	32	37	705

Logged Noise and Weather Data														
Date	Start Time	LAeq	LAMax	LA1	LA10	LA90	Rain (mm)	Av. Wind speed (m/s)	Max Wind speed (m/s)	Wind Dir (°) North=0°	Temp (°C)	Hum. (%)	Air Pres. (Hpa)
13/12/2018	14:45	58	76	71	57	42	0.0	0.9	3.1	338	32	34	704
13/12/2018	15:00	50	63	59	54	43	0.0	0.9	3.1	135	33	34	704
13/12/2018	15:15	50	59	58	53	44	0.0	0.9	3.6	0	33	32	704
13/12/2018	15:30	57	78	70	58	44	0.0	0.9	4.5	23	33	34	704
13/12/2018	15:45	49	60	57	51	44	0.0	0.9	2.2	23	32	35	704
13/12/2018	16:00	48	58	55	51	43	0.0	0.9	2.7	0	32	36	704
13/12/2018	16:15	60	90	61	55	45	0.0	0.9	3.1	0	31	38	704
13/12/2018	16:30	50	64	57	53	45	0.0	0.9	2.7	68	30	41	704
13/12/2018	16:45	52	62	59	54	48	0.0	0.4	2.7	135	29	41	704
13/12/2018	17:00	66	94	71	63	49	0.0	0.9	2.7	23	28	43	704
13/12/2018	17:15	50	63	55	52	47	0.0	0.4	2.2	23	28	45	705
13/12/2018	17:30	49	63	55	52	45	0.0	0.4	2.7	23	27	46	705
13/12/2018	17:45	49	69	55	50	44	0.0	0.4	2.2	23	27	47	705
13/12/2018	18:00	47	58	55	50	41	0.0	0.4	2.7	45	26	48	705
13/12/2018	18:15	60	84	63	52	43	0.0	0.4	2.7	0	26	49	706
13/12/2018	18:30	57	80	69	58	42	0.0	0.4	2.2	338	26	51	706
13/12/2018	18:45	46	67	53	48	41	0.0	0.4	2.7	0	26	53	706
13/12/2018	19:00	55	57	57	56	54	0.0	0.4	1.8	23	25	54	706
13/12/2018	19:15	63	90	70	63	51	0.0	0.4	3.1	90	25	56	706
13/12/2018	19:30	46	64	59	47	38	0.0	0.4	2.2	90	25	57	706
13/12/2018	19:45	42	53	49	45	38	0.0	0.4	1.3	23	25	58	706
13/12/2018	20:00	48	65	53	52	38	0.0	0.4	1.8	23	25	58	706
13/12/2018	20:15	43	54	50	46	37	0.0	0.0	1.8	0	24	57	706
13/12/2018	20:30	37	48	43	39	32	0.0	0.4	2.2	23	24	57	706
13/12/2018	20:45	40	54	51	42	32	0.0	1.3	4.9	225	24	70	707
13/12/2018	21:00	38	49	46	40	33	0.0	0.9	3.1	225	23	75	707
13/12/2018	21:15	44	53	51	48	34	0.0	0.9	2.2	248	22	78	706
13/12/2018	21:30	45	54	52	48	40	0.0	0.4	1.3	248	22	78	706
13/12/2018	21:45	48	60	57	52	40	0.0	0.4	1.8	225	22	78	705
13/12/2018	22:00	54	70	67	56	37	0.0	0.4	3.1	90	21	78	705
13/12/2018	22:15	44	58	54	47	34	0.0	0.9	2.7	113	21	79	705
13/12/2018	22:30	39	60	48	38	32	0.0	0.4	2.2	135	21	81	706
13/12/2018	22:45	35	48	44	36	32	0.0	0.0	0.9	113	21	82	706
13/12/2018	23:00	35	45	40	37	31	0.0	0.0	0.9	68	21	82	706
13/12/2018	23:15	48	61	60	48	34	0.0	0.0	0.9	68	21	82	706
13/12/2018	23:30	45	54	51	46	43	0.0	0.0	0.9	68	21	83	706
13/12/2018	23:45	56	70	67	61	36	0.0	0.0	0.9	68	21	84	706
14/12/2018	0:00	34	43	39	36	31	0.0	0.0	0.9	68	21	84	706
14/12/2018	0:15	38	53	49	41	30	0.0	0.0	0.4	68	21	84	706
14/12/2018	0:30	43	54	51	49	31	0.0	0.0	0.9	68	21	84	706
14/12/2018	0:45	54	64	60	57	47	0.0	0.0	0.9	68	21	85	705
14/12/2018	1:00	49	63	61	53	30	0.2	0.9	2.7	68	20	86	705
14/12/2018	1:15	34	46	43	37	28	0.0	0.9	4.9	68	20	89	705
14/12/2018	1:30	48	64	60	49	28	0.2	0.4	1.8	113	20	89	705
14/12/2018	1:45	46	56	51	48	44	0.0	0.0	0.9	113	20	89	705
14/12/2018	2:00	47	59	50	48	45	0.0	0.4	1.8	90	20	88	705
14/12/2018	2:15	57	74	69	60	45	0.0	0.0	2.2	225	20	87	705
14/12/2018	2:30	39	54	49	42	28	0.0	0.0	1.3	248	20	87	705
14/12/2018	2:45	31	43	40	34	26	0.0	0.0	0.4	248	20	87	705
14/12/2018	3:00	30	46	40	32	26	0.0	0.0	0.9	248	20	87	705
14/12/2018	3:15	33	44	41	36	27	0.0	0.0	1.8	248	20	87	705
14/12/2018	3:30	39	50	48	43	30	0.0	0.0	0.4	270	20	88	705
14/12/2018	3:45	37	53	47	40	30	0.0	0.4	2.2	293	20	88	705
14/12/2018	4:00	36	48	44	39	30	0.0	0.4	3.1	293	20	88	705
14/12/2018	4:15	56	77	69	58	34	0.0	0.4	3.1	293	20	89	706
14/12/2018	4:30	45	62	57	45	38	0.0	1.3	4.0	293	20	89	705
14/12/2018	4:45	51	74	62	48	38	0.0	1.8	5.4	293	20	89	705
14/12/2018	5:00	45	68	54	46	38	0.0	1.8	5.8	293	20	90	705
14/12/2018	5:15	47	59	53	49	44	0.0	2.2	5.8	293	20	90	705
14/12/2018	5:30	47	68	56	48	41	0.2	1.8	4.9	293	20	91	706
14/12/2018	5:45	49	61	56	52	44	0.2	1.3	3.6	293	19	90	706
14/12/2018	6:00	48	65	57	49	42	0.2	1.8	3.6	293	19	91	706
14/12/2018	6:15	58	80	70	61	43	0.2	1.8	5.8	293	19	90	706
14/12/2018	6:30	48	68	55	50	44	0.0	2.2	5.4	293	19	92	706
14/12/2018	6:45	46	63	56	48	41	0.0	1.8	4.9	293	19	91	706
14/12/2018	7:00	67	92	63	53	43	0.0	1.8	4.0	270	19	92	706
14/12/2018	7:15	50	66	60	50	44	0.0	1.8	3.6	270	19	92	706
14/12/2018	7:30	49	67	56	52	44	0.0	1.8	3.6	293	19	92	706
14/12/2018	7:45	49	69	57	51	43	0.0	1.3	2.7	270	19	91	706
14/12/2018	8:00	50	69	63	49	43	0.0	1.3	3.6	270	19	90	705

Logged Noise and Weather Data														
Date	Start Time	LAeq	LAMax	LA1	LA10	LA90	Rain (mm)	Av. Wind speed (m/s)	Max Wind speed (m/s)	Wind Dir (°) North=0°	Temp (°C)	Hum. (%)	Air Pres. (Hpa)
14/12/2018	8:15	47	56	52	50	43	0.0	1.8	4.9	293	19	90	706
14/12/2018	8:30	52	62	59	54	48	0.0	1.3	4.9	270	20	89	706
14/12/2018	8:45	54	66	60	57	49	0.2	0.4	2.2	90	20	85	706
14/12/2018	9:00	49	60	56	52	44	0.6	0.9	1.8	90	19	87	705
14/12/2018	9:15	51	67	63	52	40	0.2	0.9	1.8	90	19	90	705
14/12/2018	9:30	46	64	57	48	38	0.0	0.4	1.8	225	20	89	706
14/12/2018	9:45	51	79	62	51	38	0.0	0.4	1.8	113	20	87	706
14/12/2018	10:00	52	68	63	54	41	0.0	0.4	1.8	315	21	83	706
14/12/2018	10:15	53	82	56	52	40	0.0	0.0	1.8	315	23	81	706
14/12/2018	10:30	50	76	57	50	39	0.0	0.4	2.2	135	24	74	705
14/12/2018	10:45	43	57	51	45	38	0.0	0.4	1.8	113	24	73	705
14/12/2018	11:00	58	84	69	59	40	0.0	0.4	2.2	23	25	69	705
14/12/2018	11:15	48	77	50	47	40	0.0	0.4	2.2	23	26	66	705
14/12/2018	11:30	45	56	51	48	40	0.0	0.9	2.7	23	27	64	705
14/12/2018	11:45	45	58	54	47	40	0.0	1.3	3.6	23	28	61	705
14/12/2018	12:00	46	64	56	48	40	0.0	0.9	3.1	0	29	60	705
14/12/2018	12:15	48	66	60	50	40	0.0	0.9	3.1	23	30	59	705
14/12/2018	12:30	44	55	54	46	38	0.0	0.4	3.1	23	29	57	705
14/12/2018	12:45	61	92	61	55	42	0.0	0.4	2.2	338	30	57	704
14/12/2018	13:00	49	70	61	49	40	0.0	0.4	3.1	135	29	60	704
14/12/2018	13:15	44	57	51	47	37	0.0	0.4	3.1	135	28	60	704
14/12/2018	13:30	45	64	54	47	40	0.0	0.4	2.2	0	28	60	704
14/12/2018	13:45	57	80	67	59	40	0.0	0.4	3.6	113	28	60	704
14/12/2018	14:00	45	55	53	47	41	0.0	0.4	2.2	113	29	58	704
14/12/2018	14:15	45	58	54	48	40	0.0	0.4	2.7	113	29	58	704
14/12/2018	14:30	45	57	53	48	40	0.0	0.9	3.1	113	29	52	704
14/12/2018	14:45	62	90	72	62	42	0.0	0.9	3.1	113	31	48	703
14/12/2018	15:00	47	61	56	50	40	0.0	0.4	2.2	45	31	48	703
14/12/2018	15:15	47	62	56	50	42	0.0	0.4	2.7	113	31	52	703
14/12/2018	15:30	47	58	55	49	42	0.0	0.4	2.2	135	29	57	703
14/12/2018	15:45	47	56	54	50	42	0.0	0.9	2.2	113	28	61	703
14/12/2018	16:00	60	85	72	59	43	0.0	0.4	2.7	90	27	64	703
14/12/2018	16:15	47	64	55	50	42	0.0	0.4	1.8	113	26	68	703
14/12/2018	16:30	49	59	57	52	43	0.0	0.4	2.7	113	26	70	704
14/12/2018	16:45	50	59	56	53	45	0.0	1.3	3.6	90	25	73	704
14/12/2018	17:00	50	63	58	53	44	0.0	0.4	2.7	90	24	77	705
14/12/2018	17:15	54	73	63	55	46	0.0	0.4	2.2	90	23	77	704
14/12/2018	17:30	71	97	81	68	47	0.0	0.9	3.1	90	22	79	704
14/12/2018	17:45	74	101	80	67	50	0.0	0.4	3.1	68	21	82	706
14/12/2018	18:00	50	67	62	53	42	2.8	0.4	1.8	225	21	85	705
14/12/2018	18:15	58	82	71	58	44	3.0	0.0	0.9	0	21	87	706
14/12/2018	18:30	48	56	54	51	43	0.0	0.4	2.2	23	20	89	706
14/12/2018	18:45	50	60	57	54	43	0.2	0.4	1.8	90	20	91	706
14/12/2018	19:00	55	81	58	55	52	0.0	0.9	3.1	113	20	92	706
14/12/2018	19:15	53	57	56	55	51	0.2	0.4	3.6	135	20	93	706
14/12/2018	19:30	53	64	62	56	47	0.0	0.9	3.6	135	20	92	706
14/12/2018	19:45	57	67	64	60	51	0.0	0.9	5.4	113	20	92	706
14/12/2018	20:00	59	74	72	62	50	0.0	0.9	2.7	90	20	91	706
14/12/2018	20:15	54	61	59	56	50	0.0	0.9	3.6	113	20	92	707
14/12/2018	20:30	56	67	63	60	51	0.2	0.9	3.6	90	20	93	707
14/12/2018	20:45	59	82	65	62	52	1.0	0.4	1.8	90	20	93	707
14/12/2018	21:00	59	68	66	63	53	0.2	0.4	3.6	68	20	93	707
14/12/2018	21:15	49	59	53	51	47	0.4	0.4	2.2	113	20	93	707
14/12/2018	21:30	50	59	54	52	48	0.6	0.0	0.9	90	19	94	708
14/12/2018	21:45	54	62	60	56	49	1.0	0.0	0.9	90	19	94	708
14/12/2018	22:00	53	80	60	56	44	1.0	0.0	0.9	90	19	94	708
14/12/2018	22:15	44	57	50	46	41	1.0	0.4	2.2	113	19	94	707
14/12/2018	22:30	43	52	49	46	38	0.4	0.0	2.2	113	19	94	708
14/12/2018	22:45	48	58	58	50	41	0.2	0.4	2.2	113	20	94	707
14/12/2018	23:00	57	75	69	59	47	0.0	0.4	3.6	135	20	94	708
14/12/2018	23:15	52	61	58	54	48	0.6	0.4	0.9	135	20	94	708
14/12/2018	23:30	52	62	56	54	48	0.2	0.4	2.2	135	20	94	708
14/12/2018	23:45	57	71	69	59	47	0.2	0.4	2.2	113	20	94	708
15/12/2018	0:00	46	55	52	48	42	0.4	0.4	1.8	113	19	94	708
15/12/2018	0:15	47	56	54	51	40	0.2	0.4	1.8	113	19	94	707
15/12/2018	0:30	50	57	56	53	45	0.0	0.4	1.8	90	19	94	707
15/12/2018	0:45	48	60	60	51	38	0.0	0.4	2.2	90	19	94	706
15/12/2018	1:00	41	50	48	44	36	0.0	0.4	1.3	90	18	94	706
15/12/2018	1:15	45	54	52	48	40	0.0	0.4	1.3	90	18	94	706
15/12/2018	1:30	40	48	46	43	37	0.0	0.4	1.3	90	19	94	706

Logged Noise and Weather Data														
Date	Start Time	LAeq	LAMax	LA1	LA10	LA90	Rain (mm)	Av. Wind speed (m/s)	Max Wind speed (m/s)	Wind Dir (°) North=0°	Temp (°C)	Hum. (%)	Air Pres. (Hpa)
15/12/2018	1:45	43	51	49	45	40	0.0	0.4	2.2	90	19	95	706
15/12/2018	2:00	48	69	55	51	40	0.0	0.4	0.9	113	19	95	706
15/12/2018	2:15	43	51	49	46	39	0.0	0.4	1.8	113	19	95	705
15/12/2018	2:30	41	53	48	43	36	0.0	0.4	0.9	113	19	95	705
15/12/2018	2:45	41	49	47	43	38	0.0	0.4	2.2	113	19	95	705
15/12/2018	3:00	53	67	65	59	35	0.0	0.4	1.8	113	19	95	706
15/12/2018	3:15	36	47	43	38	33	0.0	0.4	1.8	113	19	95	706
15/12/2018	3:30	53	72	66	50	34	0.0	0.4	2.2	113	19	95	706
15/12/2018	3:45	56	72	69	57	39	0.0	0.9	2.2	68	19	95	706
15/12/2018	4:00	40	51	48	43	33	0.0	0.4	1.8	90	18	95	706
15/12/2018	4:15	41	54	49	43	36	0.0	0.4	2.2	90	18	95	706
15/12/2018	4:30	39	54	46	40	35	0.0	0.4	2.2	90	18	95	706
15/12/2018	4:45	44	60	55	44	38	0.0	0.4	2.7	90	18	95	707
15/12/2018	5:00	50	74	61	42	35	0.0	0.4	2.2	113	18	95	707
15/12/2018	5:15	54	73	68	48	37	0.0	0.9	3.6	90	18	95	707
15/12/2018	5:30	47	59	53	49	43	0.0	0.9	2.2	90	18	95	707
15/12/2018	5:45	59	90	61	56	44	0.0	0.9	2.7	90	18	95	708
15/12/2018	6:00	52	71	61	55	46	0.0	0.9	2.2	68	18	95	708
15/12/2018	6:15	51	67	64	53	44	0.0	0.9	2.7	90	18	95	708
15/12/2018	6:30	49	58	55	52	43	0.0	0.9	2.2	90	18	95	708
15/12/2018	6:45	50	62	61	52	43	0.0	0.9	4.0	90	18	95	708
15/12/2018	7:00	49	61	56	51	44	0.0	0.9	3.1	90	18	95	708
15/12/2018	7:15	48	59	55	51	44	0.0	0.4	1.8	68	19	95	708
15/12/2018	7:30	49	64	57	52	45	0.0	0.4	1.8	90	19	95	708
15/12/2018	7:45	55	75	68	54	46	0.0	0.4	3.1	113	19	95	708
15/12/2018	8:00	49	65	57	52	44	0.0	0.9	1.8	90	20	95	708
15/12/2018	8:15	50	59	56	53	45	0.0	0.9	2.7	90	20	95	709
15/12/2018	8:30	51	64	59	54	45	0.0	0.4	3.1	90	20	95	708
15/12/2018	8:45	49	58	56	53	43	0.0	0.9	2.7	90	21	95	708
15/12/2018	9:00	47	57	55	51	41	0.0	0.9	3.1	90	21	94	708
15/12/2018	9:15	51	63	56	53	45	0.0	0.9	2.7	90	22	91	708
15/12/2018	9:30	48	60	54	51	44	0.0	0.9	2.2	90	22	89	708
15/12/2018	9:45	49	60	56	52	43	0.0	0.4	2.2	68	23	87	708
15/12/2018	10:00	59	89	55	52	44	0.0	0.9	3.1	68	24	84	709
15/12/2018	10:15	48	58	54	50	43	0.0	0.9	2.2	90	24	79	708
15/12/2018	10:30	47	56	53	49	42	0.0	0.9	2.7	90	25	74	708
15/12/2018	10:45	57	85	64	56	43	0.0	0.9	3.6	90	26	74	708
15/12/2018	11:00	47	58	54	50	40	0.0	0.4	3.1	113	26	70	708
15/12/2018	11:15	47	64	56	50	41	0.0	0.4	2.7	113	26	69	708
15/12/2018	11:30	47	61	54	50	40	0.0	0.9	2.2	90	26	69	708
15/12/2018	11:45	48	68	57	50	41	0.0	0.9	2.7	90	26	69	708
15/12/2018	12:00	50	71	58	50	41	0.0	0.9	2.7	68	27	67	708
15/12/2018	12:15	46	58	55	49	41	0.0	0.9	3.1	90	27	66	708
15/12/2018	12:30	49	59	55	52	43	0.0	0.9	3.6	90	28	65	707
15/12/2018	12:45	48	58	55	51	42	0.0	0.9	3.1	90	28	62	707
15/12/2018	13:00	49	60	56	52	43	0.0	1.3	3.1	68	28	63	707
15/12/2018	13:15	48	59	56	52	40	0.0	1.3	3.6	68	28	63	707
15/12/2018	13:30	46	56	54	50	39	0.0	0.9	3.1	113	29	61	707
15/12/2018	13:45	47	61	54	50	40	0.0	1.3	4.0	68	29	61	707
15/12/2018	14:00	49	64	57	53	42	0.0	1.3	4.0	113	29	62	707
15/12/2018	14:15	48	63	57	50	43	0.0	1.3	4.0	113	29	62	707
15/12/2018	14:30	48	65	58	50	41	0.0	0.9	4.0	135	29	60	706
15/12/2018	14:45	55	69	68	57	39	0.0	0.4	2.2	113	29	60	707
15/12/2018	15:00	47	57	53	49	42	0.0	0.9	3.1	90	29	60	706
15/12/2018	15:15	46	60	52	49	40	0.0	0.9	3.6	113	29	59	706
15/12/2018	15:30	47	60	54	50	42	0.0	0.9	3.6	113	29	60	706
15/12/2018	15:45	48	56	54	52	41	0.0	0.9	3.6	90	29	59	706
15/12/2018	16:00	47	57	56	50	42	0.0	0.4	2.7	90	29	57	706
15/12/2018	16:15	46	56	53	49	41	0.0	0.9	2.7	90	29	60	706
15/12/2018	16:30	50	65	62	51	42	0.0	0.4	2.7	90	29	62	706
15/12/2018	16:45	53	79	58	54	44	0.0	0.4	2.2	68	28	63	706
15/12/2018	17:00	47	56	52	49	43	0.0	0.9	3.1	68	28	67	706
15/12/2018	17:15	50	58	56	53	46	0.0	1.3	3.1	68	27	69	706
15/12/2018	17:30	52	66	63	53	46	0.0	0.9	3.1	68	26	71	707
15/12/2018	17:45	48	67	53	50	44	0.0	1.3	3.6	90	26	72	707
15/12/2018	18:00	49	58	56	52	45	0.0	1.3	4.0	68	25	73	707
15/12/2018	18:15	51	63	58	54	45	0.0	0.9	2.2	90	25	73	707
15/12/2018	18:30	47	66	55	50	40	0.0	0.9	2.7	90	25	74	707
15/12/2018	18:45	58	81	69	60	44	0.0	0.9	3.1	90	25	75	707
15/12/2018	19:00	58	61	60	60	57	0.0	0.9	2.2	68	24	76	708

Logged Noise and Weather Data														
Date	Start Time	LAeq	LAMax	LA1	LA10	LA90	Rain (mm)	Av. Wind speed (m/s)	Max Wind speed (m/s)	Wind Dir (°) North=0°	Temp (°C)	Hum. (%)	Air Pres. (Hpa)
15/12/2018	19:15	57	62	59	58	55	0.0	0.9	3.1	90	24	75	708
15/12/2018	19:30	50	60	59	54	43	0.0	1.3	3.6	68	24	74	708
15/12/2018	19:45	49	58	56	51	45	0.0	1.3	3.1	68	24	75	708
15/12/2018	20:00	45	53	50	47	41	0.0	0.4	2.7	90	23	77	708
15/12/2018	20:15	49	59	60	53	41	0.0	0.4	3.6	135	23	79	709
15/12/2018	20:30	47	56	56	49	44	0.2	0.4	2.2	113	23	82	709
15/12/2018	20:45	41	57	47	43	37	0.4	0.0	2.2	135	23	86	709
15/12/2018	21:00	42	50	46	43	39	0.4	0.0	2.2	135	22	88	709
15/12/2018	21:15	40	48	46	42	36	0.0	0.4	1.8	135	21	90	709
15/12/2018	21:30	40	57	49	41	34	0.0	0.0	1.8	135	21	91	709
15/12/2018	21:45	45	58	58	46	35	0.2	1.3	4.5	113	21	91	709
15/12/2018	22:00	45	54	52	49	40	0.0	1.3	4.0	113	21	92	709
15/12/2018	22:15	55	71	68	57	43	0.0	0.9	3.6	135	21	93	709
15/12/2018	22:30	47	56	54	50	41	0.0	1.3	4.9	113	21	93	709
15/12/2018	22:45	44	52	49	46	39	0.0	1.3	4.0	113	21	93	709
15/12/2018	23:00	43	51	48	45	38	0.0	0.9	4.9	113	21	93	709
15/12/2018	23:15	45	55	54	48	39	0.0	0.4	2.2	90	21	94	709
15/12/2018	23:30	46	55	52	49	41	0.0	0.4	2.2	135	21	94	709
15/12/2018	23:45	45	60	53	48	39	0.0	0.9	4.0	158	21	94	709
16/12/2018	0:00	44	53	51	48	38	0.0	0.9	4.0	90	21	94	708
16/12/2018	0:15	46	55	52	49	40	0.0	0.9	5.8	90	21	94	708
16/12/2018	0:30	44	58	52	47	36	0.0	1.3	4.9	90	21	94	708
16/12/2018	0:45	41	51	47	44	36	0.0	1.3	4.9	68	21	94	708
16/12/2018	1:00	42	58	50	44	35	0.0	0.4	2.2	90	21	94	708
16/12/2018	1:15	45	53	50	48	36	0.0	0.4	2.7	113	21	94	708
16/12/2018	1:30	41	49	48	44	34	0.0	0.4	2.2	113	21	94	708
16/12/2018	1:45	50	79	58	54	35	0.0	0.4	4.0	135	21	95	708
16/12/2018	2:00	40	50	47	44	34	0.0	0.4	3.6	113	21	95	708
16/12/2018	2:15	40	57	47	43	34	0.0	0.4	2.7	68	21	95	708
16/12/2018	2:30	39	46	44	41	35	0.0	0.4	2.2	90	21	95	708
16/12/2018	2:45	35	45	43	38	30	0.0	0.4	2.7	135	21	94	708
16/12/2018	3:00	35	45	41	38	31	0.0	0.9	4.9	113	20	95	708
16/12/2018	3:15	33	44	39	36	30	0.2	0.4	4.9	90	20	95	708
16/12/2018	3:30	43	57	56	43	31	0.0	0.0	1.8	113	20	95	708
16/12/2018	3:45	36	45	42	39	30	0.0	0.4	3.1	113	20	95	708
16/12/2018	4:00	34	53	39	36	30	0.0	0.4	2.2	113	20	95	708
16/12/2018	4:15	38	49	45	40	33	0.0	0.4	3.1	113	20	95	708
16/12/2018	4:30	45	66	55	43	36	0.0	0.9	3.6	113	20	95	708
16/12/2018	4:45	39	64	47	39	33	0.0	0.4	3.1	113	20	95	708
16/12/2018	5:00	46	65	58	46	34	0.0	0.4	2.7	113	20	95	708
16/12/2018	5:15	40	55	51	41	34	0.0	0.4	2.2	113	20	95	709
16/12/2018	5:30	46	69	57	44	34	0.0	0.4	3.1	113	20	95	709
16/12/2018	5:45	43	60	53	46	36	0.0	0.4	3.1	113	20	95	709
16/12/2018	6:00	42	59	52	47	33	0.0	0.4	3.1	113	20	95	709
16/12/2018	6:15	49	64	61	51	34	0.2	0.9	3.6	113	20	95	709
16/12/2018	6:30	48	68	60	48	37	0.0	0.0	1.8	90	21	95	709
16/12/2018	6:45	40	53	48	43	34	0.0	0.0	2.2	113	21	95	709
16/12/2018	7:00	48	67	63	46	35	0.0	0.4	2.7	135	21	95	709
16/12/2018	7:15	47	62	61	47	36	0.0	0.4	2.7	113	21	95	709
16/12/2018	7:30	50	79	55	48	35	0.0	0.9	3.6	113	21	95	709
16/12/2018	7:45	42	55	53	46	31	0.0	0.9	2.7	113	21	95	709
16/12/2018	8:00	41	56	50	44	34	0.0	0.4	2.7	113	21	95	709
16/12/2018	8:15	41	56	50	44	34	0.4	0.4	3.1	135	21	95	709
16/12/2018	8:30	39	54	46	40	35	0.2	0.4	2.2	113	21	95	709
16/12/2018	8:45	45	66	52	48	37	0.4	0.9	4.0	113	21	95	709
16/12/2018	9:00	46	66	60	45	36	0.2	0.9	4.9	113	21	95	709
16/12/2018	9:15	45	60	57	47	37	0.0	0.4	2.2	113	21	95	709
16/12/2018	9:30	46	72	57	46	36	0.0	0.4	2.7	135	21	95	709
16/12/2018	9:45	69	81	77	73	51	0.2	1.3	3.6	113	21	95	709
16/12/2018	10:00	42	59	53	45	36	0.0	0.4	2.7	135	21	95	709
16/12/2018	10:15	42	58	52	44	37	0.4	0.4	2.7	113	21	95	709
16/12/2018	10:30	47	62	53	50	41	4.4	0.4	3.1	135	21	95	709
16/12/2018	10:45	47	60	56	49	39	11.0	0.4	3.6	135	21	95	709
16/12/2018	11:00	51	65	62	53	42	1.0	0.4	1.3	45	21	95	709
16/12/2018	11:15	47	69	55	49	41	0.6	0.4	2.2	113	21	95	709
16/12/2018	11:30	55	65	64	59	47	1.0	1.3	3.6	113	21	95	709
16/12/2018	11:45	50	58	55	52	46	0.4	0.4	2.7	90	21	95	709
16/12/2018	12:00	52	73	63	53	45	0.4	0.9	2.7	135	21	95	709
16/12/2018	12:15	52	62	59	54	47	0.0	0.4	2.7	68	21	95	709
16/12/2018	12:30	52	62	58	55	47	0.2	0.4	3.1	135	21	95	708

Logged Noise and Weather Data														
Date	Start Time	LAeq	LAMax	LA1	LA10	LA90	Rain (mm)	Av. Wind speed (m/s)	Max Wind speed (m/s)	Wind Dir (°) North=0°	Temp (°C)	Hum. (%)	Air Pres. (Hpa)
16/12/2018	12:45	55	64	61	58	50	0.0	0.9	4.5	113	21	95	708
16/12/2018	13:00	54	61	59	57	49	0.0	1.8	7.2	90	21	95	708
16/12/2018	13:15	56	69	64	59	51	0.0	1.3	5.4	113	21	95	708
16/12/2018	13:30	53	62	59	56	48	0.0	1.3	4.0	113	21	95	708
16/12/2018	13:45	51	61	58	54	45	0.6	1.8	5.4	113	21	95	708
16/12/2018	14:00	54	65	62	57	48	0.0	1.3	4.9	113	21	95	707
16/12/2018	14:15	59	74	71	60	49	0.0	1.3	4.0	68	21	95	707
16/12/2018	14:30	56	65	62	59	52	0.0	1.3	6.3	90	21	95	707
16/12/2018	14:45	55	65	61	57	50	0.0	0.9	4.0	90	21	95	707
16/12/2018	15:00	52	61	59	55	46	0.0	0.9	3.6	68	21	95	707
16/12/2018	15:15	54	66	61	57	49	0.0	0.9	3.6	113	21	95	707
16/12/2018	15:30	55	65	62	58	49	0.0	0.9	3.1	68	21	95	707
16/12/2018	15:45	52	61	58	54	48	0.0	1.3	5.4	90	21	95	707
16/12/2018	16:00	52	61	58	55	48	0.0	1.3	3.6	90	21	95	707
16/12/2018	16:15	55	66	62	58	50	0.2	1.3	6.3	90	21	95	707
16/12/2018	16:30	54	71	60	57	46	1.4	1.3	5.4	90	20	95	707
16/12/2018	16:45	54	64	60	57	48	0.0	0.9	5.8	90	20	95	707
16/12/2018	17:00	50	71	59	52	44	0.0	1.3	4.0	113	21	95	707
16/12/2018	17:15	54	64	61	57	48	0.2	0.9	4.0	113	21	95	708
16/12/2018	17:30	53	63	59	56	46	0.0	1.3	4.9	113	20	95	707
16/12/2018	17:45	49	58	55	51	45	0.0	1.3	4.9	90	20	95	708
16/12/2018	18:00	53	61	59	56	47	0.0	1.3	3.6	113	20	95	708
16/12/2018	18:15	48	57	57	51	42	0.0	0.9	4.5	90	20	95	708
16/12/2018	18:30	49	62	58	52	42	0.0	0.9	2.2	90	20	96	708
16/12/2018	18:45	50	59	59	54	44	0.0	0.9	4.0	90	20	96	708
16/12/2018	19:00	57	59	59	59	49	0.0	0.4	3.6	45	20	96	708
16/12/2018	19:15	53	62	62	56	44	0.0	0.9	3.6	113	20	95	708
16/12/2018	19:30	50	60	60	53	44	0.0	0.9	3.6	113	20	95	708
16/12/2018	19:45	51	60	61	53	41	0.0	0.9	4.0	90	20	96	708
16/12/2018	20:00	45	53	51	49	39	0.0	0.9	3.6	135	20	95	709
16/12/2018	20:15	50	58	58	53	44	0.0	0.9	2.7	90	20	96	709
16/12/2018	20:30	50	59	58	53	43	0.8	0.9	4.9	135	20	95	709
16/12/2018	20:45	51	63	60	54	44	2.6	1.3	4.9	113	20	95	709
16/12/2018	21:00	51	61	60	55	42	0.4	0.4	2.2	113	20	96	709
16/12/2018	21:15	51	61	61	55	43	0.2	0.9	3.6	135	20	96	709
16/12/2018	21:30	44	57	48	47	40	0.2	0.9	2.7	135	20	96	709
16/12/2018	21:45	41	54	50	44	36	2.2	0.4	1.8	68	20	96	709
16/12/2018	22:00	43	58	54	43	37	1.2	0.4	3.1	113	20	96	709
16/12/2018	22:15	56	73	69	60	39	0.0	0.4	3.6	158	20	96	709
16/12/2018	22:30	41	51	49	43	38	0.2	0.4	3.1	135	20	96	709
16/12/2018	22:45	51	62	62	54	42	0.4	0.9	3.6	135	20	96	709
16/12/2018	23:00	52	62	62	57	44	0.0	0.4	3.1	158	20	96	709
16/12/2018	23:15	50	62	60	53	42	0.4	0.0	0.9	158	19	96	709
16/12/2018	23:30	52	61	61	54	44	0.4	0.4	1.8	113	19	96	709
16/12/2018	23:45	55	65	65	59	49	0.4	0.4	2.2	90	19	96	709
17/12/2018	0:00	54	64	64	56	48	0.4	0.4	3.1	90	19	96	708
17/12/2018	0:15	59	73	71	61	47	0.6	0.4	2.2	90	19	95	708
17/12/2018	0:30	53	60	57	54	50	0.2	0.4	1.8	90	19	96	708
17/12/2018	0:45	57	70	68	61	45	0.6	0.4	2.7	113	19	96	708
17/12/2018	1:00	49	56	54	51	44	0.6	0.4	1.8	90	19	96	708
17/12/2018	1:15	58	68	68	63	39	0.0	0.4	2.7	90	19	96	708
17/12/2018	1:30	55	64	65	60	42	0.4	0.4	2.2	90	19	96	708
17/12/2018	1:45	54	72	67	56	42	0.0	0.4	2.2	90	19	96	707
17/12/2018	2:00	57	67	67	63	40	0.0	0.9	3.6	90	19	96	707
17/12/2018	2:15	53	66	66	52	42	0.2	0.9	3.6	90	19	96	707
17/12/2018	2:30	51	63	63	53	42	0.0	0.9	3.1	135	19	96	707
17/12/2018	2:45	52	62	62	54	46	0.0	0.9	4.0	113	19	96	707
17/12/2018	3:00	49	58	57	52	43	0.0	0.9	3.6	90	19	96	707
17/12/2018	3:15	42	51	49	45	37	0.0	0.9	2.7	90	19	96	707
17/12/2018	3:30	43	55	51	46	38	0.0	0.9	3.6	90	19	96	707
17/12/2018	3:45	40	51	48	42	35	0.0	0.9	2.7	90	19	96	707
17/12/2018	4:00	46	60	59	43	34	0.0	0.9	4.9	68	19	96	708
17/12/2018	4:15	40	60	49	40	34	0.0	0.9	3.6	90	19	96	708
17/12/2018	4:30	46	57	57	50	38	0.0	0.4	3.1	113	19	96	708
17/12/2018	4:45	48	72	56	43	36	0.0	0.9	3.6	113	19	96	708
17/12/2018	5:00	47	69	59	44	35	0.0	0.9	3.1	113	19	96	708
17/12/2018	5:15	48	62	59	50	39	0.0	0.9	5.4	135	18	96	709
17/12/2018	5:30	46	61	55	49	40	0.0	0.9	4.0	113	18	96	708
17/12/2018	5:45	51	69	62	52	42	0.0	0.9	3.1	113	18	96	709
17/12/2018	6:00	47	65	53	49	43	0.0	0.9	3.6	90	18	96	709

Logged Noise and Weather Data														
Date	Start Time	LAeq	LAMax	LA1	LA10	LA90	Rain (mm)	Av. Wind speed (m/s)	Max Wind speed (m/s)	Wind Dir (°) North=0°	Temp (°C)	Hum. (%)	Air Pres. (Hpa)
17/12/2018	6:15	49	68	58	51	42	0.0	0.4	2.2	113	18	96	709
17/12/2018	6:30	47	65	56	49	41	0.0	0.4	2.2	90	19	96	709
17/12/2018	6:45	61	92	64	53	41	0.0	0.4	3.6	113	19	96	709
17/12/2018	7:00	51	70	61	52	41	0.0	0.4	1.8	135	19	96	709
17/12/2018	7:15	55	80	64	50	40	0.0	0.4	2.2	135	19	96	709
17/12/2018	7:30	46	61	55	49	41	0.2	0.9	3.1	135	19	96	710
17/12/2018	7:45	45	55	55	48	40	0.0	0.9	3.6	135	19	96	710
17/12/2018	8:00	47	61	58	49	40	0.0	0.9	3.6	135	19	96	710
17/12/2018	8:15	43	56	50	45	39	0.0	0.9	4.0	113	19	96	710
17/12/2018	8:30	46	61	54	48	40	0.0	0.4	3.6	113	19	96	710
17/12/2018	8:45	45	56	54	48	39	0.0	0.9	3.1	113	19	96	710
17/12/2018	9:00	43	55	51	46	39	0.0	0.9	3.1	113	19	96	710
17/12/2018	9:15	45	67	53	47	39	0.0	0.4	3.6	135	19	96	710
17/12/2018	9:30	51	71	64	51	41	0.0	0.9	3.1	135	20	96	710
17/12/2018	9:45	46	72	54	48	39	0.2	0.4	2.2	113	20	96	710
17/12/2018	10:00	48	56	54	51	41	0.0	0.4	2.7	113	20	96	710
17/12/2018	10:15	51	62	58	54	45	0.0	0.4	2.2	135	20	96	710
17/12/2018	10:30	49	75	55	51	43	0.0	0.4	2.7	135	20	96	709
17/12/2018	10:45	50	61	56	52	45	0.0	0.4	2.7	113	20	96	709
17/12/2018	11:00	50	60	57	53	44	0.0	0.4	2.2	113	20	96	709
17/12/2018	11:15	51	63	59	54	45	0.0	0.4	3.1	113	20	96	709
17/12/2018	11:30	56	78	70	55	45	0.0	0.4	2.7	135	20	96	709
17/12/2018	11:45	57	71	69	57	46	0.0	0.4	3.1	135	21	96	709
17/12/2018	12:00	52	69	63	54	45	0.0	0.4	2.7	135	21	95	709
17/12/2018	12:15	53	65	59	55	49	0.0	0.4	2.7	135	21	93	709
17/12/2018	12:30	51	74	58	54	45	0.0	0.4	1.8	113	21	92	709
17/12/2018	12:45	52	62	57	54	46	0.0	0.9	4.9	113	22	87	709
17/12/2018	13:00	52	73	58	54	44	0.0	0.9	3.6	90	23	85	709
17/12/2018	13:15	54	64	61	58	47	0.0	1.3	4.9	113	23	84	709
17/12/2018	13:30	52	63	59	55	45	0.0	0.9	3.1	113	24	81	708
17/12/2018	13:45	50	60	56	53	43	0.0	0.9	3.1	90	24	81	708
17/12/2018	14:00	50	69	62	51	41	0.0	0.9	2.7	90	24	78	708
17/12/2018	14:15	49	60	55	52	43	0.0	0.4	2.7	113	24	78	708
17/12/2018	14:30	52	66	59	56	44	0.0	0.9	3.6	113	25	77	708
17/12/2018	14:45	50	57	55	53	45	0.0	0.4	2.7	113	24	79	708
17/12/2018	15:00	50	59	56	53	44	0.0	0.4	3.6	113	23	80	708
17/12/2018	15:15	49	59	57	52	43	0.0	0.9	2.7	113	23	80	708
17/12/2018	15:30	53	62	60	57	47	0.0	0.4	2.7	113	24	75	708
17/12/2018	15:45	54	65	60	56	48	0.0	1.3	4.0	90	25	73	708
17/12/2018	16:00	56	67	62	59	46	0.0	1.8	5.4	90	25	74	708
17/12/2018	16:15	57	65	63	60	52	0.0	1.8	6.3	113	24	79	708
17/12/2018	16:30	58	67	64	62	53	0.0	1.3	5.4	113	24	80	708
17/12/2018	16:45	56	69	63	59	50	0.0	1.3	4.0	90	23	80	708
17/12/2018	17:00	57	69	64	60	52	0.0	1.3	5.8	90	23	81	708
17/12/2018	17:15	54	65	60	57	48	0.0	0.9	3.1	90	23	84	708
17/12/2018	17:30	53	68	60	56	47	0.0	1.3	4.0	90	22	87	709
17/12/2018	17:45	55	64	61	58	49	0.0	1.3	4.0	113	22	88	709
17/12/2018	18:00	53	63	59	56	48	0.0	1.3	6.7	113	21	89	709
17/12/2018	18:15	53	62	59	56	48	0.0	0.9	4.0	113	21	90	709
17/12/2018	18:30	57	65	63	60	52	0.0	1.3	4.9	113	21	92	709
17/12/2018	18:45	55	66	62	58	50	0.0	1.8	6.7	90	21	92	709
17/12/2018	19:00	58	64	63	61	54	0.0	1.3	6.3	68	20	92	709
17/12/2018	19:15	60	67	64	62	57	0.0	1.3	5.4	68	20	92	710
17/12/2018	19:30	57	65	63	60	50	0.0	1.3	4.9	90	20	92	710
17/12/2018	19:45	58	66	64	60	52	0.0	1.3	3.1	68	20	93	710
17/12/2018	20:00	59	67	65	62	53	0.0	1.8	6.3	113	20	93	710
17/12/2018	20:15	56	66	63	60	48	0.0	1.3	4.9	135	20	93	710
17/12/2018	20:30	54	61	59	57	48	0.0	0.9	4.9	90	20	94	710
17/12/2018	20:45	52	60	57	55	45	0.0	0.9	4.9	90	19	94	710
17/12/2018	21:00	51	61	58	54	44	0.0	0.9	3.6	90	19	94	710
17/12/2018	21:15	50	60	58	54	45	0.2	1.3	4.0	90	19	95	710
17/12/2018	21:30	50	60	57	53	44	0.0	1.3	5.4	68	19	95	710
17/12/2018	21:45	50	60	57	53	43	0.0	1.8	5.8	90	19	95	710
17/12/2018	22:00	53	68	63	56	43	0.0	1.8	5.8	90	19	95	710
17/12/2018	22:15	54	68	62	57	49	0.0	1.3	5.8	90	19	95	710
17/12/2018	22:30	56	68	63	59	49	0.0	1.8	5.4	90	19	95	710
17/12/2018	22:45	54	64	62	58	47	0.0	1.3	5.4	113	19	95	710
17/12/2018	23:00	56	65	63	59	50	0.2	0.9	2.7	135	19	95	710
17/12/2018	23:15	51	61	57	54	44	0.2	1.8	5.8	90	19	95	710
17/12/2018	23:30	53	63	60	56	44	0.0	2.2	6.7	113	19	95	710

Logged Noise and Weather Data														
Date	Start Time	LAeq	LAMax	LA1	LA10	LA90	Rain (mm)	Av. Wind speed (m/s)	Max Wind speed (m/s)	Wind Dir (°) North=0°	Temp (°C)	Hum. (%)	Air Pres. (Hpa)
17/12/2018	23:45	53	64	60	56	42	0.0	1.8	6.7	90	19	95	709
18/12/2018	0:00	51	60	58	54	42	0.2	1.8	6.7	90	19	95	709
18/12/2018	0:15	54	66	63	58	43	0.0	1.8	6.3	113	19	95	709
18/12/2018	0:30	57	65	63	61	51	0.0	1.8	6.3	90	19	95	709
18/12/2018	0:45	56	66	63	60	49	0.0	1.8	5.8	68	19	95	709
18/12/2018	1:00	57	68	64	60	50	0.0	1.3	4.0	113	19	96	709
18/12/2018	1:15	57	69	63	60	50	0.2	0.9	3.6	90	19	96	709
18/12/2018	1:30	53	63	61	56	47	0.2	1.3	6.7	90	19	95	709
18/12/2018	1:45	48	60	58	53	35	0.0	1.8	7.6	90	19	95	709
18/12/2018	2:00	51	61	58	54	42	0.0	1.8	4.9	90	19	95	709
18/12/2018	2:15	50	62	60	53	41	0.0	1.8	5.8	90	18	95	708
18/12/2018	2:30	52	66	60	55	45	0.0	1.8	5.4	90	18	96	709
18/12/2018	2:45	53	66	59	56	48	0.0	1.3	4.9	90	18	96	709
18/12/2018	3:00	53	62	59	57	46	0.2	1.8	4.9	90	18	96	709
18/12/2018	3:15	50	59	57	53	45	0.0	1.8	4.9	90	18	95	708
18/12/2018	3:30	47	58	56	52	36	0.0	1.3	5.4	90	18	96	709
18/12/2018	3:45	47	58	55	51	38	0.0	1.8	4.9	113	18	95	709
18/12/2018	4:00	48	58	56	52	40	0.0	1.8	5.4	113	18	96	709
18/12/2018	4:15	49	59	57	52	39	0.2	1.8	4.9	90	18	96	709
18/12/2018	4:30	48	61	57	52	40	0.0	1.3	4.5	90	18	96	709
18/12/2018	4:45	54	74	62	57	46	0.0	1.3	4.0	90	18	96	709
18/12/2018	5:00	53	60	58	56	45	0.0	1.3	4.0	68	18	96	709
18/12/2018	5:15	52	62	59	55	45	0.0	1.3	3.1	68	18	96	709
18/12/2018	5:30	56	76	63	59	48	0.0	1.3	4.0	90	18	96	709
18/12/2018	5:45	55	76	63	57	48	0.0	1.8	4.9	113	18	96	710
18/12/2018	6:00	52	63	59	55	48	0.0	1.3	6.3	113	19	96	710
18/12/2018	6:15	53	63	59	56	47	0.2	1.3	4.9	90	19	96	710
18/12/2018	6:30	55	64	61	57	50	0.0	1.3	5.8	113	19	96	710
18/12/2018	6:45	54	64	61	57	49	0.0	1.3	3.6	68	19	96	710
18/12/2018	7:00	54	63	60	57	49	0.0	1.8	4.5	90	19	96	710
18/12/2018	7:15	58	66	64	61	52	0.0	1.8	8.9	90	19	96	710
18/12/2018	7:30	57	64	62	59	52	0.0	1.3	4.0	90	19	96	710
18/12/2018	7:45	55	65	61	59	51	0.0	1.3	4.9	90	19	96	711
18/12/2018	8:00	55	66	63	59	49	0.0	1.8	5.8	113	19	96	711
18/12/2018	8:15	57	66	64	60	50	0.2	0.9	4.0	90	19	96	711
18/12/2018	8:30	56	65	63	60	50	0.0	1.3	4.9	113	19	96	711
18/12/2018	8:45	56	64	61	59	52	0.0	1.3	5.8	90	19	96	711
18/12/2018	9:00	57	65	63	59	53	0.0	1.3	5.4	90	20	96	711
18/12/2018	9:15	55	63	61	58	49	0.0	1.3	4.0	113	20	96	711
18/12/2018	9:30	52	67	58	55	47	0.0	0.9	3.6	90	20	96	711
18/12/2018	9:45	60	90	61	58	51	0.0	0.9	2.7	90	20	96	711
18/12/2018	10:00	53	61	59	56	48	0.0	1.3	4.0	90	20	96	711
18/12/2018	10:15	50	61	56	53	44	0.0	1.3	5.4	90	20	96	711
18/12/2018	10:30	48	58	54	51	43	0.0	1.3	5.8	113	20	95	711
18/12/2018	10:45	51	60	58	54	46	0.0	0.9	4.0	113	21	93	711
18/12/2018	11:00	58	86	63	55	46	0.0	0.9	4.5	113	21	92	711
18/12/2018	11:15	49	59	56	52	44	0.0	0.9	3.1	90	21	88	711
18/12/2018	11:30	51	67	59	55	44	0.0	0.9	3.1	113	22	86	711
18/12/2018	11:45	51	57	56	53	46	0.0	0.9	3.1	113	22	84	711
18/12/2018	12:00	49	58	55	52	45	0.0	0.9	3.6	135	23	84	711
18/12/2018	12:15	53	61	59	56	46	0.0	0.9	5.8	113	23	80	710
18/12/2018	12:30	49	68	56	52	41	0.0	0.9	4.5	90	23	79	710
18/12/2018	12:45	53	62	59	56	47	0.0	1.3	4.0	113	24	78	710
18/12/2018	13:00	51	60	57	53	45	0.0	1.3	4.0	90	24	78	710
18/12/2018	13:15	59	90	58	53	46	0.0	1.3	4.0	90	24	76	710
18/12/2018	13:30	49	59	57	52	43	0.0	0.9	2.7	90	24	76	710
18/12/2018	13:45	49	60	57	53	43	0.0	1.3	4.9	113	25	73	710
18/12/2018	14:00	50	60	57	53	44	0.0	1.3	3.6	90	25	73	710
18/12/2018	14:15	50	62	58	53	43	0.0	1.3	4.9	113	25	72	710
18/12/2018	14:30	48	55	53	51	44	0.0	1.3	4.9	113	25	71	710
18/12/2018	14:45	64	93	63	57	46	0.0	0.9	2.7	90	26	71	710
18/12/2018	15:00	59	73	71	62	46	0.0	0.9	2.7	90	26	71	710
18/12/2018	15:15	48	62	55	51	42	0.0	0.9	3.1	68	26	71	710
18/12/2018	15:30	49	68	56	52	44	0.0	0.9	3.6	90	26	71	710
18/12/2018	15:45	52	76	62	54	41	0.0	1.3	3.1	135	25	71	710
18/12/2018	16:00	52	61	58	55	45	0.0	0.9	3.6	113	25	71	710
18/12/2018	16:15	49	59	56	52	43	0.0	1.3	4.9	113	25	69	710
18/12/2018	16:30	50	58	56	53	45	0.0	0.9	4.0	90	26	67	710
18/12/2018	16:45	59	77	74	59	44	0.0	0.9	3.1	113	26	67	710
18/12/2018	17:00	54	71	63	60	42	0.0	0.9	4.0	113	26	68	710

Logged Noise and Weather Data

Date	Start Time	LAeq	LAMax	LA1	LA10	LA90	Rain (mm)	Av. Wind speed (m/s)	Max Wind speed (m/s)	Wind Dir (°) North=0°	Temp (°C)	Hum. (%)	Air Pres. (Hpa)
18/12/2018	17:15	51	58	57	54	46	0.0	0.9	4.0	90	26	67	710
18/12/2018	17:30	54	72	64	54	43	0.0	0.4	3.1	90	25	70	710
18/12/2018	17:45	52	68	65	53	43	0.0	0.9	2.7	90	25	71	710
18/12/2018	18:00	50	64	58	53	44	0.0	0.4	1.8	113	25	72	710
18/12/2018	18:15	50	65	61	51	44	0.0	0.4	2.2	113	24	73	710
18/12/2018	18:30	53	73	65	52	44	0.0	0.4	1.8	113	24	76	710
18/12/2018	18:45	48	70	57	50	43	0.0	0.4	2.2	113	23	78	710
18/12/2018	19:00	58	75	63	60	47	0.0	0.9	2.7	113	23	81	710
18/12/2018	19:15	59	61	61	60	56	0.0	0.4	2.7	113	22	82	711
18/12/2018	19:30	52	57	57	56	42	0.0	0.4	3.1	113	22	84	711
18/12/2018	19:45	49	54	54	52	40	0.0	0.9	3.1	113	22	84	711
18/12/2018	20:00	56	74	71	57	42	0.0	0.9	3.6	90	22	86	711
18/12/2018	20:15	47	54	53	49	43	0.0	0.9	3.1	113	21	87	711
18/12/2018	20:30	49	61	57	52	43	0.0	0.9	3.6	90	21	88	711
18/12/2018	20:45	60	90	63	55	42	0.0	0.9	3.1	113	21	89	712
18/12/2018	21:00	48	60	55	51	41	0.0	0.9	5.4	113	21	90	712
18/12/2018	21:15	49	60	59	52	42	0.0	0.9	5.8	113	21	91	711
18/12/2018	21:30	57	87	59	55	45	0.0	0.9	3.6	90	20	92	712
18/12/2018	21:45	57	75	70	59	45	0.0	1.3	4.0	90	20	92	712
18/12/2018	22:00	44	54	51	47	39	0.0	0.9	3.1	90	20	92	712
18/12/2018	22:15	45	57	53	49	38	0.0	0.9	3.1	113	20	93	712
18/12/2018	22:30	42	50	48	45	36	0.0	0.9	4.9	90	20	93	712
18/12/2018	22:45	44	58	54	46	38	0.0	0.9	4.0	90	20	94	712
18/12/2018	23:00	49	57	56	53	39	0.0	0.9	2.7	90	20	94	712
18/12/2018	23:15	46	52	51	48	44	0.0	0.9	2.7	90	19	94	711
18/12/2018	23:30	45	54	49	47	43	0.0	0.9	3.1	90	19	94	711
18/12/2018	23:45	58	73	71	61	41	0.0	0.9	3.6	90	19	94	711
19/12/2018	0:00	45	54	50	47	40	0.0	0.9	2.7	90	19	94	711
19/12/2018	0:15	45	53	52	47	39	0.0	0.9	3.6	90	19	95	711
19/12/2018	0:30	45	62	54	48	39	0.0	0.9	3.1	90	19	95	711
19/12/2018	0:45	43	57	54	45	37	0.0	0.9	4.9	90	19	95	711
19/12/2018	1:00	45	56	53	48	40	0.0	1.3	4.0	113	19	95	711
19/12/2018	1:15	45	54	53	48	39	0.0	0.9	3.6	113	19	95	710
19/12/2018	1:30	48	60	57	51	40	0.0	1.3	5.4	90	19	95	711
19/12/2018	1:45	56	70	68	60	45	0.0	1.3	3.6	90	19	95	710
19/12/2018	2:00	45	56	53	49	38	0.0	1.3	5.8	90	19	95	710
19/12/2018	2:15	44	54	51	47	39	0.0	0.9	4.0	113	19	95	710
19/12/2018	2:30	46	56	52	49	40	0.0	0.9	4.0	90	19	95	710
19/12/2018	2:45	56	74	70	57	40	0.0	0.9	4.0	113	19	95	710
19/12/2018	3:00	45	54	52	48	39	0.0	0.9	2.7	90	19	95	710
19/12/2018	3:15	41	56	48	44	32	0.0	0.9	3.1	68	19	95	710
19/12/2018	3:30	42	53	51	45	34	0.0	0.9	4.0	90	19	95	710
19/12/2018	3:45	43	56	52	46	35	0.0	0.9	3.1	90	19	95	710
19/12/2018	4:00	42	53	49	46	36	0.0	0.9	3.6	90	19	95	710
19/12/2018	4:15	42	57	51	45	36	0.0	0.9	2.7	90	19	95	710
19/12/2018	4:30	52	77	64	47	39	0.0	0.9	2.7	90	19	95	710
19/12/2018	4:45	51	70	63	50	39	0.0	0.9	2.7	90	19	95	710
19/12/2018	5:00	52	74	66	48	36	0.0	0.9	2.7	90	19	95	711
19/12/2018	5:15	48	69	59	51	37	0.0	0.9	2.2	90	19	95	711
19/12/2018	5:30	51	72	63	52	39	0.0	0.4	2.7	90	19	95	711
19/12/2018	5:45	63	93	59	55	41	0.0	0.4	2.7	68	19	95	711
19/12/2018	6:00	46	63	54	50	41	0.0	0.4	2.2	113	19	95	711
19/12/2018	6:15	46	54	52	49	41	0.0	0.4	2.2	90	19	95	711
19/12/2018	6:30	56	81	61	53	43	0.0	0.9	4.0	113	19	95	711
19/12/2018	6:45	54	71	67	54	42	0.0	0.9	4.0	113	19	95	711
19/12/2018	7:00	49	60	57	52	43	0.0	0.4	3.1	90	19	95	712
19/12/2018	7:15	46	54	51	49	42	0.0	0.9	3.1	68	19	96	712
19/12/2018	7:30	61	90	64	55	43	0.0	0.9	3.6	113	19	96	712
19/12/2018	7:45	54	76	69	49	41	0.0	0.4	2.2	90	19	96	712
19/12/2018	8:00	45	55	52	48	40	0.0	0.4	3.1	90	20	96	712
19/12/2018	8:15	46	59	53	49	41	0.0	0.4	4.0	113	20	96	712
19/12/2018	8:30	59	76	72	56	42	0.0	0.4	2.7	90	20	95	712
19/12/2018	8:45	44	60	52	47	40	0.0	0.4	2.7	113	20	94	712
19/12/2018	9:00	47	64	59	47	39	0.0	0.4	2.2	135	21	91	712
19/12/2018	9:15	48	71	59	48	39	0.0	0.9	3.1	113	21	88	712
19/12/2018	9:30						0.0	0.9	3.1	135	21	86	712
20/12/2018	9:45						0.0	0.4	3.1	113	22	84	712
19/12/2018	10:00	47	66	55	49	41	0.0	0.9	4.0	113	22	82	712
19/12/2018	10:15	44	55	52	47	39	0.0	0.4	2.7	135	23	81	713

Noise Monitoring Data Sheet

Inland Rail

SITE ID

G2H-3

From	Tuesday 11/12/2018 11:15	Meas. Type	Free Field	Package	Gowrie to Helidon
To	Wednesday 19/12/2018 8:45	Mic. Height (m)	1.8	Address	130 Morris Road
Instrument Type	01 dB DUO	Weather Station	No	Suburb	Gowrie Junction
Instrument Serial #	12604	Operator	LNM	Land Use	Residential
Inst. Cal. Date	11/12/2018	Sample Int.	15 min	Latitude	27°30'2.65"S
Pre Calibration	94	RP Lot#	1/RP192838	Longitude	151°54'10.77"E
Post Calibration	93.8				

Daytime

RBL **37.9 dB(A)**

ABLs Day (Mon-Fri 7am - 6 pm)

ABLs Day (Sat 8 am - 1 pm)

Tuesday 11/12/2018	37.9	dB(A)
Wednesday 12/12/2018	37.3	dB(A)
Thursday 13/12/2018	36.2	dB(A)
Friday 14/12/2018	36.5	dB(A)
Saturday 15/12/2018	39.1	dB(A)
Monday 17/12/2018	37.9	dB(A)
Tuesday 18/12/2018	39.1	dB(A)

Evening

RBL **38.5 dB(A)**

ABLs Evening (Mon-Fri 6 pm - 10 pm)

ABLs Evening (Sat 1 pm - 10 pm)

ABLs Evening (Sun 7 am - 10 pm)

Tuesday 11/12/2018	33.2	dB(A)
Wednesday 12/12/2018	38.8	dB(A)
Thursday 13/12/2018	34.2	dB(A)
Friday 14/12/2018	42.7	dB(A)
Saturday 15/12/2018	38.7	dB(A)
Sunday 16/12/2018	35.3	dB(A)
Monday 17/12/2018	39.6	dB(A)
Tuesday 18/12/2018	38.3	dB(A)

Night

RBL **36.3 dB(A)**

ABLs Night (Mon - Thu, Sat - Sun 6pm - 7am)

ABLs Night (Fri 6pm - 8am)

Tuesday 11/12/2018	25.8	dB(A)
Wednesday 12/12/2018	29.1	dB(A)
Thursday 13/12/2018	31.7	dB(A)
Friday 14/12/2018	37.4	dB(A)
Saturday 15/12/2018	36.4	dB(A)
Sunday 16/12/2018	38.5	dB(A)
Monday 17/12/2018	38.1	dB(A)
Tuesday 18/12/2018	36.2	dB(A)

Site Diagram - Diagram

Site Attended Measurements Summary

Date	Start	Measurement Type	Lmax	L1	L10	L90	Leq	Weather Conditions Comply	End
11/12/2018	11:15 AM	Attended	59.6	52.7	48.9	37.8	44.8	Pass	11:30 AM
		Logged	57.6	55.0	50.4	39.0	46.5		
		Difference	2.0	-2.3	-1.5	-1.2	-1.7		
Comments	Data Logger: SVAN 957 (S/N: 27537). Distant traffic dominates at 38 – 44dB(A). Noise from residence at 48 - 59dB(A). Birds at 50dB(A). Truck at 54dB(A). Wind gusts at 51 – 52dB(A).								
19/12/2018	8:45 AM	Attended	72.2	55.0	44.9	38.3	46.2	Pass	9:00 AM
		Logged	72.0	56.0	46.2	39.6	47.4		
		Difference	0.2	-1.0	-1.3	-1.3	-1.2		
Comments	Data Logger: SVAN 957 (S/N: 27537). Construction back beeper and distant bird noise dominates at 38 – 48dB(A). Noise from residence at 63dB(A). Bird noise at 52 – 72dB(A). Truck at 72dB(A). Car horn at 53dB(A).								

Photos