



Townsville City Council

Infrastructure, Traffic, Transport & Air Quality Integrated Master Plan Report

May 2019

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Appendix A - Traffic and Transport Assessment

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1. Introduction

1.1 Background information

Townsville City Council (Council) engaged GHD Pty Ltd (GHD) to develop an Impact Assessment Report (IAR) to inform the Planning Scheme Major Amendment (PSMA) for the Lansdown Industrial Estate (LIE). Specifically, GHD was engaged to undertake an assessment of traffic and transport, infrastructure and air quality impacts that have the potential to occur as a result of the use of the site for medium and heavy industrial purposes.

The findings of GHD's studies has been supplemented in this report with previous work, including:

- Ranbury Management Group Pty Ltd's (Ranbury) *Lansdown Opportunities Assessment Masterplan and Infrastructure Strategy*.
- Earth Environmental *Lansdown Station Environmental Study: Final Report*.
- Converge Heritage & Community *Lansdown Station Cultural Heritage Study*.
- AECOM Pty Ltd *Lansdown Station Flood Study*.
- Department of Transport and Main Roads (TMR) *Lansdown Industrial Precinct – Flinders Highway Connection Options Analysis*.

1.2 Purpose

The purpose of this report is to summarise the findings of GHD's technical investigations and build on previous work to develop an Integrated Master Plan for the site.

1.3 Scope of works

GHD undertook the following scope of works in development of this report:

- Review and establish baseline environmental constraints
- Review and establish essential infrastructure constraints
- Review and establish management constraints
- Identify developable area for the site
- Develop high-level Integrated Master Plan for the site to support the PSMA.

1.4 Statement of limitations

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

GHD otherwise disclaims responsibility to any person other than Townsville City Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

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

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no

responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

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

2. Background

2.1 Site history

The LIE is a large site located within Calcium which has historically operated as cattle grazing land and more recently has supported the Commonwealth Scientific and Industrial Research Organisation's (CSIRO) Pasture Research Station. The subject site comprises 2,200 ha and is located 45 km south of Townsville, just west of the Flinders Highway.

The Townsville City Deal 2016 identified Commonwealth and State interest in the conversion of the Lansdown Area into an industrial and export estate, detailing access as a key hurdle of the project. In addition, a small cemetery is located immediately north of Manton Quarry Road, adjacent to the road and services corridor separating the site from the rail corridor.

The Townsville City Plan identifies the Woodstock Industrial area as an industrial investigation area and appropriate for future development following appropriate actions.

2.2 Existing and proposed industry

In accordance with the identification of the site for industrial land uses, a number of development proposals have been progressed to various states with Council. Existing and proposed industrial uses within and surrounding the site are detailed in Table 2 of the *Air Quality Impact Assessment* at Appendix C. The following provides a brief discussion of key developments proposed within the site.

2.2.1 Drive it NQ Motorsport Precinct

The development application to establish a mixed use motorsport and driver training precinct was approved with conditions on 26 March 2019. The conditions include but are not limited to:

- Restricting hours of operation at the site to protect the amenity of surrounding land uses.
- Requiring the development of a noise management plan for major events (off-road, race circuits and rallies).
- Requiring the development of a dust management plan as part of an application for Operational Work.
- Requiring the development of an on-site sewerage disposal, as the site is not located within a sewerage service area under the *Water Supply (Safety and Reliability) Act 2008*.
- Requiring the development of a private water supply in accordance with Part 9.3.6 Works code and SC6.4.3.11 of the Townsville City Plan as the site is not located within a reticulated water service area.
- Requiring the development of a stormwater management plan incorporating a flood impact assessment in accordance with the SC6.7 Flood hazard planning scheme policy of the Townsville City Plan.
- Requiring the development of a stormwater quality management plan and implementation of stormwater quality treatment devices to manage the risk of environmental harm to receiving waters in accordance with the Townsville City Plan.
- Requiring an updated traffic impact assessment that details the development's impact on the intersections of existing and new local roads.
- Restricting access to the site from the Flinders Highway at the Ghost Gum Road intersection.

The application proposed traffic to movement past the nearby Woodstock School to the north of the Lansdown site. As the precinct would host a number of large events, the associated traffic and noise have potential to impact nearby residences in the Woodstock area. The traffic layout presented in this report (Section 4) may present a more suitable access arrangement subject to ultimate development of the LIE.

2.2.2 Battery Facility

Imperium3 resources have proposed to build a 15 GWh lithium-ion battery manufacturing facility. In June 2018, Council and Imperium3 signed a high-level agreement to progress the facility. Following this, the Queensland State Government signed an assistance agreement to provide up to \$3.1 million to Imperium3 for a feasibility study into this project in August 2018. The feasibility study is due to be completed in mid-2019.

2.2.3 Wellard Integrated Live Export Facility

Wellard currently leases the Lansdown Station site from Council, with the exception of ~300 ha of land leased to Drive It NQ. Wellard has proposed to develop an integrated live export facility at the Lansdown site. Council has considered the proposal as a transitional use, and has considered the proposal in terms of a 15 year lease.

The proposal has not been further progressed, due to technical and commercial constraints around the Flinders Highway intersection.

Ranbury notes that the development of a live export facility would require significant buffering from sensitive receptors, and would present a significant constraint to future development of the LIE. Further to this, Ranbury questioned the viability of the proposal, should the capital expenditure on infrastructure not be adequately amortised before vacation of the site were required (i.e. following the completion of the 15 year lease being considered).

2.3 Studies

2.3.1 Lansdown Opportunities Assessment Masterplan and Infrastructure Strategy

In 2017 Ranbury prepared the *Lansdown Opportunities Assessment Masterplan and Infrastructure Strategy*. The report provided an in depth review of the subject site, its planning constraints, and prepared an indicative masterplan for the industrial use of the site. The report indicated necessary planning steps required for progressing the conversion of land from rural to industrial.

The masterplan provided an indicative road layout in several scenarios which both did and did not account for the existing proposals. The Queensland Government is now progressing the findings of the masterplan as they relate to access to the state-controlled road network, in seeking to establish the safest and most efficient access location between the LIE and the Flinders Highway.

Notably, the masterplan adopted the Ross River Dam Catchment boundary as an exclusion line and detailed that all land within the dam catchment area would remain as rural land. It was recommended that a low impact industry such as a solar farm may be an acceptable use in this area.

2.3.2 Lansdown Station Environment Study

In 2018 Earth Environmental prepared the *Lansdown Station Environmental Study: Final Report*. The study found significant inconsistencies between actual ecological value and the

Queensland Government Regulated Vegetation mapping and this could not be used as an accurate depiction of onsite vegetation value.

The study prepared an environmental constraints map which was based on the higher level concept of environmental infrastructure. The key elements informing the map included: core areas, connectivity, hydraulic function and buffers. The resulting mapping provides a connected and holistic representation of the existing environmental value onsite and identifies appropriate area for development to occur. As per discussions with Council, the Integrated Master Plan proposed in this report adopts the Earth Environmental Figure 6-2 'Environmental Infrastructure' geospatial data. The Integrated Master Plan is therefore considered to be representative of the actual site environmental values.

2.3.3 Lansdown Station Flood Study

In 2019 AECOM undertook modelling of the 1% AEP flood potential across the site. The results of this modelling have been incorporated into the site constraints analysis provided in Section 3.

2.3.4 Lansdown Station Cultural Heritage Study

In 2018 Converge Heritage & Community prepared the *Lansdown Station Cultural Heritage Study*. The study incorporated a desktop review to identify a list of known places of heritage significance, which were then targeted during subsequent field investigations. Four heritage places confirmed during the field assessment include:

- Manton cemetery – a historic cemetery with marked and unmarked graves.
- Lansdown Station Homestead site (former) – historic remnants including a windmill, tanks, and timber posts, and a lone grave.
- Former CSIRO research station – former stock yards.

The study recommended that the Manton Cemetery and the Lansdown Station and associated lone grave be added to the local heritage register. The study also recommended that to facilitate conservation of the Lansdown Station and associated lone grave the entire lot (Lot 500 on Plan E12466) should remain zoned as rural to facilitate its conservation or where the entire lot were not to be added to the register and there is a need to develop the area, the site should be photographically archived and the grave should be protected from future development. In addition, it was recommended that the grave site be slashed to enable a more detailed site assessment, along with undertaking community consultation to identify the buried person.

If the Lansdown Station Homestead Site and lone grave were entered on the local heritage register, the following policies within the *Townsville City Plan* would be relevant:

- SC6.3.6: Requires that developments proposing to impact on a heritage place must provide a heritage impact statement prepared by a heritage professional.
- SC6.3.8: Requires the preparation of a photographic archival report for developments proposing to demolish, change or relocate a heritage place.
- SC6.3.9: Requires that developments that have potential to impact on archaeological places must provide an archaeological management plan, prepared by an archaeologist (note that this policy is relevant to the protection of gravesite regardless of heritage listing).

Further, it was noted that if the site were developed, there is the potential for items of heritage significance to be discovered across the entire site and particularly at Lansdown Station, particularly in proximity to mango trees. It is a requirement of the *Queensland Heritage Act 1992* that any discoveries of important archaeological artefacts are reported to the Department of Environment and Science.

2.3.5 Lansdown Industrial Precinct – Flinders Highway Connection Options Analysis

TMR undertook an options analysis to identify an appropriate interface between the Flinders Highway and the LIE. The findings of this analysis have been incorporated into this report in Section 4.

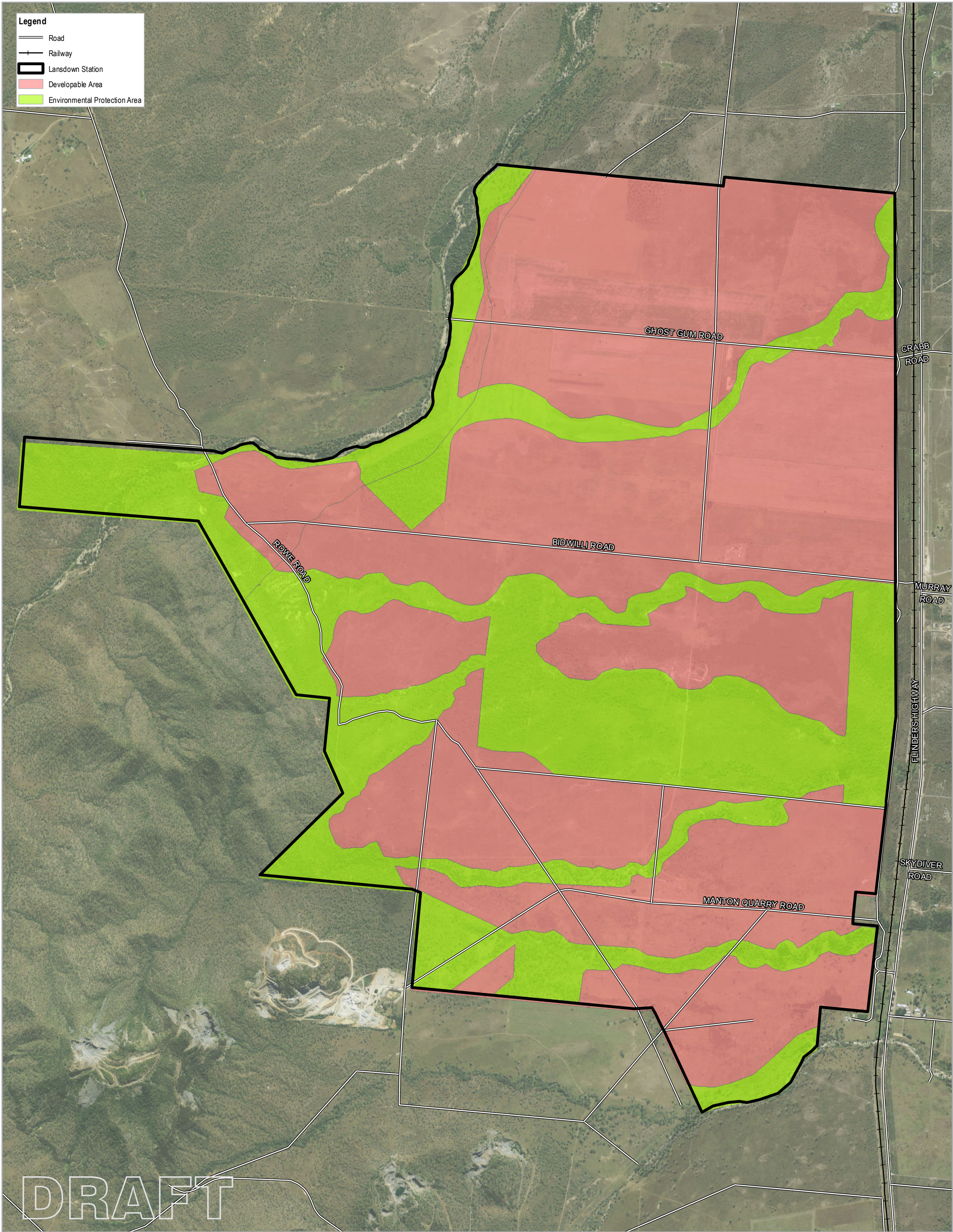
3. Site constraints

Site constraints have been considered as three levels, based on the impact they would have on potential development with the LIE as follows:

- Environmental constraints. These constraints are hard constraints and their adoption results in the creation of areas that cannot be utilised for industrial development.
- Existing and potential infrastructure. The location of existing infrastructure and its capacity to facilitate development within the LIE has been a core consideration in developing the internal road layout and will guide future development.
- Management constraints. These constraints are those that could be managed through engineering or other mitigation measures on a case by case basis subject to Council development assessment process. The constraints include the potential for air and noise impacts expected from development within the LIE on nearby sensitive receptors and 1% AEP flooding across the site.

3.1 Environmental constraints

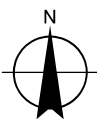
Council has advised that the constraints assessment established by Earth Environmental will be adopted for the LIE (refer Figure 1). Environmental constraints have been adopted as a hard constraint for the LIE Integrated Master Plan. In particular, the environmental protection areas in Figure 1 have been incorporated into the developable area calculations provided in Section 4. It is notable that significant proportions of the Drive IT NQ precinct are within the environmental protection area.



Based on or contains data provided by the State of Queensland (Department of Natural Resources, Mines and Energy) 2018.
In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for direct marketing or be used in breach of the privacy laws.

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
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Townsville City Council
Infrastructure, Traffic, Transport and
Air Quality Study associated with the
Lansdown Planning Scheme Major Amendment

Project No. 42-20641
Revision No. B
Date 22/03/2019

Environmental Constraints

FIGURE 1

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Data source: DNRME: Road (2018), Railway (2017), Imagery (2015); TCC: Lansdown Station; Earth Environmental: Environmental Protection Area (2018). Created by: xlee

3.2 Essential infrastructure findings

3.2.1 Road and rail infrastructure

TMR provided the intersection configuration and likely resumption requirements for the Flinders Highway/Ghost Gum Road intersection. This intersection is an unsignalised seagull arrangement with an overpass across the Flinders Highway and Mt Isa rail line. GHD has adopted this intersection as the sole access point for Stage 1 of the LIE. A second potential access point via the Flinders Highway in the south of the LIE has been provided in GHD's road layout.

Council and Queensland Rail have an Interface Agreement for rail crossings. As part of this agreement, the Office of the National Rail Safety Regulators does not support the construction of new rail crossings. Brownfield sites should also include assessment of the potential to close any existing railway crossings. An indicative rail siding located south of Ghost Gum Road, parallel to the Mt Isa railway line on the western side of Flinders Highway shown in Figure 2 is shown for sizing purposes only. The location has not been formally defined however, the current arrangement was developed in consultation with Queensland Rail. It is recommended that Council engage further with Queensland Rail to determine the final location for the rail siding.

A copy of GHD's transport assessment is provided at Appendix A.

3.2.2 Electrical infrastructure

Powerlink is the Transmission Network Service Provider (TNSP). The LIE is located near two separate double circuit 275kV transmission lines. These lines run between the Ross Station and Strathmore Station and form part of the TNSP's 'Southern Ross Zone Transmission Network'.

The western line (shown in Figure 2) generally follows the western boundary of the LIE, while the eastern line is located 5 km east of the LIE. Infrastructure in the eastern line has been recently connected to the planned Pacific Hydro Haughton Solar Farm which has a planned ultimate capacity of 500MW. Edify Energy also have planned a 200MW Majors Creek Solar Farm in the vicinity of Woodstock beneath the same transmission line.

Based on the medium economic load forecast given in the Transmission Annual Planning Report (2018), there are no network limitations forecasted to occur in the Ross zone within the next five years. However the TNSP may not have been aware of the load the LIE may add to the network.

The Distribution Network Service Provider (DNSP) is Energy Queensland. The closest zone substation is the Woodstock South Substation. This is a 66/11kV zone substation fed from the Stuart – Woodstock South (66kV subtransmission line) and the Woodstock South – Charters Towers (66kV subtransmission line). Based on GHD's electrical infrastructure analysis, capacity is available at the substation level to connect some load.

The 66kV subtransmission lines feeding the substation are the Stuart – Woodstock South (ST – WO – 1) and the Woodstock South – Charters Towers (WO – CT – 1) subtransmission lines. ST – WO – 1 is the northern line feeding the Woodstock South substation. 121A. WO – CT – 1 is the southern line feeding the Woodstock South substation. Based on Ergon's Subtransmission Feeder forecasts, both of these lines have a forecasted load at less than 35% of their rated capacity (rated capacity in the order of 180A).

Based on review of the potential land usage, the estimate demand could be expected to be in the order of 130 MVA [167.5MVA if the battery plant demand estimated by Council is realised].

3.2.3 Load planning and distribution

Based on the forecasts given by the Distribution Annual Planning Report (2018), there is capacity at existing infrastructure to service some new load. Depending on which lots develop first, their actual load requirement and the timeframe for development, it is expected the LIE could be initially fed from existing distribution network. However as the development with the LIE increases it will likely require more capacity and this will likely be most accessible from the 275kV transmission network.

The staging of the battery plant in particular will significantly change this assessment as the distribution system cannot support the indicated load this site may apply to the network.

Based on existing transmission network forecasts, it is expected that access to the transmission network to service the load will be acceptable to the TNSP. The costs to gain access to the line could be expected to be in the order of \$5-10M. This cost is subject to a number of considerations as the extent of the required infrastructure would be load dependent. Nominally speaking a 275kV switchyard and step down equipment would be required. An expected land allotment of approximately 35,000m² for the 275kV switchyard would be required.

Based on the proposed preliminary staging, it is possible that the initial development of the motorsports precinct could be supplied by the existing distribution network fed by Woodstock South substation.

3.2.4 Alternative network arrangements

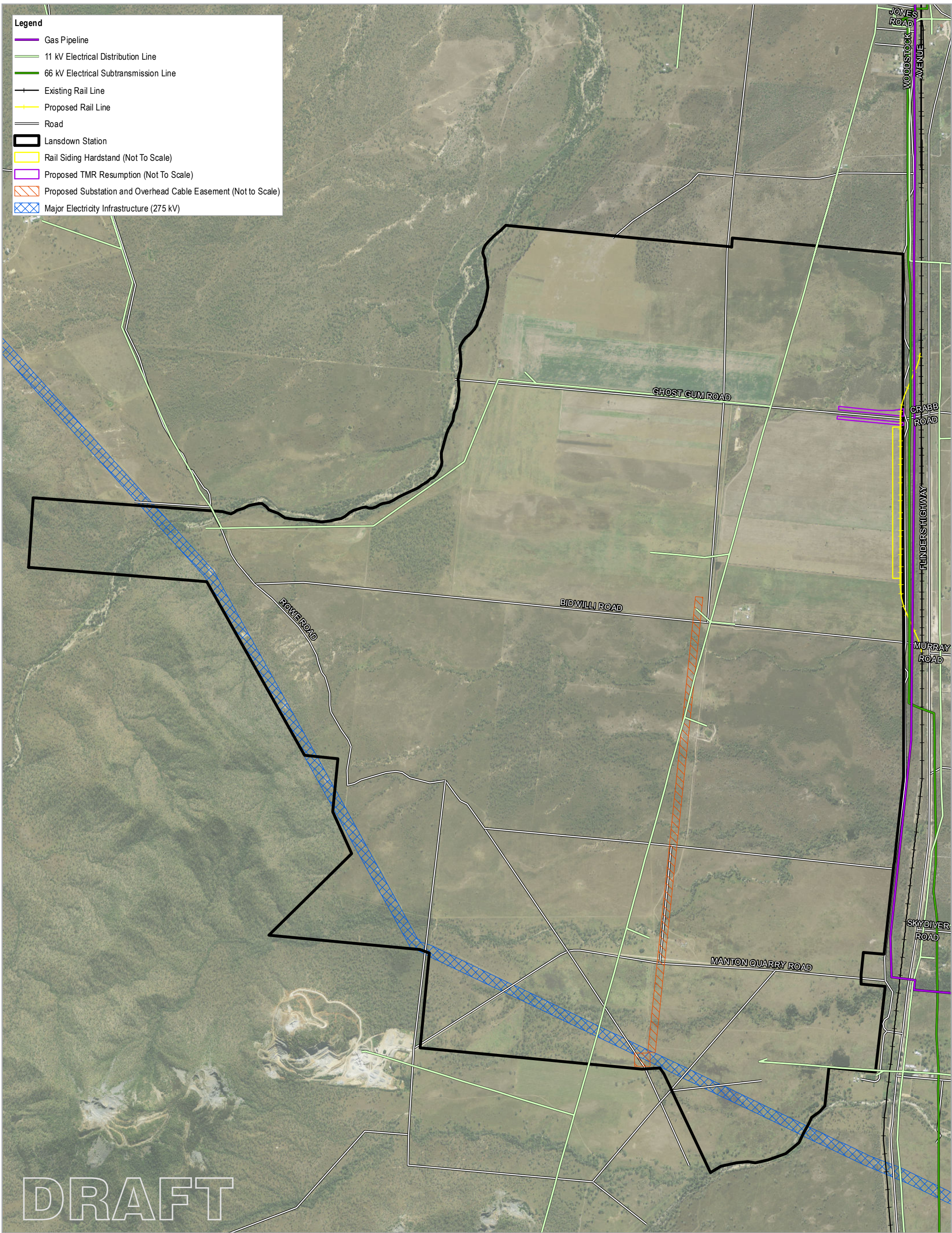
The expected total power demand of the LIE is significant with respect to connecting to the existing network. Due to this, investment in localised generation or alternate sources of energy to support the demand of the site could result in economic advantages.

Existing infrastructure that could support this include a coal seam gas pipeline that runs along the section of Flinders Highway on the eastern lot boundary. Gas can be connected to the LIE and used for large heating or cogeneration applications to reduce the amount of electricity required to be delivered through networks to the site.

Edify Energy or other renewable generation proponents may be able to assist in the development by sharing the cost of transmission network access or by connecting the development in non-traditional arrangements such as behind the meter supply from an onsite or nearby renewable generation facility.

3.2.4.1 Other essential infrastructure

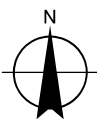
The LIE does not contain nor is connected to existing or planned trunk infrastructure (water, wastewater, stormwater, internal roads, pathways and open space). The management of water and sewerage infrastructure at the individual development level, as is proposed at the Drive IT NQ, is may impact on the total developable area within LIE, and therefore limit the productive use of the LIE. It is recommended that investigations into the provision of sewerage and water infrastructure options be undertaken, alongside or prior to review and update of the Local Government Infrastructure Planning (LGIP).



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Lansdown Planning Scheme Major Amendment

Project No. 42-20641
Revision No. A
Date 6/03/2019

Infrastructure Constraints

FIGURE 2

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Data source: Ergon: Electrical Line (2017); GA: Gas Pipeline (2013); DNRME: Road (2018), Railway (2017); Imagery (2015); TCC: Lansdown Station (2018), Rail Siding (2019); Powerlink: digitised Major Electricity Infrastructure (2019); TMR: Resumption Area digitised (2019). Created by: xee

3.3 Management constraints

The State Planning Policy July 2017 (SPP) 'Emissions and hazardous activities' is the state interest applicable to the control of environmental noise/vibration and air/odour emissions. This section addresses the relevant policies within the SPP, including:

- (1) Industrial development, major gas, waste and sewerage infrastructure, and sport and recreation activities are located, designed and managed to avoid or mitigate adverse impacts of emissions on sensitive land uses and the natural environment.
- (5) Protect the following existing and approved land uses or areas from encroachment by development that would compromise the ability of the land use to function safely and effectively:
 - (a) Medium-impact, high-impact and special industries.
- (6) Development that is incompatible with the existing and approved land uses or areas included in policy 5 above, is located to avoid adverse impacts of environmental emissions, or health and safety risks, and where the impacts cannot be practicably avoided, development is designed to minimise the impacts.

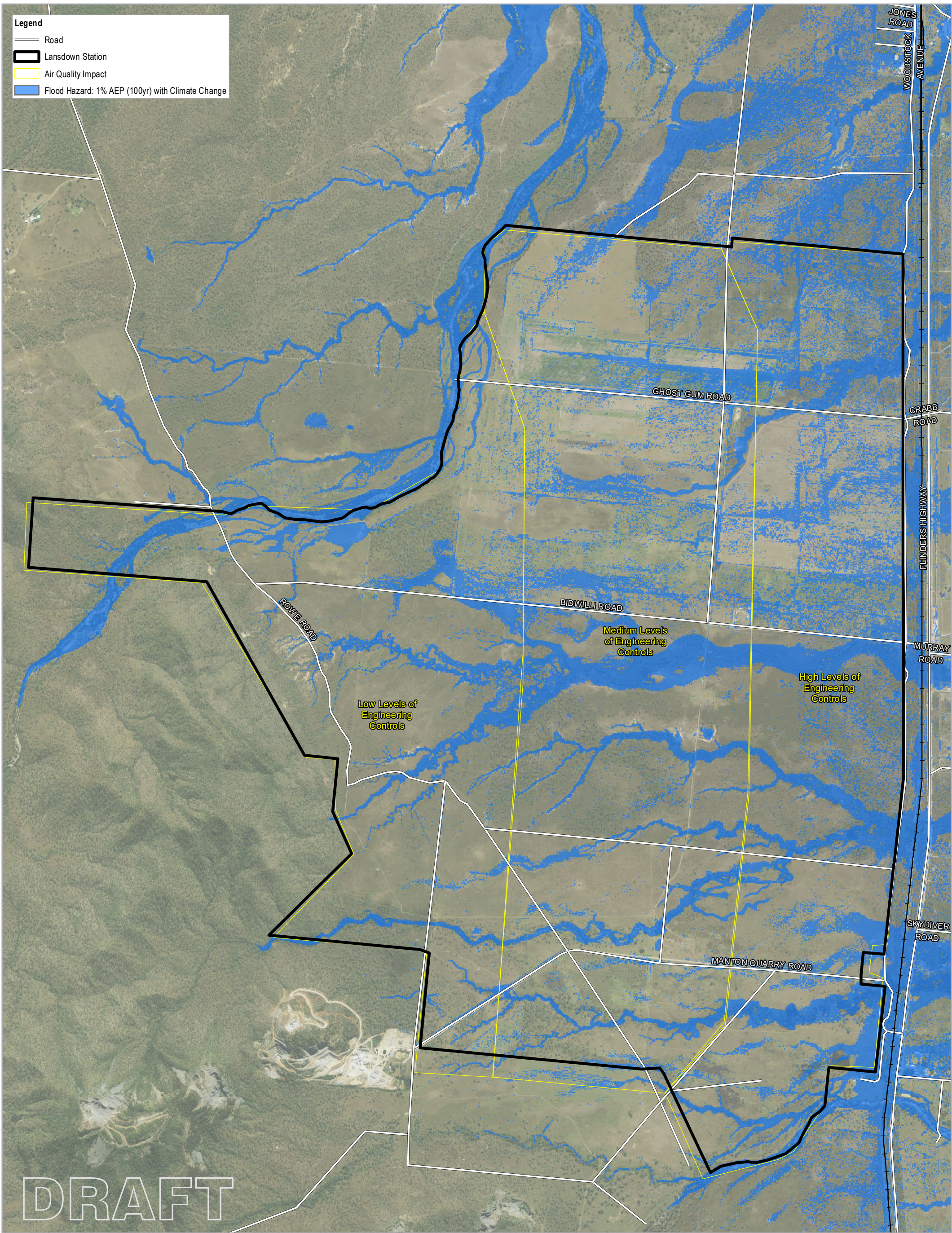
3.3.1 Air quality impact assessment – recommended engineering controls

GHD completed air, noise and vibration baseline monitoring and air quality impact assessments to inform the Integrated Master Plan and support the PSMA. Copies of the reports are provided at Appendix B and Appendix C. The assessments identified potential separation distances and emissions arising from existing, proposed and potential industries for the LIE. A buffer risk rating and emission based risk rating was developed for each industry (see Appendix C). These were combined to develop an overall risk rating for each industry (i.e. existing, proposed and potential). The overall risk ratings may be used to inform areas within the LIE requiring different levels of engineering controls (i.e. high, medium, or low¹) for specific industrial land uses to mitigate potential impacts to existing sensitive receptors. Indicative areas requiring different levels of engineering controls for the LIE are shown on Figure 3 along with the results of the 1% AEP from flood hazard modelling undertaken by AECOM.

GHD considers that industrial uses proposed in the western portion of the LIE require a low level of engineering control, as this area is located furthest from existing sensitive receptors. Medium and high levels of engineering controls would follow generally to the eastern site boundaries closest to existing sensitive receptors.

It is noted that the areas for low, medium and high levels of engineering controls recommended does not consider all aspects of existing, proposed and potential industrial land uses and this should be used as a guide only. Individual developments within the LIE should be assessed on a case by case basis in accordance with the provisions of the Townsville City Plan and State Planning Policy July 2017 and any other relevant legislation or policy. Council should encourage all development within the LIE to implement current best practice engineering controls.

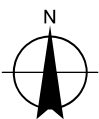
¹ Low does not negate the requirement to meet provisions of the Townsville City Plan and State Planning Policy July 2017 (or as amended).



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Townsville City Council
Infrastructure, Traffic, Transport and
Air Quality Study associated with the
Lansdown Planning Scheme Major Amendment

Project No. 42-20641
Revision No. A
Date 10/05/2019

Management Constraints

FIGURE 3

3.3.2 Flooding

AECOM was engaged by Council to undertake flood modelling for the LIE and this data has been provided to GHD for the purpose of developing the LIE Integrated Master Plan. This modelling shows that there is a considerable area of the LIE would be affected in a 1% AEP flood event (Figure 3). However, the areas of greatest impact (e.g. water depth) are associated creeks / drainage features that intersect the LIE. These are generally contained within the environmental protection areas (Figure 1). The balance of the LIE would experience relatively minor impact during the 1% AEP flood event. Consideration of the constraints associated with flooding for individual developments and the potential mitigation measures should be considered on a case by case basis during the development assessment process.

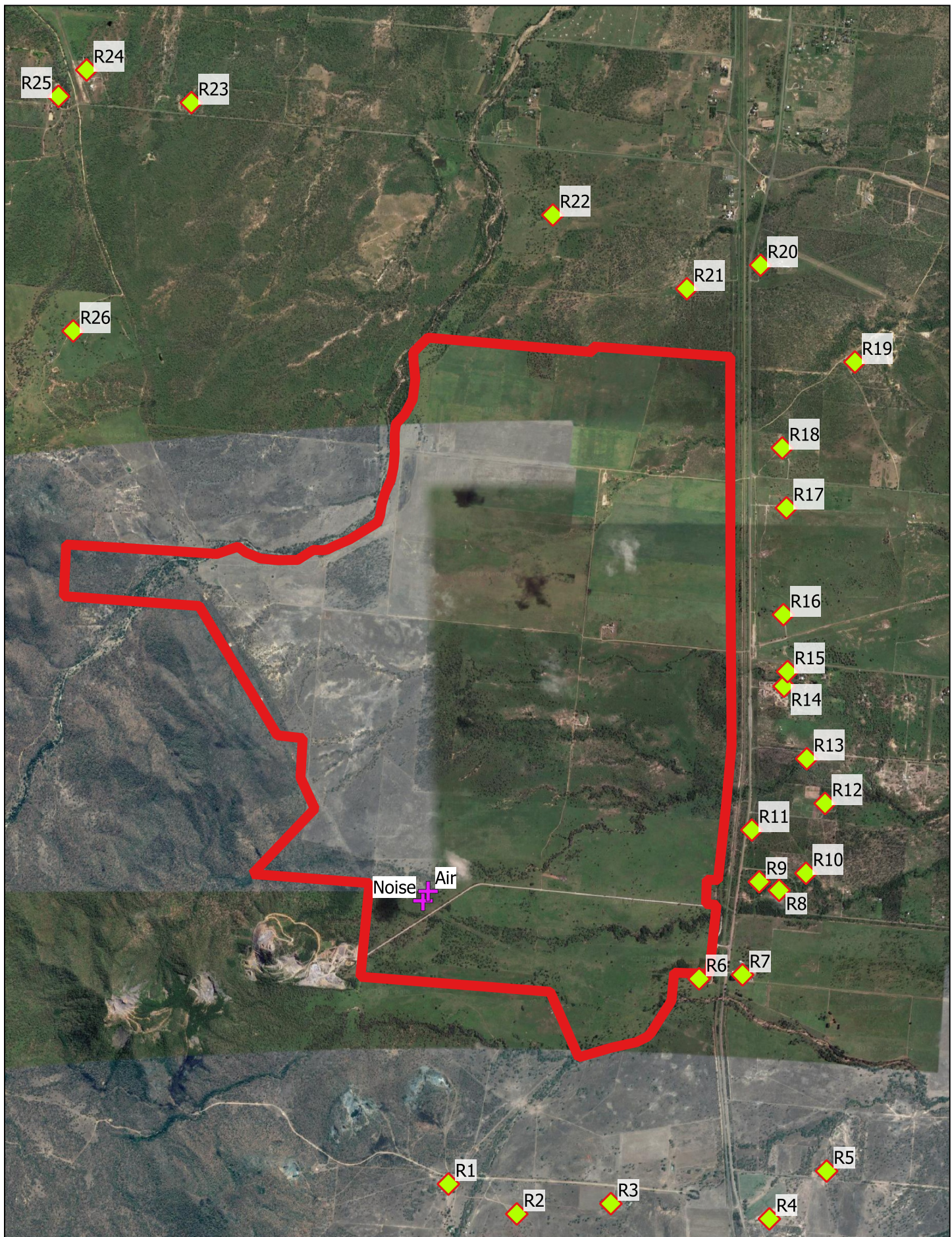
3.3.3 Noise and vibration assessment

3.3.3.1 Noise baseline monitoring and recommended criteria

GHD conducted unattended noise and vibration monitoring to determine existing background noise levels to assist in establishing project specific noise and vibration criteria for the LIE, based on *Environmental Protection Policy (Noise)* (EPP (Noise)) and the *Planning for Noise Control Guideline* (PNC Guideline). The EPP (Noise) criteria is a statutory requirement while the PNC criteria are used as a guide and will typically be enforced when formally called under planning scheme or planning conditions². The location of the sensitive receptors considered in the noise monitoring and establishment of recommended criteria is shown in Figure 4. Table 1 summarises all applicable noise criteria for each relevant noise sensitive receiver based on EPP (Noise) and PNC guideline requirements.

Compliance with the most stringent criteria will ensure that all other applicable requirements are also achieved. The lower applicable criteria for each receiver based on EPP (Noise) requirements and PNC guidelines is presented in Table 2.

² It is noted that the PNC Guideline is listed in SC6.4.3.15.1 item 3 of the Townsville City Plan as one of the reference documents applicable for noise and vibration assessments.



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Map Projection: Mercator Auxiliary Sphere
Horizontal Datum: WGS 1984
Grid: WGS 1984 Web Mercator Auxiliary



Legend

Receivers



Logger Locations



Site Area



Townsville City Council
Infrastructure, Traffic, Transport & Air Quality
Air, noise and vibration baseline monitoring

**Site location and identified
sensitive receivers (noise)**

Project No. 42-20641
Revision No. B
Date. 30/01/2019

FIGURE 4

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© 2018. Whilst every care has been taken to prepare this map, GHD (and DATA CUSTODIAN) make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.
Data Source: Google Earth Imagery 2019. Created By: V. Alamshah

Table 1 Summary of applicable project external noise criteria

Receivers	Period	Criteria	Noise level criteria (dB)			
			L _{Aeq,adj,1hr}	L _{10A,adj,1hr}	L _{1A,adj,1hr}	L _{Amax}
R1 – R2 R23 – R26	Day	EPP AQ	50	55	65	
		EPP BG	34			
		PNC	36			
	Evening	EPP AQ	50	55	65	
		EPP BG	33			
		PNC	28			
	Night	EPP AQ	45 ⁽²⁾	50 ⁽²⁾	60 ⁽³⁾	
		EPP BG	32			
		PNC	28			52
R3 – R22	Day	EPP AQ	50	55	65	
		EPP BG	34			
		PNC	37			
	Evening	EPP AQ	50	55	65	
		EPP BG	33			
		PNC	36			
	Night	EPP AQ	45 ⁽²⁾	50 ⁽²⁾	60 ⁽³⁾	
		EPP BG	32			
		PNC	35			52
R7	(When open)	EPP AQ	60 ⁽²⁾			
Notes : (1) Abbreviations are as follow : EPP AQ: EPP (Noise) Acoustic Quality Objectives EPP BG : EPP(Noise) Background Creep Criteria PNC: Planning for Noise Control Criteria (2) Based on a 15 dB outdoor to indoor correction adopted based on difference between EPP (Noise) Outdoor and Indoor L _{Aeq,adj,1hr} and L _{A10,adj,1hr} day and evening criteria. Refer Table 2. (3) Based on a 20 dB outdoor to indoor correction adopted based on difference between EPP (Noise) Outdoor and Indoor L _{1A,adj,1hr} day and evening criteria. Refer to Table 2.						

Table 2 Lowest applicable project specific criteria

Receivers	Period	Noise level criteria (dB) ⁽¹⁾			
		L _{Aeq,adj,1hr}	L _{10A,adj,1hr}	L _{1A,adj,1hr}	L _{Amax}
R1 – R2 R23 – R26	Day	34	55	65	
	Evening	28	55	65	
	Night	28	50	60	52
R3 – R22	Day	34	55	65	
	Evening	33	55	65	
	Night	32	50	60	52
R7	(When open)	60			
Notes: (1) L _{Aeq,adj,1hr} , L _{10A,adj,1hr} , L _{1A,adj,1hr} are adjusted noise levels for tonal and impulsive characters where relevant in accordance with the guidelines provided in PNC.					

3.3.3.2 Project noise criteria discussion

The lowest applicable L_{Aeq,adj,1hr} noise criteria presented in Table 2 is generally expected to be the limiting noise criteria for the future industrial developments.

The noise criteria is generally reflective of proximity to the Flinders Highway, where the lowest applicable L_{Aeq,adj,1hr} noise criteria is:

- Defined by the Noise (EPP) control of background noise creep for receivers along the Flinders Highway (i.e. R3 – R22)
- Defined by recommended PNC criteria for the evening and night for receivers away from the Flinders Highway (i.e. R1 – R2 and R23 – R26). Adopting the EPP (Noise) criteria will result in 5 dB and 4 dB higher criteria for Evening and Night periods.

Achieving such low noise level criteria at noise sensitive receivers in proximity to the LIE may be difficult for medium and heavy industrial sites and requires careful consideration of noise emissions at planning stages. It is expected that industries proposed closest to the site boundary (i.e. closest to the noise sensitive receivers) will require high levels of engineering noise control to mitigate noise emissions while those proposed further towards the west will likely require medium and low levels of engineering noise control.

Further assessment of operational noise emissions from any proposed industrial developments within the LIE prior to grant of planning approvals is recommended in accordance with the requirements of the EPP (Noise). Council should also consider if the stricter noise criteria in accordance with the PNC guidelines is appropriate. Similarly, it is noted that individual developments would need to be assessed against the applicable criteria, inclusive of the potential for the development to generate noise emissions that could be characterised as tonal or impulsive.

3.3.3.3 *Vibration monitoring results and recommended criteria*

Typical ambient vibration levels of about 0.05 – 0.16 mm/s were measured at the site, which are well below the recommended human comfort vibration targets at residential premises and typical threshold of perception. Based on the measured baseline vibration levels, adoption of human comfort vibration criteria as outlined Table 3 is considered appropriate for new industrial developments. The targets are specified as peak particle velocity (PPV) vibration levels as measured within an occupied space.

Generally, it is not expected that general industrial activities within the LIE will result in vibration levels exceeding Human Comfort or Building Damage criteria at the sensitive receivers located more than 100 m from the vibration source. However, adopting human comfort vibration criteria where the noise sensitive receiver falls within 100 m of the industrial uses will act as appropriate planning mechanism addressing SPP requirements and assessment framework where significant vibration sources are proposed or where complaint are made in future.

Table 3 Recommended human comfort vibration levels

Location	PPV, mm/s	
	Preferred	Maximum
Critical areas ¹	0.14	0.28
Residences – daytime ²	0.28	0.56
Residences – night time ²	0.2	0.4
Offices, schools, educational institutions and places of worship	0.56	1.1
Workshops	1.1	2.2
(1) Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be need to assess intermittent values against the continuous or impulsive criteria for critical areas.		
(2) Day-time is 7.00 am to 10.00 pm and night-time is 10:00 pm to 7.00 am.		

3.3.4 Drive It NQ Precinct

Impact from the Drive It NQ's primary activities, particularly major events has the potential to result in significant noise (and air) emissions that may result in impacts on amenity for sensitive receptors (generally residential properties). Additionally, in the event of a future major industrial precinct, adjacent industrial uses that become sensitive receptors. The approval recognises this impact and proposes restriction on the frequency of events of different levels of impact.

The introduction of this use may require consideration of the need for a reverse amenity buffer to prevent the introduction of new sensitive receptors and protect the operation of the precinct.

Providing Opportunities for Off-Road Motorcycling, A Guide for Local Governments

(Queensland Government, 2012) notes that off-road motorcycling facilities should “*incorporate buffer areas for the mitigation of noise and dust emissions. As a guide, the required area may vary from approximately 50 to 400 hectares, depending on the type of off-road motorcycle use*” (Queensland Government, 2012).

This buffer area (ranging from approximately 50 to 400 ha as appropriate) should be incorporated within the LIE based on the physical boundaries of the motor sport precinct (i.e. not the boundary of the overarching LIE). Notwithstanding, future industrial development within the LIE may require additional engineering controls to mitigate motor sport impacts to the LIE workforce. In addition to the reverse amenity overlay, the motor sport precinct may consider additional vegetated buffers in accordance with the Queensland Government (2012) motorcycling guidance as follows:

- Vegetated buffers of a minimum width of 20 m are to be established between recreational riding trails and existing development on land adjoining the site in order to minimise dust.
- “Where motocross tracks are developed in urban areas, vegetated dust buffers of a minimum width of 5 m are established along the common boundary of the motorsport activity facility and adjoining land.”

The document also makes reference to the types of species that should present within these buffers. GHD therefore recommends the following buffers considered for Drive it NQ:

- Minimum 20 m vegetated buffer beyond site boundary
- 50 to 400 ha (368 to 1128 m) buffer.

It is also noted that Ipswich Planning Scheme includes a motor sports buffer overlay (OV8 Motor Sports Buffer) for the Tivoli Raceway and Ipswich Motorsports Precinct. The purpose of this overlay is to provide a secondary organisational layer in the planning scheme based on special attributes of land that need to be protected, or that may constrain development. The OV8 Motor Sports Buffer:

- Identifies the area where it is likely that there would be major impacts on residential amenity.
- Identifies the area where it is likely that there would be significant impacts on residential amenity.
- New residential development, including reconfigurations that create additional lots and intensification of housing, is avoided unless an acceptable level of residential amenity can be achieved through:
 - Siting and design of dwellings.
 - Maximising separation from the noise source, and using vegetation and topography to enhance buffering effects.

- The submissions of acknowledgement from the owner / application at the time of lodging a development application of the likely impacts on residential amenity.

Establishing such an overlay may also protect other future industrial uses within the LIE in addition with meeting the outcomes of the SPP 'Emissions and hazardous activities' PO2: Industrial land uses are protected from encroaching land uses'.

Regardless of the introduction of a reverse amenity buffer or the conditions attached to the approval, the Ranbury comment that noise impacts may need to be considered further as new industrial occupiers enter the precinct and become receptors to the noise sources from the motorsport operation.

4. Developable area and internal road network

GHD conducted a *Traffic and Transport Assessment* to inform the LIE Integrated Master Plan (refer Appendix A). The assessment determined the usable, developable area within the site and provided an indicative internal road network suitable for B-Triple movements within the usable area to access industrial lots. This assessment has considered and adopted where appropriate the findings of the assessment carried out on the site, which are detailed in Sections 3.1 to 3.3 of this report.

The LIE has been divided into two stages. Stage 1 is the area to the north of the Ghost Gum Road intersection comprising a combination of medium and high impact general industrial lots and additionally encompasses the Motorsport Precinct and Battery Plant to the south of Ghost Gum Road.

The remaining area south of the Motorsport Precinct and Battery Plant is the Future Stage comprising of general industrial lots of both medium and high impact.

4.1 Developable area

The developable area is the land remaining after consideration of impacts from constraints mapping and the internal road network road reserve. A further reduction in usable area of 40% has been allowed for consideration of unusual shaped blocks, potential buffer zones and other minor road networks that may be required.

Two scenarios were developed to estimate the division of the developable area into industrial lots. The initial scenario is based on the high and medium impact lots as advised in the Air Quality Assessment. The second scenario is per Council's advice on 28 March 2019, stipulating 90% of the development as high impact industrial lots, with the remaining 10% allocated to medium impact lots. The developable area is summarised in Table 4.

As this is a high-level assessment, there is potential for additional constraints to arise during the individual development application process of each lot within the Precinct.

Table 4 Developable area

Land Use	Stage 1 (ha)	Future Stage (ha)	Total (ha)
Total Precinct Area	791.5	1283.3	2074.8
Constrained area (undevelopable)	34.3	620.6	654.9
Usable area	757.2	662.7	1419.9
Already apportioned to:			
- Motorsport Precinct	297.6	-	297.6
- Battery Plant	184.9	-	184.9
- Road reserve (*incl. TMR resumption)	73.0 [#]	114.1	187.1
Developable area (100%)	201.7	548.6	750.3
Air Quality Scenario			
Medium impact lots	141.0	289.5	430.5
High impact lots	60.7	259.1	319.8
90% High Impact Scenario			
Medium impact lots	50.4	21.8	72.2
High impact lots	151.3	526.8	678.1

[#]Excludes road reserve connecting Stage 1 to Future Stage as this area has been captured under the Motorsport Precinct and Battery Plant area.

4.2 Internal road network

An indicative internal road network has been drafted, connecting the usable and specific land use areas from the Flinders Highway/Ghost Gum Road intersection, providing a hierarchical road system to facilitate land development within the LIE.

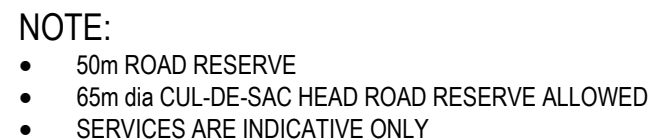
For the Future Stage, a potential second access has been provisioned just north of the Manton Cemetery site, to alleviate the expected heavy demand on the Flinders Highway/Ghost Gum Road intersection at full development. The magnitude and design of the intersection is not assessed under this scope of works and will be pertinent to the timing and individual developments within the LIE.

The potential second access has been used throughout this report to develop the internal layout road hierarchy. Without this potential second access, the impact at the Flinders Highway/Ghost Gum Road intersection would be substantial and would likely limit the ability to fully develop LIE.


To determine the road hierarchy required throughout the LIE, the Future Stage has been divided into six components to allow for separate traffic distribution for each. The internal road network along with the staged components is shown in Figure 5.


INDICATIVE INTERNAL ROAD NETWORK

STAGE 1 DEVELOPMENT (AREA ha)	
CONSTRAINED (UNDEVELOPABLE) AREA - TOTAL	34.3
USABLE AREA	757.2
MOTORSPORT PRECINCT	297.6
BATTERY PLANT	184.9
ROAD RESERVE	73.0
DEVELOPABLE AREA (REMAINING USABLE AREA)	201.6
HIGH IMPACT DEVELOPABLE AREA	60.7
MEDIUM IMPACT DEVELOPABLE AREA	141.0



INDUSTRIAL LOTS

5000m²  HIGH IMPACT

2000m²  MEDIUM IMPACT

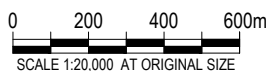


Figure 5 Future Stage component areas

5. Conclusions and recommendations

This report summarises the outcomes of a number of studies designed to support the LIE PSMA. GHD has divided these studies into three categories, which reflect the level of impact the study has on potential future development of the LIE. These categories include environmental constraints, the location of current and required infrastructure and management constraints. These constraints have been used to inform the estimation of the developable area and the internal road network for the LIE Integrated Master Plan.

5.1 Environmental constraints

As advised by Council, the environmental protection areas developed by Earth Environmental have been adopted as a primary constraint. These areas have been incorporated into the estimation of developable area within the LIE and guide the internal road layout. GHD notes that the environmental protection areas are considerable and significantly reduce the developable area of the LIE, particularly in Stage 2.

In addition, it is noted that Converge recommended that further investigation of the Lansdown Station Homestead Site and the area containing and surrounding the lone grave within the Homestead is undertaken. Converge recommended that the Lansdown Station Homestead Site, the lone grave within it and the Manton Cemetery be added to the local heritage register within the Townsville City Plan. Converge noted that SC6.3.9 – the preparation of an archaeological management plan for archaeological places would be required for gravesites located in the LIE regardless of heritage listing.

It is recommended that further investigation of the site along with the decision to add these places to the local heritage register be undertaken alongside other investigations to support future master planning of the LIE.

5.2 Management constraints

5.2.1 Air quality

GHD's air quality assessment developed overall risk ratings for industrial uses and highlighted that these may be used to inform areas within the LIE requiring different levels of engineering controls (i.e. high, medium, or low³) for specific industrial land uses to mitigate potential impacts to existing sensitive receptors.

GHD considers that industrial uses proposed in the western portion of the LIE require a low level of engineering control, as this area is located furthest from existing sensitive receptors. Medium and high levels of engineering controls would follow generally to the eastern site boundaries closest to existing sensitive receptors.

It is noted that the areas for low, medium and high levels of engineering controls recommended does not consider all aspects of existing, proposed and potential industrial land uses and this should be used as a guide only. Individual developments within the LIE should be assessed on a case by case basis in accordance with the provisions of the Townsville City Plan and State Planning Policy July 2017 and any other relevant legislation or policy.

³ Low does not negate the requirement to meet provisions of the Townsville City Plan and State Planning Policy July 2017 (or as amended).

5.2.2 Noise

The noise impact assessment established criteria for industrial developments within the LIE based on EPP (Noise) and the PNC Guideline. It is noted that achieving these criteria may be difficult for medium and heavy industrial developments. Based on the findings of this assessment and to address SPP requirements for “Emissions and hazardous activities” relating to control of noise and vibration, the following is recommended:

- Appropriate planning requirements to be included in the LIE that require assessment of operational noise and vibration emissions from proposed industrial developments within the LIE. This includes planning conditions or clauses that require:
 - Provision of an acoustic report from a suitably qualified acoustic engineer/consultant to demonstrate compliance of the proposed development and ongoing operation of the facility with requirements of the EPP (Noise).
 - Provision of a vibration impact assessment from a suitably qualified acoustic engineer/consultant where the proposed development is located less than 100 m from the nearest sensitive receivers demonstrating that the proposed development and ongoing operation of the facility achieves the Human Comfort Vibration limits (as outlined in Section 3.3.3 of this report) at nearest sensitive receivers.
- TCC should consider if stricter noise criteria in accordance with the PNC guidelines (as established in Section 3.3.3) is appropriate and where relevant incorporate demonstration of compliance with PNC requirements to the appropriate planning conditions/clauses in the LIE.

5.2.3 Flooding

Flood modelling shows that there is a considerable area of the LIE that would be affected in a 1% AEP flood event. However, the areas of greatest depth are those around the creeks / drainage features that intersect the LIE, which are generally contained within the environmental protection areas (Figure 1).

5.2.4 Summary

For all management constraints, it is recommended that Council utilise the findings of this assessment when making decisions regarding the location of new industries on a case by case basis. Further, it is important to note that this assessment provides a high level overview of likely management constraints. Assessment of individual developments should consider the potential for noise, air quality and flooding impacts relevant to the development based on the particulars of the individual lot and the proposed development.

The existing proposals and recently approved development within the LIE do not necessarily meet the proposed engineering control recommendations. Significant portions of the Drive IT NQ precinct are within the environmental protection area. In addition, the Drive IT NQ precinct is expected to generate traffic and noise during major events that has the potential to impact on future developments within and surrounding the LIE. Establishing a reverse amenity overlay in the TCC planning scheme would enable the protection of motor sports activities and potentially other future industrial uses within the LIE and prevent the establishment of new sensitive residential receptors. Notwithstanding, future industrial development within the LIE may require additional engineering controls to mitigate motor sport impacts to the LIE workforce. In addition to the reverse amenity overlay, the motor sport precinct may consider additional vegetated buffers in accordance with the Queensland Government (2012) motorcycling guidance.

5.3 Current and required infrastructure

Based on the available forecasts, there is capacity at existing infrastructure to service some new load. However, as the development grows it is likely that more capacity will be required. The staging of the Battery Plant in particular will significantly change this assessment as the distribution system cannot support the indicated load this site may apply to the network.

Based on existing transmission network forecasts, it is expected that access to the transmission network to service the load will be acceptable to the TNSP. Based on the proposed preliminary staging, it is possible that the initial development of the motorsports precinct could be supplied by the existing distribution network fed by Woodstock South substation.

The expected total power demand of the LIE is significant with respect to connecting to the existing network. Investment in localised generation or alternate sources of energy to support the demand of the site could result in economic advantages. It is therefore recommended that an investigation into options for electrical infrastructure and development be undertaken.

The LIE does not contain nor is connected to existing or planned trunk infrastructure (water, wastewater, stormwater, internal roads, pathways and open space). The management of water and sewerage infrastructure at the individual development level, as is proposed at the Drive IT NQ, is likely to impact on the developable area within the LIE, and therefore limit the productive use of the developable area. It is recommended that investigations into the provision of sewerage and water infrastructure options be undertaken, alongside or prior to master planning for trunk infrastructure (i.e. LGIPs).

5.4 Internal road network and developable area

GHD has adopted the Flinders Highway/Ghost Gum Road intersection as the sole access point for Stage 1. A second potential point via the Flinders Highway in the south of the LIE has been provided in GHD's road layout. An indicative rail siding located south of Ghost Gum Road, parallel to the Mt Isa railway line on the western side of Flinders Highway shown in Figure 2 is shown for size purposes only. The location has not been defined and further consultation with Queensland rail should be undertaken. It is noted that the Office of the National Rail Safety Regulators does not support the construction of new rail crossings. It is recommended that Council further discuss with TMR and Queensland Rail an interim heavy vehicle access across the rail line to facilitate development within the LIE.

From this assessment, it is estimated that 937.4 ha of developable area in addition to the Motorsport Precinct and Battery Plant is available for use. From both scenarios, this allows for the development of between 1,030 and 1,675 industrial lots. However, it is worth noting that as this is a high level estimate, there is potential for additional constraints to arise during future master planning and the individual development application process within each lot.

5.5 Key recommendations

Based on the investigations carried out by GHD and previous studies undertaken at the LIE, the following steps are recommended to further the development of the LIE:

- Undertake the investigations recommended by Converge to understand the heritage values within the Lansdown Station Homestead Site (contained lone grave).
 - Establish the Lansdown Station Homestead Site, lone grave and Manton Cemetery as places on the local heritage register within the Townsville City Plan. This would enable protection of these sites, while providing surety regarding the developable area within the precinct.

- Undertake an investigation of options available for providing water, wastewater and electrical infrastructure to the LIE to facilitate and encourage industrial development.
- Establish a reverse amenity buffer overlay in the Townsville City Plan that would enable the protection of motor sports activities and potentially other future industrial uses within the LIE and prevent the establishment of new sensitive residential receptors. As discussed in Appendix B, this would require detailed acoustic assessment incorporating noise modelling.
- Establish appropriate planning requirements to be included in the LIE that require assessment of operational noise/vibration and air emissions from proposed industrial developments within the LIE.
- Undertake further master planning at the site to establish all trunk infrastructure (i.e. re view and update of LGIPs).

6. References

- AECOM Pty Ltd (2018). *Lansdown Station Flood Study*, prepared for Townsville City Council
- Converge Heritage & Community (2018). *Lansdown Station Cultural Heritage Study*, prepared for Townsville City Council
- Department of Environment and Science (n.d.). *Planning for Noise Control Guideline*. Queensland Government
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- Earth Environmental (2018). *Lansdown Station Environmental Study: Final Report*, prepared for Townsville City Council
- Environmental Protection (Noise) Policy 2008
- Ipswich City Council (2005). *Ipswich Planning Scheme*
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