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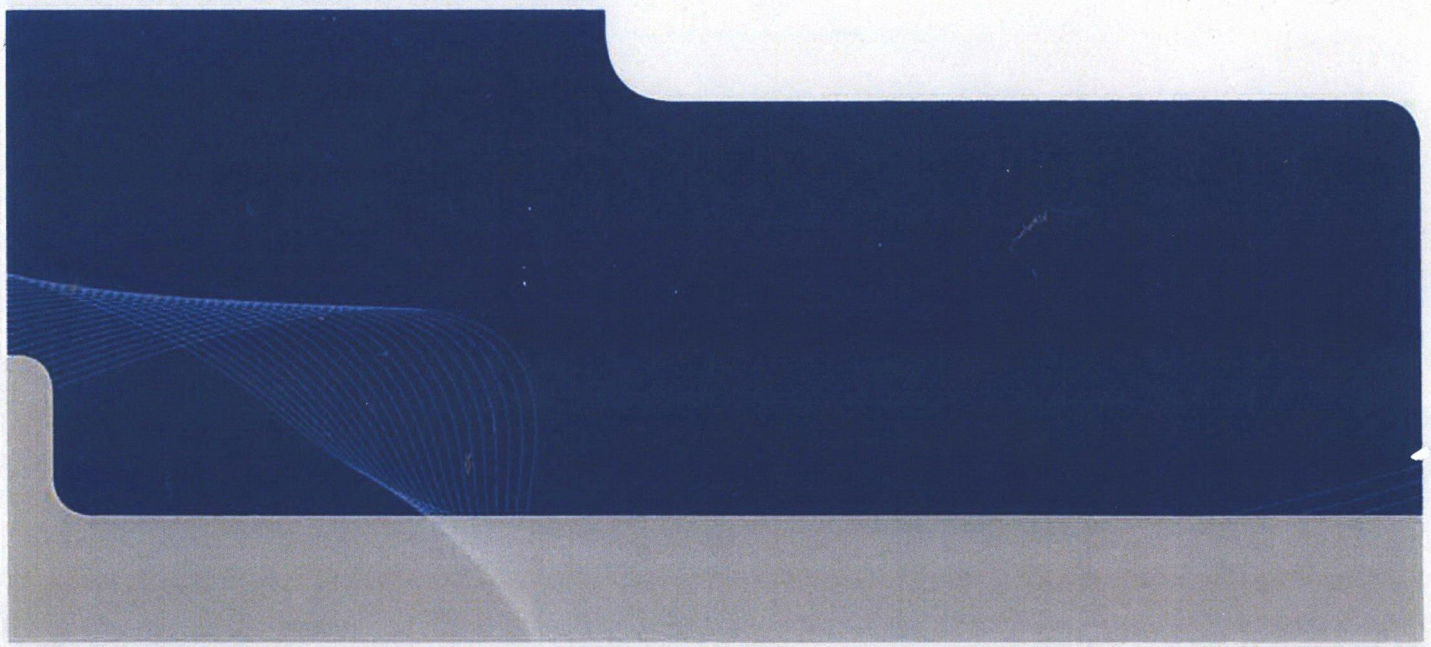
Roads and Traffic Authority

F5 Varroville Truck Rest Area

Review of Environmental Factors

January 2010



INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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Glossary and abbreviations

AHIMS	Aboriginal Heritage Information Management System
CEMP	Construction Environmental Management Plan
dBA	Decibel (A-weighted)
DECCW	NSW Department of Environment, Climate Change and Water
DEWHA	Commonwealth Department of Environment, Water, Heritage and the Arts
EP&A Act	*NSW Environmental Planning and Assessment Act 1979*
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999
F5	F5 Freeway also referred to as the Hume Highway
FM Act	*NSW Fisheries Management Act 1994*
ISEPP	State Environmental Planning Policy (Infrastructure) 2007
INP	Industrial Noise Policy
km	Kilometre
LALC	Local Aboriginal Land Council
L_{Amax}	The maximum sound pressure level measured over a given period
$L_{(min)}$	The minimum sound pressure level measured over a given period
L_{A1}	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured
L_{A10}	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured
L_{A90}	The level of noise exceeded 90% of the time. The bottom 10% of the sample is the L_{a90} noise level expressed in units of dB(A)
L_{Aeq}	The 'equivalent noise level' is the summation of noise events and integrated over a selected period of time
LEP	Local Environmental Plan
m^2	Square metre
NES matter	Matters of National Environmental Significance
NPI	National Pollution Index
PEMP	Project Environmental Management Plan
POEO Act	*NSW Protection of the Environment Operations Act 1997*

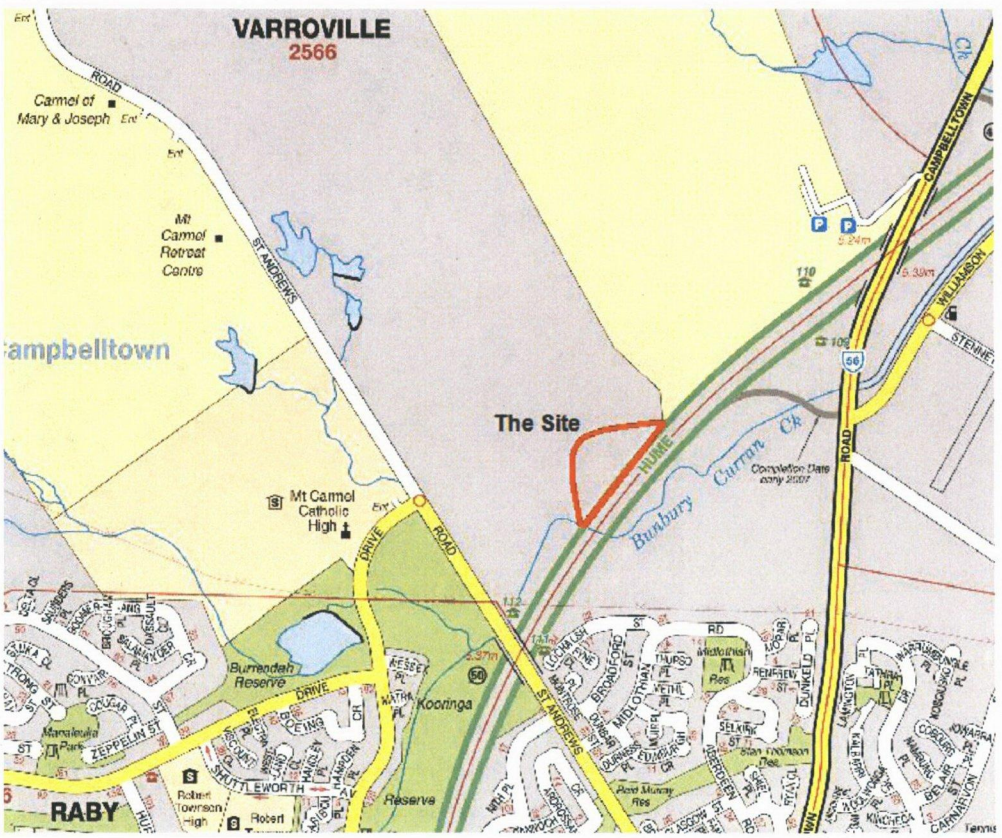
REF	Review of Environmental Factors
RTA	NSW Roads and Traffic Authority
SEPP	State Environmental Planning Policy
SIS	Species Impact Statement
TSC	*NSW Threatened Species Conservation Act 1995*
WARR Act	*NSW Waste Avoidance and Resource Recovery Act 2001*

1. Introduction

1.1 Proposal identification

The Roads and Traffic Authority of NSW (RTA) proposes to construct a truck rest area on the F5 Freeway at Varroville in southwest Sydney. The proposed rest area at Varroville has been identified as an important initiative to deal with heavy vehicle driver fatigue. The Proposal would provide truck parking for up to 60 vehicles. The Proposal stretches from approximately 220 m south of Bunbury Curran Creek to approximately 1 km north of Bunbury Curran Creek on the F5. Figure 1.1 shows the location of the site, while Figure 1.2 shows the proposed footprint of the Proposal.

Figure 1.1 Site location



Source: Universal Publishers Pty Limited (Australian UBD on disk)

Figure 1.2 Proposal footprint

Source: GHD 2009

1.2 Purpose of the report

This Review of Environmental Factors (REF) has been prepared by GHD on behalf of RTA. For the purposes of these works, the RTA is the proponent and the determining authority under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The purpose of the REF is to describe the Proposal, to document the likely impacts of the Proposal on the environment, and to detail protective measures to be implemented.

The description of the proposed works and associated environmental impacts have been undertaken in context of clause 228 of the *Environmental Planning and Assessment Regulation 2000*, the *Threatened Species Conservation Act 1995* (TSC Act), *the Fisheries Management Act 1994* (FM Act), and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). In doing

so, the REF helps to fulfil the requirements of Section 111 of the EP&A Act, that the RTA examine and take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF would be considered when assessing:

- Whether the Proposal is likely to have a significant impact on the environment and therefore the necessity for approval to be sought under Part 3A of the EP&A Act.
- The significance of any impact on threatened species as defined by the TSC Act and/or FM Act, in Section 5A of the EP&A Act and therefore the requirement for a Species Impact Statement.
- The potential for the Proposal to significantly impact a matter of national environmental significance or Commonwealth land and the need to make a referral to the Australian Government Department of the Environment, Water, Heritage and the Arts (DEWHA) for a decision by the Commonwealth Minister for the Environment, Heritage and the Arts on whether assessment and approval is required under the EPBC Act.

2. Need and options considered

2.1 Strategic need for the Proposal

The importance and pressures of the Australian freight task is most heavily felt in NSW with nearly 80% of all interstate road freight travelling to, from or through the State. Adding to this pressure is the Bureau of Transport and Regional Economics 2000 forecast that the national freight task would double by 2020.

New national road transport Heavy Vehicle Driver Fatigue laws commenced on 29 September 2008, setting revised work and rest limits for truck drivers and requiring better management of driver fatigue. Under these new laws everyone in the logistics chain, not just the driver, has responsibilities to prevent driver fatigue and to ensure drivers are able to comply with the legal work and rest hours.

The National Transport Commission in its document *National Guidelines for the Provision of Rest Areas (2005)* recommends that there is not more than 60 minutes of drive time between major rest areas. The closest major rest areas to the area of investigation are located at Pheasants Nest and Berowra. The travel time between these two sites is considerably greater than 60 minutes justifying a clear strategic need for an additional major rest area close to Sydney.

An informal truck rest area for about 15 trucks on the F5 northbound, at The Cross Roads, was removed in 2007. The informal rest area was removed during road widening due to safety issues that would have been created from merging trucks in close proximity to the M5-M7 interchange. The heavy vehicle industry has raised concerns with the RTA over this loss of area for drivers to rest and check their loads before entering Sydney and a general shortage of available truck rest areas in NSW. The Road Freight Advisory Council has identified the provision of rest areas as a key issue across NSW and particularly within metropolitan Sydney.

The introduction of the new safety fatigue management laws, the importance of NSW to the Australian freight task and the projected doubling of the freight task by 2020 have resulted in the RTA investigating locations for rest areas to cater for the projected significant increase in demand. This investigation concluded that there are few truck rest areas within and on the periphery of the Sydney metropolitan area and placed priority on increasing rest area capacity by greater than 100 trucks along the F5 northbound.

An investigation into the potential options for rest areas along the F5 was undertaken. As part of this investigation, it was also identified that there is opportunity for the existing Pheasants Nest rest area to be augmented to cater for much of the balance of the projected demand. Federal Government funding has been approved to complete Pheasants Nest Stage 1 works by June 2010 which would formalise parking for an additional 17 trucks. Ultimately the construction of Stages 1 and 2 would provide parking for 27 trucks. The results of recent driver consultation shows support for the augmentation of the Pheasants Nest site but also identified a strong preference for an additional site closer to Sydney to facilitate more efficient driver changeovers.

A discussion of the options considered during the options development is located in Section 2.3.

2.2 Proposal objectives

The objectives of the Proposal are as follows:

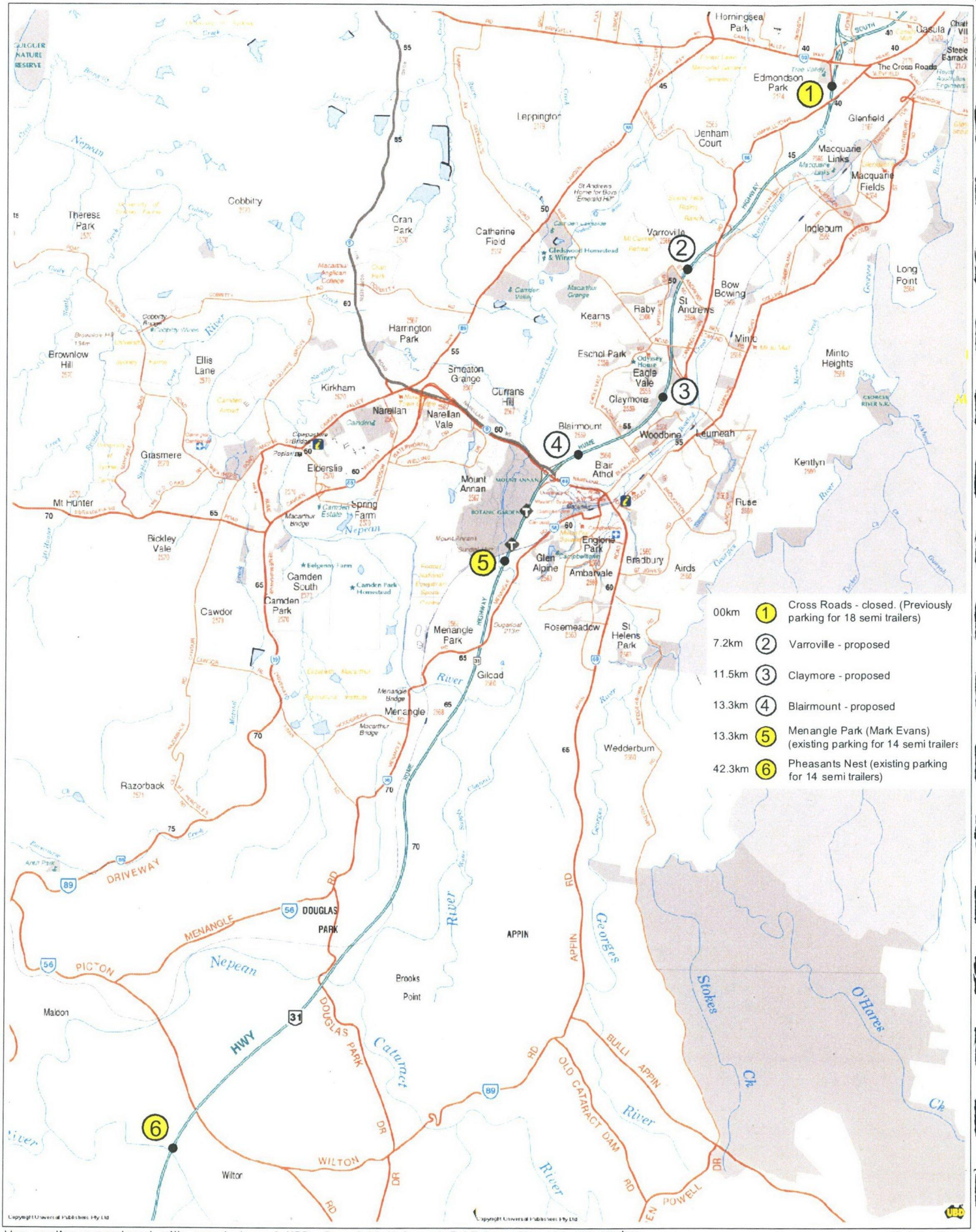
- To provide a safe location for truck drivers to park their vehicles to allow them to stop and rest and to facilitate driver change over.
- To provide major truck rest area facilities within 60 minutes of each other along major freight routes.
- To provide low maintenance amenities buildings including toilets.

2.3 Alternatives and options considered

A total of five options were considered during the site selection process for a truck rest area to be located northbound on the F5 Freeway between Pheasants Nest and the Cross Roads. In parallel, opportunities for expansion of the existing Pheasants Nest rest area were also investigated. A summary of these sites is located below.

Figure 2.1 shows the location of the alternative rest areas considered along the F5 Freeway.

Figure 2.1 Location of alternative rest areas



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Not to Scale

2.3.1 Pheasants Nest

This site is located within the existing northbound Pheasants Nest Service Centre. Trucks currently informally park along the sides of the exit road that returns back to the freeway. There is sufficient land along both sides of the access road to formalise and extend truck parking to include a formal rest area. The benefits of the site are the existing facilities located within the service centre and existing road access to and from the highway. The site currently has informal parking for around 14 trucks. Federal Government funding has been provided to improve this rest area and will be constructed in two stages resulting in an ultimate parking capacity of up to 27 spaces. Subject to an environmental assessment, this facility would be constructed in conjunction with the preferred option in order to help meet needs for truck rest areas on the F5 Freeway.

2.3.2 Menangle Park

An existing rest area is located at Menangle Park which currently provides informal parking for around 14 trucks.

This rest area has a large piece of land adjacent to the existing parking which was considered for investigation but was found to be unsuitable due to the presence of an existing Transgrid high voltage transmission tower and new works involving the construction of a further three towers on this land. The positioning of these towers and high voltage cables would effectively make this site unviable for the purpose of a truck rest area. The site also contains some endangered species on site as identified by vegetation survey undertaken in 2001.

This site is within 60 minutes of the Pheasants Nest rest area but greater than 60 minutes from the Berowra truck rest area.

2.3.3 Blairmount

This site is situated immediately north of Narellan Road interchange northwest of Campbelltown and currently does not have any truck parking. The site is clearly visible from the interchange northbound on ramp and situated within a grassed reserve. The site is visible to residential development to the east and would be adjacent to a proposed future residential land release area requiring some acquisition of this land. This site is not supported by Council.

This site was rejected because of the potential land use conflict and poor cost effectiveness resulting from necessary earthworks associated with the undulating nature of the adjacent land.

This site is within 60 minutes of the Pheasants Nest rest area but greater than 60 minutes from the Berowra truck rest area.

2.3.4 Claymore

The site is situated about 460 metres north of Badgally Road overpass, within a grassed reserve behind the existing carriageway and currently does not have any truck

parking. The site is adjacent to a residential area. Between the housing and the freeway boundary, there is an area that has been planted out as open space. However the extensive tracks and disturbance indicates it is well used as informal active recreation space. A noise mound is currently under construction at this location. This site was rejected because of the potential land use conflict and infrastructure conflict.

This site is within 60 minutes of the Pheasants Nest rest area but greater than 60 minutes from the Berowra truck rest area.

2.3.5 Varroville

The site at Varroville is located on the southern edge of Sydney approximately 7.2 kilometres south of the M5/M7 interchange. The site is adjacent to the freeway approximately 650 metres north of the St Andrews Road overpass. The site is currently not used for truck parking. The indicative layout of the site includes parking for 60 vehicles. This option is considered the preferred option as discussed in Section 2.4.

This site is within 60 minutes of the Pheasants Nest rest and is 60 minutes from the Berowra truck rest area satisfying the project objectives and the National Transport Commission *National Guidelines for the Provision of Rest Areas (2005)* recommendations for rest area locations.

2.3.6 Do nothing option

The do nothing option would involve not constructing a new truck rest area to complement the rest area improvements at Pheasants Nest. This option is not considered to be viable as the closure of the rest area at The Cross Roads has resulted in limited truck rest areas located near Sydney along the F5 Freeway. It is preferable for a site close to Sydney as it provides drivers the opportunities to secure their loads before entering Sydney and also results in more efficient driver changeovers. This option would not meet the objectives of the project.

2.4 Preferred option

The preferred option selected was the site located at Varroville. The site currently does not have any truck parking. The proposed layout would involve the introduction of up to 60 spaces with the provision for B-double parking.

A detailed description of this option is provided in Chapter 3.

The site at Varroville was selected as the preferred option due to the following, when compared to the other options:

- Proximity to Sydney to allow more efficient driver changeover.
- Closest site to the recently closed informal truck rest area at The Cross Roads.
- Location adjacent to freeway.
- Availability of space.
- Availability of town water, sewer and power.

- Low likelihood of land use conflicts due to the long distance between the closest residences.
- Initially supported by Campbelltown Council.
- Within 60 minutes of the Pheasants Nest rest and 60 minutes from the Berowra truck rest area.
- Cost of the project.

The construction of the rest area at Varroville meets the Proposal objectives and the National Transport Commission spacing requirements for major rest areas. It would also provide a rest area that is located on the periphery of the Sydney Metropolitan Area, which would give drivers a location to secure their loads before entering Sydney and also allow for more efficient driver changeovers because of its proximity to Sydney.

3. Description of the Proposal

3.1 Existing road and infrastructure

The Proposal is located to the northwest of the northbound carriageway of the F5 Freeway. The F5 is a dual carriageway with two lanes in each direction, which links up with the Hume Highway to form a link between Sydney and Melbourne. The rest area site is located approximately 1 km southwest of the Campbelltown Road overpass. However, the extent of works stretches from the Campbelltown Road overpass in the north to 220 metres south of Bunbury Curran Creek in the south.

The northbound carriageway currently has a 3 metre wide shoulder/breakdown lane. A guardrail lines the F5 from the southern extent of the works approximately to the northern edge of the parking area. From the northern edge of the parking area to the northern extent of the works there is a formal gutter.

South of the proposed parking area, the F5 crosses a two lane bridge which crosses over Bunbury Curran Creek.

3.2 Major design features

Appendix A contains a copy of the plans for the proposed works.

Rest area and parking

The purpose of this Proposal is to provide truck drivers with a safe area to park their trucks, as well as to provide some amenities such as toilets.

The parking area consists of parking suitable for B-Double (26 metres long) trucks and provides parking for up to 60 vehicles. The rest area would also include a number of driver amenities, including:

- Two low maintenance amenities blocks, including toilets.
- Shelter tables.

Other key aspects of the rest area include the following:

- Low level lighting for the entire site.
- Landscaping to provide natural shade for drivers and the vehicles.
- Drainage works.

The rest area would be separated from the F5 Freeway by a safety barrier.

Deceleration lane

The proposed deceleration lane would be 250 metres long with an additional 110 metre vehicle diverge taper. The deceleration lane would have a width of approximately 3.5 to 4.7 metres, with a 2.5 metre wide shoulder. Construction of the deceleration lane would require the construction of a bridge over Bunbury Curran Creek, details of this bridge are provided below.

Acceleration lane

The proposed acceleration lane would be 610 metres long. The acceleration lane would have a width of approximately 3.5 metres, with a 2.5 metre wide shoulder.

Bridge over Bunbury Curran Creek

The proposed bridge over Bunbury Curran Creek would have a span length of 25 metres and would be located adjacent to the bridge that currently takes the F5 Freeway over the creek. The new span would be a separate structure to the existing bridge. The bridge would be 7 metres wide between the guardrails and 8 metres wide from the outside edges of the bridge. The bridge would be constructed as a super T structure and would have a 3% cross fall to the west. 6 metre approach slabs would be constructed on either side of the bridge.

Drainage

Due to flooding issues in the vicinity of the Proposal, the construction of an overflow route is required to redirect any possible flood waters around the rest area. The construction of this route would ensure that flooding impacts to surrounding land is not any greater than currently experienced. The design of this route would be undertaken during detailed design.

Two existing drainage culverts that currently travel beneath the freeway are required to be extended further west to clear the rest area. The construction of the new extensions would be managed to ensure that the existing culverts can operate as normal during the construction phase.

Runoff would be treated through rain gardens and vegetation located on site. Runoff from a portion of the site would run through these rain gardens where some pollutants are removed by the sand or vegetation located in the garden. The remaining runoff would be directed to grass swale drains which would also act as a pollutant filter.

Utilities

The construction of the Proposal would require the following utility connections:

- Water infrastructure.
- Sewer infrastructure.
- Integral Energy infrastructure.
- Telstra infrastructure.

Only the Telstra infrastructure is currently operational within the footprint of the Proposal.

The sewer infrastructure would connect to an existing sewer main within the south of the site, near the deceleration lane.

The water infrastructure would connect with an existing water main at the Campbelltown Road overpass, approximately 970 metres north of the site. The water main would be 150 mm dia (to be confirmed with Sydney Water), requiring a trench of 600 mm wide by 1 metre deep. The pipeline would generally run in the road verge,

which is not expected to contain significant vegetation however, if required the watermain can be redirected to pass around certain trees. This would be confirmed prior to construction commencing.

The electrical infrastructure would connect to the existing electrical supply along the road that connects the Scenic Hills Riding School to Campbelltown Road, approximately 630 metres north of the site. This would most likely be placed underground to avoid having to remove additional trees. This would be laid in the road verge parallel to the watermain with sufficient clearance, but would be confirmed by the earthing design, which has not been completed yet.

Impacts to the other infrastructure would be associated with connecting any proposed services to the existing networks.

3.3 Construction activities

3.3.1 Work methodology

Below is a description of the indicative construction sequence for the Proposal:

- Bulk earthworks.
- Removal of trees and shrubs.
- Drainage works.
- Lighting installation.
- Detailed excavations.
- Pavement and safety barrier construction.
- Amenities construction/installation.
- Signposting.
- Pavement marking.
- Complete works and clean up of site.

3.3.2 Plant and equipment

The following construction equipment would be used:

- Dump trucks.
- Loaders.
- Drilling rigs.
- Concrete trucks.
- Mobile cranes.
- Diesel generators.
- Concrete paving machines.
- Static and vibratory rollers.
- Material delivery vehicles.
- Backhoes.
- Site vehicles.
- Storage containers.
- Waste bins.

3.3.3 Earthworks

Overall the Proposal would involve substantial fill works, with approximately 35,500 m^3 of fill required for construction of the rest area. Due to minimal cut earthworks on site, this fill would generally be sourced from the Raby Road upgrade which is to be constructed to the south of the site at the same time and also the F5 widening works.

Cut earthworks required on site that would provide some fill and are generally associated with the construction of the overland flow route would produce minor amounts of fill.

3.3.4 Source and quantity of materials

The contractors engaged to do the works would be responsible for the sourcing of materials. With the exception of imported fill (30,500 m^3 of fill to be sourced from the Raby Road Upgrade) materials could be sourced from anywhere in Sydney, with sources in the south west Sydney being the first preference.

In particular approximately 5000m^3 of asphalt would be required mainly for entry and exit lanes.

3.3.5 Traffic management and access

Traffic management

Traffic management would be required to be addressed by the contractor in a Traffic Management Plan. This plan would be approved by the RTA's Traffic Management Centre prior to the commencement of work.

Access

The Proposal does not require any access to properties to be restricted or modified during construction.

Truck movements

Approximately 50-80 truck movements would be required over the construction period.

During excavation works it is anticipated that the truck movements would be fairly constant. Paving and lighting works may be a little more concentrated with most movements over a two or three hour period.

3.4 Ancillary facilities

The stockpile and compound site would be located within the site.

The compound would include an area for stockpiles, parking for construction workers vehicles, site shed, toilets and plant and equipment required for the Proposal. Fuel and chemicals would be stored in a secure, bunded area in accordance with relevant legislation, manufacturer's instructions and the material data sheets.

3.5 Public utility adjustment

Aside from the new utility connections to nearby existing infrastructure (see section 3.2) there would be no utility adjustments required as a result of the Proposal.

Impacts to the other infrastructure would be associated with connecting any proposed services to the existing networks.

3.6 Property acquisition

The Proposal requires the acquisition of some land owned by the Department of Planning adjacent to the F5 corridor. Only partial acquisition of this land is required. The land forms part of a rural residential allotment that fronts on to St Andrews Road. The acquisition would occur in the northern section of this allotment on which the dwelling is located on the southern edge. The total amount of land to be acquired is approximately 20,000m^2.

4. Statutory and planning framework

4.1 State Environmental Planning Policies

4.1.1 State Environmental Planning Policy (Infrastructure) 2007

State Environmental Planning Policy (Infrastructure) 2007 (ISEPP) aims to facilitate the effective delivery of infrastructure across the State.

Clause 94 of ISEPP permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent.

Under clause 93 of the ISEPP, a road infrastructure facility can be defined as:

> *(a) Tunnels, ventilation shafts, emergency access ways, vehicle or pedestrian bridges, causeways, road-ferries, retaining walls, toll plazas, toll booths, security systems, bus lanes, transit lanes, transitways, transitway stations, rest areas and road related areas (within the meaning of the Road Transport (General) Act 2005).*

Under this definition the Proposal would be defined as a rest area and therefore can be defined as a road infrastructure facility.

As the Proposal is for a road infrastructure facility and is to be carried out by the RTA it can be assessed under Part 5 of the *Environmental Planning and Assessment Act 1979*. Development consent from council is not required.

Part 2 of the ISEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Consultation, including consultation as required by ISEPP, is discussed in Section 5 of this REF.

4.1.2 State Environmental Planning Policy (Major Developments) 2005

The Proposal is not considered a Major Project, as it does not fall under any of the classes of development listed under Schedule 1 of the SEPP.

4.1.3 State Environmental Planning Policy 55 – Remediation of Land

The site is not believed to contain any contaminated land and therefore the provisions of SEPP 55 do not apply.

4.2 Regional Environmental Plans

No regional environmental plans apply to the site.

4.3 Local Environmental Plans

The site is located on land that is controlled by two Local Environmental Plans (LEPs). Land within the freeway corridor falls under the control of the Campbelltown (Urban Area) LEP 2002. Land located outside of the freeway corridor is zoned under the Campbelltown LEP—District 8 (Central Hills Lands). The relevant provisions of each LEP are discussed below, however it should be noted that the provisions of ISEPP override any consent requirement prescribed by the LEPs.

4.3.1 Campbelltown (Urban Area) Local Environmental Plan 2002

Work that falls within the freeway corridor falls under the control of this Campbelltown LEP 2002. The Proposal is located on land that is zoned 5(b) Arterial Road. The objectives of the 5(b) Arterial Road zone are:

(a) *To identify land required for existing or proposed arterial roads (including the widening of existing roads), and*

(b) *To control vehicular access to and from roads in the zone so as not to inhibit the free flow of traffic on arterial roads, and*

(c) *To allow for the development of such land prior to its acquisition for road purposes.*

The Proposal would meet the objectives of the 5(b) zone.

Under Clause 16(3) the Proposal is permissible without consent as the works are deemed to be a public utility undertaking.

4.3.2 Campbelltown Local Environmental Plan—District 8 (Central Hills Lands)

Work that is located on land outside the freeway corridor falls under the control of the Campbelltown LEP – District 8. The Proposal is located on land that is zoned 7(d1) Environmental Protection (Scenic). The objectives of the 7(d1) Environmental Protection (Scenic) are:

(a) *To set aside certain land as a protected scenic environment,*

(b) *To ensure that that land will remain a rural environment providing visual contrast to the urban areas of Campbelltown, Camden and Liverpool,*

(c) *To ensure that the inhabitants of Campbelltown will continue to have views of, and access to, a rural environment,*

(d) *To maintain a stock of land that is capable of being developed for the purpose of providing recreation establishments of the kind that require large areas of open space, and*

(e) *To preserve existing farming and agricultural research activities.*

Under Clause 9 of the LEP, the Proposal would be permissible with consent, as the use of a truck rest area is not a prohibited use.

The Proposal is located within the Escarpment Preservation Area marked on the zoning map. Under Clause 13 of the LEP, development or clearance of vegetation is not permitted without consent of the Council however, as discussed in Section 4.1.1, Clause 94 of ISEPP permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent.

4.4 Other relevant legislation

4.4.1 Environmental Protection and Biodiversity Conservation Act 1999 (Commonwealth)

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) prescribes the Commonwealth's role in environmental assessment, biodiversity conservation and the management of protected areas and species, populations and communities, and heritage items. The EPBC Act applies to all land, waters, seabed and airspace in, under or above Australia.

Approval under the EPBC Act is required for:

- An action which has, will have or is likely to have a significant impact on 'matters of national environmental significance.
- An action by the Commonwealth or a Commonwealth agency which has, will have or is likely to have a significant impact on the environment.
- An action on Commonwealth land which has, will have or is likely to have a significant impact on the environment.
- An action, which has, will have, or is likely to have, a significant impact on the environment on Commonwealth land, no matter where it is to be carried out.

Where the proponent considers that an action will have or is likely to have a significant impact on matters of national environmental significance, or on Commonwealth land, a referral is made to the Commonwealth Department of Environment, Water, Heritage and the Arts (DEWHA). The proponent may also, but is not required to, make a referral where they consider that the action will not have or is not likely to have a significant impact.

If it is determined through the referral process by DEWHA that a project is likely to have a significant impact on a matter of national environmental significance, or on Commonwealth land, then the project is a controlled action and approval from the Commonwealth Minister for the Environment, Heritage and the Arts would be required.

Matters of National Environmental Significance

The EPBC Act Database was searched on the 28 October 2009. The search was completed for a five kilometre radius around the proposed site. The results listed the following matters for consideration.

World Heritage Properties	None

National Heritage Places	None
Wetlands of International Significance	1
Commonwealth Marine Areas	None
Threatened Ecological Communities	2
Threatened Species	22
Migratory Species	13

An assessment of the project against the matters of national environmental significance is located in Appendix G.

Cumberland Plain Woodland is listed under the EPBC Act and is present at the site. The impacts on Cumberland Plain Woodland has been assessed as part of the ecological assessment (see section 6.3). The result of this assessment concluded that the impacts on this endangered community are considered to be minimal and therefore referral to the Minister of Environment is not required.

4.5 Confirmation of statutory position

All relevant statutory planning instruments have been examined for the Proposal.

Under the two relevant Campbelltown LEPs, the Proposal is permissible with consent. However, ISEPP overrides the LEPs. Clause 94 of ISEPP operates to remove the development consent requirements, thereby permitting assessment of the Proposal under Part 5 of the EP&A Act.

5. Stakeholder and community consultation

5.1 Consultation strategy/plan

A number of consultation activities have been undertaken for the Proposal to date, as detailed in the following sections.

The design for the Proposal would be finalised in consultation with the community.

5.2 Consultation undertaken

5.2.1 Driver consultation (2005)

A comprehensive survey of driver preferences for the design of truck rest areas was undertaken through direct survey of 200 truck drivers.

5.2.2 Consultation during options investigations

An option investigation of all available sites along the F5 between Menangle Park and The Cross Roads was investigated to offset the closure of The Cross Roads site and to cater for the forecast additional demand. As part of the investigation into alternate sites on the F5 between Menangle Park and The Cross Roads, the outcomes of consultation with Campbelltown City Council, the Road Freight Advisory Council and the Transport Operations Liaison Group were used in the selection and design of the preferred site at Varroville. It was concluded that the Varroville site would complement the existing rest area at Pheasants Nest. The National Road Transport Operators Association and the Australian Trucking Association (NSW) has identified the provision of rest areas as a key issue across NSW and particularly in metropolitan Sydney. The Road Freight Advisory Council has raised concerns with the RTA over the loss of a truck rest area at The Cross Roads.

Trucking industry advocates have made submissions on design preferences and the National Road Transport Operators Association has also sought member comments on design preferences which was communicated via the Transport Operations Liaison Group and incorporated into the design.

As part of this investigation, it was identified that there is opportunity for the existing Pheasants Nest rest area to be augmented to cater for much of the balance of the projected demand. The results of recent driver consultation shows support for the augmentation of the Pheasants Nest site but also identified a strong preference for an additional site closer to Sydney to facilitate more efficient driver changeover.

5.2.3 Community consultation

Some community consultation was undertaken with local residents who raised concerns about the project. These concerns and the responses to these concerns are outlined in Section 5.5.

5.3 Aboriginal community involvement

During the REF preparation, consultation was undertaken with local Aboriginal groups, which included a site visit with the groups and the RTA. The groups that participated in the consultation were:

- Cubbitch Barta Native Title Claimants.
- Tharawal Local Aboriginal Land Council.

Each group then provided a written letter containing an outline of their concerns as a result of the site visit. These concerns are addressed in Section 6.8.

5.4 Government agency and stakeholder involvement

Agency consultation was undertaken with the following bodies:

- Department of Environment and Climate Change (now Department of Environmental, Climate Change and Water (DECCW)).
- Campbelltown City Council.

The responses received are outlined in Table 5.1 with a cross reference to where the issues are addressed in the REF.

Table 5.1 Issues raised by agencies

Stakeholder	Key Issues	Response
DECCW	Based on information provided, an Environment Protection Licence under the POEO Act is not required as the works do not constitute a 'scheduled' development.	Noted.
	Noise impacts: Identify potential impacts to receivers during construction and operation and mitigation measures.	A noise assessment was completed for the Proposal. See section 6.4.
	Dust impacts: Identify potential impacts from dust during construction and mitigation strategies.	Air quality impacts, including dust impacts are addressed in section 6.9.
	Water impacts: Identify potential impacts to receiving waters, provide mitigation strategies and any treatment of stormwater proposed.	See section 6.2 for potential water quality impacts and section 3.2 for stormwater treatment proposed.
	Waste: Provision of recycling and disposal services.	Facilities would be provided. See section 6.12.

Stakeholder	Key Issues	Response
	Storage of chemicals/fuels: Provision of spill response kits, in light of chemicals and/or fuels being stored at the rest area during construction be addressed.	Addressed in sections 3.4 and 6.2.
	Incident response protocols: Incident response procedures to be established, including notification to DECCW of incidents resulting in environmental harm as per Part 5.7 of the POEO Act.	See mitigation in section 6.2.3.
	No specific comment in relation to biodiversity and Aboriginal cultural heritage however REF should include an assessment of the potential impacts of the construction and operational phases of the project on threatened species and their habitat and on sites and places of Aboriginal cultural heritage, including areas of archaeological potential. Also include measures to avoid, mitigate or compensate these impacts.	An ecological assessment was undertaken. See section 6.3. An Aboriginal heritage assessment was undertaken. See section 6.8.
Campbelltown Council	Planning and land use: It is assumed that the Proposal will fall under SEPP and therefore local planning instruments would not be applicable. If this is not the case, it is requested that Council's Planning Unit be contacted to discuss compatibility with local planning instrument.	The Proposal would be undertaken in accordance with SEPP Infrastructure. See Chapter 4.
	Flora and fauna impacts: Site adjacent to remnant Cumberland Plain Woodland. Council request REF contain an application under the provision of Part 5A of the EP&A Act and prepare in accordance with the guidelines produced by DECC.	An ecological assessment was undertaken to determine impacts. See section 6.3.
	Soils and erosion impacts: REF should include Erosion and Sediment Control Plan based on requirements of Section 2.7 of its Sustainable City Development Control Plan. If soil disturbance required, a cut and fill management plan based on requirements of section 23.8 of the DCP should be included.	Recommendations have been provided in section 6.1.3.
	Water quality impacts: Nearby watercourse identified as having a high salinity potential. Development should have a neutral impact on condition of the stormwater system and waterways based on principles of water sensitive urban design.	Water quality potential impacts and management of these is discussed in section 6.2.
	Traffic impacts: Confirmation of anticipated merge speed of heavy vehicles exiting the stop	The Proposal has been designed in

Stakeholder	Key Issues	Response
	to minimise vehicle conflict. Should address overall vehicle safety and potential crash risks at this location. Should address weaving movements for vehicles exiting the stop, and vehicles seeking to exit the F5 at the off ramp further to the north.	accordance with RTA road design requirements. Traffic impacts are addressed in section 6.6.
	Stormwater: Review impact of Proposal on adjacent drainage systems. Water quality impacts need to be assessed particularly with oil and grease spills from truck rest area.	Drainage issues have been addressed in section 6.2, along with mitigation measures.
	Noise impacts: Impact of noise on adjacent developments, particularly night time impacts. Include vehicle start up/acceleration noise and overnight refrigeration unit operations of trucks.	A noise assessment was undertaken. See section 6.4.
	Visual amenity: Should consider impact of development on visual amenity, given scenic protection issues in this location.	A visual assessment was undertaken. See section 6.10.
	Community safety: Consider overnight parking and personal and property safety issues, including lighting levels and surveillance opportunities.	This is discussed further in section 6.11.

5.5 Community consultation

As outlined in Section 5.2.3, consultation with two local residents was undertaken after concerns were raised with the project. These concerns are summarised in Table 5.2.

Table 5.2 Issues raised during resident consultation

Issue	Response
Strategic warrant for site	See section 2.1.
Encouragement of illicit activities	A recent night time investigation of truck rest areas along the Hume Highway between Sydney and Tarcutta did not support assertions that these sites attract overt illicit activities as highlighted by nearby residents.
Negative impacts on the environment	These have been considered as part of the impact assessment. See Chapter 6.
Negative impacts on heritage	These have been considered in sections 6.7 and 6.8.

Issue	Response
Negative impacts on the scenic protection land of the Scenic Hills Area	This has been considered in Section 6.10.

5.6 Ongoing or future consultation

Wide community and industry input will be sought as part of the design development and the outcomes of this consultation will be incorporated into the final design. Consultation would occur during the construction phase of the project to notify the community of the project and to highlight any changes to traffic arrangements along the F5 freeway.

6. Environmental assessment

This section of the REF provides description of the potential environmental impacts associated with the construction and operation of the Proposal. All aspects of the environment potentially impacted upon by the Proposal are considered. Site-specific safeguards are provided to ameliorate the identified potential impact.

6.1 Geology and soils

6.1.1 Existing environment

The study area is underlain by sandstone and shale of the Wianamatta Group (1:500,000 Sydney Basin geological map sheet, Geological Survey of NSW).

The site is located in a low, slightly undulating floodplain with adjacent land being semi cleared grazed farmland with small stands of mature native and exotic vegetation occurring throughout. Bunbury Curran Creek occurs within the southern section of the Proposal impact, and contains a mixture of native riparian forest and exotic vegetation.

The DECCW contaminated land record was searched on 15 May 2009. No contaminated land record applies to the site or any adjacent land. As the previous use of some of the site has been for agricultural purposes there is potential for contamination on the site due to the use of fertilizers. As the site has primarily been used for grazing purposes the risk of contamination is considered to be relatively low.

6.1.2 Potential impacts

Construction

The proposal would require earthworks in order to prepare the site to allow for the construction of the rest area to commence. As much of the site is at the required level, impacts to the landforms within the area would be minimal.

During construction, potential impacts are likely to be focused on erosion and sedimentation as a result of land disturbance. Excavation works would result in soil exposure and the potential for soil erosion. Stockpiles may also be required within the site and there is a potential that erosion of these stockpiles may occur during periods of rain and high winds. The measures outlined in Section 6.1.3 would be implemented to ensure that impacts due to erosion and sedimentation are minimised.

Works in the vicinity of Bunbury Curran Creek have the potential to impact on the creek due to exposed soils eroding, thus causing sedimentation of the creek. These impacts would be minimised through the implementation of the safeguards and management measures.

Operation

No operational impacts to landforms and soils are anticipated, as the site is to be sealed or vegetated through landscape planting.

6.1.3 Safeguards and management measures

- An erosion and sedimentation control plan would be developed and incorporated into the Construction Environmental Management Plan (CEMP). The plan would incorporate specifications outlined in the *NSW Erosion and Sediment Control Handbook No. 2*, identify areas requiring management controls, include inspections and checklist sheets and be reviewed by the RTA's Regional Environmental Adviser, Sydney Region prior to the commencement of works.
- Campbelltown City Council's Sustainable City Development Control Plan would also be considered during preparation of the erosion and sedimentation control plan, and whether a cut and fill management plan is also required.
- Temporary stormwater control devices or erosion and sedimentation controls would be implemented at stormwater drains and adjacent to Bunbury Curran Creek to prevent sediment-laden runoff entering the local stormwater and creek systems.
- Maintenance and checking of the erosion and sedimentation controls would be undertaken on a regular basis and records kept and provided at anytime upon request. Sediment would be cleared from behind barriers on a regular basis and all controls would be managed in order to work effectively at all times.
- All stockpiles would be designed, established, operated and decommissioned in accordance with the RTA's *Stockpile Management Procedures 2001*. Where possible, all stockpiles would be located 50 meters away from the high bank of any rivers or drainage lines.
- Stockpiles would not be established on slopes greater than 2:1 (horizontal to vertical).
- Minimise the potential for mud tracking onto pavement surfaces (i.e. implement vehicle brush down methods or installation of a wheel grid facility leaving the site).
- Any material transported onto pavement surfaces would be swept and removed at the end of each working day where it is safe to do so.
- The stripping of topsoil and stockpiling activities would not be undertaken during major rainfall events.
- Site rehabilitation of disturbed areas would be undertaken progressively as stages are completed.

6.2 Water quality and drainage

6.2.1 Existing environment

Watercourses

The rest area site is located on cleared paddocks which contain no formal watercourses.

The proposed deceleration ramp crosses Bunbury Curran Creek which flows adjacent to the F5 Freeway south of the rest area, before it crosses under the freeway at the existing bridge located on the F5. Bunbury Curran Creek drains in a northeast direction

to the Georges River at Glenfield. Figure 6.1 show the section of Bunbury Curran Creek, which is located in the vicinity of the site.

The proposed acceleration ramp crosses an unnamed tributary of Bunbury Curran Creek to the north of the rest area. This tributary runs from the dams located on the Scenic Hills Riding School property across the F5 Freeway where it meets Bunbury Curran Creek.

Water quality within these watercourses is considered to be fair however, as shown in Figure 6.2 the vegetation corridor along Bunbury Curren Creek contains a large amount of rubbish.

Figure 6.1 Bunbury Curran Creek at F5 overbridge

Figure 6.2 Rubbish within Bunbury Curran Creek

Drainage

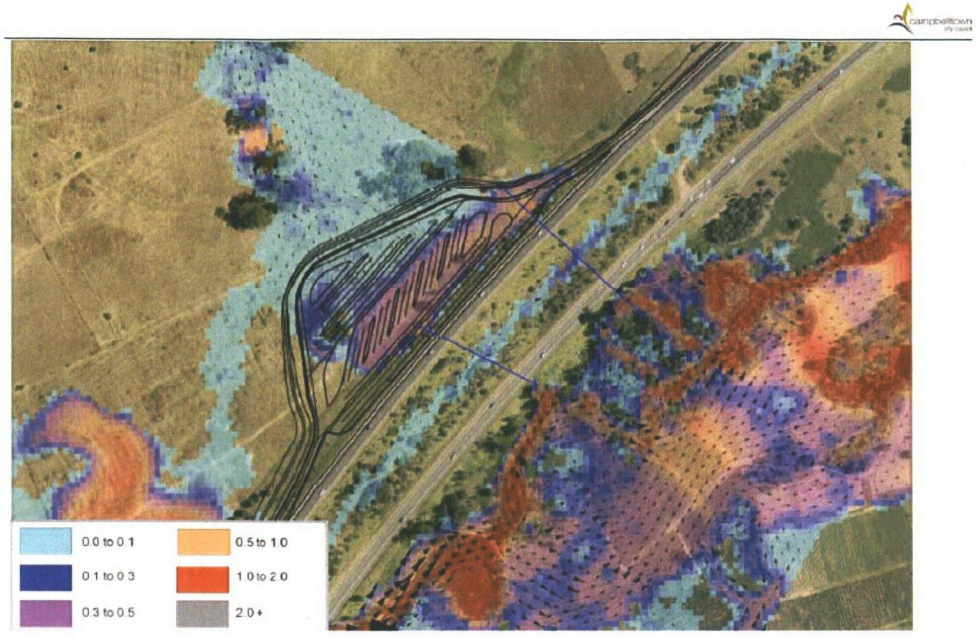
From the northern edge of the parking area to the northern extent of the works there is a formal gutter. No formal kerb and guttering are in place from the northern edge of the parking area along the southern section of the site adjacent to the F5 Freeway. Runoff from the freeway currently flows off the roadway on to neighbouring land. No formal drainage is currently located on site, though there is evidence that some drainage issues occur on site, as seen in Figure 6.3, where standing water can be witnessed in the centre of the paddock.

Figure 6.3 Standing water on site

Flooding

Flood modelling was undertaken for the site by Campbelltown City Council in July and August 2009 (CCC, 2009a and CCC, 2009b). Figure 6.4 shows the existing flooding situation on the site. As the figure shows, under the current flooding regime, the land on which the rest area is situated is prone to flooding during a 1 in 100 average recurrence interval (ARI) flood.

Figure 6.4 Existing flooding situation



6.2.2 Potential impacts

Construction

Two existing drainage culverts that currently travel beneath the freeway are required to be extended further west beyond the extent of the rest area. The construction of the new extensions would be managed to ensure that the existing culverts can operate as normal during the construction phase.

Erosion and sedimentation, if uncontrolled, could potentially increase sediment load and organic matter into local waterways as a result of construction site run-off.

Impacts could also potentially occur during construction as a result of fuel or chemical spills from construction vehicles.

The majority of the site currently does not contain any significant formal kerb or guttering along the F5 Freeway with kerb and guttering commencing at the northern end of the site. Therefore the construction of the Proposal would not greatly alter drainage patterns on the site. Some ponding in site excavations may occur during the construction of the Proposal. Mitigation measures would be put in place in order to manage stormwater on site during construction.

The RTA's Water Policy (RTA, 2006) and Code of Practice for Water Management (RTA, 1999), manage water quality from road works and their use by promoting use of best management control measures in the construction, operation and maintenance of roads. These documents would need to be considered during construction works.

Operation

The Proposal would result in an increase of approximately 24,000m^2 of impermeable surface. This increase in impermeable surface area would result in an increase in runoff. The Proposal includes the provision of formal kerb and guttering which would be designed to withstand this increase in impermeable surface area by directing run off to drainage lines.

Drainage lines that currently take water beneath the freeway would be extended to the west, to the site, in order for them to clear the rest area. Site run off would be directed into these drainage lines (which discharge into Bunbury Curran Creek on the eastern side of the freeway) or directly to Bunbury Curran Creek. Runoff would be treated through rain gardens and vegetation located on site. Runoff from a portion of the site would run through these rain gardens where some pollutants are removed by the sand or vegetation located in the garden. The remaining runoff would be directed to grass swale drains which would also act as a pollutant filter. Impacts of this runoff are considered to be minimal as the site currently drains to Bunbury Curran Creek either directly or via the drainage lines beneath the freeway.

Impacts on the water quality are considered minimal as the condition of Bunbury Curran Creek is considered to be fair, it contains large amounts of rubbish and the runoff water from the site is to be treated through rain gardens and vegetation prior to being discharged into the creek.

During operation, there is a very low potential for chemical or fuel spills to occur within the rest area due to the low speed of vehicles travelling through the site. However, should an event occur, run off containing these pollutants would be run through rain gardens located on site which would remove some of the pollutants and therefore minimise the impacts of such spills. Runoff would also be directed to grass swales around the perimeter of the site which would also act as a pollutant filter.

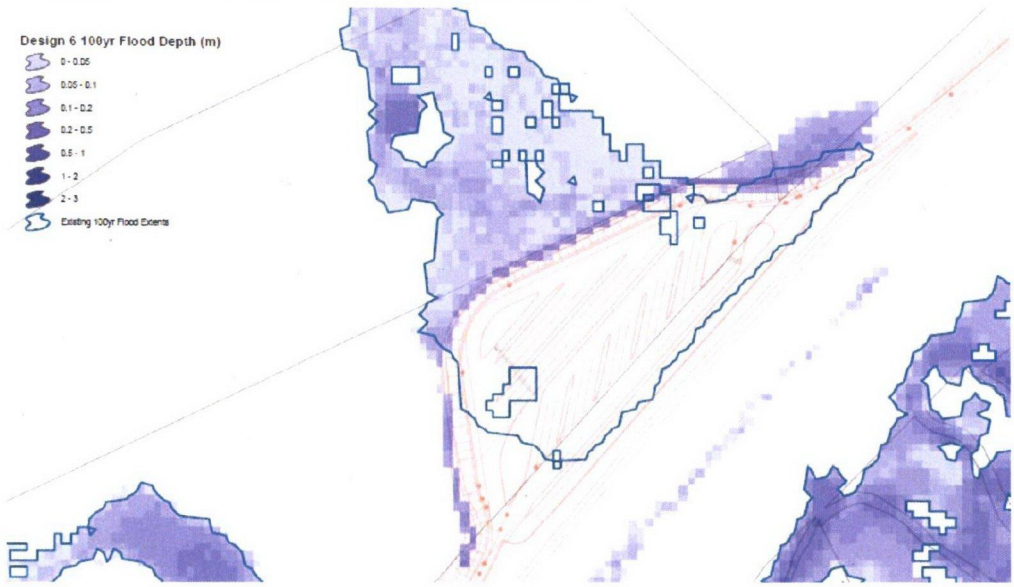
The operation of the amenities blocks would have minimal impacts as it would be connected to the local water mains and local sewer.

Flooding impacts

The project would result in a substantial increase in hard surfaces and surface flow and would result in a shift in the current area of flood inundation to adjacent properties (see Figure 6.5).

Further flood modelling will be undertaken during the detailed design of the project, to optimise the drainage design to minimise the flooding impacts to neighbouring land which have been identified by the flooding model.

Figure 6.5 Potential future flooding situation



6.2.3 Safeguards and management measures

During detailed design

- Further flood modelling to be undertaken during the detailed design of the project, to optimise the drainage design to minimise any increase in flooding impacts to neighbouring land.

Construction

- An incident emergency spill plan would be developed and incorporated into the CEMP. The plan would include measures to avoid spillages of fuels, chemicals, and fluids onto any surfaces or into any adjacent/nearby waterways and emergency response plan. An emergency spill kit would be kept onsite at all times.
- In the event of an incident the DECCW would be notified of any incidents resulting in environmental harm as per part 5.7 of the POEO Act.
- All staff would be inducted into the incident emergency procedures and made aware of the location of where the emergency spill kit would be kept.
- Should a spill occur during construction, the incident emergency spill plan would be implemented, and the Regional Environmental Adviser Sydney Region contacted.
- All fuels, chemicals, and liquids would be stored at least 50 metres away from any waterways or drainage lines and would be stored within an impervious bunded area within the compound site.
- The refuelling of plant and maintenance of machinery would be undertaken within impervious bunded areas within the compound site.

- Vehicle wash downs and/or cement truck washouts would be undertaken within a designated bunded area of an impervious surface or undertaken offsite.
- Machinery would be checked daily to ensure there is no oil, fuel or other liquids leaking from the machinery.

Operation

- Rain gardens and other water treatment systems to be maintained at regular intervals.
- Drainage systems to be maintained at regular intervals to ensure they are operating at full capacity (e.g. clearance of debris from drainage lines).

6.3 Flora and fauna

GHD Pty Ltd undertook an ecological assessment for the Proposal. A copy of this report is located in Appendix B.

6.3.1 Existing environment

Vegetation Description

Northern section – acceleration lane

The road verge along the northern section of the proposed acceleration lane is dominated by mixed exotic grasses and shrubs occurring throughout. Stands of regrowth Grey Box (*Eucalyptus moluccana*) and Forest Red Gum (*Eucalyptus tereticornis*) of varying ages, including at least one large hollow-bearing tree with a large stag, with a mixed understorey and groundcovers occur throughout the length of acceleration lane. The native vegetation in this section conforms to modified and regrowth forms of Cumberland Plain Woodland (CPW).

A stand of older modified CPW occurs at the northern most section of the acceleration lane however this section is unlikely to be directly or indirectly impacted by the Proposal.

Central section - proposed rest area

The main area proposed for the location of the rest area is currently dominated by mixed exotic and native grasses and herbs along with numerous other pasture weeds. Many of the species present were difficult to identify due to the heavily grazed nature of the vegetation on site. This mixed grassland is subject to regular heavy grazing by horses and rabbits.

A small stand of regrowth Grey Box with mixed understorey occurs within the proposed rest area (approximately 15 stems). This stand is subject to heavy grazing, and conforms to a highly degraded form of CPW.

Another stand of mature Grey Box and Forest Red Gum trees (approximately 13 large trees; 150 metres x 40 metres) with a modified weedy understorey occurs directly adjacent to the proposed rest area. This stand of vegetation conforms to a highly degraded form of CPW. These trees contain numerous hollows and spouts of various

sizes, which were being highly used by several native bird species during the surveys, and may provide potential roost locations for listed threatened birds or bats occurring within the region.

One section of mature and regrowth Swamp She-Oak (approximately 30 metres x 30 metres) which conforms to a highly degraded form of Swamp Oak Floodplain Forest (SOFF), contains a number of trees with small hollows and a stag. This patch contains a modified understorey and has been highly affected by grazing. Two smaller sections of regrowth Swamp She-Oak (approximately 60 metres x 20 metres in total) with the potential to conform to this community are also located in the vicinity of the Proposal.

A small area of regrowth native and exotic shrubs, grasses and groundcovers occurs along the road verge within this section.

Southern section – deceleration lane

A stand of Broad-leaved Apple *(Angophora subvelutina),* Swamp She-Oak and Forest Red Gum (approximately 400 metres x 40 metres) with a mixed native and exotic understorey occurs at the southern end of the deceleration lane on either side of Bunbury Curran Creek and along the road easement to the fence-line. The groundcover was dominated by Rhodes Grass, with patches of native species.

The riparian section was heavily modified having been previously disturbed for the existing bridge and freeway construction, with high weed infestation probably a result of past disturbances and edge effects. It contained a mixture of native and exotic species.

The vegetation within this section conforms to a modified version of River Flat Eucalypt Forest (RFEF).

Figure 6.6 Vegetation on the site and adjacent areas

Design Footprint

Vegetation & Adjacent to Site

1:6,000 (at A4)

0 55 110 220

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

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RTA

Varroville Ecological Assessment

Vegetation on the site and adjacent areas

Job Number	21-18426
Revision	A
Date	02 OCT 2009

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

G:\21\18426\GIS\Map_Documents\18426_Z005_VegetationOnSite.mxd

Data source: Aerial Imagery, RTA. Created by: cwilson, Cwilson

Fauna

The site and adjacent study area contains suitable habitat for a range of common and introduced species. However, due to the highly fragmented nature of the surrounding vegetation as a result of the freeway, suburban and industrial development, the diversity and value of fauna habitats available for threatened and migratory species to occur are limited.

A number of hollow-bearing trees and stags were recorded on the site and within adjacent vegetation. These hollows provide suitable breeding and nesting habitat for a range of common native species occurring in the area and may also provide potential roosting and/or breeding habitat for several threatened birds, bats, arboreal mammal and reptile species. Species were recorded using these hollows.

A relatively large number of bird species were recorded during the surveys on the site and in surrounding areas, in particular in the stands of mature Grey Box (CPW) and Swamp She-Oak (SOFF).

Water birds and waders have the potential to utilise areas adjacent to the site due to the presence of farm dams and associated paddocks, with some of these habitats in reasonable condition and already utilised by a number of waterbirds. However, these species are unlikely to utilise the subject site in any way other than of a transient nature as little to no open water or wetland vegetation is present within the proposed impact area.

A Red-bellied Black Snake was recorded just north east of the site near one of the farm dams. Habitat for this species was present around farm dams on adjacent land in the form of scattered fallen timber, as well as dense areas of vegetation under the stands of Eucalypt trees. No rocky outcrops were recorded within the site or adjacent areas during the field visit, however nearby dams and creeks and areas of dense vegetation provide some habitat for other reptiles and common amphibians.

A large number of European Rabbits were observed on the site during surveys. Burrows, diggings and droppings of this species were also wide spread across the study area. Horses were also present within the proposed rest area and in land immediately adjacent to the site. These species have exerted heavy grazing pressure within the proposed rest area and within adjacent farming land.

Bunbury Curran Creek and the associated bridge also provide limited habitat for a number of common amphibian and bird species. However the highly degraded and weedy nature of the waterway reduces the likelihood of threatened species utilising this habitat.

Threatened Species

Flora

No threatened flora species were recorded on the site or within adjacent farmland during the current surveys. It is considered unlikely that any threatened species of flora occur within the subject site due to the highly modified nature of the site and the long history of grazing and disturbance.

Fauna

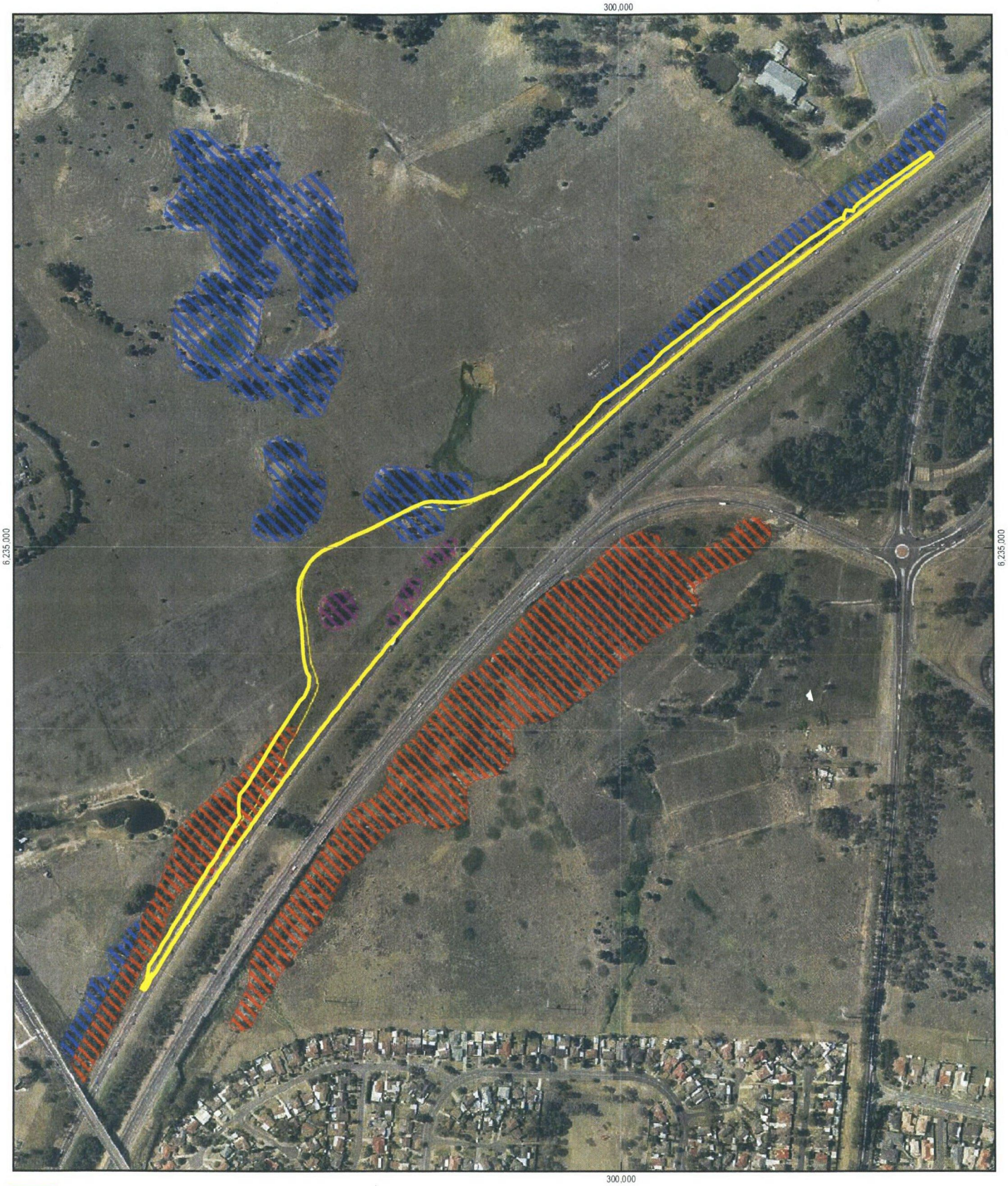
The site and adjacent study area contains potential suitable habitat for a range of threatened and migratory species known, or with the potential, to occur in the study area. However, the limited size and highly modified, linear nature of the site, and therefore limited habitats available, means the likelihood of such species occurring on site is greatly reduced.

Endangered Ecological Communities

NPWS Cumberland Plain Vegetation Mapping (DEC 2002) shows the presence of CPW (listed as endangered under the NSW TSC Act and the EPBC Act) and RFEF (listed as endangered under the NSW TSC Act) throughout the immediate study area. These endangered ecological communities (EECs), as well as small patches of SOFF (listed as endangered under the NSW TSC Act), were all recorded within the site and immediate study area during surveys. None of the vegetation occurring within the site is mapped under NPWS Cumberland Plain Vegetation Significance Mapping (DEC 2002).

Figure 6.7 shows the extent of these EECs on the site and within adjacent areas.

Figure 6.7 EECs present on the site and immediate surrounding area



Design Footprint

Endangered Ecological Communities

- Cumberland Plains Woodland - Degraded
- River Flat Eucalypt Forest - Degraded
- Swamp Oak Floodplain Forest - Degraded

1:6,000 (at A4)

0 55 110 220

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

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RTA
Varroville Ecological Assessment

Job Number 21-18426
Revision A
Date 02 OCT 2009

EEC's present within the subject site

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

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Data source: Aerial Imagery, RTA. Created by: cwilson, Cwilson

Noxious Weeds

The site contains nine (9) noxious weeds listed for the Campbelltown LGA (2009) under the *Noxious Weeds Act 1993.* These include:

- African Box-thorn (*Lyceum ferocissimum*) – Class 4
- Blackberry (*Rubus fruticosus*) – Class 4
- Bridal Creeper (*Asparagus asparagoides*) – Class 4
- Chilean Needle Grass (*Nassella neesiana*) – Class 4
- Lantana (Lantana species) – Class 5
- Oxalis (Oxalis species – non native) – Class 5
- Paterson's Curse (*Echium plantagineum*) – Class 4
- Privet (Broad-leaf) (*Ligustrum lucidum*) – Class 4
- Privet (Narrow-leaf) (*Ligustrum sinense*) – Class 4

The classes of control are as follows:

- Class 4 - The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.
- Class 5 - There are no requirements to control existing plants of Class 5 weeds. However, the weeds are "notifiable" and a range of restrictions on their sale and movement exists.

Other noxious weeds may be present on the site or within adjacent areas that may not have been picked up during current surveys due to time limitations of the survey as well as the highly grazed nature of the site in places.

6.3.2 Potential impacts

Construction

Vegetation removal

Vegetation required to be cleared from the site comprises predominantly of exotic grasses, herbs and weed species, with relatively minor areas of native vegetation to be cleared. The area to be cleared would be the predominantly the footprint boundary (see Figure 6.6) with some minor clearing in the road verge associated with the connection to the water infrastructure. Table 6.1 provides a summary of estimated areas of native vegetation to be cleared as a result of the Proposal.

Table 6.1 Approximate areas of native vegetation and EEC to be removed

Sections of Proposal	Vegetation to be removed or modified
Northern section– Acceleration lane / road verge	Approximately 0.8 hectares of modified CPW to be removed or indirectly impacted

Sections of Proposal	Vegetation to be removed or modified
Central section – proposed rest area	Approximately 0.1 hectares (15 stems) of highly modified regrowth Grey Box (CPW) to be removed Approximately 0.6 hectares (13 large trees) of highly modified mature CPW with the potential to be indirectly impacted by minor root disturbance Approximately 0.1 hectares of mature and regrowth SOFF to be removed Approximately 0.3 hectares of regrowth SOFF to be removed
Southern Section – Deceleration lane / road verge	Approximately 0.4 hectares of RFEF to be removed or indirectly impacted

Though much of the subject site contains a high level of disturbance and weed infestation, all native vegetation and vegetation stands to be removed or indirectly impacted as a result of the proposed works form a part of an endangered ecological community. Assessments of the significance of impacts on these EECs as a result of the Proposal have been prepared in accordance with Section 5A of the EPA Act (see Appendix B for a full copy of the assessments). These assessments concluded that the Proposal is unlikely to constitute a significant impact on these EECs, provided that:

- Impacts to these communities are constrained to the current maximum levels of proposed clearing as laid out in the proposed designs.
- Indirect impacts, including root damage and water run-off to the stands CPW on the northern edge of the proposed rest area and along the proposed acceleration lane are avoided or kept to an absolute minimum.

An assessment of the significance of impacts on CPW, under the EPBC Act, was also undertaken, which concluded that the removal of the small and isolated remnants of highly derived CPW is unlikely to significantly impact this EEC in the locality (see Appendix B for a full copy of the assessment). Once mitigation measures are implemented, the impacts on this community would be further reduced. The Proposal would have no significant impact on CPW and therefore a referral to the Commonwealth Minister for the Environment is not required.

Loss of hollow-bearing trees

The Proposal would result in the loss of a small number of hollow-bearing trees (estimated 4) containing predominately small and medium sized hollows. One or two larger sized hollows and stags present within the northern section of road verge, and within the small stand of mature Swamp She-Oak, would also be impacted. Some of these hollows were being used by native birds during surveys, and provide potential habitat opportunities for a number of threatened species occurring in the study area.

It is deemed unlikely that the loss of these hollow bearing trees due to the Proposal would result in significant impacts to threatened species, largely due to the number and

size of hollows to be removed is small and that a large number of alternative hollows and roosting sites are available on adjacent land.

Run-off and sedimentation

Run-off and sedimentation issues may occur as a result of construction and earthworks, which may impact on the lower section of Bunbury Curran Creek and remaining areas of native vegetation along the creek line and within the northern edge of the rest area.

Appropriate mitigation measure should be implemented to protect the creek and areas of adjacent vegetation from run-off and sedimentation during construction.

Edge effects and indirect impacts

The site occurs in a highly modified landscape with a high occurrence of weeds. All stands of native vegetation within the site were small and in a modified or highly modified, edge impacted state containing high numbers of weeds. While the Proposal would result in the removal of most native vegetation within the site, some fragments would be retained and measures to reduce weeds and limit other edge effects should be implemented, especially the increased risk to noxious weed infestation as a result of earth moving and spread via vehicle movement.

The Proposal also has the potential for some indirect impacts, including some minor root disturbance due to the digging of drainage channels to the stand of mature Grey Box and Forest Red Gum trees (approximately 13 large trees; 0.6 ha) that occurs directly adjacent to the Proposal, as well as within some of the more mature trees occurring along the road verge of the proposed acceleration lane. These indirect impacts have the potential to result in some die back amongst affected trees; however this is not considered to be a significant threat to the integrity of the habitats available or the long-term viability of these stands of trees.

Alteration of noise and dust levels

Noise and dust levels are likely to increase as a result of construction of the Proposal. The impacts of the increased noise and dust in the vicinity of the Proposal could impact on fauna utilising stands of hollow-bearing trees adjacent to the site. These impacts would be minimised by dust suppression measures. In addition, potential noise and dust impacts would be short term in nature.

Key threatening processes

A key threatening process is defined in the TSC Act as a process that threatens, or could threaten, the survival or evolutionary development of species, populations or ecological communities.

Something can be a threatening process if it:

- Adversely affects two or more threatened species, populations or ecological communities.
- Could cause species, populations or ecological communities that are not currently threatened to become threatened.

There are currently thirty (30) key threatening processes listed under the TSC Act. Three of these are potentially relevant to this Proposal.

- Clearance of native vegetation: Small areas of native vegetation constituting endangered ecological communities would be removed as a result of the proposed activity. The areas to be removed are both recent and older regrowth and some mature stands, and occur within an already modified landscape. The loss of this vegetation would result in the removal of whole stands of modified endangered ecological communities. However, due to the highly fragmented nature of the stands, and the relative small size of the stands to be removed, the loss of this vegetation is unlikely to contribute to this key threatening process in a significant way.
- Loss of hollow-bearing trees: The loss of potential roosting habitat for threatened species in the area may occur through the removal of a small number of hollow-bearing trees from the site. However, it is deemed unlikely that this Proposal would significantly contribute to this key threatening process as the number and size of hollows to be removed is small, with a large number of alternative hollows and roosting sites available on adjacent land.
- Presence and spread of noxious weeds: The site and surrounding vegetation contains moderate to high densities of noxious weeds. Proposed construction and earth works could result in the further spread of these weeds across the landscape, by further disturbing native vegetation on and adjacent to the site, and by moving earth across the landscape. Any earth to be removed from the site should be disposed of in an appropriate manner in line with Council requirements, and the spread of weeds across the site should be avoided by the constrained use of vehicles on the site and within surrounding vegetation. All unnecessary impacts on adjacent vegetation should also be avoided, in particular through areas of endangered ecological communities along the creek line and to the north of the acceleration lane. It is proposed that a noxious weed control program be put in place for the site and adjacent areas of native vegetation. If these mitigation measures are put in place, the Proposal is unlikely to further contribute to this key threatening process.

Operation

Noise and light levels are likely to be increased during the operation of the Proposal. The impacts of the increased noise and light in the vicinity of the Proposal could impact on fauna utilising stands of hollow-bearing trees adjacent to the site. These impacts would be minimised due to the high existing noise levels experienced due to the adjacent freeway and by lighting being directed away from surrounding vegetation and areas.

6.3.3 Safeguards and management measures

- Protective fencing should be placed around all areas of native vegetation outside the Proposal footprint to be retained during construction works, to avoid direct or indirect impacts on these areas, in particular along Bunbury Curran Creek, along

the edge of the proposed rest area and around trees and shrubs adjacent to the proposed acceleration lane.

- It is recommended that an appropriate buffer be maintained around the stand of mature EEC trees located along the northern edge of the proposed truck rest area to avoid any loss of hollow-bearing trees and to minimise potential impacts within the tree's root systems from the construction of the proposed rest area, including drainage line digging or other associated infrastructure.
- All native vegetation clearance should be kept to an absolute minimum. Existing cleared areas should be utilised wherever possible for drains/swales and the location of the proposed rest area.
- Any areas of native vegetation constituting a component of an EEC to be cleared or directly impacted by the proposed activities should be off-set with revegetation within surrounding areas (eg. along the northern road verge) using appropriately sourced local native species. This should also include the revegetation and rehabilitation of lower Bunbury Curran Creek post construction works.

A list of potential species suitable for revegetation of Cumberland Plain Woodland found in the area is included in Chapter 5 of the Ecology assessment in Appendix B.

A list of potential species suitable for revegetation of River Flat Eucalyptus Forest and Swamp Oak Floodplain Forest along Bunbury Curran Creek is included in Chapter 5 of the Ecology assessment in Appendix B.

- All vegetation removed from the site should be disposed of off site in consultation with Campbelltown Council.
- Hollow-bearing trees located outside of the current area of impact to be avoided.
- Care should be taken that any noxious weeds occurring on site are not further dispersed as a result of the Proposal. A follow up weed control program may be necessary to control the encroachment of these species into surrounding areas. The landowner has a legal responsibility to control and suppress these species on their property under the NSW *Noxious Weeds Act 1995*.
- An experienced fauna ecologist should be on site before and during the clearing or damage of any trees on the site, particularly those trees containing hollows (where unavoidable), to check for fauna species potentially utilising hollows, and to ensure the safe removal or relocation of any animals from the site.
- Potential impacts from run-off, erosion, and sedimentation should be mitigated by implementing appropriate management measures as outlined in section 6.4, and the revegetation of Bunbury Curran Creek post construction works.
- Any proposed access tracks should have appropriate management measures such as gravel laid, sediment fencing and revegetation following works to address issues of run-off, erosion and sedimentation.

6.4 Noise

Renzo Tonin & Associates undertook a noise and vibration assessment for the proposed rest area. A copy of this report in located in Appendix C.

6.4.1 Existing environment

Sensitive receivers

The nearest affected residential and sensitive receivers have been identified as:

- Receiver 1 (R1) – residential properties located south of the proposed truck rest area in Lochalsh Street, St Andrews.
- Receiver 2 (R2) – Properties located to the north west of the proposed truck rest area.

These locations are shown in Figure 6.8.

Figure 6.8 Sensitive receivers and monitoring locations


N
R2
F5 HIGHWAY
L2
NCA20
R1
L1
NCA3
NOTES
Monitoring locations
Receiver locations
Noise catchment areas
Proposed truck rest area
Existing noise walls

Noise monitoring locations

Noise monitoring was undertaken to determine the background noise levels within the surrounding area.

Noise monitoring was undertaken at the following locations:

- Location 1 (L1) – 34 Lochalsh Street, St Andrews.
- Location 2 (L2) – 13 Wessex Place, Raby.

The monitoring locations are shown in Figure 6.8.

Noise levels at L1 are considered to be representative of noise levels expected at R1, while noise levels at L2 are considered to be representative of noise levels expected at R2.

Existing noise levels

The measured L_{eq} traffic noise levels at the monitoring locations are presented in Table 6.2. The descriptors relevant to traffic noise according to the NSW Environmental Criteria for Road Traffic Noise (ECRTN) are the $L_{Aeq(15hr)}$ daytime and $L_{Aeq(9hr)}$ night-time descriptors.

Table 6.2 Traffic noise at monitoring locations

Monitoring location	L_{eq} Noise levels (dB(A))	
	$L_{Aeq(15hr)}$ Day	$L_{Aeq(9hr)}$ Night
Location 1	66	62
Location 2	56	56

The measured L_{90} background noise levels at the monitoring location are presented in Table 6.3. The descriptors relevant to the setting of noise criteria for the assessment of noise emissions from a site during its construction phase and its operation are the background L_{90} daytime, evening and night-time descriptors.

Table 6.3 Background noise at monitoring locations

Monitoring location	L_{90} Noise levels (dB(A))		
	Day (7am – 6pm)	Evening (6pm – 10pm)	Night (10pm – 7am)
Location 1	60	58	48
Location 2	49	51	46

6.4.2 Noise criteria

Construction

Chapter 171 of the NSW 'Environmental Noise Control Manual' (ENCM, Environment Protection Authority 1994) provides guidelines for assessing noise generated during

the construction phase. However DECCW has recently released its draft NSW 'Construction Noise Guideline' (CNG). The ENCM was used to assess noise generated during the construction phase of this project. The construction noise goals at the most affected receivers are summarised in Table 6.4.

Table 6.4 Construction noise criteria

	Construction noise criteria	
Length of construction period	**Receiver 1**	**Receivers 2**
4 weeks and under	60 + 20 = 80	49 + 20 = 69
Between 4 weeks and 26 weeks	60 + 10 = 70	49 +10 = 59
Greater than 26 weeks	60 + 5 = 65	49 + 5 = 54

As the construction period is expected to be less than 26 weeks, the construction noise goals at receiver 1 and 2 are 70 and 59 respectively.

Operation

Truck activity associated with the rest area may occur anytime during a 24 hour period. The most critical period would be the night time period (10pm to 7am Monday to Saturday and 10pm to 8am Sundays and Public Holidays) and therefore the night time period was the only period assessed for the noise assessment.

The noise criteria at the predicted most affected receivers are summarised in Table 6.5.

Table 6.5 Noise criteria – critical night time period

Location	**Noise criteria**	
	Industrial Noise Policy (dB(A))	**Sleep arousal (dB(A))**
Receiver 1	$L_{eq,15min} \leq 48+5 = 53$	$L_{eq,15min} \leq 48+15 = 63$
Receiver 2	$L_{eq,15min} \leq 46+5 = 51$	$L_{eq,15min} \leq 46+15 = 61$

6.4.3 Potential impacts

Construction

Noise levels from construction at any receptors would depend on the location of the receptor with respect to the area of construction, shielding from intervening topography and structures, and the type and duration of operation being undertaken. Furthermore, noise levels at receivers would vary substantially over the total construction program due to the transient nature and large range of plant and equipment that could be used.

Based on the construction noise levels for individual plant items identified in the Renzo Tonin & Associates noise report, most individual plant items would comply with the construction noise criteria at the nearest receivers.

Table 6.6 outlines the predicted construction noise levels for particular phases of the construction period.

Table 6.6 Predicted construction noise levels during different construction activities

Activity	Receiver 1 (dB(A))	Receiver 2 (dB(A))
Concrete barrier placement	61 – 70	52 – 58
Clearing and grubbing	63 – **71**	54 – **63**
Bulk earthworks	60 – **72**	51 – **63**
Pavement construction	59 – 67	50 – 58
Conduit installation	60 – 66	51 – 57
Drainage	54 – 65	45 – 56
Concrete works	50 – **72**	41 – **64**
Asphalt paving	59 – **74**	50 – **65**
Compounds	55	46
Bridgeworks	45 – 62	46 – **63**

Table 6.6 shows that noise levels generated by multiple plant items operating simultaneously during different phases of the work, may result in noise criteria being exceeded at each receiver location (exceedences are shown in bold in the above table). Noise levels are expected to be highest during the asphalt pavement stage of the project.

A reasonable and feasible approach towards noise management measures should be adopted to reduce noise levels as much as possible to help achieve compliance.

Operation

Trucks entering and leaving proposed rest area

It is determined that any potential increases in truck noise associated with trucks accessing the rest area as opposed to driving past without stopping, would be negligible and insignificant because of the low number of such noise events when compared to noise levels on the freeway.

Truck in the proposed rest area

Operational noise modelling was undertaken using the following worst case scenario for any 15 minute period during the night time period:

- Three trucks idling continuously.
- Three truck movements on site.
- Three trucks parked with refrigerator condensers mounted and in use.

Note: this number is based on RTA observations at other major rest areas. There will be many other vehicles but they will be parked with engines off.

The predicted operational noise levels at the nearby receivers are shown in Table 6.7.

Table 6.7 Operational noise levels at residential receivers

Receiver	Industrial Noise Policy Criteria (dB(A))	Sleep arousal criteria (dB(A))	$L_{Aeq,15min}$ (dB(A))
Receiver 1	53	63	< 20
Receiver 2	51	61	< 20

To determine operational maximum noise levels modelling was undertaken using the following conservative scenario for any 1-minute period during the night time period:

- One truck releasing air brakes on site.
- One truck reversing with beeping alarms on site.

Note: this number is considered for a 1 minute period. There will be many other vehicles but they will be parked with engines off.

The predicted maximum noise levels at the nearby receivers are shown in Table 6.8.

Table 6.8 Maximum noise levels at residential receivers

Receiver	Industrial Noise Policy Criteria (dB(A))	Sleep arousal criteria (dB(A))	$L_{Aeq,15min}$
Receiver 1	53	63	58
Receiver 2	51	61	46

Noise levels shown in Table 6.7 and Table 6.8 all comply with the relevant criteria at the most affected receivers during the operation of the truck rest area.

6.4.4 Safeguards and management measures

A construction noise management sub-plan would be incorporated into the Construction Environment Management Plan. This plan would be developed by adopting the management practices contained within the RTA's *Environmental Noise Management Manual, 2001*.

An outline of these management practices can be found in Table 5.14 of the Noise and Vibration Assessment located in Appendix C.

6.5 Vibration

6.5.1 Potential impacts

Construction

The relationship between vibration and the probability of causing human annoyance or damage to structures is complex. This complexity is mostly due to the magnitude of the vibration source, the particular ground conditions between the source and receiver, the foundation-to footing interaction and the large range of structures that exist in terms of design (e.g. dimensions, materials, type and quality of construction and footing conditions). The intensity, duration, frequency content and number of occurrences of a vibration, are all important aspects in both the annoyances caused and the strains induced in structures.

As the pattern of vibration radiation is very different to the pattern of airborne noise radiation, and is very site specific, below are some indicative minimum 'buffer' distances based on some recent projects used to avoid human discomfort during the daytime. It is noted that since the human comfort criteria are more stringent than the structural damage criteria, if compliance is achieved for the assessment of human comfort, then compliance will also be achieved for the assessment of structural damage to buildings.

Table 6.9 Recommended minimum buffer distances for construction plant – human comfort criteria

Plant item	Buffer distance (m)
Jackhammers	5
Bulldozers	5
Vibratory rollers – light	5
Vibratory rollers – medium	12
Vibratory rollers – heavy	25
Compactor	15
Truck movements	10

Based on the above table and distance to the nearest receptor (approximately 130 metres – receptor R1) to the nearest edge of the proposed works, vibration levels from the equipment above are unlikely to exceed the set limits.

Operation

Operational vibration impacts are expected to be negligible and therefore were not assessed in detail.

6.5.2 Safeguards and management measures

A construction vibration management sub-plan would be incorporated into the Construction Environment Management Plan. An outline of these management practices can be found in Table 5.14 of the Noise and Vibration Assessment located in Appendix C.

6.6 Traffic, transport and access

6.6.1 Existing environment

The site is located adjacent to the northbound carriageway of the F5 Freeway. The F5 at the site is dual carriageway in each direction with minimal shoulders due to the construction works currently occurring along this section of the freeway. A guard rail lines the F5 from the southern extent of the works to approximately the northern edge of the rest area.

The rest area site is located approximately 1 km southwest of the Campbelltown Road overpass. The extent of works stretches from the Campbelltown Road overpass in the north to 220 metres south of Bunbury Curran Creek in the south.

South of the proposed parking area, the F5 crosses a two lane bridge that crosses over Bunbury Curran Creek.

Traffic numbers on the freeway are very high (approximately 80,000 vehicles per day) with a large proportion of these vehicles being heavy vehicles.

The nearest northbound on-ramp is located approximately 2.5km south of the site at Raby Road, though access to this ramp is via Campbelltown Road. The nearest northbound off-ramp is located approximately 1.5km to the north of the rest area site. This ramp provides access to Campbelltown Road in both a northerly or southerly direction.

The F5 freeway in the vicinity of the proposed rest area is currently undergoing works to widen the freeway to four lanes in each direction. These works are proposed to be completed in 2010.

6.6.2 Potential impacts

Construction

Traffic impacts during construction would primarily be associated with the F5 Freeway. As the site is located directly adjacent to the freeway and does not have any alternate access point, impacts on the freeway would be associated with construction vehicles entering and leaving the construction site as well as any works located directly adjacent to the freeway.

The Proposal would also result in an increase of trucks entering the site for the delivery of materials and spoil. Due to the high levels of traffic on the F5 Freeway, in particular high numbers of trucks, the impacts of introducing approximately 50-80 additional trucks throughout the construction phase is considered minimal.

Operation

During operation, traffic impacts would be associated with the deceleration and acceleration of trucks entering and exiting the rest area and the effect of these movements on the traffic on the F5 Freeway. The design of the deceleration and acceleration lanes has been undertaken in accordance with RTA road design requirements and therefore these lanes are considered to be sufficient to provide adequate time for trucks to get up to speed before entering the traffic. This would therefore minimise the impacts of the trucks entering and leaving the site.

Due to the location of the Campbelltown Road off ramp approximately 250 metres along the northbound carriageway, there is potential for exiting trucks to impact on vehicles wishing to use the off ramp. The distance between the merge point and the off ramp is considered to be a suitable distance to allow such a manoeuvre to occur and therefore impacts are considered minimal.

The current widening of the F5 Freeway from two to four lanes in each direction will further mitigate any impacts associated with trucks entering and leaving the site.

The Proposal would not result in an increase of trucks on the surrounding network in particular the F5 freeway. Impacts would be limited to those described above.

6.6.3 Safeguards and management measures

- A Traffic Management Plan would be developed by the contractor in accordance with the RTA's *Traffic Control at Work Sites Manual 2003.* The plan would be required to be approved by the RTA's Traffic Management Centre. This plan would include measures such as reduced speed limits on the F5.
- Road users would be informed regularly of changed conditions through the use of variable message signs.
- Establishment of safe access points to work areas from the adjacent road network including safety measures such as barriers, maintaining sight distance requirements and signage and the provision of traffic management measures such as those identified above.

6.7 Non-Indigenous heritage

A non-Indigenous Heritage assessment was undertaken by Stedinger Associates. A copy of this report is located in Appendix D.

6.7.1 Existing environment

Heritage listings

The following results were obtained from heritage database searches conducted for the study area. Searches were undertaken for the nearby suburbs of Varroville, Ingleburn, St Andrews, Raby and Bow Bowing. The information below provides a summary of the search results.

The Australian Heritage Database was searched on 15 May 2009. A total of six items are listed in the five suburbs searched. None of these items are located on or adjacent to the site. The closest item to the site is Varroville, which is located approximately 500m to the south west and is listed on the Register of the National Estate.

Heritage Branch, Department of Planning

The State Heritage Register (SHR) was searched on 15 May 2009. The SHR indicated that there are three listings within the five suburbs. The nearest of these items is the Varroville House estate which is located approximately 500 metres to the south west of the site. The Proposal is located outside of the historic curtilage of the SHR listing for Varroville.

The State Heritage Inventory was searched on the 15 May 2009. The Inventory indicated that there are 13 items within the five suburbs; these items are listed on either the local LEPs or under state authority Section 170 Registers. None of these items are located on or adjacent to the site. The closest item to the site is in St Andrews (residential building), which is located approximately 900 metres to the south of the site.

Archaeological potential of proposed site

In the past the main access way to Varroville was from Campbelltown Road. A major travel route, houses, outbuildings or other occupied structures are not anticipated to occur within the subject location. The site itself is located in a flood area where occupied buildings, stores or shelters are unlikely to have been erected. No occupation deposits are anticipated. Satellite imagery of the area shows no evidence of any structures or features having been built within the specified area.

Similarly, a recent survey of the site did not identify any surface or potential subsurface archaeological resources within the boundary of the proposed rest area. No potential heritage items were identified like refuse pits, privies, wells, artefact scatters, nineteenth century demolition rubble or exotic vegetation that may indicate a former house site. Typically, such buildings have been positioned on the hill top allowing views over the surrounding vineyards, orchards, pasture land and entrance road leading from Campbelltown Road.

The subject site is unlikely to contain substantial and/or significant archaeological remains that may inform on the history and development of the Campbelltown area or that of New South Wales.

Archaeological potential of area adjacent to proposed site

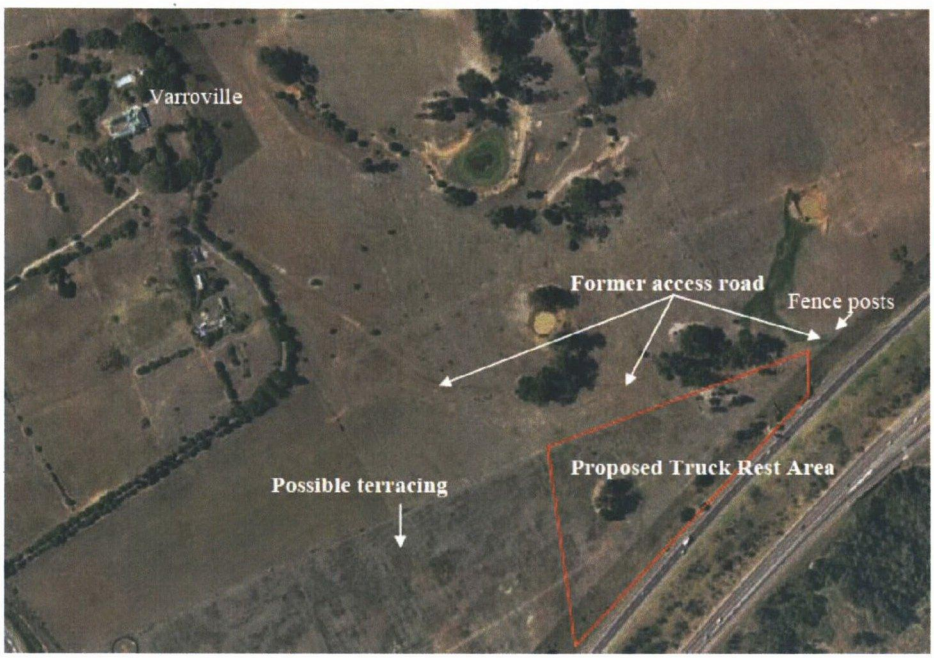
During field surveys a number of remnant historical features were located (shown on Figure 6.9), these included:

- Early entrance road leading to Varroville.
- Two remnant fence posts.
- Possible terracing to the south of the site.

Further to the above, there is potential for a race track to be located in the vicinity of the Proposal, though surveys did not locate any evidence of the presence of such a race track.

These features are located outside of the proposed site and therefore impacts on these features and any associated archaeological features are considered unlikely.

Figure 6.9 Location of historical features



Source: Stedinger Associates, 2009

6.7.2 Potential impacts

Construction

The Proposal would not have any impact upon any known heritage items due to the distances to these items.

The proposed site has been found to have no archaeological significance. And therefore the proposed works would have no impact on a potential archaeological resource given that:

- Historical research indicates that European heritage sites are unlikely to have occurred within the subject development area.
- Should the remnants of a race track have been located within the subject site, then this feature will have been largely disturbed during the construction of the Hume Highway (F5).

Features (fence posts and entrance road) that are present in the immediate vicinity of the Proposal may have the potential to be impacted upon due to works leaving the

designated construction boundary. This impact is considered to be relatively minor and will be minimised by installing perimeter fencing around the Proposal footprint.

The historical context of the access road and fence posts would be changed due to the raising of the land around the Proposal which is located a short distance from these features.

Operation

The operation of the Proposal would not result in any impacts on non-Indigenous heritage.

6.7.3 Safeguards and management measures

- Should archaeological remains be uncovered during construction, all works would cease within the vicinity of the material/find and the RTA's Regional Environmental Adviser Sydney would be contacted.
- The RTA should apply for an excavation permit exemption under 1(A) and 1(C) of the Schedule of Exemptions to Section 139(1) & (2) of the NSW Heritage Act (1977) made under Section 139(4), for the proposed construction of the F5 Varroville Truck Rest Area.
- Precautions should be taken to protect the access road and nearby fence posts during construction activities at the site. These items should not be covered or physically damaged by the proposed works. Protective measures may include temporary fencing and briefing all persons engaged on the proposed works.
- The access road and nearby fence posts are a part of the heritage landscape and should be preserved in accordance with the recommendations of the Varroville Conservation Management Plan (Orwell and Peter Phillips Architects, 1992).
- The context of the access road and nearby fence posts should be photographed within the landscape prior to its alteration by the construction of the F5 Varroville truck rest area. Photographic recording of the features will provide a visual reference and record of the heritage resource in the vicinity of the F5 Varroville truck rest area that may be used to aid further inquiries about the Varroville Estate.

6.8 Indigenous heritage

Jo McDonald Cultural Heritage Management Pty Ltd undertook an archaeological assessment for the proposed rest area. A copy of this report is located in Appendix E.

6.8.1 Aboriginal consultation

Consultation with local Aboriginal groups was undertaken by the RTA. Table 10 outlines the concerns of these groups and the response to there concerns.

Table 10 Aboriginal group consultation

Group	Issue	Response
Cubbitch Barta Native Title Claimants	Two possible glass artefacts were located on site during the site visit.	Section 6.8.2
	Two artefacts have been previously recorded in the vicinity of the Proposal during a previous project. They are not located on the AHIMS register. One of these items maybe located in close proximity to the deceleration lane. The location of this would be required to be further investigated.	Investigations have concluded that the items are unlikely to be impacted by the Proposal, due to the following reasons: ◗ The items were not identified on the AHIMS register. ◗ Items were not located by an archaeologist or Aboriginal Groups during site visits undertaken on separate days.
Tharawal Local Aboriginal Land Council	Two previously recorded artefacts that are directly in the line of work have not been addressed in the archaeological report. Further investigation would be undertaken.	Further investigations have concluded that the items were is not to be impacted by the Proposal, due to the following reasons: ◗ The items were not located on the AHIMS register. ◗ Items were not located by an archaeologist or Aboriginal Groups during site visits undertaken on separate days.
	The area of interest mentioned above, to be avoided of all machinery with a buffer zone being implemented.	Any items discovered during works would be clearly marked with a buffer zone provided around the item.

6.8.2 Existing environment

AHIMS Search

A search of the Aboriginal Heritage Information Management System (AHIMS) database was conducted for a 2 km radius and 5 km radius of the study area. The search found 4 sites are registered within a 2 km radius of the study area and 70 within a 5 km radius. No sites are registered within the current study area.

Field survey

No Aboriginal objects were identified within the study area.

Two black glass "flaked" fragments were found within the study area. Analysis by a lithics expert concluded that is was unlikely that the glass had been flaked deliberately by Aboriginal people.

The area (including the acceleration and deceleration lanes and the existing sewer line) within 10 metres of the F5 Freeway consists mostly of introduced fill and has been highly disturbed by the freeway's construction. The area of high disturbance includes the portion of Bunbury Curran Creek to be impacted by the proposed development. This portion of creek has previously been impacted by construction of a bridge and concrete walkway. The paddock area on which the rest area is to be mostly located has been moderately disturbed by tree clearing and other farming practises.

6.8.3 Potential impacts

As the study area contains no Indigenous heritage items and is considered to have low to no archaeological potential, impacts of the Proposal on Indigenous heritage are considered to be unlikely.

As mentioned in Section 5.3, consultation was undertaken with local Aboriginal groups. Both groups identified previously recorded items within the vicinity of the Proposal. Further investigations have been undertaken to determine the location of these items, these investigations have concluded that these items are not located within the area of the Proposal.

6.8.4 Safeguards and management measures

- All personnel working on site would receive training in their responsibilities under the *National Parks and Wildlife Act 1974*.
- Should Indigenous heritage items be uncovered during works, all works in the vicinity of the find would cease and the RTA's Aboriginal Programs Consultant, Regional Environmental Adviser Sydney Region, DECCW representative and relevant LALC representative would be contacted. Works would not re-commence until appropriate clearance has been received.

6.9 Air quality

6.9.1 Existing environment

Local air quality is considered to be typical of a rural environment located adjacent to a major highway. Air pollution in the vicinity of the site is primarily due to the amount of vehicles travelling along the F5 Freeway adjacent to the site.

The top sources of National Pollutant Inventory (NPI) emissions in the Varroville area are:

- Motor vehicles: 25.6%.
- Domestic/commercial solvents/aerosols: 16.6%.
- Solid fuel burning (domestic): 12.3%.

- Lawn moving: 10.9%.
- Architectural surface coatings: 8.8%.
- Others: 25.9%.

(Sourced NPI, 2009)

6.9.2 Potential impacts

Construction

Excavation works, truck movements and infilling works during the construction process have the potential to impact on air quality through the generation of dust. Construction plant and equipment have the potential to impact upon local air quality by generating vehicle emissions. However, these potential impacts would be localised and short-term in nature and safeguards listed below would be implemented to minimise any potential impacts.

Operation

Trucks would emit fumes during start-up or when left idling within the rest area. However, additional impacts on air quality are considered minimal due to the negligible increase in air quality impacts and the fact that the rest area is located directly adjacent to the F5 Freeway, which is a major contributor to air quality impacts in the area.

6.9.3 Safeguards and management measures

- Any general areas with the capacity to cause dust would be managed appropriately to suppress dust emissions during periods of high winds (i.e. through use of water carts or similar).
- Any materials transported in trucks would be appropriately covered to reduce dust generation.
- Construction activities that generate high dust levels would be avoided during high wind periods.
- Rehabilitation of disturbed surfaces would be undertaken as soon as possible.
- All construction plant and machinery would be fitted with emission control devices complying with Australian Design Standards.
- Plant and machinery would be turned off when not in use.

6.10 Visual amenity

Kiah Infranet Pty Ltd undertook a landscape visual assessment for the proposed rest area. A copy of this report is located in Appendix F.

6.10.1 Existing environment

Land use character

The land surrounding the site is of high visual quality and has been zoned under the Campbelltown LEP – District 8 (Central Hills Lands) as an Environmental Protection zone due to its 'Scenic' qualities.

The dominant urban development in the area is St Andrews. This is partly due to its visual exposure on an elevated position but also due to the contrast between the surrounding open grasslands and the built form elements of the neighbourhood. The built form comprises of single and double storey houses and is considered to be typical for a suburban neighbourhood.

The slopes directly to the north of the proposed site are used for recreational purposes (horseback riding) and as a result provide a significant amenity value.

Key visual detractors are the F5 Freeway, a major overhead power line and large scale industrial buildings in the nearby distance east of the proposed site.

Topography

The site itself is located within the low lying area of the Bunbury Curran Creek on the northbound verge of the highway. To the north and west the land steeply rises creating a strong visual backdrop that is considered high in visual and scenic amenity.

To the south-east, the topography also rises, allowing views of the surrounding landscape from an elevated position.

The low lying flats directly adjacent to Bunbury Curran Creek are strongly vegetated defining the low points of the valley. This vegetation assists in visually integrating the freeway through vegetated screening. The remaining low lying flats are grassed land and visually exposed. Spatially, the site is strongly contained by the enclosing Varroville ridges to the north and west whilst the elevated suburban residences of St Andrews spatially define the eastern edge.

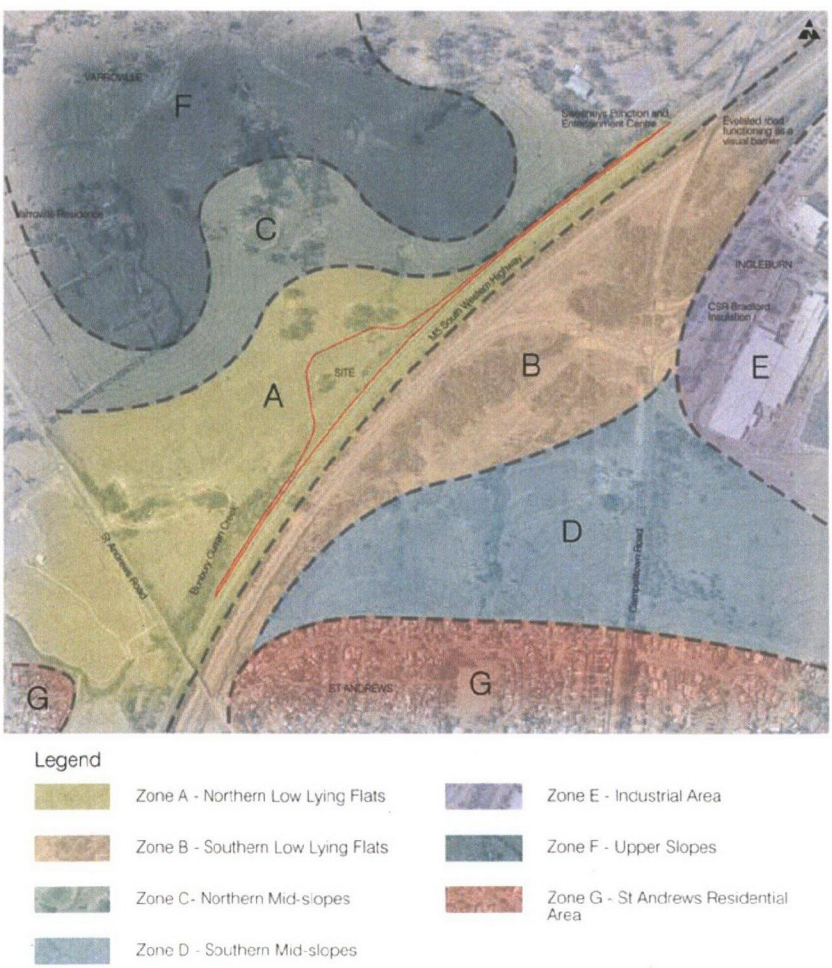
Character zones

Seven character zones have been identified in the general area surrounding the site (see Figure 6.10). These zones are as follows:

- *Zone A – Northern Low Lying Flats* - Comprised predominantly of open grazed land with the predominant vegetation running along Bunbury Curran Creek. The highway forms the south eastern boundary to this zone.
- *Zone B – Southern Low Lying Flats* - Comprised partly of open grassed land with the densest vegetation running along Bunbury Curran Creek (Casuarina dominant) with patches of scattered vegetation elsewhere. Campbelltown Road runs through this zone and the highway defines the boundary to the north-west.
- *Zone C – Northern Mid-slopes* - Comprised of grassed land with pockets of mature vegetation (Eucalypt dominant) along drainage lines and within valley forms on the northern side of the site.

- *Zone D – Southern Mid-slopes* - Characterised by open grassed Mid-slopes with pockets of scattered vegetation (Eucalypt dominant). Campbelltown Road bisects the zone.
- *Zone E – Industrial Area* - Characterised by large scale industrial buildings with little if any visual exposure to the proposed site.
- *Zone F – Upper Slopes* - Defined by skyline ridges comprised of grassed land with pockets of vegetation along drainage lines/valley forms and the Varroville Residence, a heritage listed property situated in a dominant position. This zone is visually prominent and highly exposed.
- *Zone G - St Andrews Residential Area* - Located on the opposite side of the highway, a suburban residential neighbourhood located in a raised position with numerous residences enjoying panoramic views towards the upper Varroville slopes and the low lying pasture land along Bunbury Curran Creek.

Figure 6.10 Landscape character zones



6.10.2 Potential impacts

Landscape character impact

Visual exposure

Overall, it is considered that the highest visual exposure of the site occurs within the lower, mid and high grassed slopes (Zones A, C and F) directly to the north/northwest of the site.

Visual magnitude

Key elements that have been identified which would greatly influence the magnitude of the proposed visual modification include:

- Overall scale of the development.
- The requirement of 'raising' the perimeter of the rest area by approximately 1 to 2 metres from existing ground level.
- Night time lighting.

The overall scale of the project is considered moderate when taking into consideration the overall landscape setting and its sense of scale. This is reinforced by the fact that only limited built form would be incorporated into the project, and therefore only some visual fluidity with minimal view blockage would occur. However, when taking into consideration the vehicles (as stationary elements) the visual contrast would increase substantially.

Overall as a result, the visual magnitude is considered high to moderate. It is worth noting that the proposed rest area is situated directly adjacent to the highway, thus visually consolidating the two paved areas and therefore reducing visual contrast.

The 'raising' of the rest area's perimeter by approximately 1 to 2 metres above the existing levels would visually reinforce the project as a 'foreign' element within the greater landscape. This visual effect is generally considered of a moderate magnitude as the immediate surrounding landform of the project along the highway is already raised above the natural landscape and the proposed project would form an at grade extension from the existing freeway corridor.

Night time lighting is considered to provide a moderate effect. Whilst no direct light spill would occur, some light pollution in the sense of a glowing effect would be perceived from many viewpoints. It should be noted that the contrast of this effect is considered moderate in conjunction with the light spill created by the moving traffic of the highway.

Visual sensitivity

Table 6.11 outlines the visual sensitivity of each of the character zones.

Table 6.11 Visual sensitivity of character zones

Zone	Visual Sensitivity	Reasoning for sensitivity rating
A	High - moderate	Sensitivity reduced due to zone being located adjacent to the freeway and the fact that the zone acts as a buffer zone in relation to the site.
B	High - moderate	High due to the visual significance of Bunbury Curren Creek and moderate due to fragmented character due to it being located between the residential zone and freeway.
C	High	Due to scenic nature and high visual quality of the landscape.
D	Moderate	Its use as grassland is of limited significance as it is wedged between a residential zone with extensive landscape character modifications and the highway.
E	Low	Is highly modified and the nature of the land use is not sensitive to change.
F	High	Due to scenic nature and high visual quality of the landscape.
G	High - moderate	Increased sensitivity predominately due to its use as a residential area. Views from numerous residences are achieved to the site, however these views are from a moderate distance.

Summary of landscape impacts

The combination of visual sensitivity and magnitude help provide a rating of landscape character impact. Table 6.12 provides an overview of the visual sensitivity and magnitude within each of the character zones. The table also includes the overall visual landscape impact.

Table 6.12 Landscape character impacts

Zone	Visual sensitivity	Visual magnitude	Visual impact
A	High - moderate	High	High
B	High - moderate	Low	Moderate
C	High	High - moderate	High
D	Moderate	Moderate	Moderate
E	Low	Low	Low
F	High	Moderate	Moderate - high
G	High - moderate	Moderate	Moderate - high

It can be concluded that the landscape to the north and northwest of the highway would be most affected by the proposed development. This is predominantly due to the high visual and scenic quality of the surrounding setting.

Impacts from key viewpoints

Viewpoint 1 - 'Varroville' residence

The visual sensitivity of the Varroville Residence is considered high as a result of its heritage significance and commanding position atop the knoll.

The visual effect is considered low to negligible as the property is strongly screened by vegetation around the property boundary. As a result no views towards the project site are attained except for small pockets from transient viewpoints. The main residence faces away from the site and a secondary residence partially facing the site is strongly screened by vegetation.

Further, screening vegetation towards the bottom of the slope in front of the site provides a further partial visual curtilage.

Viewpoint 2 - Northern slopes

This location could be considered high to moderate in visual sensitivity predominantly due to its scenic quality. However, the backdrop of these views includes strong elements of a highly modified landscape hence reducing its sensitivity. The transient nature of viewers (horse-back riders) is considered moderate in sensitivity. Overall, visual sensitivity is considered moderate.

The site would be partially exposed and its distance within 400 metres makes it visually prominent. However, its visual consolidation with other detracting elements such as the highway assists in visually reducing the overall effect on the landscape setting. Nevertheless, the visual effect is considered high to moderate.

Viewpoint 3 - St Andrews residences

This viewpoint is common to a number of residences along the neighbourhood's edge which look onto the northern/north western slopes. The nature of these viewpoints is considered high in sensitivity due to their static nature and sensitivity to change.

The visual effect is considered moderate to low due to the distance to the site in excess of 500 metres and the scale of the visual exposure of the site. Taking into account the various mitigation strategies, the site would have a limited exposure. Regarding night time lighting, this viewpoint is considered the most sensitive due to the nature of the viewer. No direct light spillage is expected due to the distance of the viewpoint to the site. However, indirect light spillage in the form of a night-time glow is expected and is considered to have a moderate to low impact when taking into consideration that a major highway is positioned between the viewer's position and the site. The existing impact of headlight glare from southbound traffic is considered to overpower any light spillage from the project site. As a result, the overall visual effect is considered moderate to low.

It should be noted that the visual impact would be higher immediately after construction as some of the vegetation screening from the project site would not have matured yet.

Viewpoint 4 - St Andrews Road

This location is considered moderate to low in visual sensitivity. Moderate due to the nature of the scenic views achieve and its sensitivity to change and low due to its transient nature. The partial visual exposure of the site particularly taking into account parked vehicles makes this location moderate in its visual effect.

Viewpoint 5 - St Andrews Road overpass

The visual sensitivity of this location is considered negligible as the nature of this locality is transient in character and its sensitivity to change directly adjacent to the highway is considered negligible. The visual effect of the proposed site is also considered negligible as the distance to the site exceeds 600 metres and vegetation screening would limit the exposure of the site.

Summary

Table 6.13 provides an overview of the visual impacts expected at the five viewpoints that are considered to be key viewpoints.

Table 6.13 Visual impacts at key viewpoints

Viewpoint	Visual sensitivity	Visual magnitude	Visual impact
1	High	Low-negligible	Moderate
2	Moderate	High-moderate	Moderate-high
3	High	Moderate-low	Moderate-high
4	Moderate-low	Moderate	Moderate
5	Negligible	Negligible	Negligible

6.10.3 Safeguards and management measures

Mitigation to be considered during detailed design

- The layout of planting within the site would have an impact on its effectiveness as a means of mitigation. Ensuring that the planting of evergreen trees along the perimeter is done in an informal fashion would improve the effect of integration. This would be achieved by planting trees on batters with an irregular spacing, allowing tree planting to be broken into groups to break down any continuous linear character. Reflecting the vegetation pattern in the surrounding landscape is also critical to the overall integration of the site. The grouping should be bold rather than small clusters to create the desired effect.
- To create a less formal edge treatment to further improve the site's mitigation with the surrounding landscape, batters could be varied rather than keeping them with a constant slope along the Proposal's perimeter. This would help to visually 'blend'

the proposed project with the surrounding landscape. This strategy is considered effective since most of the adjacent land is grazing land which is not greatly susceptible to a minor change in landform/slopes and hence not requiring any property acquisition.

- The opportunity exists to further screen the site from the residential properties at St Andrews by introducing vegetation screening within the highway's median. This would be also beneficial to further mitigate night-time lighting.
- Introducing tree planting within the wider portions of the median between the off-load ramp and the highway would further 'settle' the proposed project within the landscape and visually screen the site from the St Andrews residences. This would require careful examination of sight lines to ensure safety is not compromised. The introduction of large trees with clear trunks would allow views under the canopies ensuring that the site is not visually isolated from the freeway.
- Ensuring that built form elements such as amenities block, picnic shelters etc use low reflective materials and dark colours to reduce their general visibility.
- Reducing the luminance of the site by consolidating night time lighting to the centre of the site (diagonal parking area) and allowing only shadowed lighting within the minimum required levels along the perimeter.

Construction and operation

- The site would be kept tidy and rubbish free during both the construction and operational phases of the project.

6.11 Socio-economic considerations

6.11.1 Potential impacts

Construction

The project would have some impacts on both the local community and road users. The environmental impacts associated with the project have been examined in the previous sections. Most potential negative impacts are anticipated to occur throughout the construction period, as a result of construction activities (i.e. noise, visual, dust, traffic disruptions as discussed in previous sections). Mitigation measures have been proposed to minimise these impacts.

Operation

The creation of the truck rest area would have a beneficial impact on the wider road network by providing a safe location for trucks drivers to park their vehicles in order to get rest. By providing the rest area, safety on the wider network would be improved as driver fatigue related accidents would potentially be reduced.

There is potential for issues related to safety within the rest area, particularly at night. This safety issue would be related to drivers moving around the site and also sleeping/resting in their vehicles during the night. These potential issues are considered minor as the site is to be well lit with low level lighting and also due to the

high levels of passive surveillance through trucks entering, parking and leaving the site continually and to a lesser degree vehicles travelling past on the freeway.

6.11.2 Safeguards and management measures

- Potentially affected residences would be contacted prior to the commencement of construction works, in accordance with the RTA's *Community Involvement Practice Notes and Resource Manual, 1988*. Residents would be notified via door knocks, newsletters or letter box drops providing information on the proposed works, working hours adhered to and a contact name and number should any complaints wish to be registered.

6.12 Waste minimisation and management

6.12.1 Potential impacts

Construction

During the construction phase, the Proposal is likely to generate the following wastes:

- Construction/demolition waste included excavation material such as topsoil, vegetation, asphalt, concrete and other construction materials.
- Surplus materials used during site establishment such as safety fencing and barriers which may include plastics and metals.
- Wastewater including site run-off and water used to control dust.
- Domestic waste generated by site construction personnel.
- Ablution waste including waste from toilets and basins.
- Waste oil and fuels.

The Resource Management Hierarchy principles of the *Waste Avoidance and Resource Recovery Act 2001* (WARR Act 2001) would be adopted. They are as follows:

- Avoid unnecessary resource consumption as a priority.
- Avoidance is followed by resource recovery (including reuse of materials, reprocessing recycling, and energy recovery).
- Disposal is undertaken as a last resort.

Operation

Any necessary road maintenance activities would be subject to appropriate waste management as part of RTA standard procedures.

As the site is being used as a rest area, domestic waste would be generated by truck drivers. Bins would be provided on site, for drivers to dispose of any rubbish. These bins would be emptied on a regular basis with waste to be taken to an appropriately licensed waste facility.

6.12.2 Safeguards and management measures

Construction

- A Waste Management Plan would be prepared in accordance with RTA's QA Specifications and in accordance with RTA's *Waste Minimisation & Management Guidelines, 1998* and the principles of the WARR Act.
- Trees to be removed would be assessed for their value as millable timber, or possible reuse for habitat if appropriate.
- Leaf material and small branches of native vegetation would be chipped and used as mulch in revegetation works.
- There would be no burning of waste.
- All noxious weeds and exotic plant species removed would be bagged and disposed of at a licensed landfill facility.
- All construction materials, surplus soils and wastes generated from the Proposal would be stockpiled and stored at the compound site prior to reuse, recycling or disposal.
- All working areas would be maintained, kept free of rubbish and cleaned up at the end of each working day.
- Wastes would not be stored for long periods during construction of the Proposal. Empty drums of fuels, oils or chemicals and fluids would not be stored on site during construction.

Operation

- Waste bins on site would be emptied on a regular basis.

6.13 Summary of beneficial effects

The main benefits of the Proposal include:

- Provision of a safe location for truck drivers to park, check and secure their vehicles prior to entering Sydney.
- Allows for more efficient driver changeovers compared to other options considered.
- Increase in general road safety, as the provision of a rest area would assist in managing driver fatigue on the road network and therefore potentially reducing fatigue related accidents involving trucks.

6.14 Summary of adverse effects

The Proposal would result in some adverse effects that would include:

- Loss of degraded Endangered Ecological Communities.
- Temporary disruption to traffic along the F5 Freeway during construction.
- Visual impacts on the Scenic Hills Area.
- Temporary marginal noise impacts during construction.

- Potential air quality impacts during construction.

These impacts are short term in nature and would be minimised through the implementation of the mitigation measures outlined in Section 7.1.

7. Environmental management

7.1 Summary of safeguards and management measures

Environmental safeguards outlined in Table 7.1 would be incorporated into the detailed design phase of the Proposal and during construction and operation of the Proposal. These safeguards would minimise any potential adverse impacts arising from the proposed works on the surrounding environment. All safeguards described in this REF and the Decision Report/ Conditions of Approval would be incorporated into the Contractor's Environmental Management Plan (CEMP) and the Project Environmental Management Plan (PEMP).

The CEMP and PEMP (if required) would be developed in accordance with the specifications set out in the RTA's Environmental Protection (Management Plan) – QA Specification G36.

Table 7.1 Site specific environmental safeguards

Impact	Environmental safeguards
Geology and soils	◗ An erosion and sedimentation control plan would be developed and incorporated into the Construction Environmental Management Plan (CEMP). The plan would incorporate specifications outlined in the *NSW Erosion and Sediment Control Handbook No. 2*, identify areas requiring management controls, include inspections and checklist sheets and be reviewed by the RTA's Regional Environmental Adviser, Sydney Region prior to the commencement of works.
	◗ Temporary stormwater control devices or erosion and sedimentation controls would be implemented at stormwater drains and adjacent to Bunbury Curran Creek to prevent sediment-laden runoff entering the local stormwater and creek systems.
	◗ Maintenance and checking of the erosion and sedimentation controls would be undertaken on a regular basis and records kept and provided at anytime upon request. Sediment would be cleared from behind barriers on a regular basis and all controls would be managed in order to work effectively at all times.
	◗ All stockpiles would be designed, established, operated and decommissioned in accordance with the RTA's *Stockpile Management Procedures 2001*. Where possible, all stockpiles would be located 50 meters away from the high bank of any rivers or drainage lines.
	◗ Stockpiles would not be established on slopes greater than 2:1

Impact	Environmental safeguards
	(horizontal to vertical).
	◗ Minimise the potential for mud tracking onto pavement surfaces (i.e. implement vehicle brush down methods or installation of a wheel grid facility leaving the site).
	◗ Any material transported onto pavement surfaces would be swept and removed at the end of each working day where it is safe to do so.
	◗ The stripping of topsoil and stockpiling activities would not be undertaken during major rainfall events.
	◗ Site rehabilitation of disturbed areas would be undertaken progressively as stages are completed.
Water quality and drainage	◗ Further flood modelling to be undertaken during the detailed design of the project, to optimise the drainage design to minimise any increase in flooding impacts to neighbouring land.
	◗ An incident emergency spill plan would be developed and incorporated into the CEMP. The plan would include measures to avoid spillages of fuels, chemicals, and fluids onto any surfaces or into any adjacent/nearby waterways and emergency response plan. An emergency spill kit would be kept onsite at all times.
	◗ In the event of an incident the DECCW would be notified of any incidents resulting in environmental harm as per part 5.7 of the POEO Act.
	◗ All staff would be inducted into the incident emergency procedures and made aware of the location of where the emergency spill kit would be kept.
	◗ Should a spill occur during construction, the incident emergency spill plan would be implemented, and the Regional Environmental Adviser Sydney Region contacted.
	◗ All fuels, chemicals, and liquids would be stored at least 50 metres away from any waterways or drainage lines and would be stored within an impervious bunded area within the compound site.
	◗ The refuelling of plant and maintenance of machinery would be undertaken within impervious bunded areas within the compound site.
	◗ Vehicle wash downs and/or cement truck washouts would be undertaken within a designated bunded area of an impervious

Impact	Environmental safeguards
	surface or undertaken offsite.
	◗ Machinery would be checked daily to ensure there is no oil, fuel or other liquids leaking from the machinery.
	◗ Rain gardens and other water treatment systems to be maintained at regular intervals.
	◗ Drainage systems to be maintained at regular intervals to ensure they are operating at full capacity (e.g. clearance of debris from drainage lines).
Flora and fauna	◗ Protective fencing should be placed around all areas of native vegetation outside the Proposal footprint to be retained during construction works, to avoid direct or indirect impacts on these areas, in particular along Bunbury Curran Creek, along the edge of the proposed rest area and around trees and shrubs adjacent to the proposed acceleration lane.
	◗ It is recommended that an appropriate buffer should be maintained around the stand of mature EEC trees located along the northern edge of the proposed truck rest area to avoid any loss of hollow-bearing trees and to minimise potential impacts within the tree's root systems from the construction of the proposed rest area, including drainage line digging or other associated infrastructure.
	◗ All native vegetation clearance should be kept to an absolute minimum. Existing cleared areas should be utilised wherever possible for drains/swales and the location of the proposed rest area.
	◗ Any areas of native vegetation constituting a component of an EEC to be cleared or directly impacted by the proposed activities should be off-set with revegetation within surrounding areas (eg. along the northern road verge) using appropriately sourced local native species. This should also include the revegetation and rehabilitation of lower Bunbury Curran Creek post construction works.
	◗ All vegetation removed from the site should be disposed of off site in consultation with Campbelltown Council.
	◗ Hollow-bearing trees located outside of the current area of impact to be avoided.
	◗ Care should be taken that any noxious weeds occurring on site are not further dispersed as a result of the Proposal. A follow up weed control program may be necessary to control the encroachment of these species into surrounding areas. The

Impact	Environmental safeguards
	landowner has a legal responsibility to control and suppress these species on their property under the NSW *Noxious Weeds Act 1995.*
	◗ An experienced fauna ecologist should be on site before and during the clearing or damage of any trees on the site, particularly those trees containing hollows (where unavoidable), to check for fauna species potentially utilising hollows, and to ensure the safe removal or relocation of any animals from the site.
	◗ Potential impacts from run-off, erosion, and sedimentation should be mitigated by implementing appropriate management measures such as sediment fencing during construction, and the revegetation of Bunbury Curran Creek post construction works.
	◗ Any proposed access tracks should have appropriate management measures such as gravel laid, sediment fencing and revegetation following works to address issues of run-off, erosion and sedimentation.
Noise	◗ A construction noise management sub-plan would be incorporated into the projects Construction Environment Management Plan. This plan would be developed by adopting the management practices contained within the RTA's *Environmental Noise Management Manual, 2001.* An outline of these management practices can be found in Table 5.14 of the Noise and Vibration Assessment located in Appendix C.
Vibration	◗ A construction vibration management sub-plan would be incorporated into the projects Construction Environment Management Plan in order to minimise impacts of vibration on surrounding sensitive receivers. An outline of these management practices can be found in Table 5.14 of the Noise and Vibration Assessment located in Appendix C.
Traffic, transport and access	◗ A Traffic Management Plan would be developed in accordance with the RTA's *Traffic Control at Work Sites Manual 2003.* The plan would be required to be approved by the RTA's Traffic Management Centre.
	◗ Road users would be informed regularly of changed conditions through the use of variable message signs.
	◗ Establishment of safe access points to work areas from the adjacent road network including safety measures such as barriers, maintaining sight distance requirements and signage and the provision of traffic management measures such as

Impact	Environmental safeguards
	those identified above.
Non-Indigenous heritage	◗ Should archaeological remains be uncovered during construction, all works would cease within the vicinity of the material/find and the RTA's Regional Environmental Adviser Sydney would be contacted.
	◗ The RTA should apply for an excavation permit exemption under 1(A) and 1(C) of the Schedule of Exemption to Section 139(1) & (2) of the NSW Heritage Act (1977) made under Section 139(4), for the proposed construction of the F5 Varroville Truck Rest Area.
	◗ Precautions should be taken to protect the access road and nearby fence posts during construction activities at the site. These items should not be covered or physically damaged by the proposed works. Protective measures may include temporary fencing and briefing all persons engaged on the proposed works.
	◗ The access road and nearby fence posts are a part of the heritage landscape and should be preserved in accordance with the recommendations of the Varroville Conservation Management Plan (Orwell and Peter Phillips Architects, 1992).
	◗ The context of the access road and nearby fence posts should be photographed within the landscape prior to its alteration by the construction of the F5 Varroville truck rest area. Photographic recording of the features will provide a visual reference and record of the heritage resource in the vicinity of the F5 Varroville truck rest area that may be used to aid further inquiries about the Varroville Estate.
Indigenous heritage	◗ All personnel working on site would receive training in their responsibilities under the *National Parks and Wildlife Act 1974*.
	◗ Should Indigenous heritage items be uncovered during works, all works in the vicinity of the find would cease and the RTA's Aboriginal Programs Consultant, Regional Environmental Adviser Sydney Region, DECCW representative and relevant LALC representative would be contacted. Works would not re-commence until appropriate clearance has been received.
Air quality	◗ Any general areas with the capacity to cause dust would be managed appropriately to suppress dust emissions during periods of high winds (i.e. through use of water carts or similar).
	◗ Any materials transported in trucks would be appropriately

Impact	Environmental safeguards
	covered to reduce dust generation.
	◗ Construction activities that generate high dust levels would be avoided during high wind periods.
	◗ Rehabilitation of disturbed surfaces would be undertaken as soon as possible.
	◗ All construction plant and machinery would be fitted with emission control devices complying with Australian Design Standards.
	◗ Plant and machinery would be turned off when not in use.
Visual amenity	◗ The layout of planting within the site would have an impact on its effectiveness as a means of mitigation. Ensuring that the planting of evergreen trees along the perimeter is done in an informal fashion would improve the effect of integration. This would be achieved by planting trees on batters with an irregular spacing, allowing tree planting to be broken into groups to break down any continuous linear character. Reflecting the vegetation pattern in the surrounding landscape is also critical to the overall integration of the site. The grouping should be bold rather than small clusters to create the desired effect.
	◗ To create a less formal edge treatment to further improve the site's mitigation with the surrounding landscape, batters could be varied rather than keeping them with a constant slope along the Proposal's perimeter. This would help to visually 'blend' the proposed project with the surrounding landscape. This strategy is considered effective since most of the adjacent land is grazing land which is not greatly susceptible to a minor change in landform/slopes and hence not requiring any property acquisition.
	◗ The opportunity exists to further screen the site from the residential properties at St Andrews by introducing vegetation screening within the highway's median. This would be also beneficial to further mitigate night-time lighting.
	◗ Introducing tree planting within the wider portions of the median between the off-load ramp and the highway would further 'settle' the proposed project within the landscape and visually screen the site from the St Andrews residences. This would require careful examination of sight lines to ensure safety is not compromised. The introduction of large trees with clear trunks would allow views under the canopies ensuring that the site is not visually isolated from the freeway.

Impact	Environmental safeguards
	◗ Ensuring that built form elements such as amenities block, picnic shelters etc use low reflective materials and dark colours to reduce their general visibility.
	◗ Reducing the luminance of the site by consolidating night time lighting to the centre of the site (diagonal parking area) and allowing only shadowed lighting within the minimum required levels along the perimeter.
	◗ The site would be kept tidy and rubbish free during both the construction and operational phases of the project.
Socio-economic considerations	◗ Potentially affected residences would be contacted prior to the commencement of construction works, in accordance with the RTA's *Community Involvement Practice Notes and Resource Manual, 1988*. Residents would be notified via door knocks, newsletters or letter box drops providing information on the proposed works, working hours adhered to and a contact name and number should any complaints wish to be registered.
Waste minimisation and management	◗ A Waste Management Plan would be prepared in accordance with RTA's QA Specifications and in accordance with RTA's *Waste Minimisation & Management Guidelines, 1998* and the principles of the WARR Act.
	◗ Trees to be removed would be assessed for their value as millable timber, or possible reuse for habitat if appropriate.
	◗ Leaf material and small branches of native vegetation would be chipped and used as mulch in revegetation works.
	◗ There would be no burning of waste.
	◗ All noxious weeds and exotic plant species removed would be bagged and disposed of at a licensed landfill facility.
	◗ All construction materials, surplus soils and wastes generated from the Proposal would be stockpiled and stored at the compound site prior to reuse, recycling or disposal.
	◗ All working areas would be maintained, kept free of rubbish and cleaned up at the end of each working day.
	◗ Wastes would not be stored for long periods during construction of the Proposal. Empty drums of fuels, oils or chemicals and fluids would not be stored on site during construction.
	◗ Waste bins on site would be emptied on a regular basis.

7.2 Licensing and approvals

7.2.1 Threatened Species Conservation Act, 1995

Section 5A of the EP&A Act lists a number of factors to be taken into account in deciding whether there is likely to be a significant impact on threatened species, populations or ecological communities or their habitats. Should a threatened species or community be impacted, test of significance must be completed to determine the significance of the impact. A Species Impact Statement (SIS) is required if there is likely to be a significant impact on a threatened species, population or ecological community or its habitat.

The potential impact of the Proposal on threatened species and communities has been assessed in Section 6.3 and assessments of significance have been undertaken. The assessments conclude that the Proposal is unlikely to have a significant impact on any species or communities listed under the TSC Act and a SIS is not required.

7.2.2 National Parks and Wildlife Act 1974.

The *National Parks and Wildlife Act 1974* (NPW Act), among other things, provides the basis for legal protection and management of Aboriginal sites in NSW. The implementation of the Aboriginal heritage provisions in the Act is the responsibility of the DECCW.

This Act, together with the policies of the DECCW provides the following constraints and requirements on land owners and managers:

- It is an offence to knowingly disturb an Aboriginal artefact or site without an appropriate permit.
- Prior to instigating any action which may conceivably disturb a 'relic', archaeological survey and assessment is required.
- When the archaeological resource of an area is known or can be reliably predicted, appropriate land use practices should be adopted which would minimise the necessity for the destruction of sites/relics, and prevent the destruction of sites/relics that warrant conservation.

Section 6.8 discusses the potential for the Proposal to impact on items of Aboriginal significance and concludes that it is unlikely to impact on any such items. Accordingly, an approval from DECCW would only be required if items of significance are discovered during construction works.

7.2.3 NSW Heritage Act, 1977

The *Heritage Act 1977* is concerned with all aspects of conservation ranging from the most basic protection against indiscriminate damage and demolition of buildings and sites, through to restoration and enhancement.

Heritage places and items of particular importance to the people of NSW are listed on the State Heritage Register. The key to listing on the State Heritage Register is the level of significance. Only those heritage items that are of state significance are listed

on the Register. There are no items listed on the State Heritage Register within or adjacent to the study area.

In addition, the Heritage Act contains provisions relating to relics. The term 'relic' under the Heritage Act "means any deposit, object or material evidence:

> *(a) which relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and (b) which is 50 or more years old."*

Section 139 of the Heritage Act prohibits a person from disturbing or excavating any land on which the person has discovered or exposed a relic, except in accordance with an excavation permit or a notification granting exception for the permit.

As well, a person must not disturb or excavate any land knowing or having reasonable cause to suspect that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed unless the disturbance or excavation is carried out in accordance with an excavation permit or a notification granting an exception.

As highlighted in Section 6.7 the potential for relics to be located within the Proposal area is considered unlikely. However the RTA should apply for an excavation permit exemption under 1(A) and 1(C) of the Schedule of Exemptions to Section 139(1) & (2) of the NSW Heritage Act (1977) made under Section 139(4), for the proposed construction of the F5 Varroville truck rest area.

In the event that the relics are discovered, Section 146 of the Heritage Act requires that the find relics should be reported in writing to the Heritage Council of NSW. Depending on the nature of the discovery, an additional assessment and possibly an excavation permit may be required prior to the recommencement of excavation in the affected area.

7.2.4 Protection of the Environment Operations Act, 1997

Activities for which a licence is required under the Protection of the Environment Operations Act 1997 (POEO Act) are detailed in Schedule 1 of the Act.

The Proposal does not meet any of the definitions within Schedule 1 of the POEO Act and therefore an Environmental Protection Licence is not required.

7.2.5 Native Vegetation Act 2003

The *Native Vegetation Act 2003* applies to the clearing of native vegetation outside certain specified areas, and requires development consent from the Minister for Planning for certain activities. Section 6 of the Act defines native vegetation as any of the following types of indigenous vegetation:

(a) Trees (including any sapling or shrub, or any scrub).

(b) Understorey plants.

(c) Groundcover (being any type of herbaceous vegetation).

(d) Plants occurring in a wetland.

Section 7 defines clearing native vegetation as being any one or more of the following:

(a) Cutting down, felling, thinning, logging or removing native vegetation.

(b) Killing, destroying, poisoning, ringbarking, uprooting or burning native vegetation.

Section 25 of the Act goes on to state legislative exclusions. This Act does not apply to the following types of clearing of native vegetation:

(g) any clearing that is, or is part of, an activity carried out by a determining authority within the meaning of Part 5 of the EPA Act if the determining authority has complied with that Part,

(h) any clearing that is, or is part of, an activity carried out in accordance with an approval of a determining authority within the meaning of Part 5 of the EPA Act if the determining authority has complied with that Part,

As discussed in Section 6.3.2 some vegetation removal is required. However, as approval for the Proposal is required under Part 5 of the EP&A Act, and the work would be undertaken in accordance with this approval, no additional approvals are required under the Native Vegetation Act.

7.2.6 Water Management Act 2000

The Water Management Act 2000 controls the carrying out of activities in or near water sources in NSW. As the Proposal involves works in the vicinity of Bunbury Curran Creek the Proposal is considered to be a controlled activity. However, as the works are to be undertaken by the RTA which is considered a public authority, a controlled activity approval is not required.

8. Conclusion

8.1 Justification

The construction of a new truck rest area at Varroville would result in benefits to both the freight network and the wider network in general. It would benefit the freight network by providing a safe off road rest area where trucks of varying sizes could park and allow the drivers to rest. The site would also be located close to Sydney which was identified by drivers during consultation as being important as it facilitates more efficient driver changeovers.

This site is within 60 minutes of the Pheasants Nest rest area and is 60 minutes from the Berowra truck rest area satisfying the project objectives and the National Transport Commission *National Guidelines for the Provision of Rest Areas* (2005) recommendations for rest area locations.

The provision of such a rest area would benefit the wider road network as it would help fight the issue of truck driver fatigue which has the potential to generate accidents. The site would also include low maintenance amenities buildings thereby achieving the Proposal objectives

8.2 Ecologically sustainable development

The Proposal has been assessed against the following four principles of ecologically sustainable development (ESD) listed in the *Protection of the Environment Administration Act 1991*:

- The precautionary principle.
- The principle of inter-generational equity.
- The principle of biological diversity and ecological integrity.
- The principle of improved valuation of environmental resources.

An assessment of compliance of the Proposal with these principles is provided below.

8.2.1 Precautionary principle

The precautionary principle states that:

If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

In the application of the precautionary principle, public and private decisions should be guided by:

(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and

(ii) an assessment of the risk-weighted consequences of various options

A range of environmental investigations have been undertaken during the preparation of this REF to ensure that the potential environmental impacts are able to be understood with a high degree of certainty. The Proposal has evolved to avoid environmental impact where possible and mitigation measures have been recommended to minimise adverse impacts. No mitigation measures have been deferred due to a lack of scientific certainty. The Proposal is therefore considered to be consistent with the precautionary principle.

8.2.2 Intergenerational equity

The principle of inter-generational equity states that:

the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.

The study area has undergone a high degree of disturbance by previous development activities. The Proposal would not result in any impacts that are likely to adversely impact on the health, diversity or productivity of the environment for the future generations.

8.2.3 Conservation of biological diversity and ecological integrity

The principle of biological diversity and ecological integrity states that:

> *conservation of biological diversity and ecological integrity should be a fundamental consideration.*

The Proposal has been designed to avoid impacts on biological diversity and ecological integrity wherever possible. The study area has undergone substantial urban development and impacts on flora and fauna are considered minimal. The flora and fauna present is reflective of a highly modified urban environment. Appropriate safeguards are recommended to minimise impacts.

8.2.4 Improved valuation, pricing and incentive mechanisms

The principle of improved valuation of environmental resources states that:

> *environmental factors should be included in the valuation of assets and services, such as:*
>
> *(i) polluter pays – that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,*
>
> *(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,*
>
> *(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.*

The cost of environmental resources includes the costs incurred to protect the environment. The safeguards imposed to minimise adverse impacts would result in economic costs to the construction and operation of the project. This indicates the valuation of environmental resources has been assigned.

The Proposal has been designed to minimise adverse impacts on the environment by confining works to defined areas and implementing appropriate mitigation measures when impacts are expected.

8.3 Conclusion

The Proposal would result in some environmental impacts during both the construction and operational phases. These impacts would primarily be associated with traffic and access due to the Proposal's location on the F5 Freeway, ecology impacts due to vegetation removal and visual impacts associated with the Proposal. These impacts are generally considered to be minimal due to the implementation of mitigation measures outlined in Section 7.1 of this REF.

Appendix G outlines the environmental factors listed in Clause 228(2) of the *Environmental Planning and Assessment Regulation* and the matters of National Environmental Significance required to be considered under the EPBC Act. In summary the Proposal would not result in any significant environmental impacts.

This REF provides a true and fair review of the Proposal in relation to its potential impacts on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the carrying out of the Proposal. It is concluded that the Proposal is not likely to significantly affect the environment within the meaning of Section 112 of the EP&A Act.

9. Certification

This Review of Environmental Factors provides a true and fair review of the Proposal in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the Proposal.

Monique Roser

Principal Environmental Planner

Date: 21.01.10

I have examined this Review of Environmental Factors and the certification by Monique Roser and accept the Review of Environmental Factors on behalf of the RTA.

Names:

Position:

Date:

10. References

CCC (2009a). *Flood modelling for proposed heavy vehicle rest area, Varroville.* July 2009.

CCC (2009b). *Flood modelling for proposed heavy vehicle rest area, Varroville: Supplementary Report.* August 2009.

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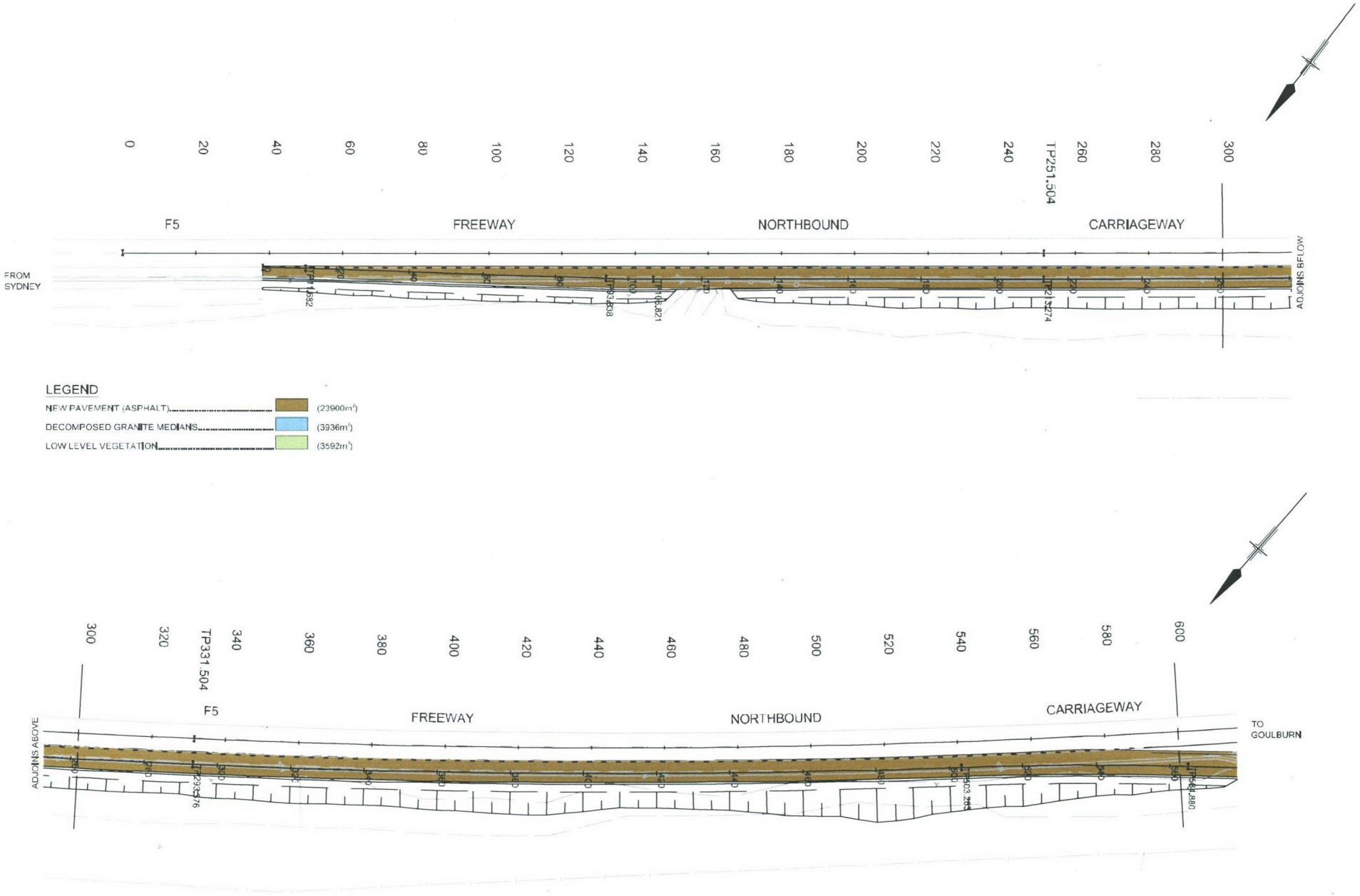
Renzo Tonin & Associates (2009). *F5 Freeway: Varroville Truck Rest Area - Operational and Construction Noise and Vibration Impact Assessment*, 11 May 2009

Appendix A

Plans



ADJOINS SHEET NUMBER 11

Plot Date: 08-Sep-09, 8:38 AM
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No.	Amendment Description	Initials	Date
A	ISSUED FOR REVIEW	SB	07.09.09

A3 Original | This sheet may be prepared using colour and may be incomplete if copied

SCALES
0 10 20 30m
1:1000 PLAN

Co-ordinate System: MGA Zone 56 | Height Datum: AHD

PREPARED BY: GHD
Level 6, 20 Smith Street, Parramatta NSW 2150 Australia
PO Box 788 Parramatta NSW 2124
T 61 2 9895 8600 F 61 2 9895 8610
E sydmail@ghd.com.au
W www.ghd.com.au
CLIENTS PEOPLE PERFORMANCE
DESIGNED N. CUPAC
DRAWN K. RANDELL
REVIEWED A. HORTON

ROADS AND TRAFFIC AUTHORITY OF NSW
CITY OF CAMPBELLTOWN
F5 - SOUTH WESTERN FREEWAY
CONCEPT DESIGN - TRUCK STOP REST AREA
BETWEEN CAMPBELLTOWN AND CAMDEN VALLEY WAY, VARROVILLE
PAVEMENT PLAN

FILE No.	DRAWING	PRINTED DATE	SHEET No.
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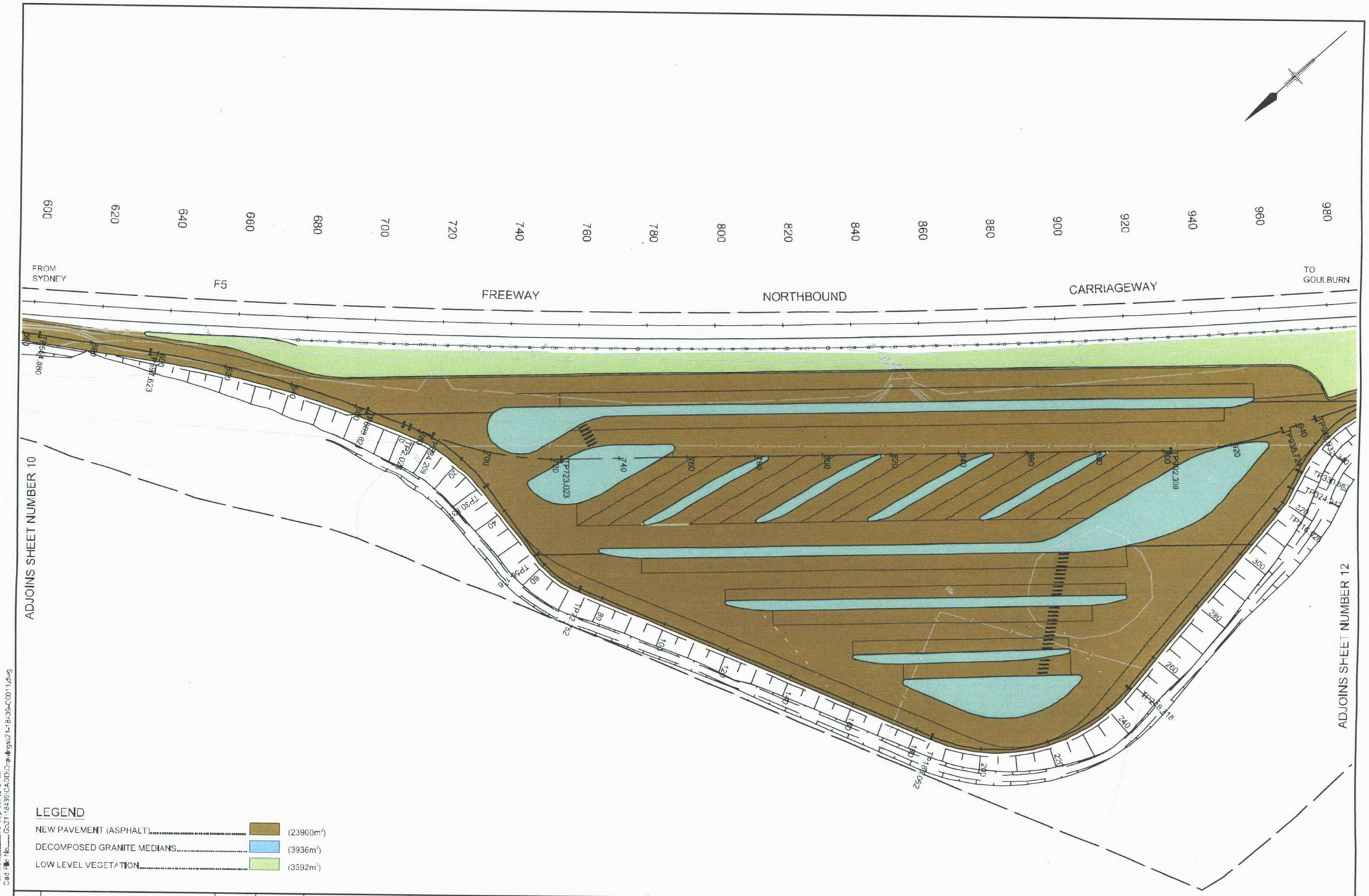
REGISTRATION NUMBER
0002.076.CD.0003



Plot Date: 08-Sep-09, 8:13 AM
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No.	Amendment Description	Initials	Date
A	ISSUED FOR REVIEW	SB	07.09.09

A3 Original This sheet may be prepared using colour and may be incomplete if copied

SCALES
0 10 20 30m
1:1000 PLAN

Coordinate System: MGA Zone 56 Height Datum: AHD

PREPARED BY
GHD
CLIENTS PEOPLE PERFORMANCE
Level 6, 10 Smith Street
Parramatta NSW 2150 Australia
PO Box 760 Parramatta NSW 2124
T 61 2 8898 8000 F 61 2 8898 8810
E sydmail@ghd.com.au
W www.ghd.com.au

DESIGNED N. CUPAC
DRAWN K. RANDELL
REVIEWED A. HORTON

ROADS AND TRAFFIC AUTHORITY OF NSW

CITY OF CAMPBELLTOWN
F5 - SOUTH WESTERN FREEWAY
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FILE No.	DRAWING	PRINTED DATE	SHEET No.
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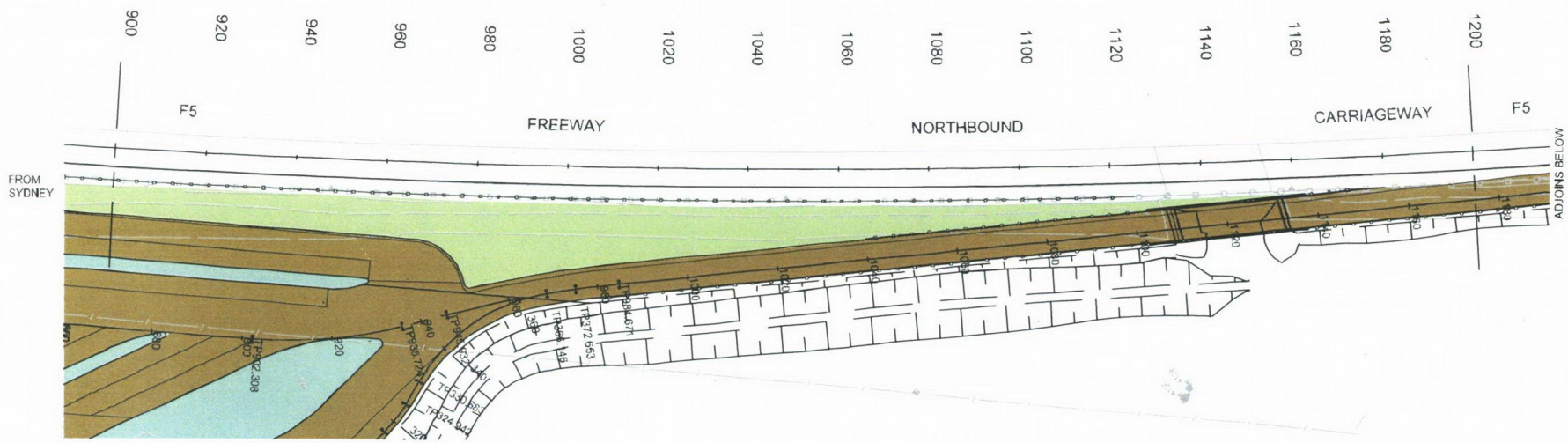
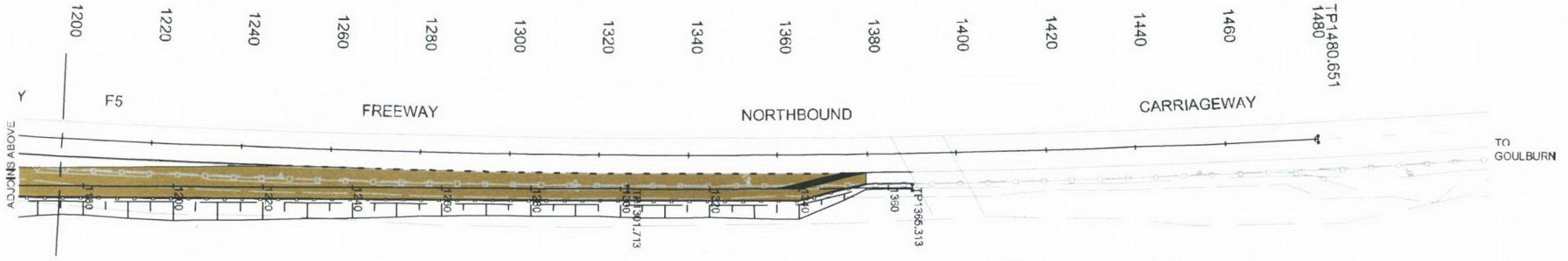
REGISTRATION NUMBER
0002.076.CD.0003

ADJOINS SHEET NUMBER 11



LEGEND

NEW PAVEMENT (ASPHALT)		(23900m²)
DECOMPOSED GRANITE MEDIANS		(3936m²)
LOW LEVEL VEGETATION		(3592m²)



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SCALES
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1:1000 PLAN

Coordinate System: MGA Zone 56 | Height Datum: AHD

PREPARED BY GHD
Level 6, 20 Smith Street
Parramatta NSW 2150 Australia
PO Box 760 Parramatta NSW 2124
T 61 2 8898 8000 F 61 2 8898 8310
E sydmail@ghd.com.au
W www.ghd.com.au

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DESIGNED N. CUPAC
DRAWN K. RANDELL
REVIEWED A. HORTON

ROADS AND TRAFFIC AUTHORITY OF NSW

CITY OF CAMPBELLTOWN
F5 - SOUTH WESTERN FREEWAY
CONCEPT DESIGN - TRUCK STOP REST AREA
BETWEEN CAMPBELLTOWN AND CAMDEN VALLEY WAY, VARROVILLE
PAVEMENT PLAN

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REGISTRATION NUMBER
0002.076.CD.0003

SHEET No. 12 OF 25

Plot Date: 08-Sep-09, 8:44 AM
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Appendix B

Flora and fauna assessment

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Roads and Traffic Authority

Report for Varroville

Preliminary Ecological Assessment

October 2009

Contents

Table Index

Figure Index

Appendices

Definitions

Activity – (the proposal) has the same meaning as in the *Environmental Planning and Assessment Act 1979* (*EP&A Act*). The nature of the proposal is described in section 1.3.

Endangered population - population specified in Part 2 of Schedule 1 of the *Threatened Species Conservation Act 1995 (TSC Act),* in Schedule 4 of the *Fisheries Management Act 1994* (*FM Act*) or in the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).*

Endangered ecological community - an ecological community specified in Part 3 of Schedule 1 of the *TSC Act,* in Schedule 4 of the *FM Act* or under the *EPBC Act.*

Likely - taken to be a real chance or possibility (NPWS 1996).

Locality - means the area within a 10 km radius of the subject site.

Local population - the population that occurs within the study area, unless the existence of contiguous or proximal occupied habitat and the movement of individuals or exchange of genetic material across the boundary can be demonstrated (NPWS 1996).

Region - means a biogeographical region that has been recognised and documented such as the Interim Biogeographical Regions of Australia (IBRA). The region that the study area falls within is the Sydney Basin bioregion.

Subject site – is the area to be directly affected by the proposal (NPWS 1996). In this case it approximately 220 m south of Bunbury Curran Creek to approximately 1 km north of Bunbury Curran Creek on the F5, and east into mixed farmland for up to approximately 300 m.

Study area – the subject site and any additional areas, which are likely to be affected by the proposal, either directly or indirectly (NPWS 1996). Includes the area contained within a 5 km radius of the subject site.

Threatened species – a species specified in Schedule 1 Part 1 (endangered species), Part 4 (presumed extinct) and Schedule 2 (vulnerable species) of the *TSC Act* or under the *EPBC Act.*

Unlikely – taken to be an unlikely or remote possibility of occurring.

1. Introduction

1.1 Purpose

GHD Pty Ltd (GHD) has been commissioned by the Roads and Traffic Authority of NSW (RTA) to undertake a preliminary ecological assessment for the proposed construction of a heavy vehicle rest area on the F5 at Varroville in southwest Sydney.

The purpose of this ecological assessment is to identify and assess the biodiversity value of the site, and assess any potential ecological impacts of the proposal, and to make recommendations to mitigate these impacts.

The Key issues that require clarification in order to address the legislative requirements include:

- Potential for endangered ecological communities, threatened species and/or their habitats listed under the *NSW Threatened species Conservation Act 1995* (TSC Act), to occur within the proposed subject site;
- Potential presence of any Matters of National Environmental Significance (NES) listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- Potential for adverse impacts on endangered ecological communities, threatened species and/or their habitats listed under the TSC Act or EPBC Act; and
- The identification of mitigation measures and recommendations for reducing impacts.

1.2 Background

1.2.1 Site location

The proposal stretches from approximately 220 m south of Bunbury Curran Creek to approximately 1 km north of Bunbury Curran Creek on the F5, and east into mixed farmland for between approximately 20 to 300 m. Figure 1 shows the location of the site and proposal outline.

1.2.2 Climate

The Commonwealth Bureau of Meteorology website (2009) provides the following climactic information taken from Campbelltown Swimming Centre (closest weather station to the site). Mean rainfall peaks in autumn with 100.7 mm falling in March, falling to 33.7 mm in July. Mean daily maximum temperatures range between 28.4°C to 17.1°C in summer and winter respectively. Mean daily minimum temperatures range between 16.9°C to 3.2°C in summer and winter respectively.

1.2.3 Soils, Geology and Hydrology

The study area is underlain by sandstone and shale of the Wianamatta Group (1:500,000 Sydney Basin geological map sheet, Geological survey of NSW).

The site is located in a low, slightly undulating floodplain with adjacent land being semi cleared grazed farmland with small stands of mature native and exotic vegetation occurring throughout. Bunbury Curran Creek occurs within the southern section of the proposal impact, and contains a mixture of native riparian forest and exotic vegetation.

1.2.4 Surrounding Land Use

The site primarily occurs in grazed agricultural land, with scattered stands of native and exotic vegetation, farm dams and mixed grassland occurring to the immediate north, west and south of the site. The site is bordered by the F5 to the east with Bunbury Currans Creek flowing north/south bordering the eastern edge of the F5. Campbelltown Road and an Industrial complex occur further to the east. Residential areas occur further south east and south west (Figure 1).

1.3 The Proposal

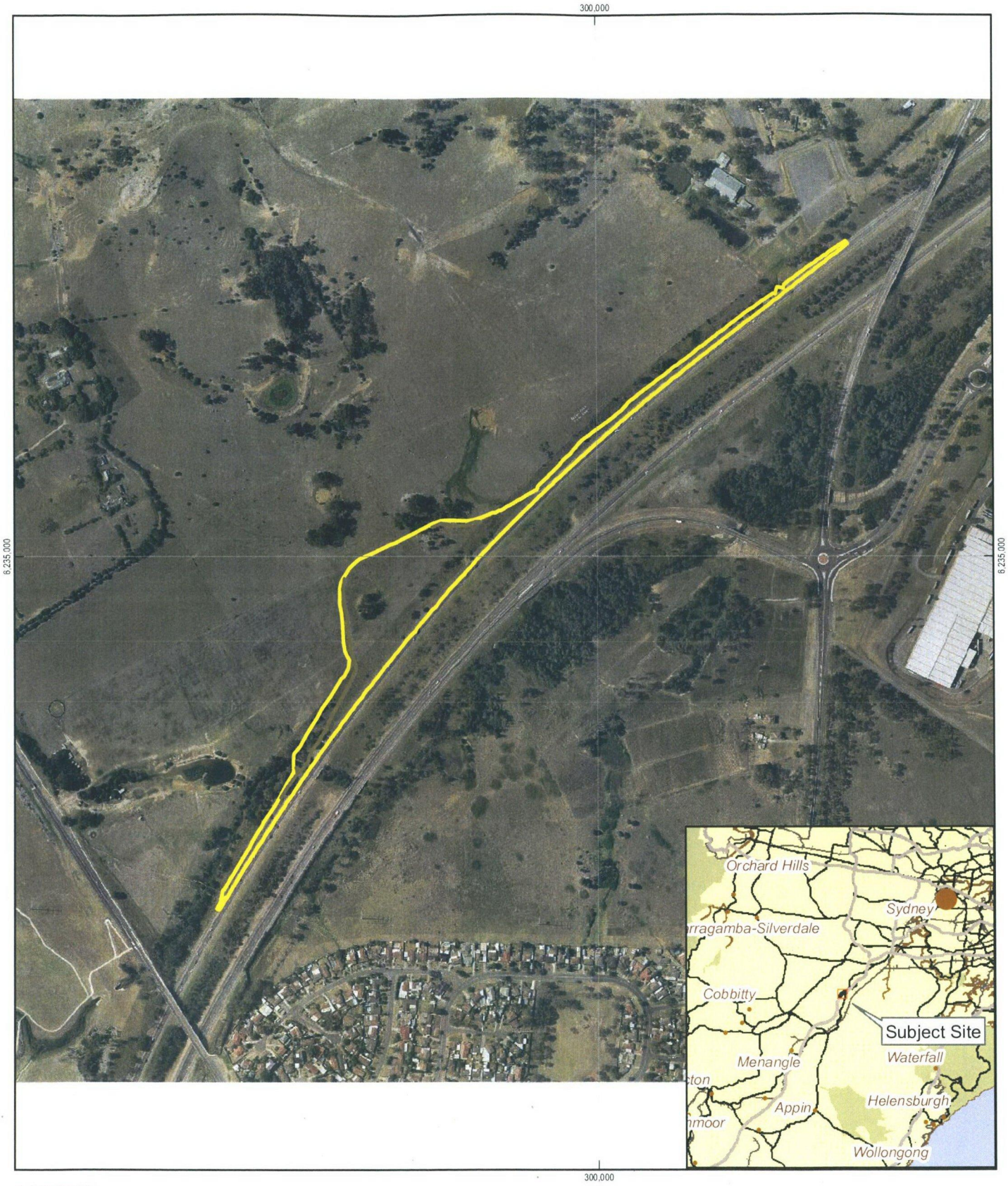
Driver fatigue is one of the biggest causes for crashes involving heavy vehicle drivers. For this reason, a large network of rest areas have been positioned along major routes throughout NSW. The Varroville heavy vehicle rest area has been identified as an important location for a heavy vehicle rest area which would assist in dealing with heavy vehicle driver fatigue.

The Roads and Traffic Authority of NSW (RTA) proposes to construct a heavy vehicle rest area on the F5 at Varroville in southwest Sydney. The rest stop at Varroville has been identified as an important initiative to deal with heavy vehicle driver fatigue. The proposal would provide truck parking for up to 59 vehicles.

The objectives of the proposal are as follows:

- To provide a safe location for heavy vehicles drivers to park their vehicles, to allow them to stop and rest; and
- To provide low maintenance amenities buildings including toilets and showers.

The proposal will require the removal of a number of small stands of mature and regrowth native vegetation and exotic weeds throughout the proposal footprint.



LEGEND

Design Footprint

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Metres
Geographic Coordinate System
Horizontal Datum: Geocentric Datum of Australia 1994

N

GHD

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RTA
Varroville Ecological Assessment

Site Location & Area of Proposed Impact

Job Number 21-18426
Revision A
Date 02 OCT 2009

Figure 1

Level 15, 133 Castlereagh Street Sydney NSW 2000 T 61 2 9239 7100 F 61 2 9239 7199 E sydmail@ghd.com.au W www.ghd.com.au

G:\21\18426\GIS\Map_Documents\18426_Z004_ProposalFootprint.mxd

Data source: Aerial Imagery, RTA. Created by: cwilson, Cwilson

2. Methodology

2.1 Literature Review

Available literature, background information and searches of databases pertaining to the site and locality (i.e. 10 km radius) were reviewed and included:

- DECCW Wildlife Atlas database (licensed) for records for threatened species and endangered ecological communities listed under the *TSC Act* which have been recorded within a 10 km radius from the site (dated 14 July 2009)(DECCW);
- DEWHA Protected Matters Search Tool for Matter of National Environmental Significance (NES) listed under the EPBC Act within a 10 km radius from the site; and
- NPWS 1:25000 (Map Sheet 6): Native Vegetation of the Cumberland Plain Mapping, October 2002 (DECCW).

2.2 Field Surveys

An ecological field survey was undertaken for the proposal footprint as well as land immediately adjacent to the site along the road reserve and within surrounding paddocks on the 7th August 2009.

2.2.1 Flora

A general survey of vegetation was undertaken as part of the ground-truthing throughout the proposed footprint and adjacent vegetation where vegetation and waterways had the potential to be impacted.

Random Meander

A random meander was taken along the entire length of the proposed works and within surrounding vegetation. All species present were recorded and are listed in Appendix C. Notes were also taken on dominant species present, level of weed invasion and any other signs of disturbance. Endangered Ecological Communities found on the site were mapped. Samples of any species unidentifiable in the field were retained for later identification.

Quadrat

Quadrats were undertaken in any vegetation with the potential to be an endangered ecological community (EEC) both within the site and surrounding vegetation. All species present within a 20m x 20m quadrat were noted and cover abundance given. Notes were also taken on the level of weed invasion and any other signs of disturbance.

2.2.2 Fauna

The study area has the potential to provide habitat for a number of fauna species. Fauna species recorded during the current field surveys are listed in Appendix C. This assessment aimed to determine the likelihood of threatened species and their habitats occurring within the study area, and potential impacts on these species should they be present. Assessments were also made to ascertain the potential importance of these areas for native fauna in general. As the physical area of disturbance of the proposal is relatively small, and contained within an already highly modified landscape, it was considered that an extensive fauna survey was not necessary. Instead, a number of other methods were used to assess the likelihood of threatened species occurring on the site. The methods used are described below.

Habitat Assessment

Detailed assessment of the nature and condition of habitats, specific resources and features of relevance for native fauna were undertaken along the length of the proposal footprint and adjacent vegetated areas. In addition, any indirect evidence of fauna (i.e. scats, feathers, fur, tracks, dens, nests, scratches, chew marks and owl wash) were recorded. Fauna was recorded opportunistically throughout the survey.

2.3 Limitations

This survey was not designed to detect all species, either resident or transitory to the study area. Its aim was to provide an overall brief assessment of the ecological values of the site and surrounding study area, with particular emphasis on threatened species and endangered ecological communities to allow an assessment of the potential impacts of the proposal.

Some vegetated areas adjacent to the site were inaccessible due to the presence of the F5, or land access through private property. In these cases assessments were made from nearby areas.

Lastly, current grazing practices present on sections of the site meant that many species of flora could not be identified due to grazing pressure. Therefore not all species of flora present on sections of the site could be identified during surveys.

3. Results

3.1 Literature Review

Results of the literature review indicate a number of threatened species and EEC's that have been recorded, or have the potential to occur within a 10 km radius of the site (the locality). Each threatened species and an assessment of their potential to occur within the subject site are shown in Appendix A. DECCW mapping of EEC's within the locality is shown in Figure 3.

3.2 Vegetation Description

3.2.1 Northern Section – Acceleration lane (Section 1)

The road verge along the northern section of the proposed acceleration lane (approximately 600 m or more in length) (Figure 2) is dominated by mixed exotic grasses and shrubs, including Rhodes Grass (*Chloris gayana*), Kangaroo Grass (*Themeda australis*), Kikuyu (*Pennisetum clandestinum*) and Couch (*Cynodon dactylon*) with scattered patches of Blackthorn (*Bursaria spinosa*), Hickory (*Acacia implexa*) and African Olive (*Olea europaea*) occurring throughout. Stands of regrowth Grey Box (*Eucalyptus moluccana*) and Forest Red Gum (*Eucalyptus tereticornis*) of varying ages, including at least one large hollow-bearing tree with a large stag, with a mixed understorey, including Blackthorn, *Indigofera australis*, False Sarsaparilla (*Hardenbergia violacea*) and groundcovers, including Kidney Weed (*Dichondra repens*), Mulga Fern (*Cheilanthes sieberi*), Rhodes Grass, Kangaroo Grass, and Couch occur throughout the length of this section. The native vegetation in this section conforms to modified and regrowth forms of Cumberland Plain Woodland (CPW), listed as an endangered ecological community (EEC) under both the NSW TSC Act and Commonwealth EPBC Act. The proposal will result in some minimal direct and indirect impacts along the length of this section of vegetation.

A stand of older modified CPW occurs at the northern most section of the acceleration lane; however this section is unlikely to be directly or indirectly impacted by the proposal.

3.2.2 Central Section - Proposed Truck Stop Area (Section 2)

The main area proposed for the location of the truck stop is currently dominated by mixed exotic and native grasses and herbs, including Paterson's Curse (*Echium plantagineum*), Couch, and Paspalum (*Paspalum dilatatum*), along with numerous other pasture weeds (Figure 2). Many of the species present were difficult to identify due to the heavily grazed nature of the vegetation on site. This mixed grassland is subject to regular heavy grazing by horses and rabbits.

A small stand of regrowth Grey Box with mixed understorey (section 2a, Figure 2) occurs within the proposed truck stop area (approximately 15 stems). This stand is subject to heavy grazing, and conforms to a highly degraded form of CPW. All the trees within this stand will be removed as a result of the proposal.

Another stand of mature Grey Box and Forest Red Gum trees (section 2b, Figure 2) (approximately 13 large trees; 150 m x 40 m) with a modified weedy understorey, including African Box-thorn (*Lycium ferocissimum*), Paddy's Lucerne (*Sida rhombifolia*), Weeping Meadow Grass (*Microlaena stipoides*) and *Einadia trigonos* highly affected by grazing, occurs directly adjacent to the proposed truck stop area. This stand of vegetation conforms to a highly degraded form of CPW. These trees contain numerous hollows and spouts of various sizes, which were being highly used by several native bird species during the surveys, and may provide potential roost locations for listed threatened birds or bats occurring within the region.

The proposal will not result in the direct removal of any trees within this stand, however indirect impacts including root disturbance due to the digging of drainage channels, and increased (and potentially polluted) run-off, may occur.

One section of mature and regrowth Swamp She-Oak (section 2c, Figure 2)(approximately 30 m x 30 m) which conforms to a highly degraded form of Swamp Oak Floodplain Forest (SOFF), listed as endangered under the NSW TSC Act, contains a number of trees with small hollows and a stag. This patch contains a modified understorey and has been highly affected by grazing. The proposal would remove this stand. Two smaller sections of regrowth Swamp She-Oak (section 2d, Figure 2) (approximately 60 m x 20 m in total) with the potential to conform to this community over time will also be removed as a result of the proposal.

A small area (section 2e, Figure 2) of regrowth native and exotic shrubs, grasses and groundcovers, including Sydney Green Wattle (*Acacia decurrens*), African Box-thorn, African Olive, Fennel (*Foeniculum vulgare*) and Rhodes Grass occurs along the road verge within this section.

3.2.3 Southern Section – Deceleration lane (Section 3)

A stand of Broad-leaved Apple *(Angophora subvelutina),* Swamp She-Oak and Forest Red Gum (approximately 400 m x 40 m) (Figure 2) with a mixed native and exotic understorey occurs at the southern end of the deceleration lane on either side of Bunbury Curran Creek and along the road easement to the fence-line. The canopy species include Broad-leaved Apple, Forest Red Gum, Willow Bottle-brush (*Callistemon salignus*) and Swamp She-Oak with African Olive, African Box-thorn and False Sarsaparilla occurring in the shrub layer. The groundcover was dominated by Rhodes Grass, with patches of native species, including Kidney Weed, Weeping Meadow Grass (*Microlaena stipoides*) and White Root (*Pratia purpurescens*).

The riparian section was heavily modified having been previously disturbed for the existing bridge and Freeway construction, with high weed infestation probably a result of past disturbances and edge effects. It contained a mixture of native and exotic species, including Forest Red Gum, Bull-rush (*Typha orientalis*), Swamp She-Oak, Fennel, Moth Vine (*Araujia sericifera*) and Broad-leaved Privet (*Ligustrum lucidum*).

The vegetation within this section conforms to a modified version of River Flat Eucalypt Forest, listed as an EEC under the NSW TSC Act. The proposal will result in the removal of approximately 100 m x 40 m of this community predominately from the northern, and a small section from the southern, side of Bunbury Currans Creek along the proposed deceleration lane, as well as some potential minor indirect impacts along the creek line.

Design Footprint

Vegetation & Adjacent to Site

1:6,000 (at A4)

0 55 110 220

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

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RTA
Varroville Ecological Assessment

Vegetation on the site and adjacent areas

Job Number 21-18426
Revision A
Date 02 OCT 2009

Figure 2

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

G:\21\18426\GIS\Map_Documents\18426_Z005_VegetationOnSite.mxd

Data source: Aerial Imagery, RTA. Created by: cwilson, Cwilson

3.3 Fauna

The site and adjacent study area contains suitable habitat for a range of common and introduced species (Table 4). However, due to the highly fragmented nature of the surrounding vegetation as a result of the road, suburban and industrial development, the diversity and value of fauna habitats available for threatened and migratory species to occur are limited (Appendix A).

A number of hollow-bearing trees and stags were recorded on the site and within adjacent vegetation (section 1 and 2, Figure 2). These hollows provide suitable breeding and nesting habitat for a range of common native species occurring in the area and may also provide potential roosting and/or breeding habitat for several threatened birds, bats, arboreal mammal and reptile species. Red-rumped Parrots (*Psephotus haematonotus*) and Rainbow Lorikeets (*Trichoglossus haematodus*) were recorded utilising these hollows during surveys.

A relatively large number of bird species were recorded during the surveys on the site and in surrounding areas, in particular in the stands of mature Grey Box (CPW) and Swamp She-Oak (SOFF) (sections 2b and 2c, Figure 2). Species recorded included the Superb Fairy Wren (*Malurus cyaneus*), Common Myna (*Acridotheres tristis*), Australian Magpie (*Gymnorhina tibicen*), Red-rumped Parrot, Rainbow Lorikeet, Striated Pardalote (*Pardalotus striatus*), Red-browed Finch (*Neochmia temporalis*), Crested Pigeon (*Ocyphaps lophotes*), and Little Corella (*Cacatua sanguinea*). The adjacent dams and creek provided habitat for the Pied Cormorant (*Phalacrocorax varius*), Hardhead (*Aythya australis*), Dusky Moorhen (*Gallinula tenebrosa*) and Chestnut Teal (*Anas castanea*). An unidentified bird of prey was also recorded flying over the site.

Water birds and waders such as the Cattle Egret (*Ardea ibis*), Great Egret (*Ardea alba*) and Freckled Duck (*Stictonetta naevosa*) have the potential to utilise areas adjacent to the site due to the presence of farm dams and associated paddocks, with some of these habitats in reasonable condition and already utilised by a number of waterbirds. However, these species are unlikely to utilise the subject site in any way other than of a transient nature as little to no open water or wetland vegetation is present within the proposed impact area.

A Red-bellied Black Snake (*Pseudechis porphyriacus*) was recorded just north east of the site near one of the farm dams. Habitat for this species was present around farm dams on adjacent land in the form of scattered fallen timber, as well as dense areas of vegetation under the stands of Eucalypt trees. No rocky outcrops were recorded within the site or adjacent areas during the field visit, however nearby dams and creeks and areas of dense vegetation provide some habitat for other reptiles and common amphibians. While no frogs were heard calling during the surveys, cold weather and limited survey time may have precluded detection of these species.

A large number of European Rabbits (*Oryctolagus cuniculus*) were observed on the site during surveys. Burrows, diggings and droppings of this species were also wide spread across the study area. Horses (*Equus caballus*) were also present within the proposed truck stop area and in land immediately adjacent to the site. These species have exerted heavy grazing pressure within the proposed truck stop area and within adjacent farming land.

Bunbury Currans Creek and the associated bridge also provide limited habitat for a number of common amphibian and bird species. However the highly degraded and weedy nature of the waterway reduces the likelihood of threatened species utilising this habitat.

3.4 Threatened Species

No threatened species were recorded on the site during the field surveys. However, the site and immediately adjacent areas contains potential and suitable, albeit limited, habitat for a number of threatened species known or thought to potentially occur in the study area (Appendix A).

3.4.1 Flora

The site occurs within a modified landscape subject to regular grazing across part of the site, and within a modified road verge for the remainder of the area.

No threatened flora species were recorded on the site or within adjacent farmland during the current surveys. However, due to the highly grazed nature of parts of the site, not all species present on the site could be identified to species level. The seasonal nature of some flora species means that the time of year when surveys are conducted can have an influence on whether or not those species are detected.

However, it is considered unlikely that any threatened species of flora occur within the subject site due to the highly modified nature of the site and the long history of grazing and disturbance. Previous disturbance, competition with weeds, council spraying and periodical mowing reduce the likelihood of these species persisting within the road verge.

3.4.2 Fauna

The site and adjacent study area contains potential suitable habitat for a range of threatened and migratory species known, or with the potential, to occur in the study area (Appendix A). However, the limited size and highly modified, linear nature of the site, and therefore limited habitats available, means the likelihood of such species occurring on site is greatly reduced.

Given that a number of threatened bat species previously recorded in the locality are highly mobile, such as Eastern False Pipistrelle (*Falsistrellus tasmaniensis*), Eastern Freetail-bat (*Mormopterus norfolkensis*), Greater Broad-nosed Bat (*Scoteanax rueppellii*), Large-footed Myotis (*Myotis adversus*) and the Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*), all have the potential to utilise the hollow-bearing trees present within the subject site and adjacent vegetation stands. However, given the large number of available roosts in adjacent areas, it is considered that the loss of the small number of hollow-bearing trees from the site is unlikely to have a substantial impact on hollow dependant species.

The Cumberland Plain Land Snail (*Meridolum corneovirens*) has been recorded within the locality. Potential marginal habitat for this species was present along the northern section of the road verge within the modified regrowth CPW stand (section 1, Figure 2). However, due to the disturbed history of the site, minimal fallen debris and the isolated nature of the vegetation, it is unlikely that this species is present within this area. The more degraded sections of this community within the truck stop area and immediately adjacent land (section 2a and 2b, Figure 2) subject to regular horse and rabbit grazing are unlikely to contain suitable habitat for this species due to the lack of ground debris and fallen timber required by this species.

Hollow dependant bird species such as the Powerful Owl (*Ninox Strenua*), as well as other species that utilise open farmland and disturbed woodland vegetation, including the Swift Parrot (*Lathamus discolour*), White-throated Needle-tail (*Hirundapus caudacutus*), and Rainbow Bee-eater (*Merops ornatus*), have been recorded in the study area. However, due to the small size and fragmented, linear nature of the vegetation on the site and the close proximity to the freeway, as well as the presence of other more suitable foraging and roosting habitat

in land adjacent to the site, the potential use of the subject site by these species is likely to be of a limited and transient nature.

Adjacent dams and Bunbury Currans Creek also provide potential habitat for the Green and Golden Bell Frog (*Litoria aurea*) however the highly disturbed nature of Bunbury Currans Creek, and the relative lack of sedges and rushes, as well as reduced bank vegetation within surrounding farm dams, means the likely presence of this species utilising these habitats is diminished. Also, the presence of Plague Minnow (*Gambusia holbrookia*), a listed key threatening process (KTP) for this species, means the likelihood of this species occurring is also greatly reduced.

The Koala (*Phascolarctos cinereus*) has been recorded within the south eastern section of the study area, however has not been recorded in close proximity to the site. The site contains some suitable foraging trees for the Koala (Forest Red Gum and Grey Box), however the scattered nature of these trees occurring within the landscape, as well as the freeway occurring between the recorded population and the subject site, make it unlikely that this species would utilise the site or immediate surrounding area.

3.5 Endangered Ecological Communities

NPWS Cumberland Plain Vegetation Mapping (DEC 2002) shows the presence of Cumberland Plain Woodland and River Flat Eucalypt Forest throughout the immediate study area. These endangered ecological communities (EEC's), as well as small patches of Swamp Oak Floodplain Forest, were all recorded within the site and immediate study area during surveys (Figure 3). None of the vegetation occurring within the site is mapped under NPWS Cumberland Plain Vegetation Significance Mapping (DEC 2002).

The current design will result in the direct removal or indirect impact on at least three EEC's identified during current surveys as occurring on the site and within adjacent areas. These include:

- Cumberland Plain Woodland (CPW), listed as endangered under both the NSW TSC Act and EPBC Act;
- Swamp Oak Floodplain Forest (SOFF), listed as endangered under the NSW TSC Act; and
- River-flat Eucalypt Forest on Coastal Floodplain (RFEF), listed as endangered under the NSW TSC Act.

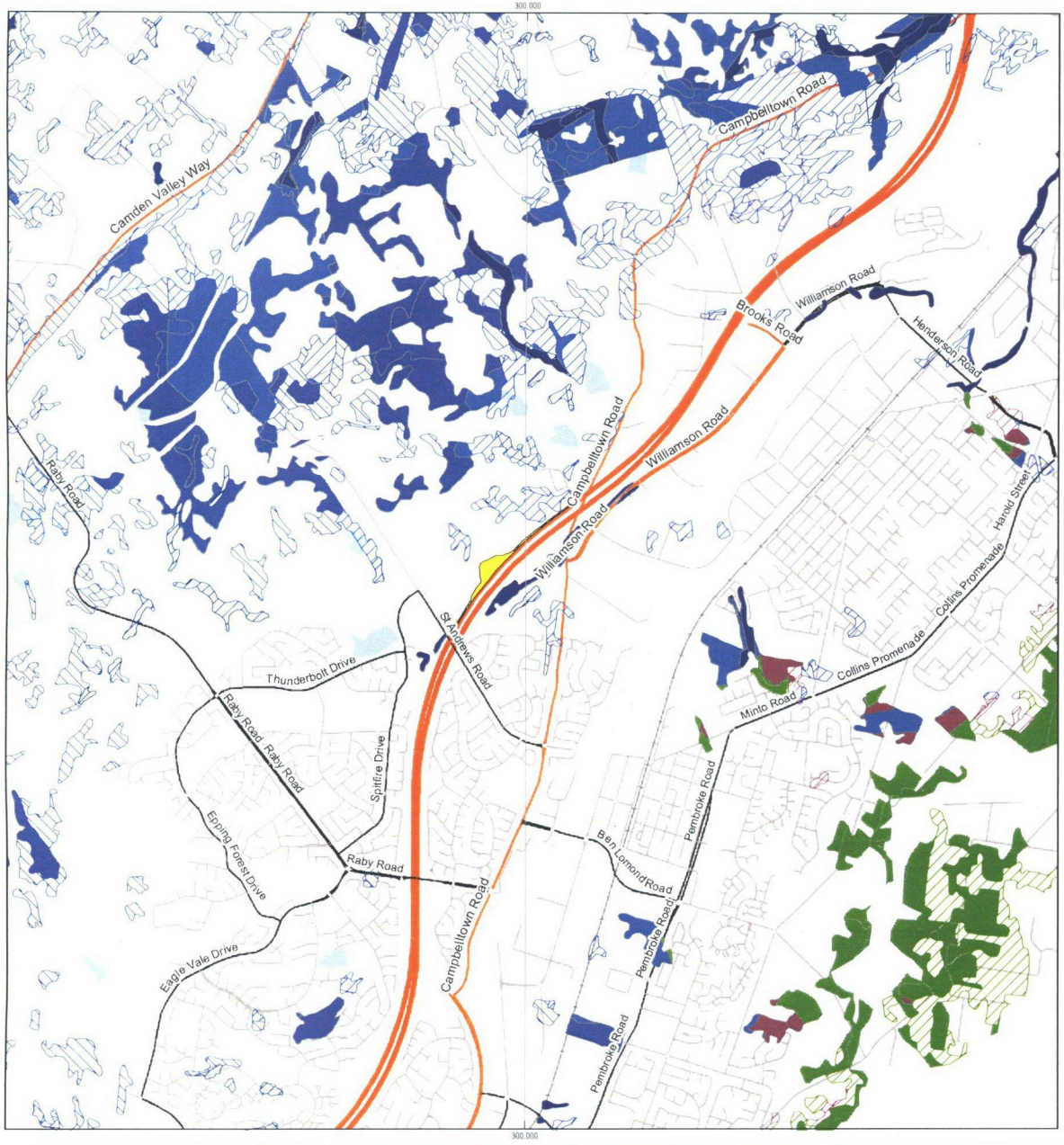
Table 1 shows the extent of EEC's present on the site and within the immediate surrounding area.

Figure 4 shows the extent of these EEC's on the site and within adjacent areas.

Table 1 Area of EEC present within the site and surrounding study area

Sections of Proposal	Extent of EEC present
Northern Section – Acceleration lane / road verge	A linear stand of modified regrowth Cumberland Plain Woodland occurs along this entire section (section 1, Figure 2) Also occurs to the immediate north of this section.
Central Section – Proposed Truck Stop	Small isolated stand of highly modified regrowth Cumberland Plain Woodland (Grey Box) (section 2a, Figure 2). Small isolated stands of mature and regrowth highly modified Swamp Oak Floodplain Forest (Swamp She-Oak) (section 2c and 2d, Figure 2). May also occur along sections of Bunbury Currans Creek immediately to the east of the F5.

Sections of Proposal	Extent of EEC present
Adjacent Farmland	A small isolated stand of mature highly modified Cumberland Plain Woodland (section 2b, Figure 2) occurs on the immediate north western boundary of the proposed truck stop. Other isolated and larger stands of modified Cumberland Plain Woodland occur to the west and north west of the site.
Southern Section – Deceleration lane / road verge	Small to moderate linear stand of degraded modified River Flat Eucalypt Forest occurs to the north and south along Bunbury Currans Creek (section 3, Figure 2).
Adjacent Creek line – Bunbury Currans Creek	Moderate to large stand of River Flat Eucalypt Forest occurs along Bunbury Currans Creek on the eastern side of the F5 Freeway.



Legend

Design Footprint

Cumberland Plain Canopy Cover < 10 percent

- 1 - Shale Sandstone Transition Forest (Low Sandstone Influence)
- 10 - Shale Plains Woodland
- 11 - Alluvial Woodland
- 2 - Shale Sandstone Transition Forest (High Sandstone Influence)
- 3 - Cooks River Castlereagh Ironbark Forest
- 36 - Freshwater Wetlands
- 9 - Shale Hills Woodland

Cumberland Plain Canopy Cover > 10 percent

- 1 - Shale Sandstone Transition Forest (Low Sandstone Influence)
- 10 - Shale Plains Woodland
- 11 - Alluvial Woodland
- 2 - Shale Sandstone Transition Forest (High Sandstone Influence)
- 3 - Cooks River Castlereagh Ironbark Forest
- 36 - Freshwater Wetlands
- 9 - Shale Hills Woodland

0 0.25 0.5 1 1.5 2

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

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Silky Constructions
Luddenham Land Capability Study

Job Number 21-18612
Revision A
Date 02 OCT 2009

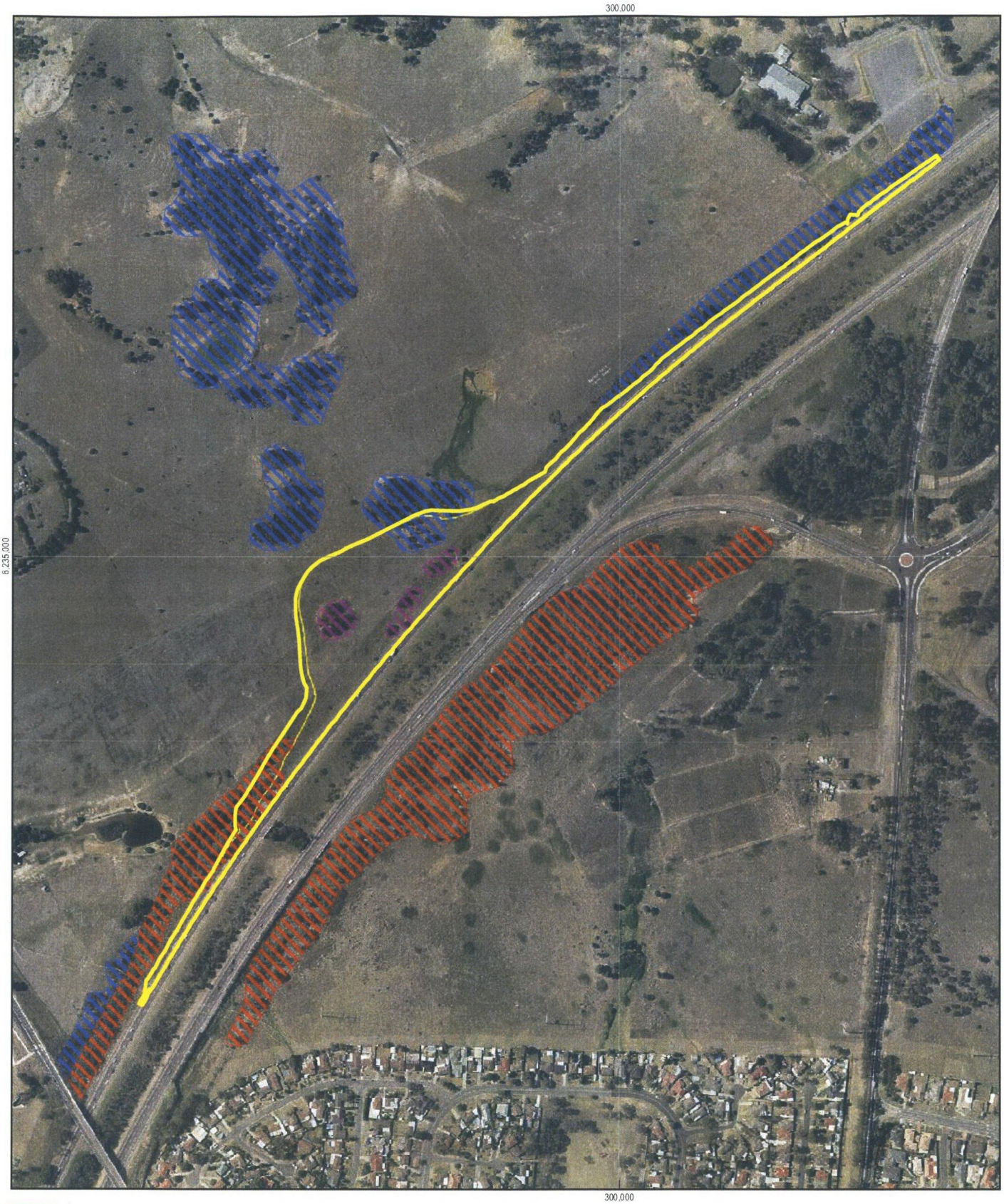
NPWS Cumberland Plains Woodland Mapping of the Study Area

Figure 3

G:\21\18426\GIS\Map_Documents\18426_Z002_Cumberland_Plain.mxd

10 Bond Street Sydney NSW 2000 T 61 2 9239 7100 F 61 2 9239 7199 E sydmail@ghd.com.au W www.ghd.com.au

Data Source: Department of Lands DCDB - 2009; Navigate Pty Ltd. StreetMap - 2008; Department of Lands 2m Contours - 2008. Created by: bahambly, Bahambly, Gwilson



Design Footprint

Endangered Ecological Communities

- Cumberland Plains Woodland - Degraded
- River Flat Eucalypt Forest - Degraded
- Swamp Oak Floodplain Forest - Degraded

1:6,000 (at A4)

0 55 110 220

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

GHD

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RTA
Varroville Ecological Assessment

Job Number	21-18426
Revision	A
Date	02 OCT 2009

EEC's present within the subject site **Figure 4**

Level 15, 133 Castlereagh Street Sydney NSW 2000 **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com.au **W** www.ghd.com.au

G:\21\18426\GIS\Map_Documents\18426_Z003_Vegetation.mxd

Data source: Aerial Imagery, RTA. Created by: cwilson, Cwilson

4. Impact Assessment

4.1 Vegetation Clearance

Vegetation required to be cleared from the site comprises predominantly of exotic grasses, herbs and weed species, with relatively minor areas of native vegetation to be cleared. Table 2 provides a summary of estimated areas of native vegetation to be cleared as a result of the proposal.

Table 2 Approximate areas of native vegetation and EEC to be removed

Sections of Proposal	Vegetation to be removed or modified
Northern Section– Acceleration lane / road verge	Approximately 0.8 ha of modified CPW to be removed or indirectly impacted (section 1, Figure 2)
Central Section – Proposed Truck Stop	Approximately 0.1 ha (15 stems) of highly modified regrowth Grey Box (CPW) to be removed (section 2a, Figure 2)
	Approximately 0.6 ha (13 large trees) of highly modified mature CPW with the potential to be indirectly impacted by minor root disturbance (section 2b, Figure 2)
	Approximately 0.1 ha of mature and regrowth SOFF to be removed (section 2c, Figure 2)
	Approximately 0.3 ha of regrowth SOFF to be removed (section 2d, Figure 2)
Southern Section – Deceleration lane / road verge	Approximately 0.4 ha of RFEF to be removed or indirectly impacted (section 3, Figure 2)

Though much of the subject site contains a high level of disturbance and weed infestation, all native vegetation and vegetation stands to be removed or indirectly impacted as a result of the proposed works form a part of an endangered ecological community. Assessments of the significance of impacts on these EEC's as a result of the proposed activity have been prepared in accordance with Section 5A of the EPA Act (see Section 4.8).

4.2 Loss of Hollow-bearing Trees

The proposal will result in the direct or potential loss of a small number of hollow-bearing trees containing predominately small and medium sized hollows. One or two large sized hollows and stags present within the northern section (section 1, Figure 2) of road verge, and within the small stand of mature Swamp She-Oak (section 2c, Figure 2) will also be impacted. Some of these hollows were being used by native birds during surveys, and provide potential habitat opportunities for a number of threatened species occurring in the study area (as previously discussed).

4.3 Run-off and Sedimentation

Run-off and sedimentation issues may occur as a result of construction and earthworks, which may impact on the lower section of Bunbury Currans Creek and remaining areas of native vegetation along the creek line and within the northern edge of the truck stop.

Appropriate mitigation measure should be implemented to protect the creek and areas of adjacent vegetation from run-off and sedimentation during construction. The scope of this assessment did not cover aquatic areas. An aquatic assessment may be required for Bunbury Currans Creek prior to construction to properly assess the impacts on this ecosystem as a result of the proposed activities.

4.4 Edge Effects and Indirect Impacts

The site occurs in a highly modified landscape with a high occurrence of weeds. All stands of native vegetation within the site were small and in a modified or highly modified, edge impacted state containing high numbers of weeds. While the proposal will result in the removal of most native vegetation within the site, some fragments will be retained and measures to reduce weeds and limit other edge effects should be implemented, especially the increased risk to noxious weed infestation as a result of earth moving and spread via vehicle movement.

The proposal also has the potential for some indirect impacts, including some minor root disturbance due to the digging of drainage channels to the stand of mature Grey Box and Forest Red Gum trees (section 2b, Figure 2) (approximately 13 large trees; 0.6 ha) that occurs directly adjacent to the proposed truck stop, as well as within some of the more mature trees occurring along the road verge of the proposed acceleration lane (section 1, Figure 2). These indirect impacts have the potential to result in some die back amongst affected trees; however this is not considered to be a significant threat to the integrity of the habitats available or the long-term viability of these stands of trees.

4.5 Noxious Weeds

The site contains nine (9) noxious weeds listed for the Campbelltown LGA (2009) under the *Noxious Weeds Act 1993.* These include:

- African Box-thorn (*Lyceum ferocissimum*) – Class 4
- Blackberry (*Rubus fruticosus*) – Class 4
- Bridal Creeper (*Asparagus asparagoides*) – Class 4
- Chilean Needle Grass (*Nassella neesiana*) – Class 4
- Lantana (Lantana species) – Class 5
- Oxalis (Oxalis species – non native) – Class 5
- Paterson's Curse (*Echium plantagineum*) – Class 4
- Privet (Broad-leaf) (*Ligustrum lucidum*) – Class 4
- Privet (Narrow-leaf) (*Ligustrum sinense*) – Class 4

The classes of control are as follows:

- Class 4 - The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.
- Class 5 - There are no requirements to control existing plants of Class 5 weeds. However, the weeds are "notifiable" and a range of restrictions on their sale and movement exists.

Other noxious weeds may be present on the site or within adjacent areas that may not have been picked up during current surveys due to time limitations of the survey as well as the highly grazed nature of the site in places.

4.6 Alteration of Light, Noise and Dust Levels

Noise and dust levels are likely to increase as a result of the proposal. Dust levels are likely to increase during construction however should dissipate to current levels following the completion of construction. Noise levels are likely to increase as a result of the proposal both during construction works and as a result of the truck stop functioning. Light levels are also likely to increase with the inclusion of lighting and trucks moving within the truck stop.

General dust suppression measures are to be implemented during periods of earthwork activities. Lighting within the truck stop should be designed in order to limit dissipating light, with lighting being directed away from surrounding vegetation and agricultural areas. Noise levels are not likely to increase greatly beyond the existing background freeway level, except in the immediate vicinity of the truck stop. This could impact on fauna utilising stands of hollow-bearing trees adjacent to the site and on the northern section of the proposed truck stop area (if retained).

4.7 Key Threatening Processes

A key threatening process is defined in the *Threatened Species Conservation Act* (DECCW 2009) as a process that threatens, or could threaten, the survival or evolutionary development of species, populations or ecological communities.

Something can be a threatening process if it:

- adversely affects two or more threatened species, populations or ecological communities; or
- could cause species, populations or ecological communities that are not currently threatened to become threatened.

There are currently thirty (30) key threatening processes (KTP's) listed under the TSC Act. Three of these are potentially relevant to this proposal.

CLEARANCE OF NATIVE VEGETATION: Small areas of native vegetation constituting endangered ecological communities will be removed as a result of the proposed activity. The areas to be removed are both recent and older regrowth and some mature stands, and occur within an already modified landscape. The loss of these patches of vegetation will result in the removal of whole stands of modified endangered ecological communities, however due to the highly fragmented nature of the stands, and the relative small size of the stands to be removed, the loss of this vegetation is unlikely to contribute to this KTP in a significant way.

LOSS OF HOLLOW-BEARING TREES: The removal of potential roosting habitat for threatened species occurring in the area may occur through the loss of a small number of hollow-bearing trees from the site. However, it is deemed unlikely that this proposal will significantly contribute to this KTP as the number and size of hollows to be removed is small, with a large number of alternative hollows and roosting sites available on adjacent land.

PRESENCE AND SPREAD OF NOXIOUS WEEDS: The site and surrounding vegetation contains moderate to high densities of noxious weeds. Proposed construction and earth works could result in the further spread of these weeds across the landscape, by further disturbing native vegetation on and adjacent to the site, and by moving earth across the landscape. Any earth to be removed from the site should be disposed of in an appropriate manner in line with Council rules, and the spread of weeds across the site should be avoided by the constrained use of vehicles on the site and within surrounding vegetation. All unnecessary impacts on adjacent vegetation should also be avoided, in particular through areas of endangered ecological communities along the creek line and to the north of the acceleration lane. It is proposed that a noxious weed control program be put in

place for the site and adjacent areas of native vegetation. If these mitigation measures are put in place, the proposal is unlikely to further contribute to this KTP.

4.8 Assessment under Section 5A of the NSW EP&A Act

Pursuant to the NSW *Environment Planning and Assessment Act 1979* (EP&A Act), an assessment of the impacts of the proposed works on land that is critical habitat or is likely to affect threatened species, populations, or ecological communities, or their habitats listed under the TSC Act, must be undertaken in the form of an Assessment of Significance. This involves assessing the potential impacts of the proposal based on seven criteria contained within Section 5A of the EPA Act. These criteria aid in assessing if the proposal is likely to have a significant impact on threatened species or their habitat or endangered ecological communities which occur at the site or have the potential to occur. If the Assessment of Significance concludes that a significant impact is likely then the Development Application must be accompanied by a Species Impact Statement (SIS).

An assessment of significance (AoS) has been carried out for three (3) endangered ecological communities with respect to each of the criteria contained within Section 5A(2) of the NSW EPA Act. This assessment is shown in full in Appendix C.

Cumberland Plain Woodland, Swamp Oak Floodplain Forest, and River Flat Eucalypt Forest on Coastal Floodplains are all listed as Endangered Ecological Communities under the NSW TSC Act. These three communities occur within the study area and will be both directly and indirectly impacted as a result of the proposal.

The assessments concluded that, if:

1. impacts to these communities are constrained to the current maximum levels of proposed clearing as laid out in the proposed designs given in Figure 1 and stated within this report; and
2. indirect impacts, including root damage and water run-off to the stands Cumberland Plain Woodland on the northern edge of the proposed truck stop (section 2b, Figure 2) and along the proposed acceleration lane (section 1, Figure 2) are avoided or kept to an absolute minimum;

the proposal is unlikely to constitute a significant impact on these EEC's.

The current design of the deceleration lane requires the widening and/or creation of a new bridge over Bunbury Currans Creek. Because of the absence of detailed design documents and the scope of this assessment, no detailed aquatic or stream side assessments were undertaken to assess the potential impacts of a new bridge or widening of the existing bridge. When detail of design is available, depending on the outcomes of the design, additional investigations on potential aquatic impacts may be required.

It has been assumed in the assessments of significance that much of the native vegetation, particularly the large mature and hollow-bearing trees occurring immediately adjacent to the proposed impact area along the acceleration lane (section 1), along the southern portion of Bunbury Currans Creek (section 3), and immediately adjacent to the proposed truck stop (section 2b), will be avoided by the current design. Should this not be the case, the AoS will need to be re-examined and determined based on complete vegetation loss and associated impacts to hollow-bearing trees, the creek line and surrounds.

4.9 Assessment under the Commonwealth EPBC Act

Pursuant to the Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*, an assessment of the impacts of the proposed works on land that is critical habitat or is likely to affect threatened species, populations, or ecological communities, or their habitats listed under the *EPBC Act* ("Matters of National Environmental Significance"), must be undertaken. This involves assessing the potential impacts of the proposal based on several criteria. These criteria aid in assessing if the proposal is likely to have a significant impact on threatened species or their habitat or endangered ecological communities which occur at the site or have the potential to occur. If the assessment concludes that a significant impact is likely then a referral to the Minister of the Department of Environment and Heritage is required.

Cumberland Plain Woodland, an endangered ecological community listed under the EPBC Act will be impacted upon as a result of this proposal.

As such an assessment of significance under the EPBC Act has been made. This assessment is provided in Appendix D.

The Assessment concluded that the removal of these small and isolated remnants of highly derived CPW are unlikely to significantly impact this EEC in the locality. Combined with recommended mitigation measures to minimise direct and indirect impacts on areas of native vegetation constituting a component of this community occurring immediately adjacent to the proposed impact area, the proposed activities will have no significant impact on CPW therefore a referral to the Minister of the Environment is not required.

5. Management Measures and Mitigation

A number of management and mitigation measures are recommended for the construction phase of this proposal to minimise the impacts on endangered ecological communities, threatened species and/or their habitats occurring within the study area:

- It is recommended that protective fencing be placed around all areas of native vegetation to be retained during construction works to avoid direct or indirect impacts on these areas, in particular along Bunbury Currans Creek, along the edge of the proposed truck stop, and within the proposed acceleration lane.
- It is recommended that an appropriate buffer should be maintained around the stand of mature EEC trees located along the northern edge of the proposed truck stop (to encompass the drip-line of the closest trees to the site) to avoid any loss of hollow-bearing trees and to minimise potential impacts within the trees root systems from the proposed truck stop's construction and operation, including drainage line digging or other associated infrastructure.
- All native vegetation clearance should be kept to an absolute minimum (See Figure 4 for community extents). Existing cleared areas should be utilised wherever possible for drains/swales and the location of the proposed truck stop.
- Any areas of native vegetation constituting a component of an EEC to be cleared or directly impacted by the proposed activities should be off-set with revegetation within surrounding areas (i.e. along the northern road verge) using appropriately sourced local native species. This should also include the revegetation and rehabilitation of lower Bunbury Currans Creek post construction works.
- All vegetation removed from the site should be disposed of off site in consultation with local Council.
- Hollow-bearing trees should be avoided where possible, in particular along the acceleration lane (section 1, Figure 2).
- Care should be taken that any noxious weeds occurring on site are not further dispersed as a result of the proposal. A follow up weed control program may be necessary to control the encroachment of these species into surrounding areas. The landowner has a legal responsibility to control and suppress these species on their property under the NSW *Noxious Weeds Act 1995*.
- An experienced fauna ecologist should be on site before and during the clearing or damage of any trees on the site, particularly those trees containing hollows (where unavoidable), to check for fauna species potentially utilising hollows, and to ensure the safe removal or relocation of any animals from the site.
- Potential impacts from run-off, erosion, and sedimentation should be mitigated by implementing appropriate management measures such as sediment fencing during construction, and the revegetation of Bunbury Currans Creek post construction works.
- Any access tracks located within the study area should have appropriate management measures such as gravel laid where appropriate to reduce disturbance to top-soil, sediment fencing and revegetation following works to address issues of run-off, erosion and sedimentation to avoid potential impacts on nearby waterways i.e. Bunbury Currans Creek.

- Potential species suitable for revegetation of Cumberland Plain Woodland found in the area include, but are not limited to:

Trees	Shrubs	Grasses and Groundcovers
Eucalyptus moluccana	*Bursaria spinosa*	*Einadia trigonis*
Eucalyptus tereticornis	*Dillwynia sieberi*	*Einadia nutans*
Eucalyptus crebra	*Pultenaea viscosa*	*Lomandra longifolia*
Allocasuarina littoralis	*Indigofera Australia*	*Lomandra filiformis*
	Hakea sericea	*Dichondra repens*
	Dodonaea viscosa	*Themeda australis*
	Hardenbergia violacea	*Microlaena stipoides*
		Chloris ventricosa
		Cymbopogon refractus

- Potential species suitable for revegetation of River Flat Eucalyptus Forest and Swamp Oak Floodplain Forest along Bunbury Currans Creek include, but are not limited to:

Trees	Shrubs	Grasses and Groundcovers
Angophora subvelutina	*Melaleuca decora*	*Lomandra longifolia*
Angophora floribunda	*Melaleuca stypheloides*	*Einadia hastata*
Casuarina glauca	*Callistemon salignus*	*Carex appressa*
Eucalyptus amplifolia	*Ozothamnus diosmifolium*	*Microlaena stipoides*
Eucalyptus tereticornis	*Bursaria spinosa*	*Dichondra repens*
	Dodonaea viscosa	
	Hardenbergia violacea	

6. Conclusions

The proposal occurs in a modified landscape, and will result in the direct and indirect impact on a number of small stands of endangered ecological communities listed under both state and federal legislation. It will also result in the direct loss of a small number of hollow-bearing trees.

Small stands of fragmented, linear and highly modified degraded mature or regrowth native vegetation constituting Cumberland Plain Woodland (EEC), Swamp Oak Floodplain Forest (EEC) and River Flat Eucalypt Forest (EEC) occur across the site however impacts from the proposed development are unlikely to be significant provided the extent of clearing within these communities does not extend beyond proposed impacts as stated by the current proposal and outlined within this report.

Although the loss of vegetation constituting a part of these EEC's has not been deemed a significant impact, the proposal will still result in the loss of EEC from the site and as such it is recommended that this loss be offset through revegetation and regeneration efforts as discussed below.

The current design of the deceleration lane requires the widening and/or creation of a new bridge over Bunbury Currans Creek, with potential impacts on Bunbury Currans Creek. Because of the scope of this assessment, no detailed aquatic or stream side assessments were undertaken to assess the potential impacts of the proposal on Bunbury Currans Creek or aquatic fauna. If this is required at a later stage, additional targeted surveys would need to be undertaken

A number of mitigation measures have been recommended in order to reduce further impacts on remaining areas of EEC's present adjacent to the site. It has also been recommended that the loss of any native vegetation within EEC's be offset with suitable revegetation and regeneration works within adjacent areas to be retained, in particular along the acceleration lane and the remaining southern section of Bunbury Currans Creek.

The implementation of mitigation measures will need to be managed to minimise the risk of direct and indirect impacts through clearing, run-off, sedimentation, weed invasion, increased dust, light, or noise levels having an adverse impact on surrounding EEC's and their associated native vegetation, waterways, and possible threatened fauna species and/or their habitat as a result of the proposed activities.

GHD has assumed in our assessments of significance, that much of the native vegetation, particularly the large mature and hollow-bearing trees occurring immediately adjacent to the proposed impact area along the acceleration lane (section 1), along the southern portion of Bunbury Currans Creek (section 3), and immediately adjacent to the proposed truck stop (section 2b), will be avoided by the current design. Should this not be the case, the AoS will need to be re-examined and determined based on complete vegetation loss and associated impacts to the creek and surrounds. Avoidance of these impacts, or at least a minimal impact, will negate the need to undertake additional investigations.

7. References

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Appendix A

Threatened species, populations and endangered ecological communities likely to occur within the study area, and an assessment of the potential for these to be impacted by the proposal.

Table 3 Threatened Species, Populations and Ecological Communities previously recorded within 10 kilometres of the Study Area and the likelihood of being impacted by the proposal.

Common Name (Species Name)	TSC Act Status	EPBC Act Status	Habitat Association	Likelihood of being impacted
EEC's				
Cumberland Plain Woodland	E	E	Cumberland Plain Woodland is characterised by canopy species Grey Box (*Eucalyptus moluccana*) and Forest Red Gum (*E. tereticornis*), with Narrow-leaved Ironbark (*E. crebra*), Spotted Gum (*Corymbia maculata*) and Thin-leaved Stringybark (*E. eugenoides*) occurring less frequently. The shrub layer is dominated by Blackthorn (*Bursaria spinosa*), and grasses such as Kangaroo Grass (*Themeda australis*) and Weeping Meadow Grass (*Microlaena stipoides var stipoides*). Only 9 percent of the original extent remains intact, with remnants scattered widely across the Cumberland Plain (DECCW 2009).	**Occurs** Small isolated patches of vegetation conforming to a modified regrowth or mature version of this EEC occur along the northern strip of road verge along the proposed acceleration lane and within the proposed truck stop.
River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions	E		River-Flat Eucalypt Forest on Coastal Floodplains includes and replaces Sydney Coastal River-Flat Forest. This community is found on the river flats of the coastal floodplains and is characterised by a tall open canopy layer of eucalypts, up to or exceeding 40 m in height. Though composition varies considerably, characteristic tree species include Forest Red Gum (*Eucalyptus tereticornis*), Cabbage Gum (*E. amplifolia*), Rough-barked Apple (*Angophora floribunda*) and Broad-leaved Apple (*A. subvelutina*). Blue Box (*Eucalyptus baueriana*), bangalay (*E. botryoides*), and south of Sydney, River Peppermint (*E. elata*) may also occur. Swamp Gum (*E. ovata*) occurs on the far south coast, Sydney Blue Gum (*E. saligna*) and Flooded Gum (*E. grandis*) may occur north of Sydney, while *E. benthamii* is restricted to the Hawkesbury floodplain. *Melaleuca decora*, Prickly Leaved tea tree (*M. styphelioides*), Grey Myrtle (*Backhousia myrtifolia*), White Cedar (*Melia azaderach*), River Oak (*Casuarina cunninghamiana*) and Swamp Oak (*C. glauca*) may occur elsewhere in these bioregions (DECCW 2009).	**Occurs** A modified version of this EEC occurs along Bunbury Currans Creek within the proposed deceleration lane.

Common Name (Species Name)	TSC Act Status	EPBC Act Status	Habitat Association	Likelihood of being impacted
Swamp Oak Floodplain forest of the NSW North Coast, Sydney basin and South East Corner Bioregions	E		Swamp Oak Floodplain is found on coastal floodplains of NSW. It has a dense to sparse tree layer dominated by Swamp Oak (*Casuarina glauca*). Lilly Pilly (*Acmena smithii*), Cheese Trees (*Glochidion spp.*) and Paperbarks (*Melaleuca spp.*) may be present. Tree diversity decreases with latitude, and *Melaleuca ericifolia* is the only abundant tree in this community south of Bermagui. The understorey is characterised by frequent occurrences of vines *Parsonsia straminea, Geitonoplesium cymosum* and *Stephania japonica var. discolor*, a sparse cover of shrubs, and a continuous groundcover of forbs, sedges, grasses and leaf litter. Varying salinity levels alter groundcover species. In less saline conditions prominent ground layer plants include *Centella asiatica, Commelina cyanea, Persicaria decipiens* and *Viola banksii*; graminoids such as *Carex appressa, Gahnia clarkei, Lomandra longifolia, Oplismenus imbecillis*, and the *fern Hypolepis muelleri*. On more saline fringes of coastal estuaries, the threatened grass species, A*lexfloydia repens*, as well as *Baumea juncea, Juncus kraussii, Phragmites australis, Selliera radicans* and other saltmarsh species may occur (DECCW 2009).	**Occurs** Small isolated patches of vegetation conforming to a highly modified regrowth or mature version of this EEC occur within the proposed truck stop.
FLORA				
Acacia pubescens	V	V	This species occurs on alluvium, shales, and at the intergrade between shales and sandstones. This species flowers from August to October with pods maturing in October to December although seed production appears quite low. This is a clonal species and recruitment is more commonly vegetative. (DECCW 2009).	**Unlikely – no specimens recorded during survey** This species was not found to occur on the site, however may occur within the study area.
Cynanchum elegans	E	E	This species is a climber or twiner with a highly variable form. It usually occurs on the edge of dry rainforest or littoral rainforest, but also occurs in Coastal Banksia Scrub, open forest and woodland, and Melaleuca scrub (DECCW 2009).	**Unlikely – no specimens recorded during survey** This species was not found to occur on the site, however may occur within the study area.

Common Name (Species Name)	TSC Act Status	EPBC Act Status	Habitat Association	Likelihood of being impacted
Eucalyptus scoparia	E	V	This species is a tree to 15 m tall. In NSW it is found on well-drained granitic hilltops, slopes and outcrops, often as scattered trees in open forest and woodland (DECCW 2009).	**Unlikely – no specimens recorded during survey** This species was not found to occur on the site, however may occur within the study area.
Genoplesium baueri	V		This species is a terrestrial orchid, growing in sparse sclerophyll forest and moss gardens over sandstone (DECCW 2009).	**Unlikely – no specimens recorded during survey** This species was not found to occur on the site, however may occur within the study area.
Grevillea parviflora subsp. parviflora	V	V	The habitat for this species are broad, and are known to occur in areas supporting heath, shrubby woodland and forest and often in disturbed areas such as on the fringes of tracks. It has been known to flower over two periods throughout the year, July to December and April to May (DECCW 2009).	**Unlikely – no specimens recorded during survey** This species was not found to occur on the site, however may occur within the study area.
Gyrostemon thesioides	E		Grows on hillsides and riverbanks and may be restricted to fine sandy soils. Within NSW, has only ever been recorded at three sites, to the west of Sydney, near the Colo, Georges and Nepean Rivers (DECCW 2009)	**Unlikely – no specimens recorded during survey** This species was not found to occur on the site, however may occur within the study area.
Leucopogon exolasius	V	V	This species grows in woodland on sandstone and is known from the upper Goerges River area and in Heathcote National Park (DECCW 2009).	**Unlikely – no specimens recorded during survey** This species was not found to occur on the site, however may occur within the study area.

Common Name (Species Name)	TSC Act Status	EPBC Act Status	Habitat Association	Likelihood of being impacted
Marsdenia viridiflora subsp. Viridiflora population	EP		This species of climber grows to 4 m and occurs in open grassy woodlands, moist creeklines and wetland, and in vine thickets on shale derived soils in the Cumberland Plain region of Western Sydney. Current records exist from St Marys, Prospect, Bankstown, Smithfield and Cabramatta Creek in NSW (DECCW 2009).	**Unlikely – no specimens recorded during survey** This species was not found to occur on the site, however may occur within the study area.
Melaleuca deanei	V	V	This species is a shrub to 3 m high, with fibrous papery bark. It occurs in two distinct areas, in the Ku-ring-gai / Berowra and Holsworthy/Wedderburn areas. There are also more isolated occurrences at Springwood in the Blue Mountains, Wollemi National Park, Yalwal (west of Nowra), and Central Coast (Hawkesbury River) areas. It grows on sandstone and flowers in summer (DECCW 2009).	**Unlikely – no specimens recorded during survey** This species was not found to occur on the site, however may occur within the study area.
Persoonia nutans	E	E	This species of shrub grows to 2.5 m occurs only on aeolian and alluvial sediments in sclerophyll forest and woodland vegetation communities. This species is restricted to the Cumberland Plain in western Sydney, between Richmond in the north and Macquarie Fields in the south with the largest populations occur in Agnes Banks Woodland or Castlereagh Scribbly Gum Woodland. Flowering occurs December to January, though may flower at any time of the year (DECCW 2009).	**Unlikely – no specimens recorded during survey** This species was not found to occur on the site, however may occur within the study area.
Pimelea spicata	E	E	This species of small spreading shrub occurs within undulating substrates derived from Wianamatta Shale on well-structured clay soils, within the Cumberland Plain and Illawarra regions. It is associated with Grey Box (Eucalyptus moluccana) and Ironbark (E. crebra, E. fibrosa) within the Cumberland Plain, and in Coast Banksia open woodland within the Illawarra regions (DECCW 2009).	**Unlikely – no specimens recorded during survey** This species was not found to occur on the site, however may occur within the study area.
Pomaderris brunnea	V	V	This species of shrub to 3 m grows in moist woodland and forest communities on clay and alluvial soils of flood plains and creek lines. It occurs in a restricted area near the Nepean and Hawkesbury Rivers in NSW, Walcha on the New England tablelands and in far eastern Gippsland in Victoria. Flowering occurs from September to October (DECCW 2009).	**Unlikely – no specimens recorded during survey** This species was not found to occur on the site, however may occur within the study area.

Common Name (Species Name)	TSC Act Status	EPBC Act Status	Habitat Association	Likelihood of being impacted
Pterostylis saxicola	E	E	A ground orchid with a slender stem to 35cm, restricted to western Sydney between Freemans Reach in the north and Picton in the south. There are very few known populations and they are all very small and isolated. Only one population occurs within a conservation reserve (Georges River National Park). Most commonly found growing in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines. The vegetation communities above the shelves where P. saxicola occurs are sclerophyll forest or woodland on shale/sandstone transition soils or shale soils (DECCW 2009).	**Unlikely – no specimens recorded during survey** This species was not found to occur on the site, however may occur within the study area.
Pultenaea parviflora	E	V	This species of small shrub is endemic to the Cumberland Plain, occurring mostly from Windsor to Penrith and to Deans Park, Kemps Creek, and Wilberforce. This species occurs in scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays. It also occurs in transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland. Flowering occurs between August and November with seed ripening in December. Seeds are hard coated and persistent in the soil seed bank (DECCW 2009).	**Unlikely – no specimens recorded during survey** This species was not found to occur on the site, however may occur within the study area.
Pultenaea pedunculata	E		This species of prostrate shrub grows to 20 cm high. It is found on clay or sandy clay soils on Wianamatta Shale, close to localised patches of tertiary alluvium, or on the shale / sandstone interface. In NSW it is represented by three disjunct populations, in the Cumberland Plains in Sydney, the coast between Tathra and Bermagui and the Windellama area south of Goulburn (where it is locally abundant). The species occurs in a range of habitats including woodland vegetation, road batters and coastal cliffs. It is largely confined to loamy soils in dry gullies in populations in the Windellama area (DECCW 2009).	**Unlikely – no specimens recorded during survey** This species was not found to occur on the site, however may occur within the study area.

Common Name (Species Name)	TSC Act Status	EPBC Act Status	Habitat Association	Likelihood of being impacted
FAUNA				
Australian Grayling (*Prototroctes maraena*)		V/M	This species of migratory fish inhabits estuarine waters and coastal seas as larvae/juveniles, and freshwater rivers and streams as adults. It occurs in coastal rivers and streams in South East New South Wales into Victoria and Tasmania. Most of their life is spent in freshwater rivers and streams in cool, clear waters with a gravel substrate and alternating pool and riffle zones, however can also occur in turbid water. The species can penetrate well inland, being recorded over 100 km inland from the sea. Larvae and juveniles inhabit estuaries and coastal seas, with an apparent obligatory marine stage (DSE 2007).	**Unlikely to occur** Suitable habitat may exist within the study area, however was largely absent from the site and surrounding area.
Australian Painted Snipe (*Rostratula australis*)	E	V/M	This bird is a wetland species with a scattered distribution in Australia. It occurs primarily along the east coast from north QLD to the Eyre Peninsular in SA excluding the majority of Victoria and NSW. This species is normally found in permanent or ephemeral shallow inland wetlands, either freshwater or brackish. This cryptic species nests on the ground amongst tall reed-like vegetation near water. It emerges from the dense growth at dusk to feed on mudflats and the water's edge taking insects, worm and seeds (DECCW 2009).This species prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	**Unlikely to occur** Suitable habitat may exist within the study area, however was largely absent from the site and surrounding area.
Black-faced Monarch (*Monarcha melanopsis*)		M	This species of bird usually inhabits dense gullies of rainforest, sclerophyll forests and eucalypt woodlands along the coastal regions from Victoria to Cape York and is migratory over much of its range (Slater et al. 1989).	**May occur on occasion but unlikely to be impacted** Suitable habitat may exist within the study area, however was largely absent from the site.

Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis gularis*)	V		This species is the largest of its genus, and is widespread, from the Tablelands of the Great Dividing Range to the northwest and central west plains of the Riverina. It is rarely recorded east of the Great Dividing Range, although regularly observed from the Richmond River district. It occupies mostly upper levels of drier open forest or woodlands dominated by Box and Ironbark eucalypts, as well as open forests of smooth-barked gums, stringybarks, ironbarks and tea-trees. This species usually occurs in pairs or is nomadic. It forages along twigs, branches, and trunks probing for insects. Nectar is taken from flowers and honeydew is gleaned from foliage. The Black-chinned Honeyeater nests high in the crown of a tree in the uppermost lateral branches (DECCW 2009).	**Unlikely to occur** Suitable habitat may exist within the study area, however only marginal habitat existed on the site and immediate surrounding area.
Broad-headed Snake (*Hoplocephalus bungaroides*)	E	V	This species of snake is nocturnal, sheltering in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter, and spring, moving to shelters in hollows of large trees within 200m of escarpments in summer. It feeds mostly on geckos and small skinks, as well as occasionally on frogs and small mammals. Threats include the removal of bushrock from sandstone escarpments, the intentional killing of snakes discovered during bushrock collecting or other outdoor activities, illegal collection of individuals by reptile collectors, removal of large hollow-bearing trees adjacent to sandstone escarpments, and damage to habitat by feral goats (DECCW 2009).	**Unlikely to occur** Suitable habitat may exist within the study area, however was largely absent from the site.
Brush-tailed Rock-wallaby (*Petrogale penicillata*)	E	V	This species is a relatively small and muscular wallaby that is rufous in colour with a characteristic long and bushy, dark rufous-brown tail. It also has a characteristic white cheek-stripe and a black stripe from its forehead to the back of its head. It is known from southeast QLD to the Grampians in western Victoria, roughly following the line of the great Dividing Range, although the distribution of the species has declined and become fragmented (DECCW 2009).	**Unlikely to occur** Suitable habitat may exist within the study area, however is unlikely to occur within the subject site due to the degraded nature of the remnant vegetation patches.
Bush Stone-curlew (*Burhinus grallarius*)	E		This species inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber. Largely nocturnal, being especially active on moonlit nights, it feed on insects and small vertebrates, such as frogs, lizards and snakes. Nests are on the ground in a scrape or small bare patch (DECCW 2009).	**Unlikely to occur** Suitable habitat may exist within the study area, however is unlikely to occur within the subject site due to the degraded nature of the remnant vegetation patches.

Cattle Egret (*Ardea ibis*)		M	This species of Migratory bird occurs in grasslands, woodlands, wetlands and pasture areas often seen with cattle and other animals. It makes shallow platform nests in wetland areas in surrounding trees and shrubs. They feed on grasshoppers and other invertebrates, frogs, lizards, and small mammals.	**Potential to occur but unlikely to be impacted** Suitable habitat may exist within the study area, however only marginal habitat existed on the site and immediate surrounding area.
Cumberland Plain Land Snail (*Meridolum corneovirens*)			This species of snail has a 25 - 30 mm diameter shell that may be any shade of brown, is always uniform in colour, and is more flattened and very thin and fragile than the common exotic garden snail. It is found primarily under litter of bark, leaves and logs, or in loose soil around grass clumps within Cumberland Plain Woodland - a grassy, open woodland with occasional dense patches of shrubs. It has also been found under rubbish. It occurs within a small area on the Cumberland Plain, from Richmond and Windsor to Picton and from Liverpool to the Hawkesbury and Nepean Rivers. It feeds on fungus, and does not eat green plants. During periods of drought this species can burrow into the soil to escape the dry conditions (DECCW 2009).	**Unlikely** Suitable habitat may exist within the study area, however only marginal habitat existed on the site and immediate surrounding area.
Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)	V		This species of bat inhabits moist forest generally with trees larger than 20 m and roosts in eucalypt hollows, underneath bark or in buildings. Diet consists of moths, beetles and other insects, which it collects within or just below the tree canopy. This species hibernates during winter and breeding takes place in late spring (DECCW 2009).	**Potential to occur but unlikely to be impacted** Suitable foraging and roosting habitat exists for this species within the site and immediate study area.
Eastern Freetail-bat (*Mormopterus norfolkensis*)	V		This species occurs in dry sclerophyll forest and woodland east of the Great Dividing Range and roosts primarily in tree hollows but also in man-made structures or under bark. This species is solitary and probably insectivorous (DECCW 2009).	**Potential to occur but unlikely to be impacted** Suitable foraging and roosting habitat exists for this species within the site and immediate study area.

Fork-tailed Swift (*Apus pacificus*)		M	This species of migratory bird breeds in the north-east and mid-east Asia and winters in Australia and southern New Guinea. It forages over open country and nests in cliffs and tall tress. Occasional mass movements occur and this species may spend nights on the wing (Pizzey and Knight 2003).	**Potential to occur but unlikely to be impacted** Suitable habitat may exist within the study area, however only marginal habitat existed on the site and immediate surrounding area.
Freckled Duck (*Stictonetta naevosa*)	V		This species prefers permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds. They generally rest in dense cover during the day, usually in deep water. They feed at dawn and dusk and at night on algae, seeds and vegetative parts of aquatic grasses and sedges and small invertebrates. Nesting usually occurs between October and December but can take place at other times when conditions are favourable and nests are usually located in dense vegetation at or near water level (DECCW 2009).	**Unlikely to occur** Potential habitat exists for this species within the immediate study area on suitable surrounding farm dams, however only marginal habitat for this species occurred on the subject site.
Gang-gang Cockatoo (*Callocephalon fimbriatum*)	V		This species is nomadic, spending summer in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests and winter at lower altitudes in drier more open eucalypt forest and woodlands, particularly in coastal areas. This species nests in hollow-bearing trees close to water with breeding taking place between October and January. Breeding usually occurs in tall mature sclerophyll forests that have a dense understorey, and occasionally in coastal forests (DECCW 2009).	**Unlikely to occur** Suitable habitat may exist within the study area, however only marginal habitat existed on the site and immediate surrounding area.

Giant Burrowing Frog (*Heleioporus australiacus*)	V	V	This species of frog ranges from south-eastern NSW through to Victoria and appears to exist as two distinct populations: The Northern population occurs on sandy soils supporting heath, woodland or open forest and has a marked preference for sandstone ridge top habitats and broader upland valleys along slow flowing to intermittent creek lines. It requires creeks and watercourses for breeding but spends drier months buried under deep leaf litter or sandy loose soil within vegetated areas. This species has been found occurring at considerable distance from suitable riparian breeding or other moist habitats, indicating an ability to move about freely. This species calls mainly in spring and autumn with calling bouts after rains in late summer (Anstis 2002), although may be sampled at any time of the year providing it is raining (Recsei 1996). Breeding takes place from August to march. It feeds on ground-dwelling invertebrates such as beetles, ants, and spiders (DECCW 2009).	**Unlikely to occur** Suitable habitat does not exist within the subject site, and is unlikely to occur within the study area due to the degraded nature of the remnant vegetation patches, and waterbodies.
Great Egret / White Egret (*Ardea alba*)		M	This species of wetland bird occurs in a variety of habitats including marshes, swamps, river margins, lake shorelines, flooded grasslands, sea-grass flats, mangrove swamps, coastal lagoons, and offshore coral reefs. Feeds in shallow to moderately deep water, on shore next to the water, or on dry ground primarily on fish, insects and shrimp. Other foods include frogs, lizards, snakes, small mammals, and small birds. Breeding occurs in early spring and summer, nesting in trees, bushes, bamboo, reeds and other plants near water and on islands.	**May occur on occasion but unlikely to be impacted** Suitable habitat may exist within the study area, however only marginal habitat existed on the site and immediate surrounding area.
Greater Broad-nosed Bat (*Scoteanax rueppellii*)	V		This species is a large bat that feed on slow-flying moths and beetles. It hunts from above rows of trees lining creeks and the edges of woodland in otherwise cleared paddocks, roosting in hollow tree trunks and branches as well as the roofs of old buildings (Churchill 1998). It inhabits a variety of habitats ranging from moist and dry eucalypt forest and rainforest to tall wet forest, however tends to prefers moist gullies in mature coastal forest or rainforest from the Atherton Tablelands in north QLD, along the coastal regions to southern NSW. The species is only found at low altitudes (below 500 m) (Churchill 1998; DEC 2006). Reproduction takes place in January at maternal roosting sites (DECCW 2009).	**Potential to occur but unlikely to be impacted** Suitable foraging and roosting habitat exists for this species within the site and immediate study area.

Green and Golden Bell Frog (*Litoria aurea*)	E	V	This species inhabits marshes, natural and artificial freshwater to brackish wetlands, dams and instream wetlands. It prefers sites containing bullrushes (Typha spp.) or spikerushes (Eleocharis spp.), which are unshaded and have a grassy area and/or rubble as shelter/refuge habitat nearby. They are active by day and breed during the summer months (DECCW 2009).Plague Minnow (Gambusia holbrooki) is a key threatening process as they feed on green and Golden Bell Frog eggs and tadpoles. DECC have a recovery plan for this species.	**Unlikely to occur** Suitable habitat is unlikely to exist within the study area, and it is unlikely to occur within the subject site due to the degraded nature of Bunbury Currans Creek.
Grey-headed Flying-fox (*Pteropus poliocephalus*)	V	V	This species roosts in camps generally located within 20 km of a regular food source and are commonly found in gullies, close to water and in vegetation with a dense canopy. This species is known to forage in areas supporting subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps on the nectar and pollen of native trees, in particular eucalypts, melaleucas and banksias. Grey-headed Flying-Fox show a regular pattern of seasonal movement with much of the population moving to northern NSW and QLD during May and June where they exploit the winter flowering trees such as Swamp Mahogany, Forest red gum and Paperbark (NSW Scientific Committee 2004). This species will also forage in urban gardens and cultivated fruit crops (DECCW 2009).	**May occur on occasion but unlikely to be impacted** Suitable habitat may exist within forested areas and along the creek line within the study area, however only marginal foraging habitat for this species was found to occur within the subject site.
Growling Grass Frog / Southern Bell Frog (*Litoria raniformis*)	E	V	This species is usually found in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. They are also found in irrigated rice crops, particularly where there is no available natural habitat. Currently, the species is known to exist only in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria (DECCW 2009).	**Unlikely to occur** Highly unlikely to occur in the study area or subject site. No recent records of this species occur within the Sydney Basin Bioregion. No suitable habitat within the subject site.

Koala (*Phascolarctos cinereus*)	V		The Koala is protected under SEPP 44, which aims to conserve habitat within its current distribution. The Koala has a fragmented distribution throughout eastern Australia. It is limited to areas of preferred feed trees in eucalypt woodlands and forests. Along the coastal fringe these areas are becoming more fragmented and isolated due to urbanisation. Koalas are generally inactive for 20 hours a day, with activity peaking just after sunset when they begin to forage (Martin and Handasyde 1995). The size of their home range varies depending on the quality of habitat, ranging from less than 2 ha to several hundred hectares in size. Females breed at two years of age and produce one young per year (DECCW 2009).NPWS have developed a draft Recovery Plan for this species.	**Unlikely to occur** Suitable foraging habitat exists within the study area, however was not found to occur within the subject site. The highly fragmented remnants are unlikely to support this species. No scats or characteristic scratches were recorded within the subject site.
Large-eared Pied Bat (*Chalinolobus dwyeri*)	V	V	This species is distributed between southeastern QLD to NSW from the coast to the western slopes of the divide. This species roosts in caves and mines and has been most commonly recorded from dry sclerophyll forests and woodlands. C. dwyeri is an insectivorous species that flies relatively slowly over the canopy or along creek beds (Churchill 1998).	**Unlikely to occur** Suitable habitat may exist within the broader study area, however only limited habitat for this species was found to occur within the subject site.
Large-footed Myotis (*Myotis adversus*)	V		Primarily a coastal species that forages over streams and watercourses feeding on fish and insects which it catches by raking its feet across the water surface. Breeding takes place during November or December, roosting in a variety of habitats including caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage (DECCW 2009).	**Potential to occur but unlikely to be impacted** Suitable foraging and roosting habitat exists for this species within the site and immediate study area.
Latham's Snipe / Japanese Snipe (*Gallinago hardwickii*)		M	This species of medium sized wading bird occurs in permanent and ephemeral wetlands up to 2000 m above sea-level, usually inhabiting open, freshwater wetlands with low, dense vegetation such as swamps, flooded grasslands or heathlands, around bogs and other water bodies. This species can also occur in habitats with saline or brackish water and in modified or artificial habitats. It feeds in mud, either exposed or in very shallow water with low, dense vegetation. Roosting occurs on the ground near or in foraging areas beside or under clumps of vegetation, among dense tea-tree, in forests, in drainage ditches or plough marks, among boulders, or in shallow water if cover is unavailable. They feed on a variety of seeds, plant material, and insects (DECCW 2009).	**Unlikely to occur** Marginal habitat may exist for this species within the immediate study area on suitable surrounding farm dams, however it is deemed unlikely this species would occur within the site.

Littlejohn's Tree Frog (*Litora littlejohni*)	V	V	Littlejohn's Tree Frog has a distribution that includes the plateaus and eastern slopes of the Great Dividing Range from Watagan State Forest (90 km north of Sydney) south to Buchan in Victoria. It occurs along permanent rocky streams with thick fringing vegetation associated with eucalypt woodlands and heaths among sandstone outcrops, hunting either in shrubs or on the ground. Breeding is triggered by heavy rain and can occur from late winter to autumn, but is most likely to occur in spring when conditions are favourable. Males call from low vegetation close to slow flowing pools and eggs are laid in loose gelatinous masses attached to small submerged twigs. Eggs and tadpoles are mostly found in slow flowing pools that receive extended exposure to sunlight, but will also use temporary isolated pools (DECCW 2009).	**Unlikely to occur** Suitable habitat may exist within the study area, however was not found to occur within the subject site due to the degraded nature of Bunbury Currans Creek within the subject site.
Long-nosed Potoroo (*Potorus tridactylus tridactylus*)	V	V	This species of small mammal is generally restricted to areas with high annual rainfall, inhabiting coastal heath and dry and wet sclerophyll forests. Its major habitat requirement is relatively thick ground cover with occasional open areas and may consist of grass trees, sedges, ferns or heath, or low shrubs of tea-trees and Melaleucas where soil is light and sandy. It feeds on the fruiting bodies of underground-fruiting fungi, roots, tubers, insects and their larvae, and other soft-bodied animals in the soil. Breeding occurs biannually in late winter / early spring and in late summer, with one young being reared (Johnston 1995). In NSW it is generally restricted to coastal heaths and forests east of the Great Dividing Range, with a n annual rainfall exceeding 760 mm (DECCW 2009).	**Unlikely to occur** Suitable habitat may exist within the study area, however was not found to occur within the subject site.
Macquarie Perch (*Macquaria australasica*)	V		This species of freshwater fish inhabits river and lake habitats, especially the upper reaches of rivers and their tributaries. Spawning occurs in spring and summer in shallow upland streams or flowing sections of river systems. This species is found in the upper reaches of the Lachlan, Murrumbidgee and Murray Rivers, and in parts of the Hawkesbury and Shoalhaven catchment areas (DECCW 2009).	**Unlikely to occur** Suitable habitat may exist within the study area, however was not found to occur within the subject site.

Painted Snipe (*Rostratula benghalensis*)	E	V, M	Normally found in permanent or ephemeral shallow inland wetlands, either freshwater or brackish. This cryptic species nests on the ground amongst tall reed-like vegetation near water. It emerges from the dense growth at dusk to feed on mudflats and the water's edge taking insects, worm and seeds (DECCW 2009).This species prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	**Unlikely to occur** Potential habitat exists for this species within the immediate study area on suitable surrounding farm dams, however only marginal habitat for this species occurred on the subject site.
Powerful Owl (*Ninox strenua*)	V		This species is a nocturnal, solitary and sedentary species. They occur in a number of vegetation types ranging from woodland and open sclerophyll forest to tall open wet forest and rainforest. However, this species does prefer large tracts of vegetation. Powerful Owls nest in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old with breeding taking place from late summer to late autumn. Pairs of Powerful Owls are believed to have high fidelity to a small number of hollow-bearing nest trees and will defend a large home range of 400 - 1,450 ha. It forages within open and closed woodlands as well as open areas (DEC 2006). This Owl has a variety of vocal calls and is known to 'dawn call' when returning from its night hunting activities to mark the position of its daytime roost (Parks Victoria 2003).	**Unlikely to occur** Suitable habitat may exist within the study area, however only marginal habitat existed on the site and immediate surrounding area.
Rainbow Bee-eater (*Merops ornatus*)		M	This species of small bird occurs in a variety of habitat but seems to prefer open forests and woodlands, shrublands, and various cleared or semi-cleared habitats, including farmland and areas of human habitation often located close to permanent water. It also occurs in inland and coastal sand dune systems, and in mangroves in northern Australia, and has been recorded in heathland, sedgeland, vine forest and vine thicket, and on beaches. Breeding occurs from August to January, nesting in enlarged chambers at the end of long burrow or tunnel excavated by both sexes in flat or sloping ground, in the banks of rivers, creeks or dams, in roadside cuttings, in the walls of gravel pits or quarries, in mounds of gravel, or in cliff-faces. Nest sites are often re-used. This species primarily feeds on insects including bees, wasps, beetles, moths, butterflies, damselflies, dragonflies, flies, ants and bugs, and will occasionally eat earthworms, spiders and tadpoles. This species migrates north for the winter months within Australia after breeding has occurred (DPI 2007).	**Potential to occur but unlikely to be impacted** Suitable habitat may exist within the study area, however only marginal habitat existed on the site and immediate surrounding area.

Red Crowned Toadlet (*Pseudophryne australis*)	V		This species occurs in open forest, mostly on Hawkesbury and Narrabeen Sandstones. It inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or capping, sheltering under rocks and amongst masses of dense vegetation or thick pile of leaf litter. Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters, and eggs are laid in moist leaf litter, from where they are washed by heavy rain. This species will disperse outside the breeding period, when they are found under rocks and logs on sandstone ridges and forage amongst leaf litter (DECCW 2009).	**Unlikely to occur** Suitable habitat may exist within the broader study area, however only limited habitat for this species was found to occur within the subject site.
Regent Honeyeater (*Xanthomyza phrygia*)	E	E	This species is a semi-nomadic species that inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River She-oak where there are significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. Every few years non-breeding flocks are seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests, particularly on the central coast and occasionally on the upper north coast (DECCW 2009).	**Unlikely to occur** Suitable foraging habitat may exist for this species within the immediate study area along timbered watercourses, however only marginal habitat for this species occurs within the subject site.
Rufous Fantail (*Rhipidura rufifrons*)		M	This species is a breeding migrant to southeast Australia during July to December, wintering in Papua New Guinea. It prefers wetter eucalypt forests, gullies, coastal scrub, watercourses, and rainforests where it feeds of insects. Occasional reports have this species utilising parks and gardens during migration (Pizzey & Knight 1998).	**Potential to occur but unlikely to be impacted** Suitable habitat may exist within the study area along timbered watercourses and larger forested areas, however only limited habitat for this species was found to occur within the subject site.
Satin Flycatcher (*Myiagra cyanoleuca*)		M	This is a migratory species which breeds around the Calliope Ranges in QLD southward to Tasmania during September / October to January / February before migrating north to southern and eastern Papua New Guinea and adjacent islands over winter (Readers Digest 1993). It prefers heavily vegetated gullies in forests, tall woodlands and during migration, coastal forests, woodlands, mangroves, trees in open country, and even gardens (Pizzey & Knight 1998).	**Potential to occur but unlikely to be impacted** Suitable habitat may exist within the study area, however only marginal habitat existed on the site and immediate surrounding area.

Speckled Warbler (*Pyrrholaemus sagittatus)*	V		This species lives in a wide range of *Eucalyptus* dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat includes an open canopy with a sparse shrub layer and scattered native tussock grasses. This species requires large areas of undisturbed remnants to persist in an area (DECCW 2009).	**Unlikely to occur** Suitable habitat may exist within the broader study area, however due to the fractured nature of the surrounding native vegetation, only limited habitat for this species was found to occur within the subject site.
Spotted-tailed Quoll (*Dasyurus maculatus*)	V	E	This species is a carnivorous marsupial that is largely nocturnal but opportunistically hunts prey during the day. It inhabits a range of environments including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Den sites are found in hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces. Females occupy home ranges of up to 750 ha and males up to 3,500 ha, which are usually traversed along densely vegetated creek lines (DECCW 2009).	**Unlikely to occur** Suitable habitat may exist within the broader study area, however only limited habitat for this species was found to occur within the subject site.
Square-tailed Kite (*Lophoictinia isura*)	V		Although this species shows a preference for timbered watercourses, they have been found in a variety of habitats including woodlands and open forests. It appears to occupy large hunting grounds and breeds from July - February with nests generally located along of near watercourses. It is a solitary bird, and a specialised predator, taking small passerines, especially honeyeaters and their eggs and nestlings as well as large insects in the tree canopy. It generally hunts low over open forest, woodlands and mallee communities, heaths, and other low scrubby habitats that are rich in passerines. This species prefers a structurally diverse landscape with a broad range of habitats and appears to utilise a large range greater than 100 km2 (DECCW 2009).	**Unlikely to occur** Suitable foraging habitat may exist within the study area along timbered watercourses, however only limited habitat for this species was found to occur within the subject site.
Swift Parrot (*Lathamus discolor*)	E	E	This species is migratory, travelling to the mainland from March to October to forage on winter flowering eucalypts and lerps. While on the mainland, it mostly occurs in the southeast, with records of the species spread approximately between Adelaide and Brisbane. Breeding takes place in Tasmania from September to January. Fragmentation and land clearing for agricultural, urban, and coastal development has resulted in the restriction of the range and distribution of the species (DECCW 2009).	**Unlikely to occur** Suitable habitat may exist within the study area, however only marginal habitat existed on the site and immediate surrounding area.

White-bellied Sea Eagle (*Haliaeetus leucogaster*)		M	This species of large bird occurs along the coastline of Australia and also range inland over large rivers and wetlands, favouring forested coasts and forested margins of inland waterways. Nests are usually near water, in tall live or dead trees or on remote coastal cliffs. River Red Gum (Eucalyptus camaldulensis), Forest Red Gum (E. tereticornis) and Southern Mahogany (E. botryoides) are commonly used as nest trees (Emison & Bilney 1982). On islands free of predators, nests may be close to the ground in shrubs or rocky platforms (Marchant & Higgins 1993)	**Unlikely to occur** Suitable habitat exists within the study area, however only limited habitat for this species was found to occur within the subject site.
White-throated Needletail (*Hirundapus caudacutus*)		M	This species of migratory bird migrates from Siberia, the Himalayas, and Japan to Australia in Summer, arriving mid-October and departing mid-April. It is known to inhabit a variety if habitats including forests, woodlands, farmlands, plains, lakes, coasts and towns (Pizzey and Knight 1999). The White-throated Needletail nests in tree hollows and feeds on insects during flight, chiefly ahead of weather changes. In Australia this species is nomadic, responding to local weather changes (Readers Digest 1993).	**Potential to occur but unlikely to be impacted** Suitable habitat may exist within the study area, however only marginal habitat existed on the site and immediate surrounding area.
Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)	V		This species of insectivorous bat forages across a range of habitats including those with and without trees, from wet and dry sclerophyll forest, open woodland, Acacia shrubland, mallee, grasslands and desert. This species roosts in tree hollows and buildings and in areas where trees are scarce or absent, and has been known to utilise mammal burrows. Breeding takes place between December and mid-March (DECCW 2009).	**Potential to occur but unlikely to be impacted** Previous records of this species are known from the immediate study area. Suitable foraging and roosting habitat exists for this species within the site and immediate study area.

Appendix B

Flora and Fauna Lists

Table 4 Flora and fauna species recorded within the study area

Family	Botanical Name	Common Name
FLORA		
ACLEPIADACEAE	*Gomphocarpus fruticosus**	Cotton Bush
APIACEAE	*Foeniculum vulgare**	Fennel
APOCYNACEAE	*Araujia hortorum**	Moth Vine
ASPARAGACEAE	*Asparagus asparagoides**	Bridal Creeper
ASTERACEAE	*Bidens pilosa**	Cobbler's Pegs
	*Hypochoeris radicata**	Catsear
	*Onopordum acanthium**	Scotch thistle
	*Senecio madagascariensis**	Fireweed
	*Taraxacum officinale**	Dandelion
	*Conyza sp.**	Flea Bane
BORAGINACEAE	*Echium plantagineum**	Paterson's Curse
BRASSICACEAE	*Cardamine paucijuga**	Flick weed
CARYOPHYLLACEAE	*Stellaria media**	Chickweed
CASUARINACEAE	*Casuarina glauca*	Swamp She-oak
CHENOPODIACEAE	*Einadia trigonis*	
	Einadia polygonoides	
CONVOLVULACEAE	*Dichondra repens*	Kidney Weed
CYPERACEAE	*Carex appressa*	Tussock Sedge
	Cyperus brevifolius	Mullumbimby Couch
FABACEAE	*Indigofera australis*	
	Glycine clandestina	Twining Glycine
	Glycine microphylla	
	Hardenbergia violacea	False Sarsaparilla
	*Trifolium repens**	White Clover
JUNCACEAE	*Juncus usitatus*	Common Rush
LOBELIACEAE	*Pratia purpurescens*	White root
MALVACEAE	*Malva parviflora**	Marshmallow
	*Sida rhombifolia**	Paddy's Lucerne
MIMOSOIDEAE	*Acacia baileyana**	Cootamundra wattle
	Acacia falcata	Sickle-leaved Wattle
	Acacia decurrens	Sydney Green Wattle

	Acacia implexa	Hickory
MYRTACEAE	*Angophora subvelutina*	Broad-leaved Apple
	Calistemon salignus	Willow Bottlebrush
	Eucalyptus tereticornis	Forest Red Gum
	Eucalyptus moluccana	Grey Box
	Eucalyptus crebra	Narrow-leaved Ironbark
OLEACEAE	*Ligustrum lucidum**	Large-leaved Privet
	*Ligustrum sinense**	Small-leaved Privet
	*Olea europaea spp Africana**	African Olive
OXALIDACEAE	*Oxalis pes-capre**	Oxalis
PHYTOLACCACEAE	*Phytolacca octandra**	Ink Weed
PITTOSPORACEAE	*Bursaria spinosa*	Blackthorn
PLANTAGINACEAE	*Plantago lanceolata**	Ribwort
POACEAE	*Aristida ramosa*	Wire grass
	*Avena fatua**	Wild Oats
	*Chloris gayana**	Rhodes Grass
	Cynodon dactylon	Couch grass
	Austraidanthonia sp.	A Wallaby Grass
	*Eragrostis curvula**	African lovegrass
	Microlaena stipoides	Weeping rice-grass
	*Nassella neesiana**	Chilean Needle grass
	*Paspalum dilatatum**	Paspalum
	*Pennisetum clandestinum**	Kikuyu
	*Setaria sp.**	Pigeon Grass
	*Sporobolus africanus**	Weed Sporobolus
	Themeda australis	Kangaroo Grass
POLYGONACEAE	*Rumex crispus**	Curled Dock
PRIMULACEAE	*Anagallis arvenssi**	Scarlet Pimpernel
PROTEACEAE	*Grevillea robusta*	Silky Oak
RANUNCULACEAE	*Clematis aristata*	Old Man's Beard
ROASACEAE	*Cotoneaster frigidus**	Cotoneaster
	*Rubus fruticosus**	Blackberry
SCHIZAECEAE	*Cheilanthes sieberi*	Mulga fern
SOLANACEAE	*Lycium feroissimum**	African Boxthorn
	*Solanum nigrum**	Deadly Nightshade

	*Solanum mauritianum**	Wild tobacco
TYPHACEAE	*Typha orientalis*	Bull Rush
URTICACEAE	*Urtica incisa*	Stinging Nettle
VERBENACEAE	*Lantana camara**	Lantana
	*Verbena bonariensis**	Purple Top

FAUNA

Scientific name	**Common name**
Reptiles	
Pseudechis porphriacus	Red-bellied Black Snake
Birds	
Anas castanea	Chestnut Teal
Anas superciliosa	Pacific Black Duck
Aythya australis	Hardhead
Chenonetta jubata	Australian Wood-duck
Tachybaptus novaehollandiae	Australasian Grebe
Phalacrocorax varius	Pied Cormorant
Threskiornis molucca	Australian White Ibis
Elanus axillaris	Black-shouldered Kite
Fulica atra	Eurasian Coot
Gallinula tenebrosa	Dusky Moorehen
Porphyrio porphyrio	Purple Swamp Hen
Vanellus miles	Masked Lapwing
Ocyphaps lophotes	Crested Pigeon
Cacatua roseicapilla	Galah
Cacatua sanguinea	Little Corella
Psephotus haematonotus	Red-rumped Parrot
Trichoglosus haematodus	Rainbow Lorikeet
Malurus cyaneus	Superb Fairy-wren
Pardalotus striatus	Striated Pardalote
Acanthiza pusilla	Brown Thornbill
Anthochaera carunculata	Red Wattlebird
Manorina melanocephala	Noisy Miner
Rhipidura fuliginosa	Grey Fantail

FAUNA

Scientific name	**Common name**
Rhipidura leucophrys	Willie Wagtail
Coracina novaehollandidae	Black-faced Cuckoo- shrike
Grallina cyanoleuca	Australian Magpie-lark
Gymnorhina tibicen	Australian Magpie
Corvus coronoides	Australian Raven
Neochmia phaeton	Red-browed Finch
*Sturnus vulgaris**	Common Starling
*Acridotheres tristis**	Common Mynah
*Turdus merula**	Common Blackbird
Mammals	
*Oyryctolagus cuniculus**	Rabbits
*Equus callabus**	Domestic Horse
# = THREATENED SPECIES LISTED UNDER NSW *TSC* or COMMONWEALTH *EPBC Act*	
* = INTRODUCED SPECIES	

Appendix C

State Assessment of Significance

Assessment of significance

An assessment of significance has been carried out for three endangered ecological communities with respect to the criteria contained within Section 5A(2) of the NSW EPA Act: It has been assumed that all measures of mitigation and avoidance outlined in section 5 will be incorporated in the re-design of the truck stop when undertaking these assessments of significance.

Endangered Ecological Communities

- Cumberland Plain Woodlands;
- Swamp Oak Forest;
- River Flat Eucalypt Forest on Coastal Floodplains;

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

N/A

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

N/A

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

> **(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
>
> **(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**

Cumberland Plain Woodland, Swamp Oak Floodplain Forest, and River Flat Eucalypt Forest on Coastal Floodplains all occur within the subject site and will be both directly and indirectly impacted as a result of the proposal. These EEC's occur within a highly modified environment.

Two small isolated stands and a linear strip of modified or highly modified Cumberland Plain Woodland (CPW) will be removed or indirectly impacted upon as a result of this proposal. These stands vary in condition, however all show varying levels of disturbance and all have moderate to high weed infestation. This EEC is also present within adjacent lands as isolated and larger modified stands. It is recommended that appropriate mitigation measures be put in place to ensure direct or indirect impacts on areas of this community along the northern edge of the proposed truck stop and along the acceleration lane to avoid impacts into these adjacent areas as much as possible. It has also been recommended that any areas of this community that cannot be avoided should be offset through appropriate revegetation, and weed control and revegetation undertaken in areas of this EEC to be retained.

A moderate stand of River Flat Eucalypt Forest (RFEF) occurs along Bunbury Currans Creek and adjacent land within the road verge. This stand contains good canopy cover in parts, however has moderate weed infestation and is in a disturbed state. The northern section of this stand will be completely removed with a smaller section on the southern side of the creek also removed or indirectly impacted as a result of the proposed works. Proposed mitigation measures including minimising the impacts of clearing into this EEC as much as possible,

with offset measures put in place for vegetation loss that cannot be avoided for this community, and as a larger, more intact version of this vegetation community also occurs on the northern extent of Bunbury Currans Creek, adjacent to the site, the loss of this patch of RFEF is unlikely to place this EEC at risk of local extinction.

Three small stands of regrowth and mature Swamp She-Oak that conform to a highly degraded form of Swamp Oak Floodplain Forest will be removed from the site. These stands are highly modified or immature, and occur as very tiny isolated stands. The proposal will result in the loss of these two stands. Given this community is in a highly degraded state and as the species present (predominately Swamp She-Oak) also occurs within River Flat Eucalypt Forest, it is deemed that this community will not be further placed at risk of local extinction as a result of this proposal.

Based on the above considerations it si concluded that the removal of some stands of native vegetation that conform to modified versions of the three endangered ecological communities is unlikely to have an adverse effect on the extent or substantially modify the composition of these communities such that their local occurrence is likely to be placed at risk of extinction.

Two of these EEC's – Cumberland Plain Woodland and River Flat Eucalypt Forest - are well represented within the immediate locality including areas adjacent to the impact zone within the study area, as well as the adjacent creek line and other surrounding nearby bushland areas. The numbers of individual stems to be either removed or impacted upon as a result of this proposal will not result in the EEC's within the study area being placed at risk of extinction.

(d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

The proposed activity is to occur within areas already predominately cleared of native vegetation and comprising mostly exotic grasses and weed species, with the removal of relatively small and isolated stands of vegetation. Also, larger stands of at least two of the three EEC's occur in the surrounding area.

Only small stands of predominately immature and semi mature highly modified regrowth trees, shrubs and groundcovers are likely to be directly impacted or cleared as a result of this proposal. Consequently most of the vegetation to be cleared comprises a mixture of exotic and native grasses, and exotic weeds with only minor clearance of isolated stands of native regrowth to be impacted upon or cleared as a result of this proposal. It has been recommended that any losses to EEC's within the site be offset through revegetation and regeneration of appropriate species along Bunbury Currans Creek and the northern acceleration lane.

If appropriate mitigation measures to avoid impacts on adjacent areas of native vegetation and the removal of hollow-bearing trees, then it is deemed that no significant vegetation or habitat will be removed or modified or become more isolated from other areas of known habitat as a result of the proposed activity. As such the long-term survival of these ecological communities in the locality is unlikely to be significantly affected by the proposal.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No declared critical habitat has been identified within the study area.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

Cumberland Plain Woodland has a draft recovery plan in place which looks to protect against losses of this community. The proposed activity has the potential to impact on this ecological community, and thus has the potential to have an adverse effect on the recovery of this community. However, if current maximum levels of proposed clearing are not changed, and appropriate mitigation measures to avoid impacts into stands of this community are implemented, then the proposal is unlikely to further impact on any draft recovery actions or the proposed priority actions for recovery of this EEC due to the modified, small, isolated and linear nature of the stands of this community to be removed or impacted. Furthermore, recommended regeneration to provide an offset for the loss of CPW from the site is in line with recovery plans for this community.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

There are currently 30 Key threatening processes (KTP's) listed under the TSC Act. Three of these are potentially relevant to this proposal.

CLEARANCE OF NATIVE VEGETATION: Small areas of native vegetation constituting endangered ecological communities will be removed as a result of the proposed activity. The areas to be removed are both recent and older regrowth and some mature stands, and occur within an already modified landscape. The loss of these patches of vegetation will result in the removal of small whole or partial stands of modified endangered ecological communities. However due to the highly fragmented nature of the stands, and the relative small size of the stands to be removed, the loss of this vegetation is unlikely to contribute to this KTP in a significant way.

LOSS OF HOLLOW-BEARING TREES: The removal of a small number of potential roosting habitat for threatened species occurring in the area may occur through the loss of a small number of hollow-bearing trees from the site. If appropriate mitigation measures are put in place to minimise the further loss of hollow-bearing trees in areas adjacent to the proposed development, including the strategic avoidance of hollow-bearing trees along the acceleration and deceleration lanes, then it is unlikely that this proposal will significantly contribute to this KTP.

SPREAD OF NOXIOUS WEEDS: The site and surrounding vegetation contains moderate to high densities of noxious weeds. Proposed construction and earth works could result in the further spread of these weeds across the landscape, by further disturbing native vegetation on and adjacent to the site, and by moving earth across the landscape. Any earth to be removed from the site should be disposed of in an appropriate manner in line with Council rules, and the spread of weeds across the site should be avoided by the constrained use of vehicles on the site and within surrounding vegetation. All unnecessary impacts on adjacent vegetation should also be avoided, in particular through areas of endangered ecological communities along the creek line and to the north of the acceleration lane. If these mitigation measures are maintained, it is unlikely that the proposal will significantly contribute to this KTP.

Summary:

Clearing of isolated and linear stands of modified, highly modified or regrowth native vegetation, comprising vegetation representative of Cumberland Plain Woodland, Swamp Oak Floodplain Forest, and River Flat Eucalypt Forest on Coastal Floodplains EECs, is required along the Bunbury Currans Creek, the road verge, and within the proposed truck stop area as part of the proposed activity. Mitigation measures have been recommended to reduce potential impacts on these EECs and surrounding vegetation.

If current levels of maximum clearing are not exceeded, and appropriate mitigation measures to minimise direct and indirect impacts on areas of adjacent EECs and the removal of hollow-bearing trees are implemented, it is considered the proposed activity will have not have a significant impact on EECs within the study area and therefore a Species Impact Statement is not required.

Appendix D

EPBC Assessment of Significance

Cumberland Plain Woodland as assessed under the EPBC Act

a) Will the action reduce the extent of the ecological community?

Two small isolated stands and a linear strip of modified or highly modified Cumberland Plain Woodland (CPW) will be removed or indirectly impacted upon as a result of this proposal. These stands vary in condition, however all show varying levels of disturbance and all have moderate to high weed infestation. This EEC is also present within adjacent lands as isolated and larger modified stands.

It is recommended that appropriate mitigation measures be put in place to ensure direct or indirect impacts on areas of this community along the northern edge of the proposed truck stop and along the acceleration lane to avoid impacts into these adjacent areas as much as possible. It has also been recommended that any areas of this community that cannot be avoided should be offset through appropriate revegetation, and weed control and revegetation undertaken in areas of this EEC to be retained.

Therefore it is considered unlikely that the action will reduce the extent of the Cumberland Plain Woodland found within the study area or locality to any measurable extent.

b) Will the action fragment or increase fragmentation of an ecological community?

The proposal is unlikely to further fragment this community as the stands to be removed are already small and occur on the edge of an already fragmented landscape.

c) Will the action adversely affect habitat critical to the survival of the ecological community?

The proposal will not adversely affect habitat critical to the survival of the endangered ecological community, as the areas to be cleared fall within a previously cleared or modified road easement and within cleared and heavily grazed paddocks that are currently in a modified or highly modified form. It is recommended that any vegetation lost from this community as a result of the proposal be replaced by appropriate offsetting through revegetation.

d) Will the action modify or destroy abiotic factors necessary for an ecological community's survival, including reduction in ground water level, or substantial alteration of surface water drainage patterns?

The proposal is unlikely to modify or destroy abiotic factors necessary for the community's survival, and will not reduce ground water levels or substantially alter surface water drainage. Changes to soil, ground cover and water regimes will only be temporary. Mitigation measures will be implemented to reduce the likelihood of these effects including sedimentation fencing, revegetation of areas directly impacted upon by the proposal, and the replacement of any cleared native vegetation.

e) Will the action cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, eg regular mowing, burning or harvesting?

The current proposal falls within a modified landscape subject to grazing and road easement. If appropriate mitigation measures are put in place including the minimising of impacts into this community along the acceleration lane and within adjacent land, then the area of impact into this community will be relatively small, and only indirect impacts may affect areas of adjacent Cumberland Plain Woodland. Due to the existing modified and weedy nature of the stands of this community within the subject site, the proposal is unlikely to cause a substantial change in species composition causing the loss or decline of functionally important species.

f) Will the action cause a substantial reduction in the quality or integrity of an occurrence of an ecological community including but not limited to:

- ***Assisting invasive species that are harmful to the ecological community to become established;***
- ***Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community; or***
- ***Interfere with the recovery of an ecological community.***

The action is unlikely to cause a substantial reduction in the quality or integrity of an occurrence of the Cumberland Plain Woodland in the study area or locality. The existing areas of Cumberland Plain Woodland contain high numbers of weeds, including some infestations of noxious weeds. If appropriate mitigation measures are put n place to avoid impacts into this community, and the mitigate against the spread of noxious weds across the site, as well as weed control and revegetation measures within remaining areas of this community an revegetation areas, then it is deemed the proposal is unlikely to cause a substantial detriment to the quality or integrity of the community. Sediment fencing and other measures will be implemented to help prevent the spread of weeds into nearby bushland. A noxious weed control program has been recommended along with a weed management plan for the site in order to reduce the further potential impacts of weed encroachment into surrounding native vegetation and waterways.

Conclusion

The removal of these small and isolated remnants of highly derived CPW is unlikely to significantly impact this EEC in the locality. Moreover, if appropriate mitigation measures to minimise direct and indirect impacts into areas of adjacent native vegetation and the removal of hollow-bearing trees, it is considered the proposed activities will have no significant on CPW therefore a referral to the Minister of the Environment is not required.

GHD

10 Bond Street Sydney NSW 2000

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T: 2 9239 7100 F: 2 9239 7199 E: sydmail@ghd.com.au

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		Name	Signature	Name	Signature	Date
1	Skye Rivett	B. Ryan	*B. Ryan*			
2	Skye Rivett	Jayne Tipping	*Jayne Tipping*			2/10/09

Appendix C

Noise assessment

RENZO TONIN & ASSOCIATES
inspired to achieve

Consultants in Acoustics, Vibration & Structural Dynamics
email: sydney@renzotonin.com.au
website: www.renzotonin.com.au

F5 FREEWAY: VARROVILLE TRUCK REST AREA OPERATIONAL AND CONSTRUCTION NOISE AND VIBRATION IMPACT ASSESSMENT

TE384-01F02 (REV 5) TRUCK REST AREA OPERATIONAL & CONSTRUCTION N&V ASSESSMENT.DOC

18 AUGUST 2009

Prepared for:

Roads and Traffic Authority

Project Development Manager

Infrastructure Development

Attention: Mr Jim Campbell

25 1982-2007 ACOUSTIC ENGINEERING EXCELLENCE

AAAC Member of the Association of Australian Acoustical Consultants

Sydney (Head Office)
Renzo Tonin & Associates (NSW) Pty Ltd
ABN 29 117 462 861
1/418A Elizabeth St., SURRY HILLS, NSW 2010
PO Box 877 STRAWBERRY HILLS, NSW 2012
Ph (02) 8218 0500 Fax (02) 8218 0501

Melbourne
Brisbane
Gold Coast
Kuwait

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CONTENTS

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1 INTRODUCTION

Renzo Tonin & Associates were engaged by the NSW Roads and Traffic Authority to conduct an environmental noise and vibration assessment for the proposed truck rest area at Varroville as a part of the widening project of the F5 Freeway between Brooks Road, Ingleburn and Narellan Road, Menangle. More specifically, this report quantifies potential impacts from the site's operation and construction associated with the proposed truck rest area and assesses the potential noise and vibration impacts on residential premises close to the site.

This report summarises the results of long-term noise monitoring undertaken at potentially affected residential premises near the site to determine existing background and ambient noise.

Noise sources related to the construction of the truck rest area were identified and noise emissions were calculated at the potentially most affected residential premises. Similarly, noise sources related to the operation of the site were identified and noise emissions were modelled to the potentially most affected neighbouring premises using well recognised and accepted noise modelling software. Noise modelling took into account the source of the activity, the locations, orientations and directivity of the noise sources, ground topography, shielding provided by buildings and structures, distance and air absorption.

Noise emissions are assessed against the relevant noise criteria in accordance with the requirements of the NSW Department of Environment and Climate Change (DECC, formerly EPA) as follows:

Operational Noise:

- NSW Industrial Noise Policy (INP)
- NSW Environmental Criteria for Road Traffic Noise (ECRTN)

Construction Noise:

- Draft Construction Noise Guideline (CNG)
- Environmental Noise Control Manual (ENCM)

Vibration impacts during construction are also assessed herein against the relevant vibration criteria in accordance with the requirements of the NSW Department of Environment and Climate Change (DECC) and relevant standards:

- DECC's 'Assessing Vibration; A Technical Guideline'
- British Standard 7385: Part 2 "Evaluation and measurement of vibration in buildings"
- German standard DIN 4150 - Part 3 - "Structural vibration in buildings - Effects on Structures"

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001.

2 PROJECT DESCRIPTION

2.1 Site Description

The Road and Traffic Authority is proposing to build a truck rest area as a part of the widening project of the F5 Freeway between Brooks Road, Ingleburn and Narellan Road, Menangle.

The proposed truck rest area is to be sited at Varroville, on the northern side of the F5 Freeway and opposite the Williamson Road F5 southbound onramp, north of St Andrews Road and Curran Creek. Vehicle access to the truck rest area will be directly from the F5 Freeway northern carriageway.

The facility will accommodate up to 60 heavy vehicles and will also accommodate toilets and amenities for drivers.

The nearest affected residential and sensitive receivers have been identified as follows:

- **Receiver R1 – Lochalsh St, St Andrews**
  Residential properties located to the south of the truck rest area in the first row facing the F5 Freeway, on the northern side of Lochalsh St and Midlothian Rd, St Andrews.
- **Receiver R2 – Properties North West of Site, Varroville**
  Rural properties north west of the Truck Rest Area, accessed via St Andrews Rd.

Figure 1 shows the proposed truck rest area and nearest affected residential receivers.

2.2 Noise Catchment Areas

To facilitate the assessment of noise impacts from the F5 Widening upgrade project, residential and other noise sensitive areas along the route have been divided into Noise Catchment Areas (NCAs). NCAs are areas that are likely to have similar noise exposures, on the basis of factors such as topography, road design (cuttings, embankments, intersections etc), setbacks, and types of residences or other noise receptors.

NCAs for the F5 Widening upgrade project, were previously established in the noise assessment report prepared by Koikas Acoustics Pty Ltd and form the basis for the establishment of NCAs used for this study.

For the purpose of this study, the NCAs identified nearby the proposed truck rest area are set out in Table 2.1.

Table 2.1 – Location of Noise Catchment Areas

NCA ID	Location		
	Start Station	End Station	Side of Road
NCA 3	7560	8000	East
NCA 20	8540	8210	West

Note: NCAs are based on previously established NCAs from the Koikas Acoustic report (ref. R07015a4.nk5, dated 27 January 2005)

Figure 1 presents the locations and extent of the abovementioned NCAs.

2.3 Noise Issues

It is anticipated that noise from the proposed facility will essentially emanate from the three main sources, outlined below:

- Construction noise during the development of the site;
- Operational noise from on-site activities, including:
  - Intermittent noise from heavy vehicles decelerating as they approach the rest area and accelerating as they depart the rest area;
  - Intermittent noise from heavy vehicles releasing their air brakes;
  - Intermittent noise emissions from parked trucks, mainly idling engines;
  - Continuous noise from truck mounted refrigeration units, which may operate continuously while the truck is parked.
- Road traffic noise from additional heavy vehicle movements and other road vehicles associated with the site travelling on public roads (namely the F5 Freeway).

Since the proposed truck rest area is not expected to increase the number of heavy vehicles travelling along the F5 Freeway, the road traffic noise impact due to heavy vehicle movements related to the proposed facility is anticipated to not be an issue and therefore is not further assessed herein.

RENZO TONIN & ASSOCIATES
inspired to achieve
Consultants in Acoustics, Vibration and Structural Dynamics
Email: acoustics@rtagroup.com.au www.renzotonin.com.au
Sydney - Ph: (02) 8218 0500 Fax: (02) 8218 0501
Melbourne - Ph: (03) 9606 0041 Fax: (03) 9606 0042
Brisbane - Ph: (07) 3211 9155 Fax: (07) 3211 9188
Gold Coast - Ph: (07) 5593 5633 Fax: (07) 5593 5635
Kuwait - Ph: +0011 965 533 3829
Member of the Association of Australian Acoustical Consultants

Title : Figure 1 - Proposed Truck Rest Area & Surrounds

Date : 18/08/09

Scale: NTS

Project: F5 Widening

Ref : TE384-01P01 (rev 1)

3 EXISTING NOISE ENVIRONMENT

Background noise varies over the course of any 24 hour period, typically from a minimum at 3am in the morning to a maximum during morning and afternoon traffic peak hours. Therefore, the NSW Department of Environment and Climate Change (DECC) requires that the level of background and ambient noise be assessed separately for the daytime, evening and night-time periods when noise from a site or facility is assessed. These periods are defined as follows:

- **Day** is defined as 7:00am to 6:00pm, Monday to Saturday and 8:00am to 6:00pm Sundays & Public Holidays.
- **Evening** is defined as 6:00pm to 10:00pm, Monday to Sunday & Public Holidays.
- **Night** is defined as 10:00pm to 7:00am, Monday to Saturday and 10:00pm to 8:00am Sundays & Public Holidays.

Traffic noise measurements were also conducted to determine whether existing traffic noise levels already exceed the traffic noise criteria. Traffic noise levels are assessed separately for daytime and night time periods, which are defined as follows:

- **Day** is defined as 7:00am to 10:00pm;
- **Night** is defined as 10:00pm to 7:00am.

3.1 Noise Monitoring Locations

Existing traffic noise levels were previously monitored by Koikas Acoustics between July and November 2004. Results of the noise monitoring performed by Koikas Acoustics in the vicinity of the proposed truck rest area were referred to in this study. However, to obtain updated traffic noise level data in certain areas, additional noise monitoring of existing noise levels was also undertaken by Renzo Tonin & Associates between July and August 2008.

For the purpose of this study, the nearest noise monitoring locations to the potentially most affected locations for the proposed truck rest area are:

- **Location L1 – 34 Lochalsh Street, St Andrews**
  Long term unattended monitoring location on the eastern side of the F5 Freeway, south of the proposed truck rest area site. Noise environment dominated by traffic noise from the F5 Freeway. Noise levels at this location were considered representative of Receiver R1.

- **Location L2 – 13 Wessex Place, Raby**
  Long term unattended monitoring location on the western side of the F5 Freeway, south of the proposed truck rest area site. Noise environment dominated by traffic noise from the F5 Freeway. Noise levels at this location were considered representative of Receiver R2.

Figure 1 shows the two most relevant locations to this study where noise monitoring has been conducted. Noise monitoring was conducted by Renzo Tonin & Associates at Location 1 and by Koikas Acoustics at Location 2.

Renzo Tonin & Associates installed an RTA Technology noise monitor to monitor the existing acoustic environment at Location 1. The noise monitoring equipment used complies with Australian Standard 1259.2-1990 "Acoustics - Sound Level Meters" and is designated as either a Type 1 or Type 2 instrument suitable for field use.

A noise monitor consists of a sound level meter and a computer housed in a weather resistant enclosure. Ambient noise levels were recorded at a rate of 10 samples per second. Every 15 minutes, the data is processed statistically and stored in memory. The equipment was calibrated prior and subsequent to the measurement period using a Bruel & Kjaer Type 4230 calibrator. No significant drift in calibration was observed.

Weather information was obtained from the Bureau of Meteorology for the area over this period and any data adversely affected by rain, wind or extraneous noise was discarded.

The graphical recorded outputs of the noise monitor are presented in Appendix B.

3.2 Noise Monitoring Results

The measured L_{eq} traffic noise levels at the monitoring locations are presented in Table 3.1. The descriptors relevant to traffic noise according to the NSW ECRTN are the $L_{Aeq(15hr)}$ daytime and $L_{Aeq(9hr)}$ night-time descriptors.

Table 3.1 – Results of L_{eq} Traffic Noise Monitoring

NCA ID	Monitoring Location	Year of Monitoring	L_{eq} Noise Levels, dB(A)	
			$L_{Aeq(15hr)}$ Day	$L_{Aeq(9hr)}$ Night
NCA 3	Location 1: 34 Lochalsh Street, St Andrews[1]	2008	66	62
NCA 20	Location 2: 13 Wessex Place, Raby[2]	2004	56	56

Notes: 1. Renzo Tonin & Associates monitoring results
2. Koikas Acoustics monitoring results

The measured L_{90} background noise levels at the monitoring locations are presented in Table 3.2 – Results of L_{90} Background Noise MonitoringTable 3.2. The descriptors relevant to the setting of noise criteria for the assessment of noise emissions from a site during its construction phase and its operation are the background L_{90} daytime, evening and night-time descriptors.

Table 3.2 – Results of L_{90} Background Noise Monitoring

NCA ID	Monitoring Location	Year of Monitoring	L_{90} Noise Levels, dB(A)		
			Day	Evening	Night
NCA 3	Location 1: 34 Lochalsh Street, St Andrews[1]	2008	60	58	48
NCA 20	Location 2: 13 Wessex Place, Raby [2]	2004	49	51	46

Notes: 1. *Renzo Tonin & Associates monitoring results*
2. *Koikas Acoustics monitoring results*

4 OPERATIONAL NOISE ASSESSMENT

4.1 Noise Criteria

There are no specific goals for addressing noise from truck rest areas. Therefore, it is appropriate to assess its potential impact on the general noise amenity surrounding the site, using the NSW Environmental Criteria for Road Traffic Noise (ECRTN) and the RTA's Environmental Noise Management Manual (ENMM) when trucks are on the freeway, and the NSW Industrial Noise Policy (INP) and DECC's sleep arousal policy for noise from trucks once off the freeway and inside the truck rest area.

4.1.1 Trucks on the Freeway

4.1.1.1 Road Traffic Noise

The noise of all vehicles, including trucks, travelling along the F5 has been assessed for NCAs 3 and 20 in a separate study to this one [ref: Renzo Tonin & Associates 'F5 Widening - Brooks Road, Ingleburn to Narellan Road, Menangle – Detailed Noise Assessment', TD437-02F06]. However, any potential increase in road traffic noise induced by the insertion of a truck rest area has not previously been studied and assessed, and is done so herein.

Road traffic noise impact is assessed in accordance with the NSW 'Environmental Criteria for Road Traffic Noise' (ECRTN, Environment Protection Authority 1999). The ECRTN sets out criteria to be applied to particular types of road and land uses. These noise criteria are applied when assessing noise impacts and determining mitigation measures for road projects that may potentially impose on the amenity appropriate to the land use in the vicinity of the road project. The ECRTN was used to assess traffic noise impacts associated with the proposed F5 upgrade project.

The L_{eq} noise level or the "equivalent continuous noise level" correlates best with the human perception of annoyance associated with traffic noise, and is the noise metric applied by the ECRTN for the assessment of traffic noise.

The F5 project is essentially an expansion of an existing freeway to increase traffic carrying capacity and for the most affected residential premises in NCAs 3 and 20, there is already an existing road traffic noise exposure (defined as greater than $L_{Aeq(15hr)}$ 60dB(A) or $L_{Aeq(9hr)}$ 55dB(A)). Therefore, the 'redeveloped road' criteria as set out in the ECRTN apply to NCAs 3 and 20. The noise criteria for redevelopment of an existing freeway are as follows.

Table 4.1 – NSW Environmental Criteria for Road Traffic Noise

Type of Development	Criteria		
	Day, dB(A)	Night, dB(A)	Where Criteria are Already Exceeded
3. Redevelopment of existing freeway/arterial road	$L_{Aeq(15hr)}$ 60	$L_{Aeq(9hr)}$ 55	In all cases, the redevelopment should be designed so as not to increase existing noise levels by more than 2 dB. Where feasible and reasonable, noise levels from existing roads should be reduced to meet the noise criteria. In many instances this may be achievable only through long-term strategies such as improved planning, design and construction of adjoining land use developments; reduced vehicle emission levels through new vehicle standards and regulations of in-service vehicles; greater use of public transport; and alternative methods of freight haulage

Source: NSW 'Environmental Criteria for Road Traffic Noise' (May 1999).

4.1.1.2 Sleep Disturbance

Maximum noise levels generated by road traffic noise have the potential to cause disturbance to sleep. The ECRTN and the ENMM however, do not include noise criteria for assessing maximum noise level events. This is primarily because research conducted to date in this field has not been definitive and the relationship between maximum noise levels, sleep disturbance and subsequent health effects is not currently well defined.

Notwithstanding this, the ECRTN requires a broad assessment and reporting of maximum noise levels during each hour of the night time period (10pm to 7am) to give an indication of the likelihood of awakening reactions.

Furthermore, guidelines for assessing maximum noise levels are provided in Practice Note (iii) of the RTA's ENMM. The guidelines are to be used as a tool to help prioritise and rank mitigation strategies, but should not be used as a decisive criterion in itself.

According to Practice Note (iii) of the RTA's ENMM, a "maximum noise event" can be defined as any passby for which:

$$\mathbf{L_{max} - L_{eq} \geq 15\ dB(A)}$$

where the L_{max} noise level is greater than 65 dB(A).

4.1.2 Trucks in the Truck Rest Area

4.1.2.1 Operational Noise Criteria (INP)

The truck rest area operational noise assessment is to be conducted in accordance with the NSW Industrial Noise Policy (INP, Environment Protection Authority 2000).

The assessment procedure in terms of the NSW *Industrial Noise Policy* (INP, Environment Protection Authority 2000) has two components:

- Controlling intrusive noise impacts in the short term for residences, and
- Maintaining noise level amenity for particular land uses for residences and other land uses.

Intrusive Noise Criteria

According to the INP, the intrusiveness of a mechanical noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the L_{Aeq} descriptor), measured over a 15-minute period, does not exceed the background noise level measured in the absence of the source by more than 5dB(A).

The intrusiveness criterion is summarised as follows:

$L_{Aeq,\ 15\ minute} \leq L_{A90}$ background noise level plus 5dB(A)

The intrusiveness criteria for each residential assessment location (R1 and R2) are presented below:

Table 4.2 - Intrusiveness Criteria – Determined at Each Residential Assessment Location, dB(A)

Period		Intrusiveness Criteria at Each Location[1], dB(A)	
		Location R1:	Location R2:
Daytime[1]	$L_{Aeq,\ 15\ min}$	≤ 60 + 5 = 65	≤ 49 + 5 = 54
Evening[2]	$L_{Aeq,\ 15\ min}$	≤ 58 + 5 = 63	≤ 51 + 5 = 56
Night[3]	$L_{Aeq,\ 15\ min}$	≤ 48 + 5 = 53	≤ 46 + 5 = 51

Notes: *1. Intrusiveness criteria have been determined from background L_{A90} noise monitoring results conducted at the nearest and most relevant locations to each residential assessment location*

2. Daytime refers to the period from 0700 to 1800h (Monday to Saturday) and 0800 to 1800 h (Sundays and Public Holidays)

3. Evening refers to the period from 1800 to 2200 h

4. Night time refers to the period from 2200 to 0700h (Monday to Saturday) and 2200 to 0800 h (Sundays and Public Holidays)

Amenity Criteria

Assessment of the operation of the truck rest area against the amenity criteria is not suitable as noise events in the rest area are short duration and only occur infrequently within the Day, Evening and Night periods. The few short duration noise events that do occur within the 11 hour Day period, 4 hour Evening period and 9 hour Night period would have no impact on the noise amenity of the surrounding area. Rather, the noise amenity of the area adjacent to the F5 Freeway is controlled by freeway traffic noise.

4.1.2.2 Sleep Intrusiveness Noise Criteria (DECC)

Noise emanating from site operations after 10:00pm and before 7:00am, has the potential for creating sleep arousal. The INP does not address the issue of sleep arousal. A number of other publications produced by the Department of Environment & Climate Change (DECC), however make the general observation that a person's sleep can be significantly disrupted by noise and provide guidance on this matter.

Guidance for assessing sleep disturbance resulting from short-duration high-level noises which occur between 10:00pm and 7:00am is taken from the NSW Department of Environment and Climate Change's (DECC's) policy with respect to sleep disturbance:

> *"Peak noise level events, such as reversing beepers, noise from heavy items being dropped or other high noise level events, have the potential to cause sleep disturbance. The potential for high noise level events at night and effects on sleep should be addressed in noise assessments for both the construction and operational phases of a development. The INP does not specifically address sleep disturbance from high noise level events.*
>
> *DEC reviewed research on sleep disturbance in the NSW Environmental Criteria for Road Traffic Noise (ECRTN) (EPA, 1999). This review concluded that the range of results is sufficiently diverse that it was not reasonable to issue new noise criteria for sleep disturbance.*
>
> *From the research, DEC recognised that current sleep disturbance criterion of an $L_{A1,\ (1\ minute)}$ not exceeding the $L_{A90,\ (15\ minute)}$ by more than 15 dB(A) is not ideal. Nevertheless, as there is insufficient evidence to determine what should replace it, DEC will continue to use it as a guide to identify the likelihood of sleep disturbance. This means that where the criterion is met, sleep disturbance is not likely, but where it is not met, a more detailed analysis is required.*
>
> *The detailed analysis should cover the maximum noise level or $L_{A1,\ (1\ minute)}$, that is, the extent to which the maximum noise level exceeds the background level and the number of times this happens during the night-time period. Some guidance on possible impact is contained in the review of research results in the appendices to the ECRTN. Other factors that may be important in assessing the extent of impacts on sleep include:*
>
> - *how often high noise events will occur*
> - *time of day (normally between 10pm and 7am)*
> - *whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods).*

The $L_{A1, (1\ minute)}$ descriptor is meant to represent a maximum noise level measured under 'fast' time response. DEC will accept analysis based on either $L_{A1, (1\ minute)}$ or $L_{A, (Max)}$."

The policy states that a sleep disturbance criterion of $L_{A1(1min)} \leq L_{A90(15min)} + 15dB(A)$, should be used as a first step 'guide' as it is 'not ideal' and 'where it is not met, a more detailed analysis is required'. That detailed analysis includes a reference to the research material contained in the NSW 'Environmental Criteria for Road Traffic Noise' (ECRTN) in the assessment of the subject proposal.

It is noted that in reviewing the research material referred to in the ECRTN and more recent research, and notwithstanding DECC's policy, noise levels less than "background + 15dB(A)" do not guarantee zero sleep disturbance.

The sleep arousal criteria described in the DECC's policy indicated above is used for the purpose of noise impact assessment for this study and is summarised in Table 4.3.

4.1.2.3 Summary of Noise Criteria

Truck activity associated with the truck rest area may occur anytime during a 24 hour period. The most critical period would be the night time period (10:00pm to 7:00am Monday to Saturday and 10:00pm to 8:00am Sundays & Public Holidays) and therefore only the night time period is assessed from herein.

The noise criteria at the predicted most affected receivers are summarised in the table below.

Table 4.3 – Summary of Noise Criteria – Critical Night time Period

Location	Noise Criteria	
	INP, dB(A)	Sleep Arousal, dB(A)
Receiver R1 - Lochalsh St, St Andrews	$L_{eq,15min} \leq 48+5 =$ **53**	$L_{eq,15min} \leq 48+15 =$ **63**
Receiver R2 - Properties North West of Site	$L_{eq,15min} \leq 46+5 =$ **51**	$L_{eq,15min} \leq 46+15 =$ **61**

4.2 Operational Noise Sources

Typical noise sources for truck rest areas, obtained from Renzo Tonin & Associates data library, are summarised in the Table 4.4 below. The data includes individual sound exposure levels (SEL) for a variety of sources measured over a period representing the duration of an entire noise event. SEL noise measurements are useful as they can be converted to obtain L_{eq} sound levels over any period of time to assess the impact against the NSW INP. $L_{1,1min}$ source noise levels are also provided as they are to be used to assess the potential sleep disturbance impact. These levels are used to predict noise levels at the potentially most affected residences.

Table 4.4 – Sound Power Levels for Truck Rest Area Activities

Activity	Sound Power Level, dB(A) re 1pW	
	SEL	L_{max} / L_1
Truck moving on site (<10km/hr)	106	107
Truck idling	97	100
Truck mounted refrigerator condenser	102	-
Truck reverse signal	-	107
Truck air brake release	-	116
Truck engine compression brakes	-	120

The SEL values presented in Table 4.4 take into account the typical duration of noise from each activity. The numbers of activities assumed in the noise predictions are addressed in Section 4.3.2 of this report.

4.3 Predicted Noise Levels & Assessment

4.3.1 Trucks on the Freeway

4.3.1.1 Road Traffic Noise

The noise emissions of trucks gearing down and braking upon arrival to the truck rest area and gearing up and accelerating when departing the truck rest area, have been compared to the noise emissions of general traffic travelling past NCAs 3 and 20.

It is determined that any potential increases in truck noise associated with trucks accessing the truck rest area as opposed to driving past without stopping, would be negligible and insignificant because the low number of such noise events would not affect the overall bulk L_{eq} traffic noise over a 15 hour day and 9 hour night period.

4.3.1.2 Sleep Disturbance

By using the highest sound power level from Table 4.4, being that of truck engine compression brakes at 120dB(A) re 1pW, applicable at the approach end (southern-end) of the truck rest area, the L_{max} noise level calculated at NCA 3 (Receiver R1) is approximately 65dB(A) and at the property west of site (Receiver R2) is approximately 60dB(A). These levels have been calculated for the worst-affected residences located nearest to the road and at their first floors (where applicable), and assumes a truck using compression braking as soon as it enters the southern-end of the truck rest area entry lane.

Based on the existing and future night-time L_{eq} traffic noise levels reported for the F5 freeway in the F5 Widening noise report [ref: Renzo Tonin & Associates 'F5 Widening - Brooks Road, Ingleburn to Narellan Road, Menangle – Detailed Noise Assessment, TD437-02F06], an L_{max} of 65dB(A) would not exceed the night L_{eq} noise levels for NCA 3 [existing $L_{eq(9hr)}$ 62 dB(A)] by more than 15dB(A). Likewise, an L_{max} of 60dB(A) would not exceed the night L_{eq} noise levels for NCA 20 [existing $L_{eq(9hr)}$ 56 dB(A)] by more than 15dB(A).

Therefore, according to the ENMM's maximum noise level threshold, described in Section 4.1.1.2 of this report, trucks entering and departing the truck rest area are not likely to cause sufficient noise to trigger an increase in the level and number of maximum noise events for residential receivers along the F5 freeway.

4.3.2 Trucks in the Truck Rest Area

Industrial noise emissions from typical activities at the proposed Varroville truck rest area were determined by modelling the noise sources, outdoors receptor locations and topographical features of the surrounding area using the SoundPLAN computer noise model. The program calculates the contribution of each noise source at each specified receptor point and allows for the prediction of the total noise from a site.

The SoundPLAN computer program is accepted by the DECC and its environmental noise predictions have been verified on many past occasions in the field.

For operational noise modelling purposes the following worst-case scenario for any 15-minute period during the night time period was assumed:

- 3 trucks idling continuously;
- 3 trucks movements on site;
- 3 trucks parked with refrigerators condensers mounted and in use.

The predicted operational noise levels at the nearby receivers are as follows:

Table 4.5 – Predicted Operational Noise Levels at Residential Receivers, dB(A)

Receiver	$L_{Aeq,15min}$	Criteria	Comply?
Receiver R1 - Lochalsh St, St Andrews	< 20	**53**	Yes
Receiver R2 - Properties North West of Site	< 20	**51**	Yes

For operational maximum noise levels modelling purposes the following worst-case scenario for any 1-minute period during the night time period was assumed:

- 1 truck releasing air brakes on site;
- 1 truck reversing with beeping alarms on site;

The predicted maximum noise levels at the nearby receivers are as follows:

Table 4.6 – Predicted Maximum Noise Levels at Residential Receivers, dB(A)

Receiver	$L_{A1,1min}$	Criteria	Comply?
Receiver R1 - Lochalsh St, St Andrews	58	**63**	Yes
Receiver R2 - Properties North West of Site	46	**61**	Yes

From Table 4.5 and Table 4.6 above, noise levels from the operation of the proposed truck rest area are predicted to comply with the relevant criteria at the potentially most affected residential receivers.

5 CONSTRUCTION NOISE AND VIBRATION ASSESSMENT

5.1 Construction Noise and Vibration Criteria

Chapter 171 of the NSW 'Environmental Noise Control Manual' (ENCM, Environment Protection Authority 1994) provides guidelines for assessing noise generated during the construction phase. However, the 'Department of Environment and Climate Change' (DECC) has recently released its draft NSW 'Construction Noise Guideline' (CNG). This document is currently only issued for consultation and comment, although it will become DECC's standard policy for assessing construction noise. It is intended that eventually this new guideline will supersede Chapter 171 of the ENCM, however at this stage, Chapter 171 of the ENCM remains the NSW government's construction noise policy.

The ENCM was used to assess noise generated during the construction phase of this project. Chapter 171 of the ENCM contains the following:

LEVEL RESTRICTIONS

a) *Construction period of 4 weeks and under*

The L_{10} level measured over a period of not less than 15 minutes when the construction site is in operation must not exceed the background level by **more than 20 dB(A)**.

b) *Construction period greater than 4 weeks and not exceeding 26 weeks*

The L_{10} level measured over a period of not less than 15 minutes when the construction site is in operation must not exceed the background level by **more than 10 dB(A)**.

c) *Construction period greater than 26 weeks*

d) The L_{10} level measured over a period of not less than 15 minutes when the construction site is in operation must not exceed the background level **by more than 5 dB(A)**.

TIME RESTRICTIONS

- Monday to Friday, 7am to 6pm.
- Saturday, 7am to 1pm if inaudible at residential premises, otherwise: 8am to 1pm.
- No construction work to take place on Sundays or Public Holidays.

e) Construction works should be restricted to occur within these periods. Where it is necessary for construction works to be undertaken outside the preferred construction hours, the L_{10} noise levels emitted by the works is normally restricted to a margin **not greater than 5dB(A)** above the background noise level for that period.

It is noted that the above criteria are only applicable to residential receivers.

The duration of the construction activities is anticipated to be approximately two months (8 weeks).

The construction noise criteria are summarised below.

Table 5.1 – Summary of Construction Noise Criteria

	Construction Noise Criteria, dB(A)	
Length of Construction Period	**Location R1 – NCA 3**	**Locations R2 – NCA 20**
4 weeks and under	60 + 20 = 80	49 + 20 = 69
Greater than 4 weeks and not exceeding 26 weeks	60 + 10 = 70	49 + 10 = 59
Greater than 26 weeks	60 + 5 = 65	49 + 5 = 54

Further to the noise level criteria, noise management measures must also be implemented. Practice Note VII of the ENMM provides guidelines and procedures which should be considered when undertaking night time or out of restricted periods construction work.

5.1.1 Construction Vibration Guidelines

5.1.1.1 Disturbance to Buildings Occupants

For disturbance to human occupants of buildings, we refer to DECC's 'Assessing Vibration; a technical guideline', published in February 2006. This document provides criteria which are based on the British Standard BS 6472-1992, *'Evaluation of human exposure to vibration in buildings (1-80Hz)'.*

Vibration sources are defined as *Continuous, Impulsive or Intermittent.* Section 2 of the technical guideline defines each type of vibration as follows:

> *'**Continuous** vibration continues uninterrupted for a defined period (usually throughout the day-time and/or night-time).*
>
> ***Impulsive** vibration is a rapid build up to a peak followed by a damped decay that may or may not involve several cycles of vibration (depending on frequency and damping). It can also consist of a sudden application of several cycles at approximately the same amplitude, providing that the duration is short, typically less than 2 seconds.*
>
> ***Intermittent** vibration can be defined as interrupted periods of continuous or repeated periods of impulsive vibration that varies significantly in magnitude'.*

The criteria are to be applied to a single weighted root mean square (rms) acceleration source level in each orthogonal axis. Section 2.3 of the guideline states:

> *'Evidence from research suggests that there are summation effects for vibrations at different frequencies. Therefore, for evaluation of vibration in relation to annoyance and*

comfort, overall weighted rms acceleration values of the vibration in each orthogonal axis are preferred (BS 6472).'

Preferred and maximum values for continuous and impulsive vibration are defined in table 2.2 of the guideline and are reproduced below.

Table 5.2 - Preferred and maximum weighted rms values for continuous and impulsive vibration acceleration (m/s^2) 1-80Hz

Location	Assessment period[1]	Preferred values		Maximum values	
		z-axis	x- and y-axis	z-axis	x- and y-axis
Continuous vibration					
Critical areas[2]	Day- or night-time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day- or night-time	0.020	0.014	0.040	0.028
		0.04	0.029	0.080	0.058
Workshops	Day- or night-time	0.04	0.029	0.080	0.058
Impulsive vibration					
Critical areas[2]	Day- or night-time	0.005	0.0036	0.010	0.0072
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day- or night-time	0.64	0.46	1.28	0.92
Workshops	Day- or night-time	0.64	0.46	1.28	0.92

Notes:
1. Daytime is 7.00 am to 10.00 pm and night-time is 10.00pm to 7.00 am
2. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specify above. Stipulation of such criteria is outside the scope of their policy and other guidance documents (e.g. relevant standards) should be referred to. Source: BS 6472-1992

Intermittent vibration is to be assessed using vibration dose values (VDVs). The VDV method is a fourth power approach which is more sensitive to peaks in the acceleration waveform and makes corrections to the criteria based on the duration of the source's operation. The VDV can be calculated using the overall weighted rms acceleration of the vibrating source in each orthogonal axis and the total period during which the vibration may occur. Weighting curves are provided in each orthogonal axis in the guideline. Preferred and maximum VDV values are defined in Table 2.4 of the guideline and are reproduced below.

Table 5.3 – Acceptable vibration dose values for intermittent vibration ($m/s^{1.75}$)

Location	Daytime [1]		Night-time [1]	
	Preferred values	Maximum values	Preferred values	Maximum values
Critical areas[2]	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Notes: *1. Daytime is 7.00 am to 10.00 pm and night-time is 10.00pm to 7.00 am*

2. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be a need to assess intermittent values against the continuous or impulsive criteria for critical areas. Source: BS 6472-1992

5.1.1.2 Structural Damage to Buildings

Currently there exists no Australian Standard for assessment of structural building damage caused by vibrational energy. Therefore, reference is made to both the British and German standards below which are relevant to the assessment of structural damage.

British Standard

British Standard 7385: Part 2 "Evaluation and measurement of vibration in buildings", can be used as a guide to assess the likelihood of building damage from ground vibration. BS7385 suggests levels at which 'cosmetic', 'minor' and 'major' categories of damage might occur.

BS7385 recommends that the peak particle velocity is used to quantify vibration and specifies damage criteria for frequencies within the range 4Hz to 250Hz, which is the range usually encountered in buildings. At frequencies below 4Hz, a maximum displacement value is recommended. The levels from the standard are given below in Table 5.4.

Table 5.4 – BS 7385 Structural Damage Criteria

Group	Type of Structure	Peak component particle velocity, mm/s		
		4Hz to 15Hz	15Hz to 40Hz	40Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings		50	
2	Un-reinforced or light framed structures Residential or light commercial type buildings	15 to 20	20 to 50	50

The peak vibration limits set for minimal risk of 'cosmetic' damage are: 15mm/s for un-reinforced or light framed structures, for example residential or light commercial buildings (Group 2; increasing as the frequency content of the vibration increases) and 50mm/s for reinforced or framed structures, for example industrial and heavy commercial buildings (Group 1; constant across all frequencies). 'Minor' damage is considered possible at vibration

magnitudes which are twice those given and 'major' damage to a building structure may occur at levels greater than four times those values.

These values relate to transient vibrations and to low rise buildings. Continuous vibration can give rise to dynamic magnifications due to resonances and may need to be reduced by up to 50%.

The levels set by this standard are considered 'safe limits' up to which no damage due to vibration effects has been observed for certain particular types of buildings. Damage comprises minor non-structural effects such as hairline cracks on drywall surfaces, hairline cracks in mortar joints and cement render, enlargement of existing cracks and separation of partitions or intermediate walls from load bearing walls.

This standard states that it considers sources of vibration including blasting, demolition, piling, ground treatments, compaction, construction equipment, tunnelling, road and rail traffic and industrial machinery.

As stated in the standard, it sets guide values for building vibration based on the lowest levels above which damage has been credibly demonstrated. That is, it gives guidance on the levels of vibration above which building structures could be damaged.

German Standard

The German standard DIN 4150 - Part 3 - "Structural vibration in buildings - Effects on Structures", also provides recommended maximum levels of vibration that reduce the likelihood of building damage caused by vibration. This standard too, presents recommended maximum limits over a range of frequencies measured in any direction at the foundation or in the plane of the uppermost floor.

The minimum 'safe limit' of vibration at low frequencies for commercial and industrial buildings is 20mm/s. For dwellings it is 5mm/s and for particularly sensitive structures (eg historical with preservation orders etc), it is 3mm/s. These limits increase as the frequency content of the vibration increases. These values are presented in

Table 5.5 below and are generally recognised to be conservative.

Table 5.5 – DIN 4150-3 Structural Damage Criteria

Group	Type of Structure	Vibration Velocity, mm/s			
		At Foundation at Frequency of			Plane of Floor Uppermost Storey
		Less than 10Hz	10Hz to 50Hz	50Hz to 100Hz	All Frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15

Group	Type of Structure	Vibration Velocity, mm/s			
		At Foundation at Frequency of			Plane of Floor Uppermost Storey
		Less than 10Hz	10Hz to 50Hz	50Hz to 100Hz	All Frequencies
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Group 1 or 2 and have intrinsic value (eg buildings under a preservation order)	3	3 to 8	8 to 10	8

5.2 Construction Noise and Vibration Sources

5.2.1 Construction Noise Sources

The following table lists construction plant and equipment likely to be used by the contractor to carry out the necessary construction work for this project.

Table 5.6 - Typical Construction Equipment & Sound Power Levels, dB(A)

Plant Item	Plant Description	L_{A10} Sound Power Levels	
		Range	Typical L_{10} (Mid-Point)
1	Concrete Saw	118	118
2	Piling	105 - 130	118
3	Chainsaw	105 - 126	116
4	Mobile Crane	110 - 115	113
5	Machine Mounted Hydraulic Drill	110 - 115	113
6	Compactor	110 - 115	113
7	Profiler	110 - 115	113
8	Pneumatic Hand Tools (general)	110 - 115	113
9	Pneumatic Jack Hammer	110 - 115	113
10	Pavement Laying Machine	110 - 114	112
11	Road Milling Machine	111 - 111	111
12	Excavator	105 - 115	110
13	Grader	105 - 115	110
14	Concrete Truck	108 - 110	109
15	Vibratory Roller	108 - 110	109
16	Dump Trucks	102 - 113	108
17	Water Truck	106 - 108	107
18	Rollers	100 - 113	107
19	Asphalt Truck	106 - 106	106
20	Truck (>20tonne)	103 - 108	106
21	Concrete Pump	100 - 109	105
22	Welders	100 - 110	105
23	Cherry Picker	105 - 105	105

Plant Item	Plant Description	L_{A10} Sound Power Levels	
		Range	Typical L_{10} (Mid-Point)
24	Backhoe	100 - 108	104
25	Concrete Vibrator	101 - 105	103
26	Power Generator	100 - 106	103
27	Light Commercial Vehicles	103 - 103	103
28	Silenced Air Compressor	90 - 105	98

Note: The sound power data within the column marked "Typical (Mid-Point)" has been used in this study to calculate typical noise levels at the nominated assessment locations.

The sound power levels for the majority of activities presented in the above table are based on maximum levels given in Table D2 of Australian Standard 2436 - 1981 "Guide to Noise Control on Construction, Maintenance and Demolition Sites", DECC's Draft 'NSW Construction Noise Guideline', information from past projects and information held in our library files.

5.2.2 Construction Vibration Sources

Typical vibration levels from construction equipment most likely to cause significant vibration are summarised below. The information was sourced from a variety of reference materials available in the Renzo Tonin & Associates library.

Table 5.7 – Typical Ground Vibration Generated by Construction Plant

Activity	Typical Ground Vibration
Pile Drivers	Typical levels of ground vibration from pile driving range from 1 mm/s to 3 mm/s at distances of 25m to 50m, depending on ground conditions and the energy of the pile driving hammer.
Excavators	Typical ground vibration from bulldozers range from 1mm/s to 2mm/s at distances of approximately 5m and at distances greater than 20m, vibration levels are usually below 0.2mm/s.
Compactor	Compactors typically generate 20mm/s at distances of approximately 5m, 2mm/s at distances of 15m. At distances greater than 30m, vibration are usually below 0.3mm/s.
Jackhammers	Typical ground vibration levels from jackhammers range from 1 mm/s to 2mm/s at distances of approximately 5m. At distances greater than 20m, vibration levels are usually below 0.2 mm/s.
Vibratory rollers	Ground vibration caused by vibratory rollers can range up to 1.5mm/s at distances of 25m. The highest levels of vibration usually occur as the roller is brought to rest and the frequency of the centrifugal forces passes through resonance with the natural frequency of the roller/ground/structure. Machinery should therefore not be brought to rest when in the vicinity of susceptible buildings, especially dwellings. Higher levels could occur at closer distances, however, no damage would be expected for any building at distances greater than approximately 12m (for a medium to heavy roller).

Activity	Typical Ground Vibration
Truck traffic	Typical vibration from heavy trucks passing over normal (smooth) road surfaces generate relatively low vibration levels in the range of 0.01 - 0.2mm/s at the footings of buildings located 10 - 20m from a roadway. Very large surface irregularities can cause levels up to five to ten times higher. In general, ground vibration from trucks is usually imperceptible in nearby buildings. The rattling of windows and other loose fittings that is sometimes reported is more likely to be caused by airborne acoustic excitation from very low frequency (infrasonic) noise radiated by truck exhausts and truck bodies. While this may cause concern to the occupants, the phenomenon is no different from the rattling caused by wind or people walking or jumping on the floor and fears of structural damage or even accelerated ageing are usually unfounded.

5.2.3 Proposed Construction Activities

Construction works have been classified into day works and night works. Day works take place from 7am to 6pm while night works occur during the remaining hours. All construction works take place 5 days a week.

The total duration of site works is currently estimated at approximately 2 months.

Table 5.8 – Proposed Typical Construction Activities

Activity	Description of Activity	Plant/ Equipment	No. Units	Hours of use
1. Concrete Barrier Placement	Install concrete safety barriers.	Semi trailer	4	Night time works
		Franna Crane	2	
		Traffic control	1	
2. Clearing & Grubbing	General land clearing, tree and stump removal, topsoil stripping and loading.	Excavator	2	Mostly carried out during the day. Only require night work in rare cases of lane closure for driver safety
		Chainsaw	3	
		Mulcher	1	
		Bogie tipper	4	
3. Bulk Earthworks	Excavation of soil and rock, loading, haulage.	Excavator 4t to 20t	4	Mostly daytime, with some night works.
		Grader	2	
		Road truck	12	
		Compaction eqpm't	2	
		Water Truck	2	
4. Pavement Construction	Rip and re-compact subgrade, place select material and compact.	Grader	2	Mostly daytime with some night works.
		Excavator	1	
		Roller	2	
		Bogie tippers	3	
5. Conduit Installation	Install utility conduits along route.	Excavator 4t to 12t	1	Mostly daytime, with some night works on road crossings etc.
		Truck	2	
		Boring machine	1	

Activity	Description of Activity	Plant/ Equipment	No. Units	Hours of use
6. Drainage	Excavation of trenches and pits, delivery and placement of precast pipes and pits, filling and compacting.	Backhoe	1	Single location activities during the day
		Excavator	1	
		Compactor	1	
		Dump truck	1	
7. Concrete Works	Construction of concrete pavement, kerbing and barrier construction.	Agitator	4	Mostly daytime, with some night works expected.
		Concrete pump	2	
		Slipform machine	2	
		Compaction eqpm't	2	
		Concrete saw	1	
		Compressor	2	
		Air tools	4	
		Generator	2	
8. Asphalt Paving	Delivery of raw materials, placement of surface material, saw cutting, linemarking.	Profiler	2	Profiling at night. Paving works during the day and night. Saw cutting during the day. Line marking at night mostly.
		Paver/small paver	2	
		Asphalt truck & sprayer	10	
		Roller	2	
		Concrete saw	2	
9. Compounds	Deliveries. Plant and equipment. Maintenance. Office areas. Storage areas.	Welding equipment	1	24 hour compound activity
10. Bridgeworks	Widening of existing bridge over Curran Creek.	Piling Drilling Rig	1	*To be advised*
		Cherry Picker	1	
		Vibratory Roller	1	
		Concrete Truck	1	
		Delivery Truck	1	
		Mobile Crane	1	
		Pneumatic Jack Hammer	1	
		Road Milling Machine	1	
		Power Generator	1	

5.3 Predicted Construction Noise and Vibration Levels

5.3.1 Construction Noise

An assessment of construction noise impacts was completed at the following residential assessment locations, selected to represent the potentially worst affected residential receivers affected by construction activities. These locations typically represent residences nearest to the truck rest area.

Receiver R1 **Lochalsh St, St Andrews**

Nearest boundary located at a distance of approximately 130m from the proposed construction site. Representative of residences nearest to the construction works in NCA 3.

Receiver R2 **Properties North West of Site, Varroville**

Nearest boundary located at a distance of approximately 360m from the proposed construction site.

Table 5.9 presents predicted external construction noise levels at the residential receivers.

Table 5.9 – Predicted L_{10} Construction Noise Levels - Individual Plant Items, dB(A)

Plant Item	Plant Description	Receiver R1	Receiver R2
	Applicable Day Criteria	*70*	*59*
1	Concrete Saw	68	59
2	Piling	67	58
3	Chainsaw	65	56
4	Mobile Crane	62	53
5	Machine Mounted Hydraulic Drill	62	53
6	Compactor	62	53
7	Profiler	62	53
8	Pneumatic Hand Tools (general)	62	53
9	Pneumatic Jack Hammer	55	56
10	Pavement Laying Machine	62	53
11	Road Milling Machine	53	54
12	Excavator	60	51
13	Grader	60	51
14	Concrete Truck	59	50
15	Vibratory Roller	51	52
16	Dump Trucks	57	48
17	Water Truck	57	48
18	Rollers	56	47
19	Asphalt Truck	61	52
20	Truck (>20tonne)	55	46
21	Concrete Pump	54	45
22	Welders	55	46
23	Cherry Picker	47	48
24	Backhoe	54	45
25	Concrete Vibrator	53	44
26	Power Generator	53	44
27	Light Commercial Vehicles	53	44
28	Silenced Air Compressor	47	38

Noise levels at any receptors resulting from construction would depend on the location of the receptor with respect to the area of construction, shielding from intervening topography and structures, and the type and duration of operation being undertaken. Furthermore, noise levels at receivers will vary significantly over the total construction program due to the transient nature and large range of plant and equipment that could be used.

Based on the construction noise levels predicted above, most individual plant items will comply with the construction noise criteria at the nearest residences in each NCA. It should also be noted that noise levels could exceed those shown if two or more items of plant are operating concurrently in close proximity, as demonstrated below.

Preliminary staging information and proposed plant for construction work has been provided. Typical construction activities across different stages, and the range of noise levels at representative worst-affected locations in each NCA during each stage, are presented in Table 5.10. The range of noise levels has been calculated from the quietest plant item operating alone to all plant items operating concurrently for each activity.

Table 5.10 – Predicted L_{10} Construction Noise Level Ranges – Plant Items Operating Simultaneously, dB(A)

Activity	Receiver R1	Receiver R2
Applicable Day Criteria	*70*	*59*
Concrete Barrier Placement	61 - 70	52 - 58
Clearing & Grubbing	63 - **71**	54 - **63**
Bulk Earthworks	60 - **72**	51 - **63**
Pavement Construction	59 - 67	50 - 58
Conduit Installation	60 - 66	51 - 57
Drainage	54 - 65	45 - 56
Concrete Works	50 - **72**	41 - **64**
Asphalt Paving	59 - **74**	50 - **65**
Compounds	55 - 55	46 - 46
Bridgeworks	45 - 62	46 - **63**

Table 5.10 shows that noise levels generated by multiple plant items operating simultaneously may exceed the noise criteria during clearing & grubbing, bulk earthworks, concrete works, asphalt paving and bridgeworks (at Receiver 2). Noise levels are expected to be highest during the asphalt pavement stage of the project.

A reasonable and feasible approach towards noise management measures should be adopted to reduce noise levels as much as possible to help achieve compliance.

5.3.2 Construction Vibration

The relationship between vibration and the probability of causing human annoyance or damage to structures is complex. This complexity is mostly due to the magnitude of the vibration source, the particular ground conditions between the source and receiver, the foundation-to-footing interaction and the large range of structures that exist in terms of design (eg dimensions, materials, type and quality of construction and footing conditions). The intensity, duration, frequency content and number of occurrences of a vibration, are all important aspects in both the annoyances caused and the strains induced in structures.

As the pattern of vibration radiation is very different to the pattern of airborne noise radiation, and is very site specific, below are some indicative minimum 'buffer' distances based on some recent projects used to avoid human discomfort during daytime. It is noted that since the human comfort criteria are more stringent than the structural damage criteria, if compliance is achieved for the assessment of human comfort, then compliance will also be achieved for the assessment of structural damage to buildings.

Table 5.11 – Recommended Minimum Buffer Distances for Construction Plant – Human Comfort Criteria

Plant Item	Recommended Minimum Buffer Distance (m)
Jackhammers	5
Bulldozers	5
Vibratory rollers - light	5
Vibratory rollers - medium	12
Vibratory rollers - heavy	25
Compactor	15
Truck movements	10

Based on the above table and distance of approximately 130m (Location R1 – NCA 3 – the closest residences) to the nearest edge of the proposed works, vibration levels from the equipment above are unlikely to exceed the set limits.

Since the human comfort criteria are more stringent than the structural damage criteria, and compliance with the human comfort criteria is likely to be achieved, the construction plant items above do not warrant assessment against structural damage criteria.

5.4 Construction Noise and Vibration Mitigation

The following recommendations provide in-principle noise control solutions to reduce noise impacts to residential receivers. Where actual construction activities differ from those assessed in this report, more detailed design of noise control measures may be required once specific items of plant and construction methods have been chosen and assessed on site.

The advice provided here is in respect of acoustics only. Supplementary professional advice may need to be sought in respect of fire ratings, structural design, buildability, fitness for purpose and the like.

Implementation of noise control measures, such as those suggested in Australian Standard 2436-1981 "Guide to Noise Control on Construction, Maintenance and Demolition Sites", are expected to reduce predicted construction noise levels. Reference to Australian Standard 2436-1981, Appendix E, Table E1 suggests possible remedies and alternatives to reduce noise emission levels from typical construction equipment. Table E2 in Appendix E presents typical examples of noise reductions achievable after treatment of various noise sources. Table E3 in Appendix E presents the relative effectiveness of various forms of noise control treatment.

Table 5.12 below presents noise control methods, practical examples and expected noise reductions according to AS2436 and according to Renzo Tonin & Associates' opinion based on experience with past projects.

Table 5.12– Relative Effectiveness of Various Forms of Noise Control, dB(A)

Noise Control Method	Practical Examples	Typical noise reduction possible in practice		Maximum noise reduction possible in practice	
		AS 2436	Renzo Tonin & Assoc.	AS 2436	Renzo Tonin & Assoc.
Screening	Acoustic barriers such as earth mounds, temporary or permanent noise barriers	7 to 10	5 to 10	15	15
Acoustic Enclosures	Engine casing lagged with acoustic insulation and plywood	15 to 30	10 to 20	50	30
Engine Silencing	Residential class mufflers	5 to 10	5 to 10	20	20
Substitution by alternative process	Use electric motors in preference to diesel or petrol	15 to 25	15 to 25	60	40

The Renzo Tonin & Associates' listed noise reductions are conservatively low and should be referred to in preference to those of AS2436, for this assessment.

Table 5.13 below identifies possible noise control measures, which are applicable on the construction plant likely to be used on site.

Table 5.13 – Noise Control Measures for Likely Construction Plant

Plant Description	Screening	Acoustic Enclosures	Silencing	Alternative Process
Vibrating Pile Driving Attachment	✔	✖	✔	✔
Impact Sheet Piling	✔	✖	✔	✔
Mobile Crane	✔	✔	✔	✖
Pneumatic Hand Tools (general)	✔	✔	✔	✔
Dump Trucks	✔	✖	✔	✖

Plant Description	Screening	Acoustic Enclosures	Silencing	Alternative Process
Concrete Truck	✔	✖	✔	✖
Welders	✔	✔	✖	✖
Concrete Pump	✔	✔	✔	✔
Water Cart	✔	✖	✔	✖
Truck (> 20 tonne)	✔	✖	✔	✖
Power Generator	✔	✔	✔	✖
Concrete Vibrator	✔	✖	✖	✖
Silenced Air Compressor	✔	✔	✔	✔
Rock-breaker	✔	✖	✔	✖
Jack hammers	✔	✖	✔	✖
Excavator (30 tonne)	✔	✖	✔	✖
Bulldozer	✔	✖	✔	✖
25 tonne truck	✔	✖	✔	✖
Concrete Truck	✔	✖	✔	✖
Excavator (25 tonne)	✔	✖	✔	✖
De-watering Equipment	✔	✔	✔	✖

To ensure efficient noise attenuation performance is achieved using any of the methods listed above, it is recommended acoustic engineers work closely with the construction contractors and carry out preliminary testing prior to commencement of works.

A construction noise and vibration management plan should be implemented to avoid adverse noise and vibration disturbance to affected residences.

The ENMM (Section 5) outlines a number of techniques for controlling construction noise and vibration. Furthermore the DECC draft NSW 'Construction Noise Guideline' (CNG) provides current best practice noise management measures.

Table 5.14 below summarises these options and the methods described above and should be employed, where considered reasonable and feasible.

Table 5.14 – Construction Noise and Vibration Management Options

Construction Noise and Vibration Management Options	
Source controls	
Time constraints	Limit work to daylight hours. Consider implementing respite periods with low noise/vibration-producing construction activities.
Scheduling	Perform noisy work during less sensitive time periods.
Equipment restrictions	Select low-noise plant and equipment. Ensure equipment has quality mufflers installed.

Emission restrictions	Establish stringent noise emission limits for specified plant and equipment. Implement noise monitoring audit program to ensure equipment remains within specified limits.
Substitute methods	Use quieter and less vibration emitting construction methods where possible. For example, when piling is required, bored piles rather than impact-driven piles will minimise noise and vibration impacts. Similarly, diaphragm wall construction techniques, in lieu of sheet piling, will have significant noise and vibration reduction benefits.
Limit equipment on site	Only have necessary equipment on site.
Limit activity duration	Where possible, concentrate noisy activities at one location and move to another as quickly as possible. Any equipment not in use for extended periods during construction work should be switched off.
Equipment Location	Noisy plant and equipment should be located as far as possible from noise sensitive areas, optimising attenuation effects from topography, natural and purpose built barriers and materials stockpiles.
Site access	Vehicle movements outside construction hours, including loading and unloading operations, should be minimised and avoided where possible.
Equipment maintenance	Ensure equipment is well maintained and fitted with adequately maintained silencers which meet the design specifications.
Reduced equipment power	Use only necessary size and power.
Quieter work practices	For example, implement worksite induction training, educating staff on noise sensitive issues and the need to make as little noise as possible.
Reversing alarms	Consider alternatives, such as manually adjustable or ambient noise sensitive types ("smart" reversing alarms) and closed circuit TV systems. Alternative site management strategies can be developed, in accordance with the *Occupational Health and Safety Plan*, with the concurrence of the Occupational Health and Safety Officer.
	Path controls
Noise barriers	Consider installing temporary construction noise barriers. Install any permanent noise barriers required to minimise road traffic noise as early as possible in the construction process. Locate equipment to take advantage of the noise barriers provided by existing site features and structures, such as embankments and storage sheds.
Project Planning	Construction should be programmed so that noise barriers or mounding required to control noise are built as soon as possible.
Enclosures	Install noise-control kits for noisy mobile equipment and shrouds around stationary plant, as necessary.
Increased distance	Locate noisy plant as far away from noise-sensitive receptors as possible.
Site access	Select and locate site access roads as far away as possible from noise-sensitive areas.
	Receptor controls
Architectural treatment	Upgrade the glazing or window shutters of affected bedrooms.
Structural surveys and vibration monitoring	Pre-construction surveys of the structural integrity of vibration sensitive buildings may be warranted. At locations where there are high-risk receptors, vibration monitoring should be conducted during the activities causing vibration.
Temporary relocation	In extreme cases.

Consultation	Community consultation, information, participation and complaint responses are essential aspects of all construction noise management programs. They typically involve: A community information program before construction and/or high risk activities are commenced. This usually involves a leaflet distribution and direct discussions and negotiations with affected residents, explaining the type, time and duration of expected noise emissions. The involvement of affected residents in the development of acceptable noise management strategies. A nominated community liaison officer with a contact telephone number. A complaints hotline. Timely responses to complaints, providing information on planned actions and progress towards the resolution of concerns.
Noise / Vibration Monitoring	Noise and vibration compliance monitoring for all major equipment and activities on site should be undertaken.

6 CONCLUSION

Renzo Tonin & Associates have completed an assessment of the proposed truck rest area to be located on the F5 Freeway at Varroville.

Noise emissions from the operation of the proposed truck rest area have been found to comply with all relevant criteria.

Noise emissions from activities associated with the construction of the proposed truck rest area have been found to comply with the relevant criteria for the majority of the proposed works. Where exceedances of the construction noise criteria should occur, construction noise management measures should be implemented, as detailed herein, to reduce noise emissions to compliant levels.

Vibration emissions generated by activities associated with the construction of the proposed truck rest area have been found unlikely to exceed relevant human annoyance and structural damage criteria.

APPENDIX A - GLOSSARY OF ACOUSTIC TERMS

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse Weather — Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).

Ambient Noise — The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.

Assessment Period — The period in a day over which assessments are made.

Assessment Point — A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.

Background Noise — Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the $\mathbf{L_{90}}$ noise level (see below).

Decibel [dB] — The units that sound is measured in. The following are examples of the decibel readings of every day sounds:

0dB	The faintest sound we can hear
30dB	A quiet library or in a quiet location in the country
45dB	Typical office space. Ambience in the city at night
60dB	Martin Place at lunch time
70dB	The sound of a car passing on the street
80dB	Loud music played at home
90dB	The sound of a truck passing on the street
100dB	The sound of a rock band
115dB	Limit of sound permitted in industry
120dB	Deafening

dB(A):	A-weighted decibels The ear is not as effective in hearing low frequency sounds as it is hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L_{max}	The maximum sound pressure level measured over a given period.
L_{min}	The minimum sound pressure level measured over a given period.
L_1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L_{10}	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L_{90}	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L_{90} noise level expressed in units of dB(A).
L_{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.

SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound Absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound Level Meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound Pressure Level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound Power Level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B - NOISE MONITORING RESULTS

RENZO TONIN & ASSOCIATES
inspired to achieve

Consultants in Acoustics, Vibration & Structural Dynamics
email: acoustics@rtagroup.com.au
website: www.renzotonin.com.au

noise logger results

36 Lochalsh St, St Andrews

TRAFFIC NOISE MONITORING RESULTS
NSW DEC 'ENVIRONMENTAL CRITERIA FOR ROAD TRAFFIC NOISE', 1999

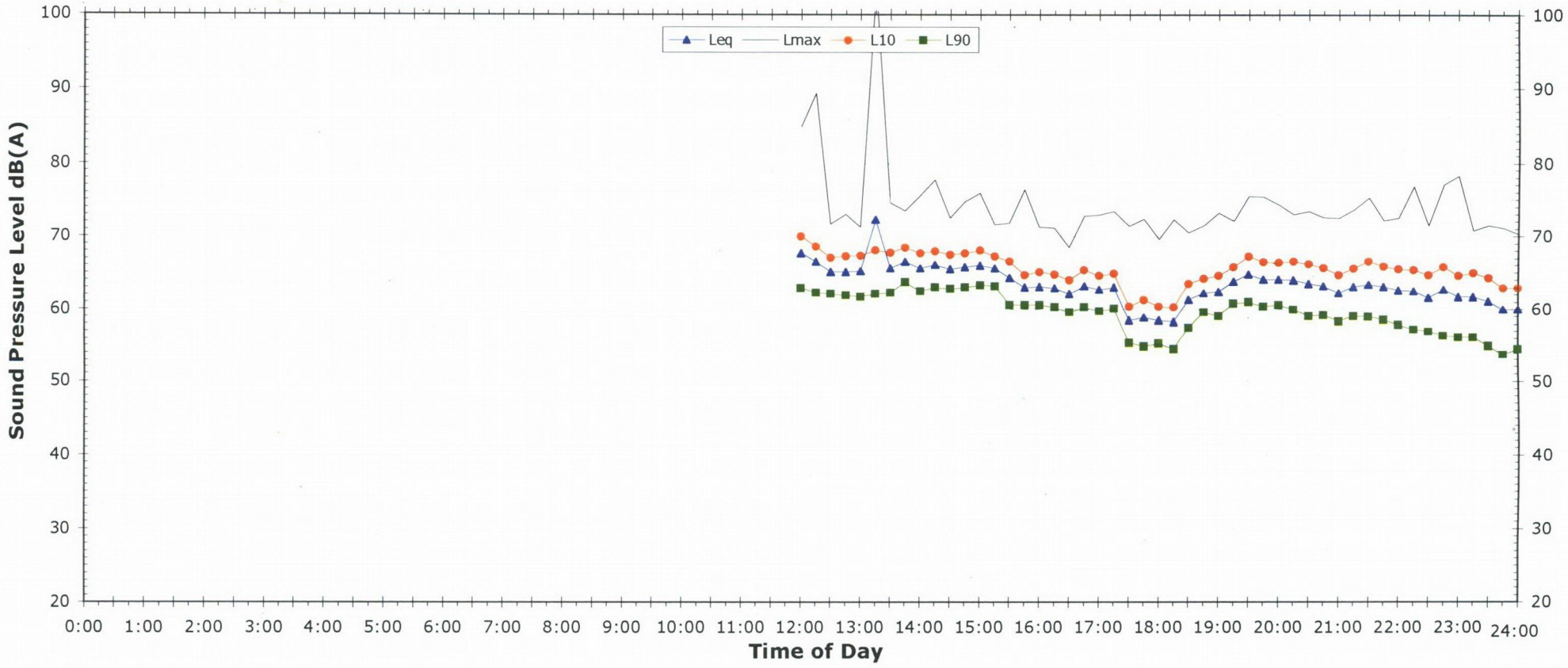
	L_{Aeq} Noise Levels		$L_{Aeq\ 1hr}$ Noise Levels			
Day	Day	Night	Day - Up	Day - Low	Night - Up	Night - Low
Friday-25-July-2008	65	61	68	60	63	59
Saturday-26-July-2008	65	59	66	61	62	57
Sunday-27-July-2008	64	62	66	61	66	59
Monday-28-July-2008	66	64	67	65	67	61
Tuesday-29-July-2008	65	63	68	63	66	60
Wednesday-30-July-2008	65	63	66	63	66	59
Thursday-31-July-2008	65	62	66	64	65	60
Friday-01-August-2008	68	64	72	63	67	61
Saturday-02-August-2008	66	60	68	62	62	57
Sunday-03-August-2008	64	62	65	62	65	58
Monday-04-August-2008	65	63	66	63	65	61
Tuesday-05-August-2008	67	-	71	63	-	-
Representative Weekday	**66**	**63**	**69**	**63**	**66**	**60**
Representative Weekend	**65**	**61**	**66**	**62**	**64**	**58**
Representative Week	**66**	**62**	**68**	**63**	**65**	**59**

25 1982-2007 ACOUSTIC ENGINEERING EXCELLENCE

EXISTING AMBIENT NOISE LEVELS

36 Lochalsh St, St Andrews

Friday, 25 July 2008



NOTES:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

2. "Night" relates to period from 10pm on this graph to 7am on the following graph.

3. Graphed data measured 1m from facade; tabulated results free-field corrected

4. Night time Lmax values are shown only where Lmax > 65dB(A) and where Lmax-Leq ≥ 15dB(A)

NSW ECRTN Policy (1m from facade)		(see note3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	64.6	61.4
$L_{eq\ 1hr}$ upper 10 percentile	68.5	63.4
$L_{eq\ 1hr}$ lower 10 percentile	60.3	58.9

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	74.2	to	78.3
Lmax - Leq (Range)	15.1	to	16.1

Data File: WM56 - NCA03- 36Loch.xls

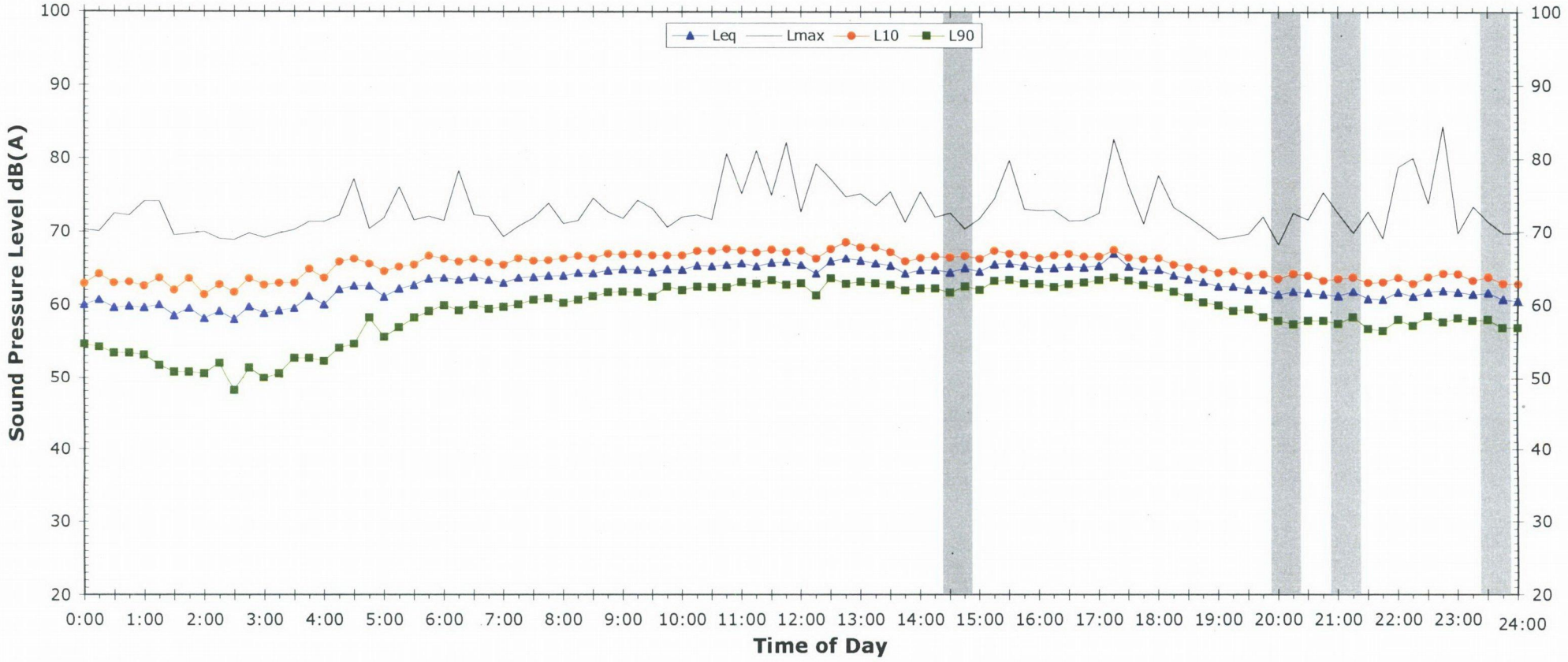
Template QTT-01 (rev 50) Logger Graphs

NCA03 - WM56

EXISTING AMBIENT NOISE LEVELS

36 Lochalsh St, St Andrews

Saturday, 26 July 2008



NOTES:

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2. "Night" relates to period from 10pm on this graph to 7am on the following graph.

3. Graphed data measured 1m from facade; tabulated results free-field corrected

4. Night time Lmax values are shown only where Lmax > 65dB(A) and where Lmax-Leq ≥ 15dB(A)

NSW ECRTN Policy (1m from facade)		(see note3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	64.7	59.2
$L_{eq\ 1hr}$ upper 10 percentile	65.7	61.7
$L_{eq\ 1hr}$ lower 10 percentile	61.4	56.9

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	73.4	to	84.4
Lmax - Leq (Range)	16.4	to	22.7

Data File: WM56 - NCA03- 36Loch.xls

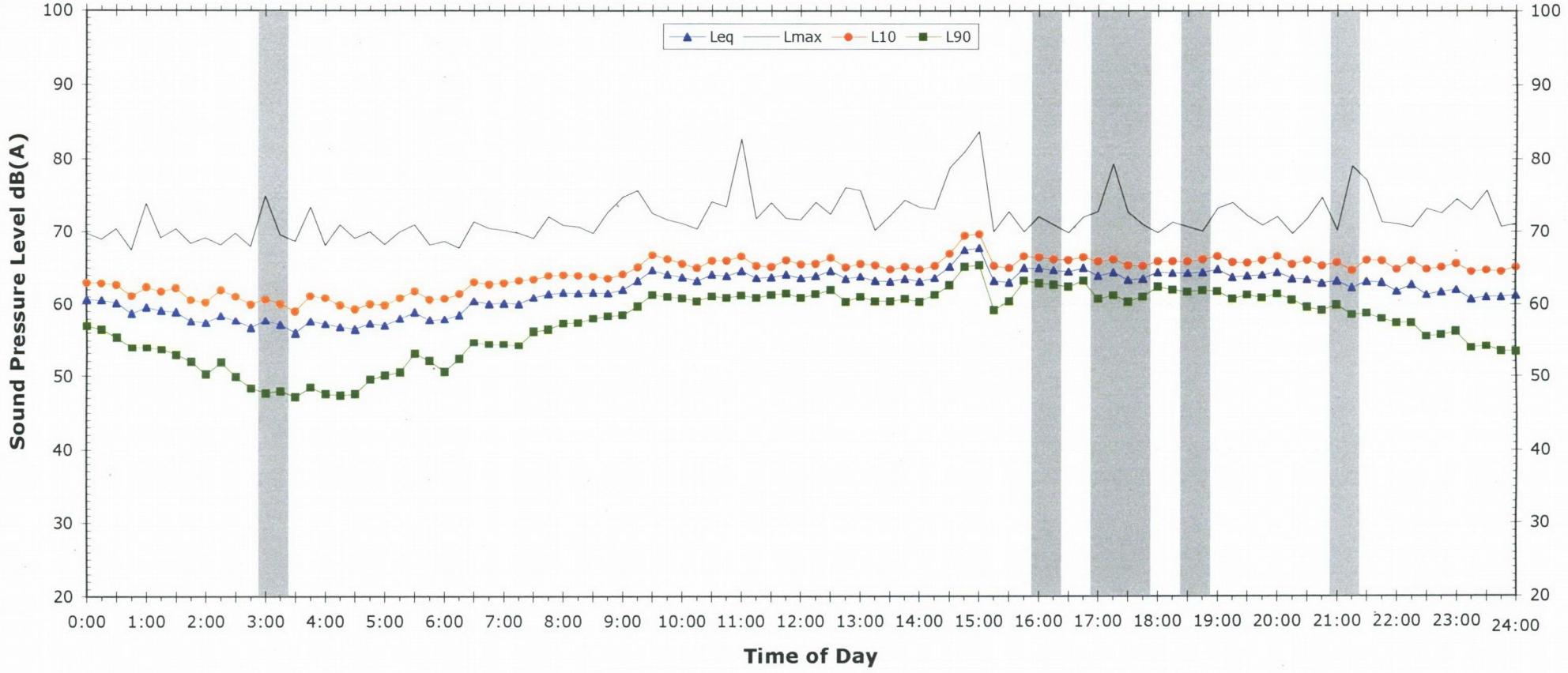
Template QTT-01 (rev 50) Logger Graphs

NCA03 - WM56

EXISTING AMBIENT NOISE LEVELS

36 Lochalsh St, St Andrews

Sunday, 27 July 2008



NOTES:

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2. "Night" relates to period from 10pm on this graph to 7am on the following graph.

3. Graphed data measured 1m from facade; tabulated results free-field corrected

4. Night time Lmax values are shown only where Lmax > 65dB(A) and where Lmax-Leq ≥ 15dB(A)

NSW ECRTN Policy (1m from facade)		(see note3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	63.8	62.3
$L_{eq\ 1hr}$ upper 10 percentile	65.6	66.2
$L_{eq\ 1hr}$ lower 10 percentile	61.3	58.7

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	-	to	-
Lmax - Leq (Range)	-	to	-

Data File: WM56 - NCA03- 36Loch.xls

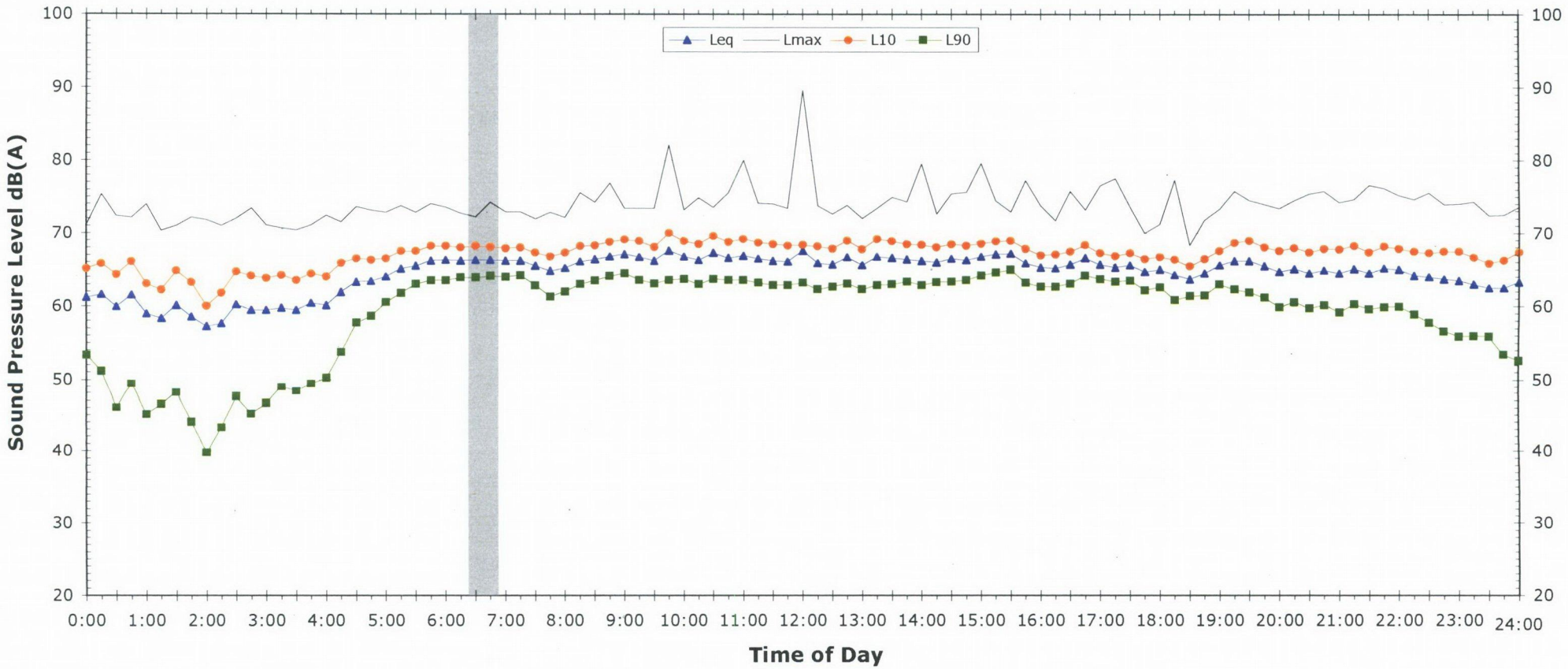
Template QTT-01 (rev 50) Logger Graphs

NCA03 - WM56

EXISTING AMBIENT NOISE LEVELS

36 Lochalsh St, St Andrews

Monday, 28 July 2008



NOTES:

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2. "Night" relates to period from 10pm on this graph to 7am on the following graph.

3. Graphed data measured 1m from facade; tabulated results free-field corrected

4. Night time Lmax values are shown only where Lmax > 65dB(A) and where Lmax-Leq ≥ 15dB(A)

NSW ECRTN Policy (1m from facade)		(see note3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\,hr}$ and $L_{eq\ 9\,hr}$	66.0	64.0
$L_{eq\ 1hr}$ upper 10 percentile	66.8	67.3
$L_{eq\ 1hr}$ lower 10 percentile	64.7	60.5

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	-	to	-
Lmax - Leq (Range)	-	to	-

Data File: WM56 - NCA03- 36Loch.xls

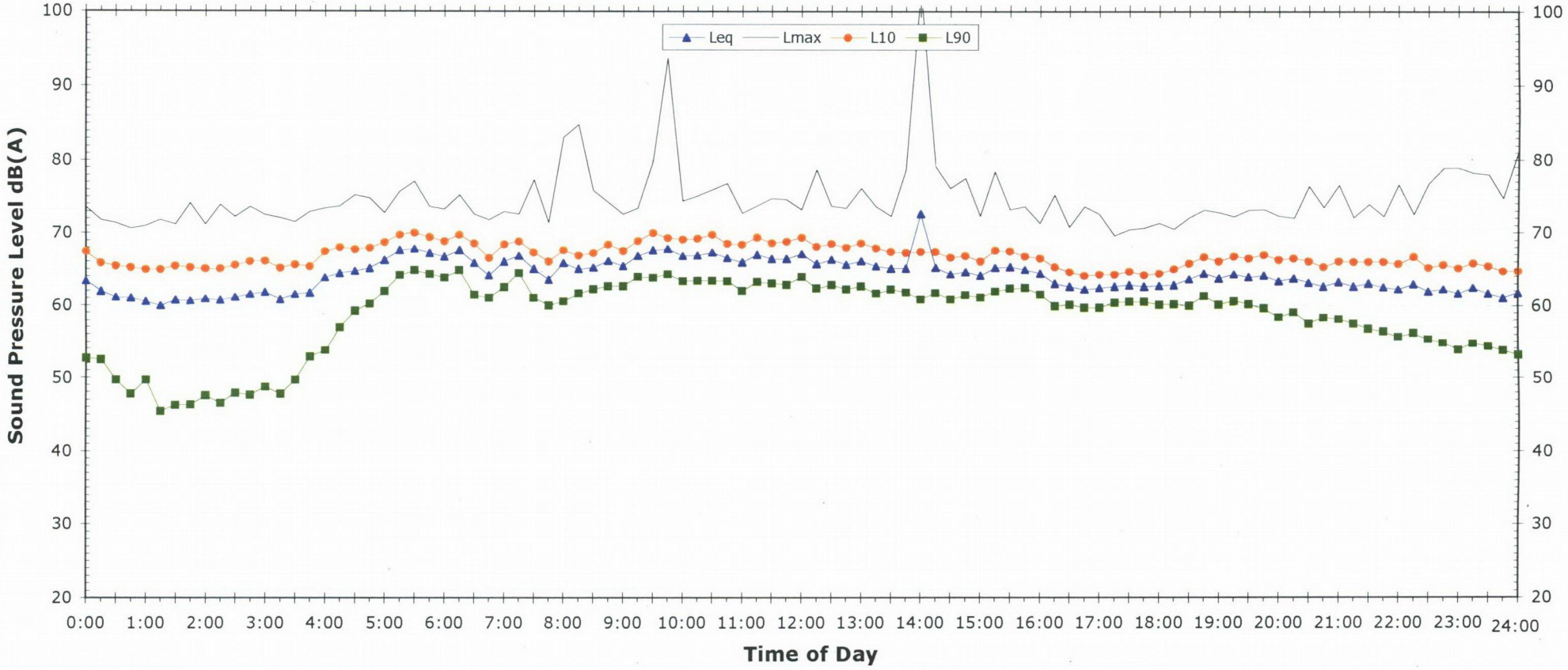
Template QTT-01 (rev 50) Logger Graphs

NCA03 - WM56

EXISTING AMBIENT NOISE LEVELS

36 Lochalsh St, St Andrews

Tuesday, 29 July 2008



NOTES:

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2. "Night" relates to period from 10pm on this graph to 7am on the following graph.

3. Graphed data measured 1m from facade; tabulated results free-field corrected

4. Night time Lmax values are shown only where Lmax > 65dB(A) and where Lmax-Leq ≥ 15dB(A)

NSW ECRTN Policy (1m from facade)		(see note3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	65.3	62.8
$L_{eq\ 1hr}$ upper 10 percentile	67.9	65.7
$L_{eq\ 1hr}$ lower 10 percentile	62.6	59.7

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	78.9	to	81.7
Lmax - Leq (Range)	16.0	to	20.7

Data File: WM56 - NCA03- 36Loch.xls

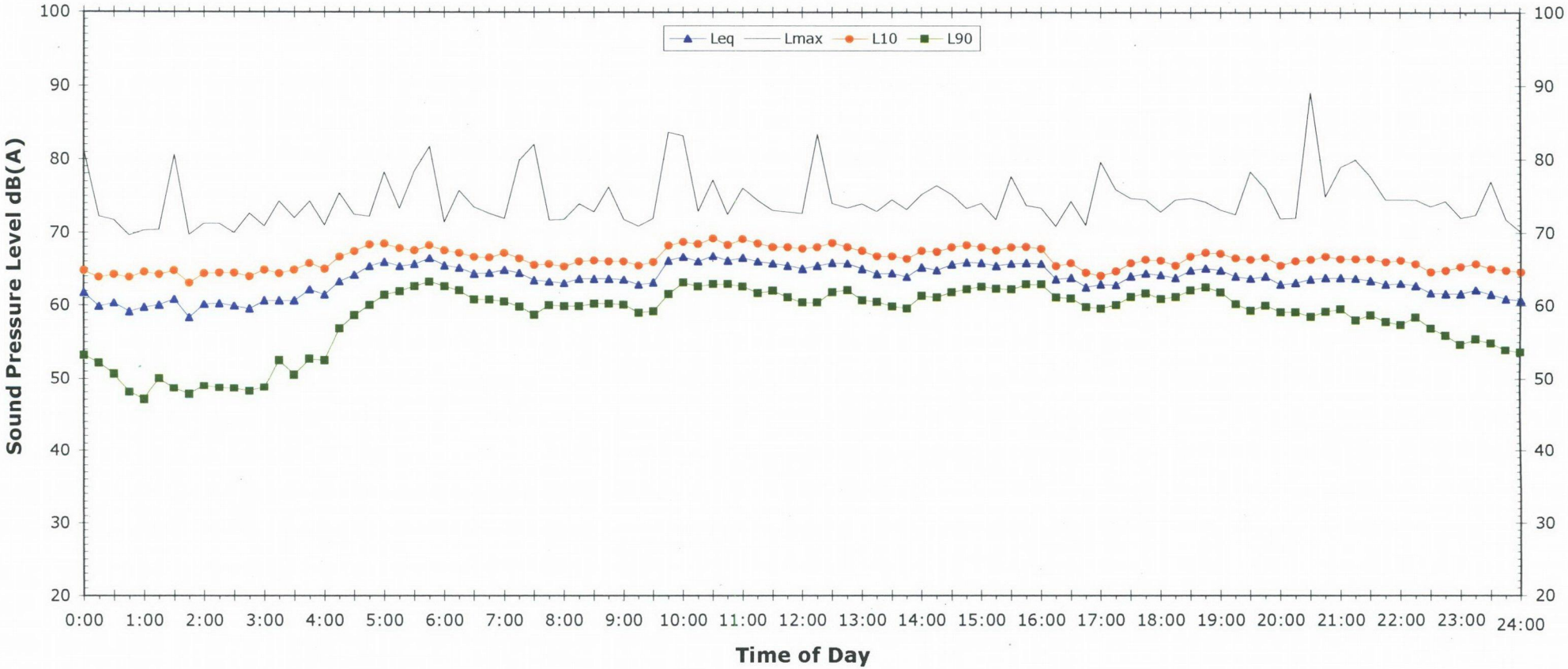
Template QTT-01 (rev 50) Logger Graphs

NCA03 - WM56

EXISTING AMBIENT NOISE LEVELS

36 Lochalsh St, St Andrews

Wednesday, 30 July 2008



NOTES:

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2. "Night" relates to period from 10pm on this graph to 7am on the following graph.

3. Graphed data measured 1m from facade; tabulated results free-field corrected

4. Night time Lmax values are shown only where Lmax > 65dB(A) and where Lmax-Leq ≥ 15dB(A)

NSW ECRTN Policy (1m from facade)		(see note3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	64.6	62.6
$L_{eq\ 1hr}$ upper 10 percentile	66.0	65.6
$L_{eq\ 1hr}$ lower 10 percentile	63.2	59.4

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	77.0	to	86.3
Lmax - Leq (Range)	15.7	to	22.5

Data File: WM56 - NCA03- 36Loch.xls

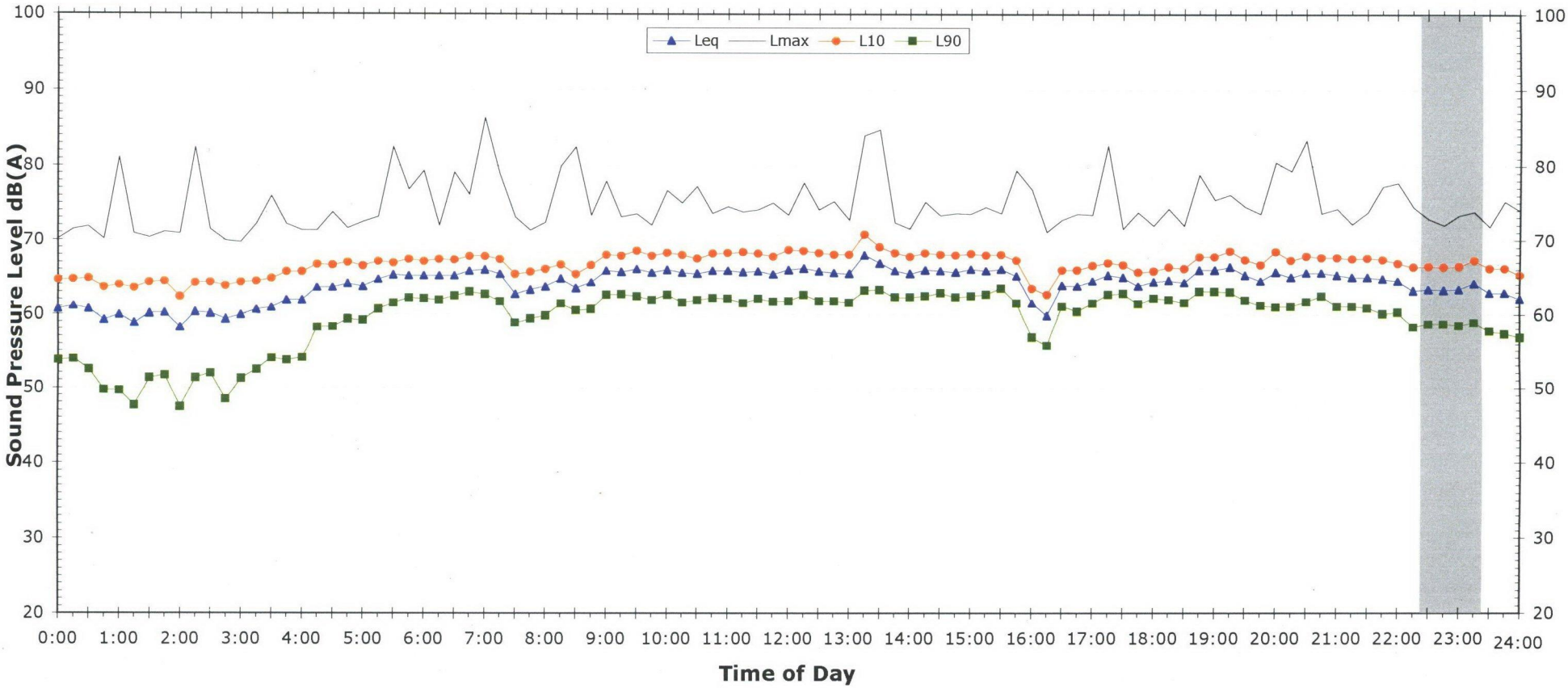
Template QTT-01 (rev 50) Logger Graphs

NCA03 - WM56

EXISTING AMBIENT NOISE LEVELS

36 Lochalsh St, St Andrews

Thursday, 31 July 2008



NOTES:

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2. "Night" relates to period from 10pm on this graph to 7am on the following graph.

3. Graphed data measured 1m from facade; tabulated results free-field corrected

4. Night time Lmax values are shown only where Lmax > 65dB(A) and where Lmax-Leq ≥ 15dB(A)

NSW ECRTN Policy (1m from facade)		(see note3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	65.3	62.5
$L_{eq\ 1hr}$ upper 10 percentile	66.3	65.1
$L_{eq\ 1hr}$ lower 10 percentile	63.6	60.2

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	-	to	-
Lmax - Leq (Range)	-	to	-

Data File: WM56 - NCA03- 36Loch.xls

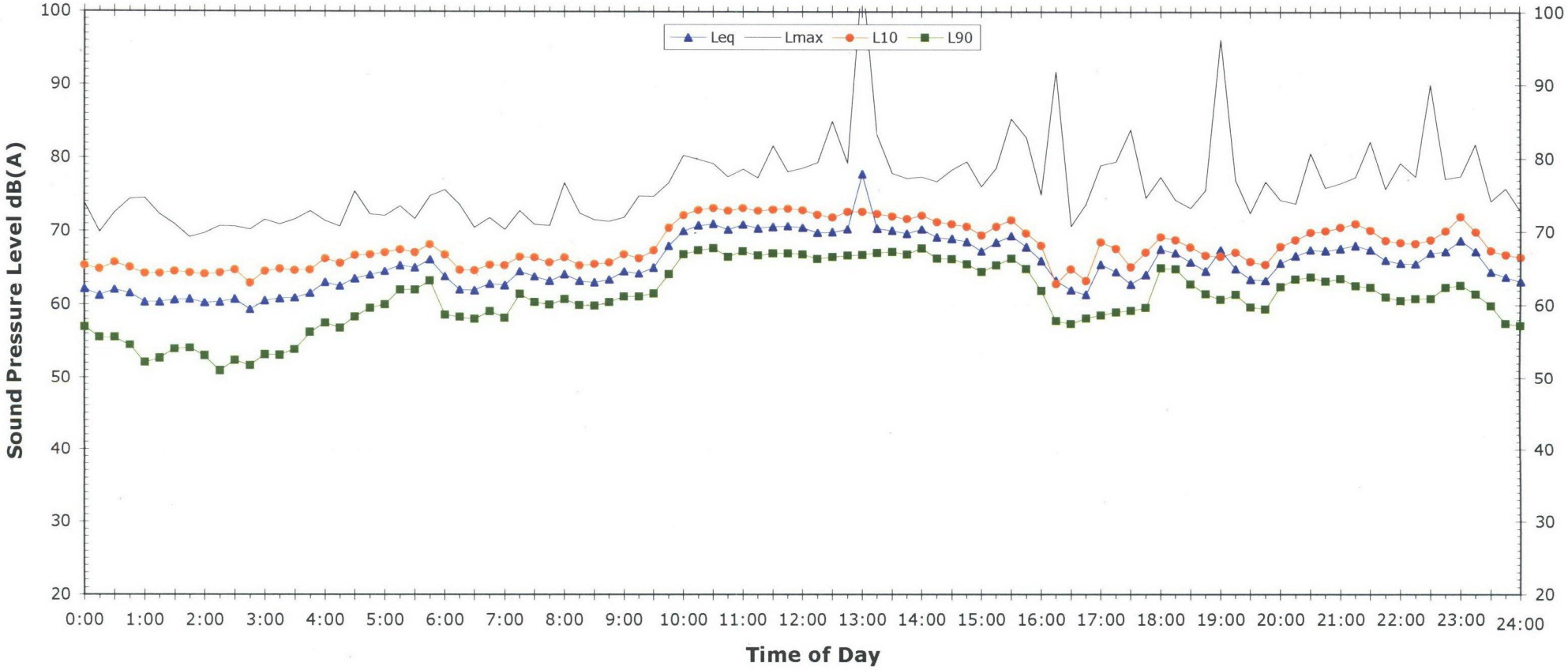
Template QTT-01 (rev 50) Logger Graphs

NCA03 - WM56

EXISTING AMBIENT NOISE LEVELS

36 Lochalsh St, St Andrews

Friday, 1 August 2008



NOTES:

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2. "Night" relates to period from 10pm on this graph to 7am on the following graph.

3. Graphed data measured 1m from facade; tabulated results free-field corrected

4. Night time Lmax values are shown only where Lmax > 65dB(A) and where Lmax-Leq ≥ 15dB(A)

NSW ECRTN Policy (1m from facade)		(see note3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	68.4	63.9
$L_{eq\ 1hr}$ upper 10 percentile	72.4	67.3
$L_{eq\ 1hr}$ lower 10 percentile	63.5	60.9

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	76.0	to	93.1
Lmax - Leq (Range)	15.1	to	28.1

Data File: WM56 - NCA03- 36Loch.xls

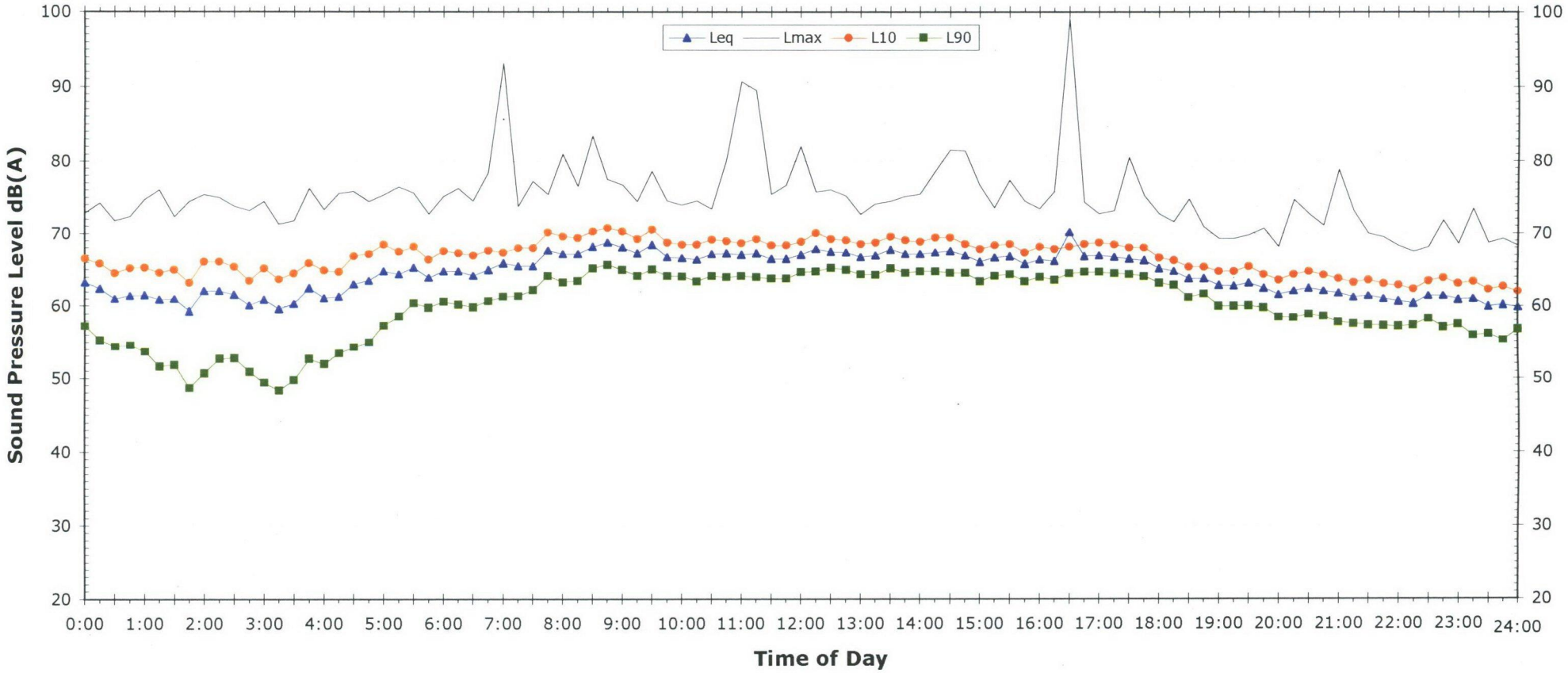
Template QTT-01 (rev 50) Logger Graphs

NCA03 - WM56

EXISTING AMBIENT NOISE LEVELS

36 Lochalsh St, St Andrews

Saturday, 2 August 2008



NOTES:

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2. "Night" relates to period from 10pm on this graph to 7am on the following graph.

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4. Night time Lmax values are shown only where Lmax > 65dB(A) and where Lmax-Leq ≥ 15dB(A)

NSW ECRTN Policy (1m from facade)		(see note3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	66.3	59.8
$L_{eq\ 1hr}$ upper 10 percentile	68.0	62.2
$L_{eq\ 1hr}$ lower 10 percentile	61.6	56.7

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	74.5	to	74.5
Lmax - Leq (Range)	15.3	to	15.3

Data File: WM56 - NCA03- 36Loch.xls

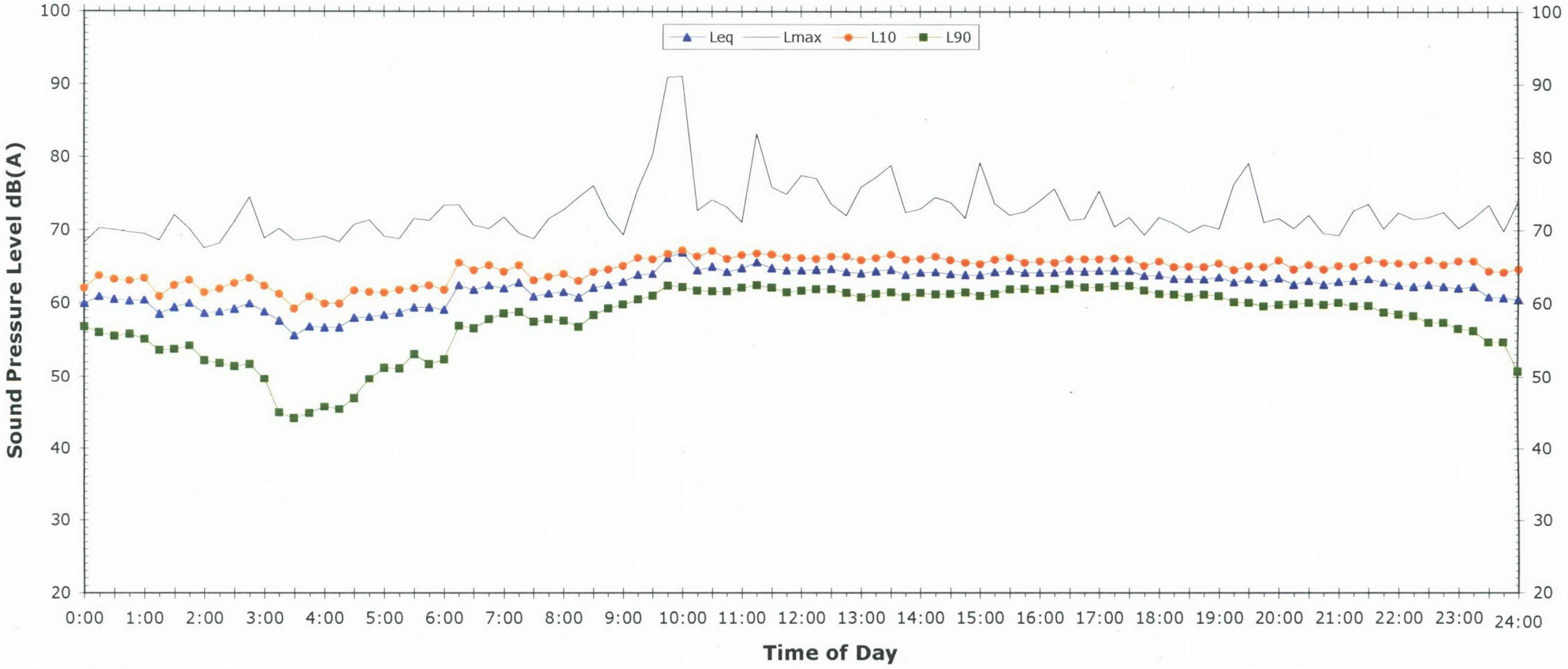
Template QTT-01 (rev 50) Logger Graphs

NCA03 - WM56

EXISTING AMBIENT NOISE LEVELS

36 Lochalsh St, St Andrews

Sunday, 3 August 2008



NOTES:

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2. "Night" relates to period from 10pm on this graph to 7am on the following graph.

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NSW ECRTN Policy (1m from facade)		(see note3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	63.9	62.0
$L_{eq\ 1hr}$ upper 10 percentile	65.2	65.2
$L_{eq\ 1hr}$ lower 10 percentile	61.9	58.2

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	81.4	to	82.6
Lmax - Leq (Range)	20.0	to	21.0

Data File: WM56 - NCA03- 36Loch.xls

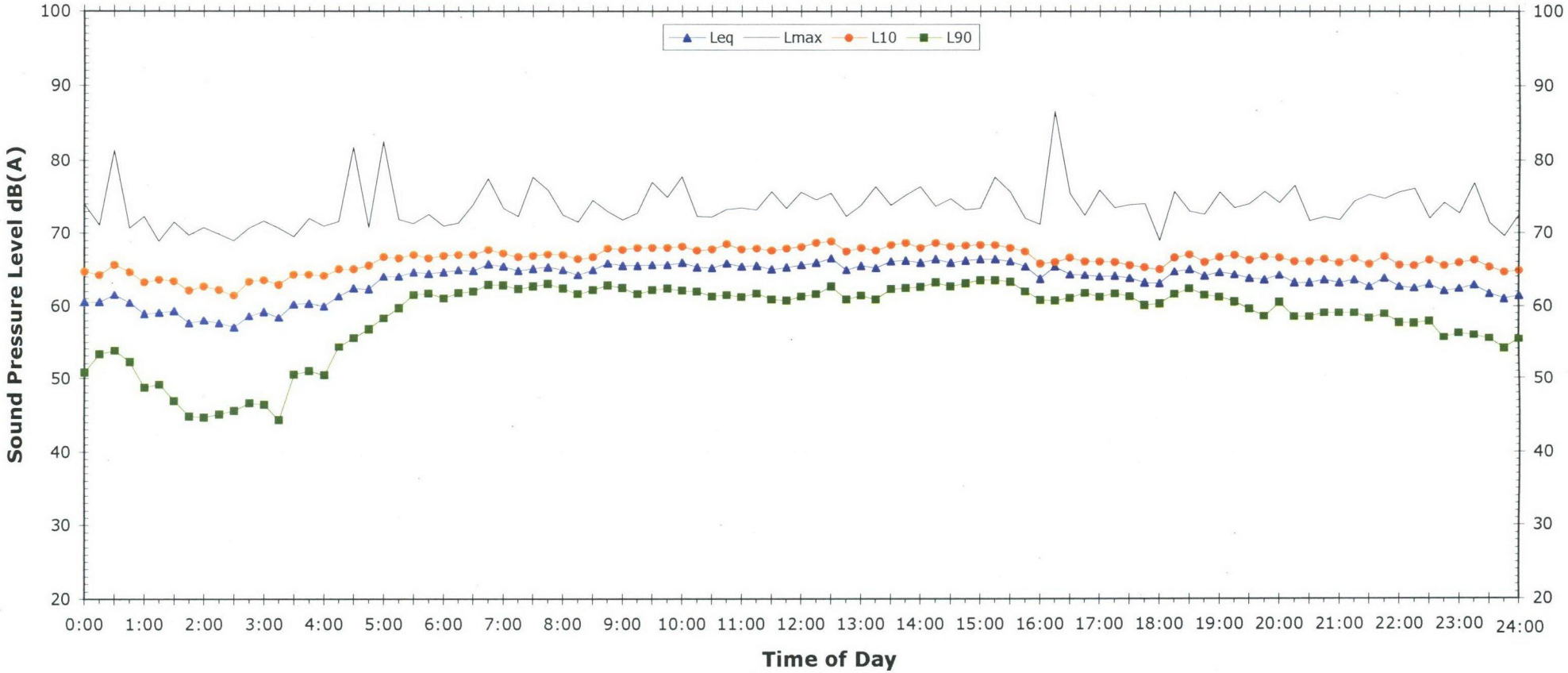
Template QTT-01 (rev 50) Logger Graphs

NCA03 - WM56

EXISTING AMBIENT NOISE LEVELS

36 Lochalsh St, St Andrews

Monday, 4 August 2008



NOTES:

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2. "Night" relates to period from 10pm on this graph to 7am on the following graph.

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4. Night time Lmax values are shown only where Lmax > 65dB(A) and where Lmax-Leq ≥ 15dB(A)

NSW ECRTN Policy (1m from facade)		(see note3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	65.0	62.5
$L_{eq\ 1hr}$ upper 10 percentile	66.1	64.7
$L_{eq\ 1hr}$ lower 10 percentile	63.3	60.7

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	76.9	to	76.9
Lmax - Leq (Range)	15.1	to	15.1

Data File: WM56 - NCA03- 36Loch.xls

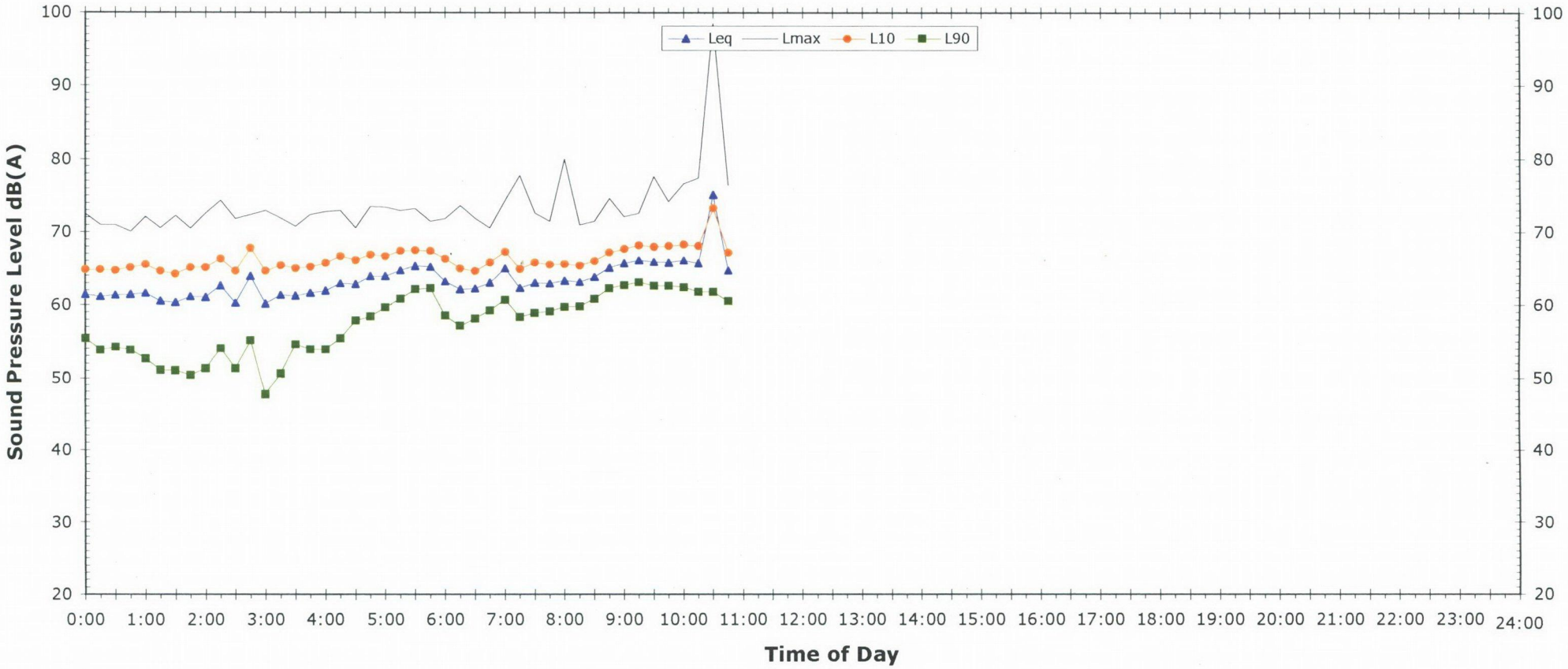
Template QTT-01 (rev 50) Logger Graphs

NCA03 - WM56

EXISTING AMBIENT NOISE LEVELS

36 Lochalsh St, St Andrews

Tuesday, 5 August 2008



NOTES:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.

2. "Night" relates to period from 10pm on this graph to 7am on the following graph.

3. Graphed data measured 1m from facade; tabulated results free-field corrected

4. Night time Lmax values are shown only where Lmax > 65dB(A) and where Lmax-Leq ≥ 15dB(A)

NSW ECRTN Policy (1m from facade)		(see note3)
Descriptor	Day	Night[2]
	7am-10pm	10pm-7am
$L_{eq\ 15\ hr}$ and $L_{eq\ 9\ hr}$	66.9	-
$L_{eq\ 1hr}$ upper 10 percentile	71.1	-
$L_{eq\ 1hr}$ lower 10 percentile	62.9	-

Night Time Maximum Noise Levels			(see note 4)
Lmax (Range)	-	to	-
Lmax - Leq (Range)	-	to	-

Data File: WM56 - NCA03- 36Loch.xls

Template QTT-01 (rev 50) Logger Graphs

NCA03 - WM56

Appendix D

Non-Indigenous archaeological assessment

An Historical Archaeological Assessment of the Proposed F5 Varroville Truck Rest Area.

September 2009

Stedinger Associates
65 Broughton Street, CAMDEN, NSW 2570
PO Box 1206, CAMDEN, NSW 2570
Tel. (02) 4657 2480

www.stedinger.com.au
M.ICOMOS, M.AACAI

For

NSW Roads and Traffic Authority
Level 5, 260 Elizabeth Street, SURRY HILLS, NSW 2010

CONTENTS.

EXECUTIVE SUMMARY.

The subject survey area and location of the proposed F5 Varroville Truck Rest Area is considered to have no archaeological potential or archaeological significance. No evidence of surface or potential subsurface remains were located during a survey of the site or an examination of satellite images. The subject survey area is considered to be historically significant for its association with the wider Varroville Estate which dates back to 1810 and for its association with several prominent figures of New South Wales including Dr. Robert Townson, Captain Charles Sturt the explorer, Postmaster General James Raymond and Justice Alfred Cheeke.

During the present study, archaeological features were noted in the immediate vicinity of the proposed F5 Truck Rest Area. Archaeological features are present that are considered to be of Local and potentially State significance – the early access road and possibly associated fencing located immediately to the northeast of the subject site. Recommendations in this report stress the importance of avoiding these significant items in the proposed development.

Because of the heritage significance of items in the vicinity of the proposed F5 Varroville Truck Rest Area and being proposed on historic lands associated with a property listed on the State Heritage Register, the NSW Roads and Traffic Authority should apply for an excavation permit exception under 1(A) and 1(C) of the Schedule of Exceptions to Section 139(1) & (2) of the NSW Heritage Act (1977) made under Section 139(4), for the proposed construction of the F5 Varroville Truck Rest Area.

1. INTRODUCTION.

An Historical Archaeological Assessment of the Proposed F5 Varroville Truck Rest Area.

1.1. Application Details.

This report was commissioned by the NSW Roads and Traffic Authority on the 05th of August 2009. It is an archaeological assessment and impact statement of a proposed truck rest area along the Hume Highway (F5) near historic Varroville, New South Wales (refer to Figure 1.1). This archaeological assessment is part of a Review of Environmental Factors (REF) for the proposed works. It includes a brief investigation of the history and development of historic Varroville, evaluates the probable extent, nature and integrity of surface and sub-surface remains within the site of the proposed truck rest area and assesses historical archaeological significance. It also identifies areas of potential archaeological sensitivity and discusses the possible impact of the proposed construction project on the archaeological resource. Included in this archaeological assessment are recommendations having regard to the significance of the potential archaeological resource and statutory requirements.

1.2. The Study Area and its Location.

The subject study area is located 41 kilometres southwest of Sydney in New South Wales and is located in the local government area of Campbelltown, the Parish of Minto and the County of Cumberland. It lies on the west side of the Hume Highway (F5) between St Andrew's Road and Campbelltown Road and has an area of 19 532 metres^2. The Varroville homestead complex lies 475 metres to the northwest.

Sited at the low lying foot of the scenic hills of Varroville, the site itself was once part of this larger historic homestead and farming complex. To the southeast, the Hume Highway (F5) is a dominant modern feature that runs across the landscape, separating rural Varroville to the northwest from the modern residential development of St Andrews to the southeast. The tributaries of Bunbury Curran Creek pass through Varroville by the subject site. Located within the flood zone, the study area has been used as grazing land. To the west and north, the scenic hills remain the prominent

topographic feature of the local area. Upon these hills, elevated to the west, Varroville with its farm house and ancillary buildings, remnant gardens, grazing paddocks and landscape features survives from the former Colonial settlement and farming years. The adjoining Scenic Hills Riding Ranch, to the northeast, also remains as part of the rural landscape that has a history dating back to the early settlement of the Campbelltown area.

1.3. Methodology.

This report has been prepared in accordance with the NSW Heritage Management System described in the *NSW Heritage Manual* and follows procedures and approaches outlined in *Statements of Heritage Impact, Archaeological Assessments* and *Assessing Heritage Significance.*[1] It supports the principals and practices outlined in *The Conservation Plan* by J.S. Kerr and the *Australia ICOMOS Charter for Places of Cultural Significance* (The Burra Charter) and has regard for statutory requirements.[2] Based on the findings, this report identifies areas of potential archaeological sensitivity and discusses the possible impact of proposed works on existing heritage items within the subject area and the potential archaeological resource. The recommendations in this report incorporate mitigating measures.

This report includes:

1. A history of the subject area in context with the Varroville homestead complex;
2. An assessment of the archaeological significance of the subject area;
3. A description of the site and remnant heritage items within this road reserve;
4. An evaluation of the probable extent, nature and integrity of surface and sub-surface remains within the specified site;
5. An assessment of the impact of the proposed works on the significance of the identified heritage items and the potential archaeological resource;

---

[1] NSW Heritage Office and Department of Urban Affairs and Planning. 1996. *NSW Heritage Manual.* HO/DUAP, Sydney. *Statements of Heritage Impact* (update, 2001).
NSW Heritage Office. 2001. *Assessing heritage significance.* NSW Heritage Office, Parramatta.
NSW Heritage Office and Department of Urban Affairs and Planning. 1996. *Archaeological Assessments. Archaeological Assessment Guidelines.* HO/DUAP, Sydney.

[2] Australia ICOMOS. 1999. *The Burra Charter. The Australia ICOMOS Charter for Places of Cultural Significance.* Australia ICOMOS Inc.
Kerr, James, Semple. 1996. *The Conservation Plan. A Guide to* the preparation of conservation plans for places of European cultural significance. The National Trust (NSW).

6. Measures to mitigate or minimise negative impacts on the heritage values of items and the site; and
7. A bibliography of primary and secondary research sources used.

In 1992 a Conservation Management Plan was written by Orwell & Peter Phillips Architects. As part of this Plan, a detailed history of Varroville and an archaeological assessment of Varroville and its landscape were carried out by Wendy Thorp.[3] These works were revised and updated by Pearson-Smith & Associates Pty Ltd in 1999. The findings of these documents have been considered in this present study.

1.4. Limitations.

The present study focuses on the potential archaeological resource at the site of the proposed truck rest area, a site that comprises 19 532 metres^2 of land. It does not extend to heritage resources within the listed heritage curtilage of the Varroville homestead and farming complex.

A separate study of views in and around the subject study area is in process for the NSW Roads and Traffic Authority and is not a part of this report or the consultant's brief.

1.5. Author Identification.

Dr. Louise Steding and Mr Gerald Steding of Stedinger Associates carried out a site inspection of the Varroville F5 Proposed Truck Rest Area on the 10th of August 2009. This archaeological assessment was written by Dr. Louise Steding.

---

[3] Orwell and Peter Phillips Architects. 1992. Conservation Policy Plan. Varro Ville. St Andrews Road, Varroville. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999.
Thorp, Wendy. 1992. *Historical Context "Varro Ville"*. For Orwell and Peter Phillips Architects. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999.
Thorp, Wendy. 1992. *Archaeological Assessment "Varro Ville"*. For Orwell and Peter Phillips Architects. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999.

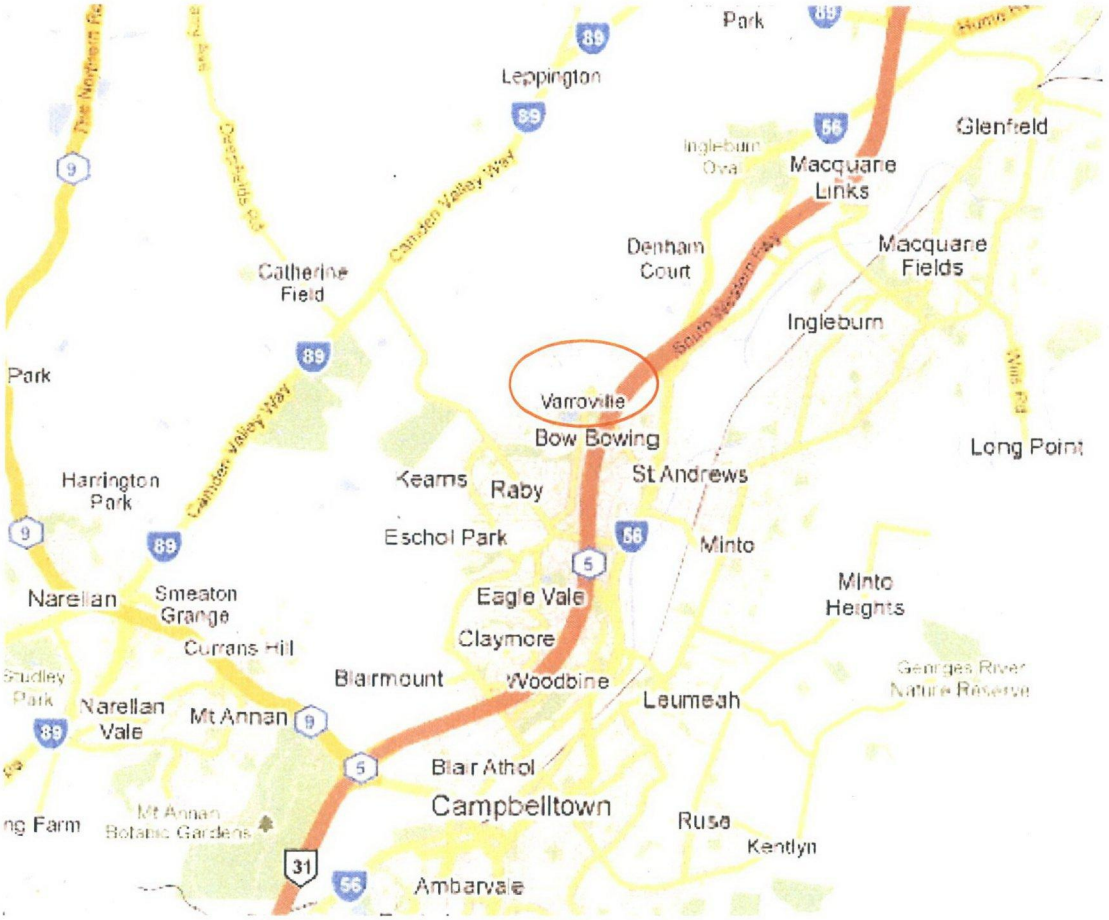


Figure 1.1. Location of Varroville and the Hume Highway (F5). Google Maps. MapData Sciences Pty Ltd., 2009.

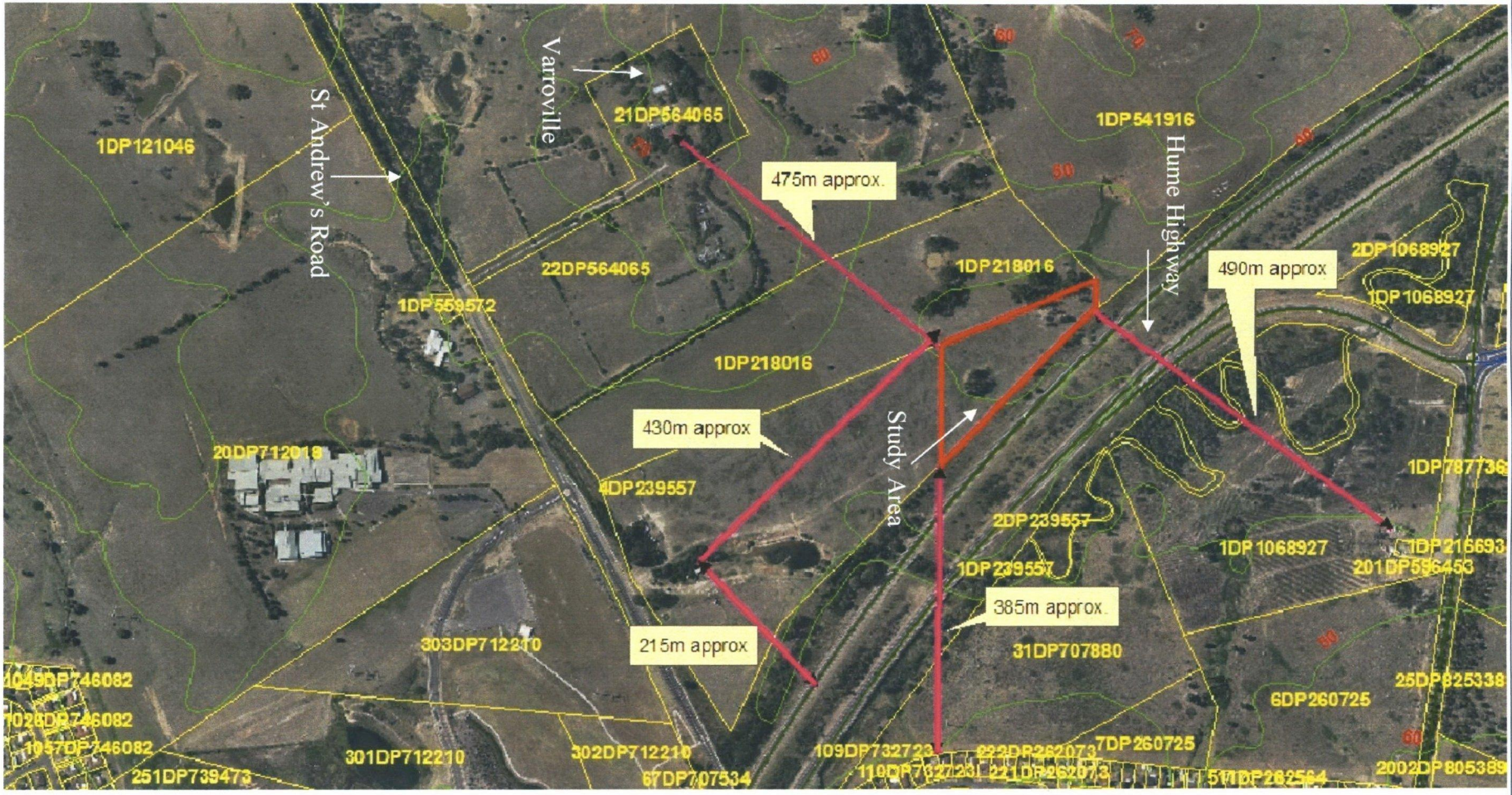


Figure 1.2. Aerial photograph showing the location of the proposed Varroville truck rest area along the F5 near Varroville. Courtesy of the NSW Roads and Traffic Authority. 2009.

Figure 1.3. The location of Varroville. From the UBD Sydney and Blue Mountains Street Directory, 2008.

2. PROPOSED WORKS.

2.1. Background.

New national road transport heavy vehicle driver fatigue laws took effect on the 29th of September 2008. These laws established revised work and rest limits for truck drivers and require better management of driver fatigue. The proposed truck rest area at Varroville is intended to help prevent driver fatigue and to ensure drivers are able to comply with the legal work and rest hours.

The northbound widening of the Hume Highway (F5) between Brooks Road and the M5/M7 interchange was completed in August 2008. As part of this project an informal northbound truck rest stop for about 15 trucks near the Camden Valley Way exit ramp was removed for safety reasons. Additional informal northbound truck parking on the southern approach to Sydney is located at Pheasants Nest, 35 kilometres south of the M5/M7 interchange and at Menangle Park. Each of these truck rest areas caters for 14 semi-trailers.

Considering representations made by the trucking industry, the NSW Roads and Traffic Authority has investigated options for improving the opportunity for truck drivers to stop and rest and check loads before entering the Sydney urban road system. The subject location was identified as a possible truck rest area along the southern approach to Sydney.

2.2. Proposed Works.

The NSW Roads and Traffic Authority (RTA) propose to construct a northbound truck only rest area on the Hume Highway (F5) approximately 7 kilometres south of the M5/M7 interchange. The truck rest area is to cater for some 55 to 60 trucks. Parking includes spaces for 25 semi-trailers (19m in length), spaces for 21 B-Double trucks (25m in length) and an additional 9 spaces for use by B-triple vehicles (36.5m in length) or 13 spaces for B-Double vehicles. An architectural impression of the final facility is shown below (refer to Figure 2.2).

The rest area is to include a deceleration lane extending for a length of 360 metres and an acceleration lane on a marginally downhill grade for a length of 810 metres. It is to have an additional single lane bridge over Bunbury Curran Creek. Other facilities are to include toilets, wash basins, shower facilities, sheltered tables and parking area lighting. This will require the connection of town water, sewer and power. Fencing and safety barriers are to be erected around the bitumen parking area. Stormwater runoff is to be conveyed to a detention basin.

The following proposed works are associated with the construction of this Truck Rest facility:

1. Excavation and construction of a retaining wall;
2. Raising area 3m to 6m;
3. Construction of a single lane bridge over Bunbury Curran Creek;
4. Construction of deceleration and acceleration lanes.
5. Laying of pavement and the installation of kerbs, gutters, drainage and a detention basin;
6. Excavation for installation of sewer, water and electricity;
7. Erection of fencing, safety barriers and signage; and
8. General landscaping.

Rather than bulk excavation, the proposed works mostly involve the build up of deposits raising the level of the subject site to that of the existing Freeway. Here, the land level would be raised between 3 metres and 6 metres. Excavations for the installation of toilet facilities, sheltered tables and associated services within the proposed truck rest area itself, kerbing and guttering, stormwater drains and the laying of road pavement will extend through newly deposited material leaving intact deposits undisturbed.

The exceptions to this are the following works:

1. excavations for electricity poles northeast of the proposed truck rest area;
2. excavation for the sewer line southwest of the proposed truck rest area;
3. excavation beneath the Hume Highway for a water main;

4. excavation in preparation for the construction of a retaining wall (presumably around the perimeter of the proposed truck rest area; and
5. Excavation for the detention basin (location not shown).

These works will involve excavation of intact deposits in the vicinity of the proposed truck rest area (refer to Figure 3.1). Footings for the electricity poles are likely to extend to a depth of 2 metres. The depth of the sewer and water mains will be a minimum of 600mm. The retaining wall is likely to extend to a depth of about a metre.

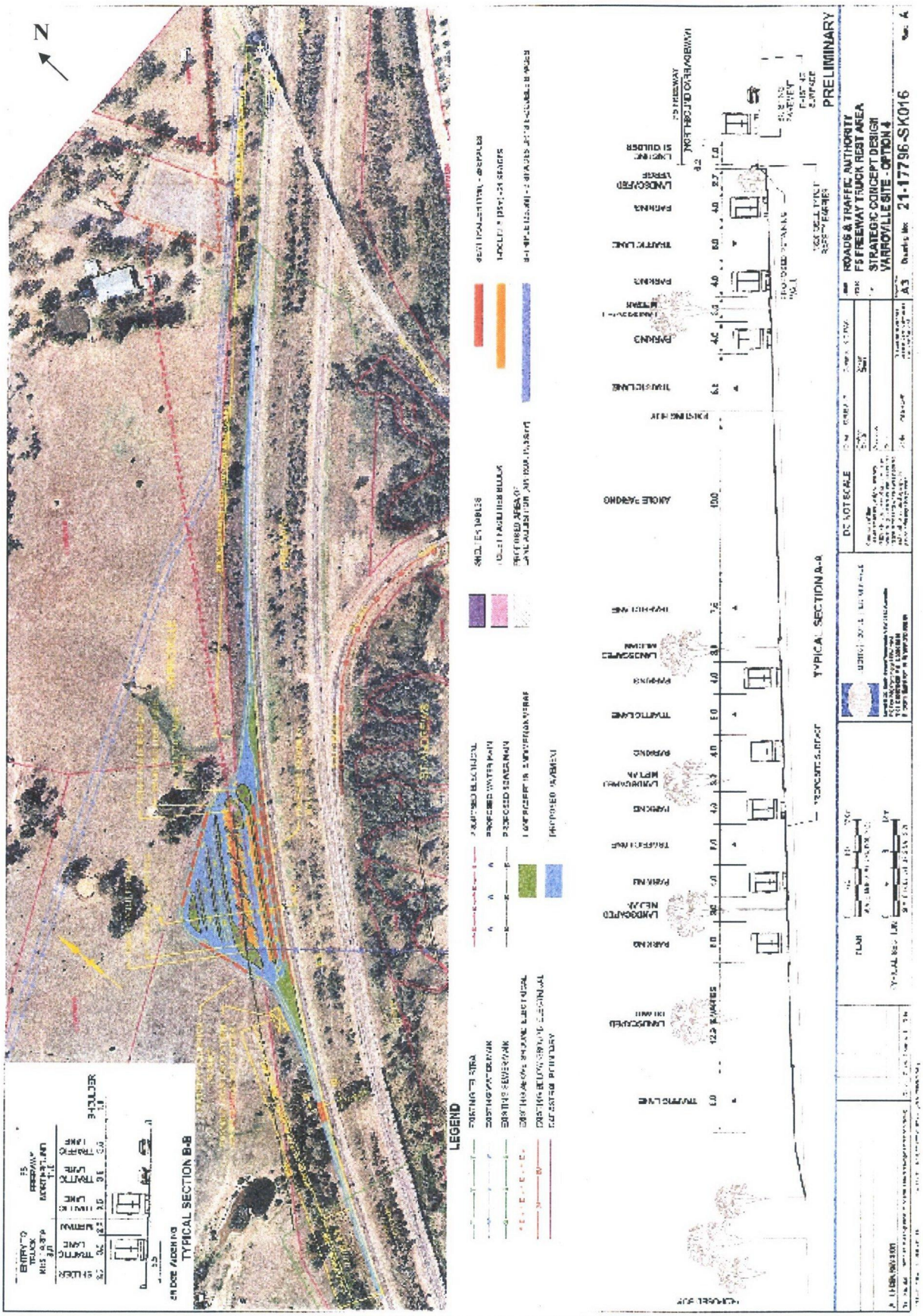


Figure 2.1. F5 Freeway Truck Rest Area Strategic Concept Design, Varroville. GHD, 2009.

Figure 2.2. Varroville Truck Rest Area. Architectural impression. GHD, 2nd April 2009.

3. HERITAGE STATUS AND STATUTORY OBLIGATIONS.

3.1. The State Heritage Register and the NSW Heritage Act 1977.

The historic place Varroville was listed on the State Heritage Register on the 2nd of April 1999 (SHR No.00737). Earlier on the 27th of August 1993 a Permanent Conservation Order had been placed on the site. Although once a part of Varroville, the subject site lies beyond the historic curtilage of Varroville as defined in the State Heritage Register (refer to Figure 3.1).

The NSW Heritage Act of 1977 (and the Heritage Amendment Act 2009) is a statutory framework for the identification and conservation of heritage in New South Wales. The Act established the Heritage Council of New South Wales, which makes recommendations to the Minister on the implementation of the Heritage Act.

Sub surface remains or relics are protected under Section 139 of the NSW Heritage Act 1977. This provision for the protection of archaeological relics applies generally to all land in New South Wales. It applies to locally listed and unlisted sites, but does not apply to places listed on the NSW State Heritage Register or to those which are the subjects of Interim Heritage Orders. When a relic is a component of a place listed on the NSW State Heritage Register or is subject of an Interim Heritage Order, protection for that relic is provided under Section 57(1) (c) and (d) of the Act and is identical to that under Section 139.

Under Section 4(1) of the NSW Heritage Act 1977 and the Heritage Amendment Act 2009 (No.34) a 'relic' is defined as:

> Any deposit, artefact, object or material evidence that:
> (a) relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and
> (b) is of State or local significance.

Under Section 139 of the NSW Heritage Act 1977:
(1) a person must not disturb or excavate any land knowing or having reasonable cause

to suspect that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed unless the disturbance or excavation is carried out in accordance with an excavation permit.
(2) a person must not disturb or excavate any land on which the person has discovered or exposed a relic except in accordance with an excavation permit.

If a site is listed on the State Heritage Register or is the subject of an Interim Heritage Order then approval to excavate is required under section 60 of the NSW Heritage Act. This applies to Varroville within its registered heritage curtilage. For sites not listed on the State Heritage Register or which are not subject of an Interim Heritage Order, where significant relics may be destroyed, damaged or disturbed, approval to excavate should be sought from the Heritage Council of NSW under section 140 of the Heritage Act, as defined by section 139 of the NSW Heritage Act 1977, unless there is an applicable gazetted 'exception' (refer below to 3.2).

As discussed, the subject area at the proposed F5 Truck Rest Area has not been entered on the State Heritage Register nor is it the subject to an Interim Heritage Order. The granting of a section 140 permit or an exception by the Heritage Council of NSW will be required at the subject site only where works involving ground disturbance may impact upon significant relics (refer to Chapters 5-8).

Section 146 of the NSW Heritage Act requires that the accidental discovery of relics should be reported in writing to the Heritage Council of NSW. Depending on the nature of the discovery, an additional assessment and possibly an excavation permit may be required prior to the recommencement of excavation in the affected area.

3.2. Excavation Permit Exceptions.

Under Section 139 of the NSW Heritage Act 1977:
139(4) The Heritage Council may by order published in the Gazette create exceptions to this section, either unconditionally or subject to conditions, in respect of any of the following:
(a) any relic of a specified kind or description,

(b) any disturbance or excavation of a specified kind or description,

(c) any disturbance or excavation of land in a specified location or having specified features or attributes,

(d) any disturbance or excavation of land in respect of which an archaeological assessment approved by the Heritage Council indicates that there is little likelihood of there being any relics in the land.

In 2005, 2006 and 2008 new exceptions to subsections 139(1) and (2) of the Heritage Act 1977 were created by the Chair of the Heritage Council of New South Wales.

For items not listed on the State Heritage Register, like the site of the proposed Varroville Truck Rest Area, an excavation permit under Section 139 of the Heritage Act 1977 for the excavation or disturbance of land is not required, where the Director of the NSW Department of Planning (Heritage Office) is satisfied that: [4]

> (1A) An archaeological assessment, zoning plan or management plan has been prepared in accordance with Guidelines published by the Heritage Council of NSW which indicates that any relics in the land are unlikely to have State or local heritage significance;
>
> (1B) The excavation or disturbance of land will have a minor impact on archaeological relics including the testing of land to verify the existence of relics without destroying or removing them;
>
> (1C) The proposed excavation demonstrates that evidence relating to the history or nature of the site, such as its level of disturbance, indicates that the site has little or no archaeological research potential. or disturbance of land involves only the removal of fill which has been deposited on the land;
>
> (2A) The excavation or disturbance of the land is for the purpose of exposing underground utility services infrastructure which occurs within an existing service trench and will not affect any other relics;

---

[4] Refer to Standard Exemptions for W*orks Requiring Heritage Council Approval. Standard Exemption 4: Excavation*;
Refer to Heritage Act 1977 Notice of Order under Section 139(4).

(2B) The excavation or disturbance of the land is to carry out inspections or emergency maintenance or repair on underground utility services and due care is taken to avoid effects on any other relics;

(2C) The excavation or disturbance of the land is to maintain, repair or replace underground utility services to buildings which will not affect any other relics;

(2D) The excavation or disturbance of the land is to maintain or repair the foundations of an existing building which will not affect any associated relics; or

(2E) The excavation or disturbance of the land is to expose survey marks for use in conducting a land survey.

Where an applicant proposes to undertake or disturb land in the manner described above, they must notify the Director in writing describing the proposed works and explaining why they satisfy criteria (a), (b) or (c) above. The Director will then notify the applicant as to whether or not an exception is granted.

3.3. Campbelltown Local Environmental Plan – District 8 (Central Hills Lands).

Section 84 of the NSW Heritage Act 1977 requires that when a council prepares a Local Environmental Plan under the Environmental Planning and Assessment Act 1979 that will apply to land on which a building, work or relic is situated, or that comprises a place or precinct, that is an item of the environmental heritage, then the council must ensure that the plan (or some other local environmental plan being amended by the plan) contains provisions to facilitate the conservation of the building, work, relic, place or precinct.

Varroville has been listed as an item of environmental heritage in Schedule 1 of the *Campbelltown Local Environmental Plan – District 8 (Central Hills Lands)*. This heritage inventory describes it as:

- "Varro Ville", lot 21, DP 564065.

Under Part 3 Special Provisions, Regulation18 – Items of the Environmental Heritage:

(1) A person shall not, in respect of a building, work, relic or place that is an item of the environmental heritage:

(a) demolish, renovate or extend the building or work,

(b) damage or despoil the relic or place or any part of the relic or place,

(c) excavate any land for the purpose of exposing or removing the relic,

(d) erect a building on the land on which the building, work or relic is situated or on the land which comprises that place, or

(e) subdivide the land on which the building, work or relic is situated or the land which comprises that place,

except with the consent of the Council.

(2) The Council shall not grant consent as referred to in subclause (1) unless it has made an assessment of:

(a) the significance of the item as an item of the environmental heritage of the Central Hills Lands,

(b) the extent to which the carrying out of the development in accordance with the consent would affect the historic, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance of the item and its site,

(c) whether the setting of the item, and in particular whether any stylistic, horticultural or archaeological features of the setting, should be retained, and

(d) whether the item constitutes a danger to the users or occupiers of the item or to the public.

It should be noted that in the subject Campbelltown Local Environmental Plan, the Varroville property is zoned 7d(i), Environmental Protection – Scenic. As described in Section 1.4 of this report, a separate study of views in and around the subject study area is in process for the NSW Roads and Traffic Authority and is not a part of this present report.

3.4. Campbelltown (Sustainable) City DCP 2009.

Under this Development Control Plan, Council is to ensure that new development takes appropriate account of the significance of heritage items, heritage conservation areas,

relics and their settings.

Under the design requirements for non-indigenous heritage:

a) Any development application made in respect to development on land that is:

i) occupied by a heritage item; or

ii) adjoining land occupied by a heritage item; or

iii) located within a heritage conservation are,

shall have regard to the Articles of 'The Burra Charter' (published by Australia ICOMOS) and the provisions of any relevant Study or Conservation Management Plan.

b) Any development on land occupied by an item of heritage, land in the vicinity of an item of heritage or land located within a heritage conservation area shall be designed by a suitably qualified person.

c) A heritage impact statement shall be submitted with a development application relating to land that is occupied by or directly adjoining a heritage item.

The location of the proposed truck rest area is adjacent to a heritage item listed in both Campbelltown City Council's LEP and on the State Heritage Register.

3.5. Australian Heritage Lists.

The Environment Protection and Biodiversity Conservation Act 1999 applies to matters of national environmental significance. Commonwealth and National heritage places are registered on the Commonwealth Heritage List or the National Heritage List. Specifically, a natural, historic or indigenous place can only be added to the National Heritage List if the Minister is satisfied that it has outstanding heritage value to the Australian community as a whole. Varroville does not comprise Commonwealth owned land. Further, neither Varroville nor the subject area has been listed on the National Heritage List.

3.6. Register of the National Estate.

The Register of the National Estate is an inventory for items listed by the Department of Environment and Heritage. It is a non-statutory register, but provide a good indication

that listed items are held in high regard by the community, and indeed professionals in the field. Varroville was included on the Register of the National Estate as early as the 21st of March 1978 (Place ID 3268, Place File No.1/15/010/0010).

3.7. National Trust Register.

Varroville was listed on the National Trust Register (NSW) in 1976 (ID No.10651). Like the Register of the National Estate, the National Trust Register for items listed by the National Trust of Australia is a non-statutory register. However, Varroville was once owned by the National Trust of Australia (NSW). It was sold due to financial constraints at which time the National Trust of Australia (NSW) set out heritage controls as a condition of sale to ensure the preservation of the historic building(s), structures and relics. These controls or National Trust requirements "must continue to pass from future owner to future owner".[5] They restrict building alterations or additions, change of use, subdivision, demolition, material excavation, and plantings that would significantly change the landscape.

These National Trust of Australia (NSW) conditions appear to focus on the listed heritage curtilage encompassing the homestead area and do not appear to extend to the paddocks beside the Hume Highway, including the proposed truck rest area. Indicating this, the site is defined in the Conservation Management Plan (refer to Figure 3.4).[6] Further, the land specifically referred to is Lot 21/564065 (Schedule 1, The Land). This does not include the proposed Truck Rest Area (refer to Figure 1.2).[7]

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[5] Orwell and Peter Phillips Architects. 1992. Conservation Policy Plan. Varro Ville. St Andrews Road, Varroville. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. p.12.
The Conservation Management Plan, for example, was updated in 1999 under the terms of Sale.
Requirements from National Trust of Australia (NSW). 1992. Made under the Real Property Act 1990 and the Conveyancing Act 1919 for Folio Identifier 21/564065.

[6] Orwell and Peter Phillips Architects. 1992. Conservation Policy Plan. Varro Ville. St Andrews Road, Varroville. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. Site Plan p.17.

[7] Requirements from National Trust of Australia (NSW). 1992. Made under the Real Property Act 1990 and the Conveyancing Act 1919 for Folio Identifier 21/564065.

3.8. RTA S170 Register.

The subject area has not been entered on the RTA S170 Register as the land is not located within the defined heritage curtilage of Varroville.

3.9. Plans Showing Heritage Curtilage.

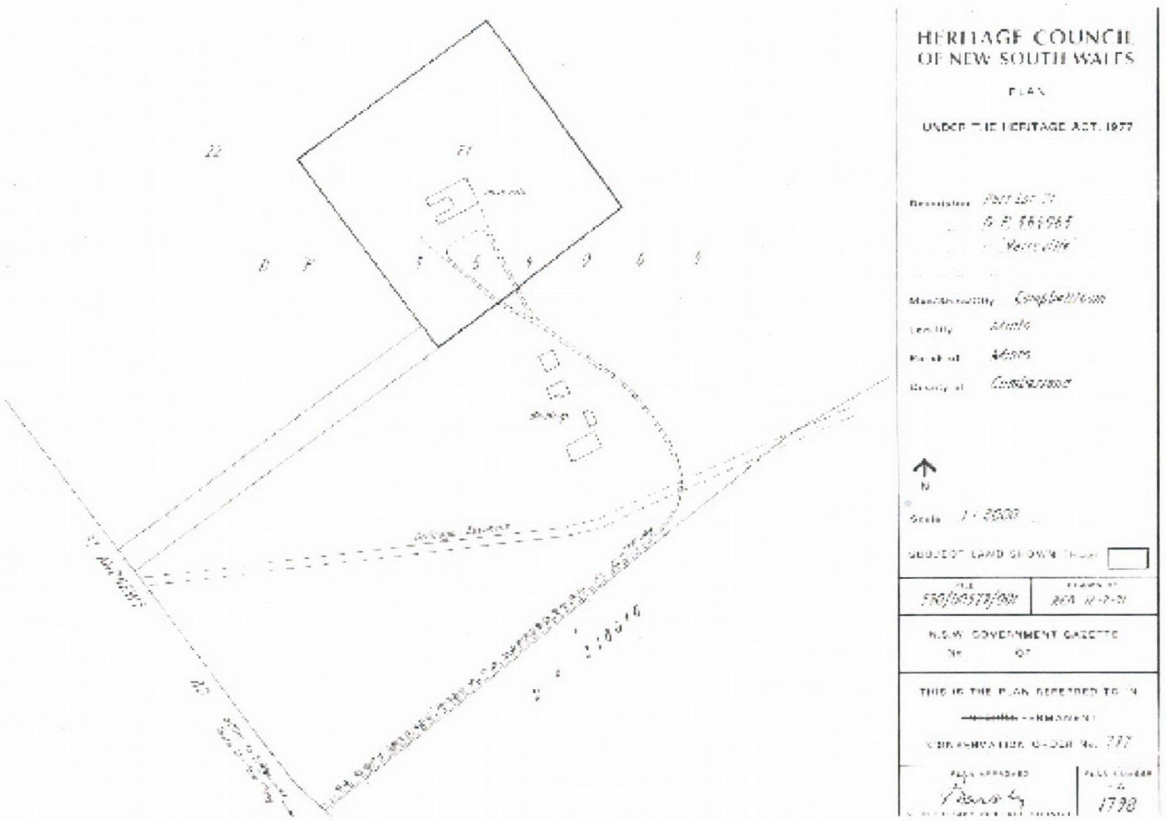

Figure 3.1. Above. Heritage curtilage of Varroville as currently recorded on the State Heritage Register. Image by Heritage Council of NSW.

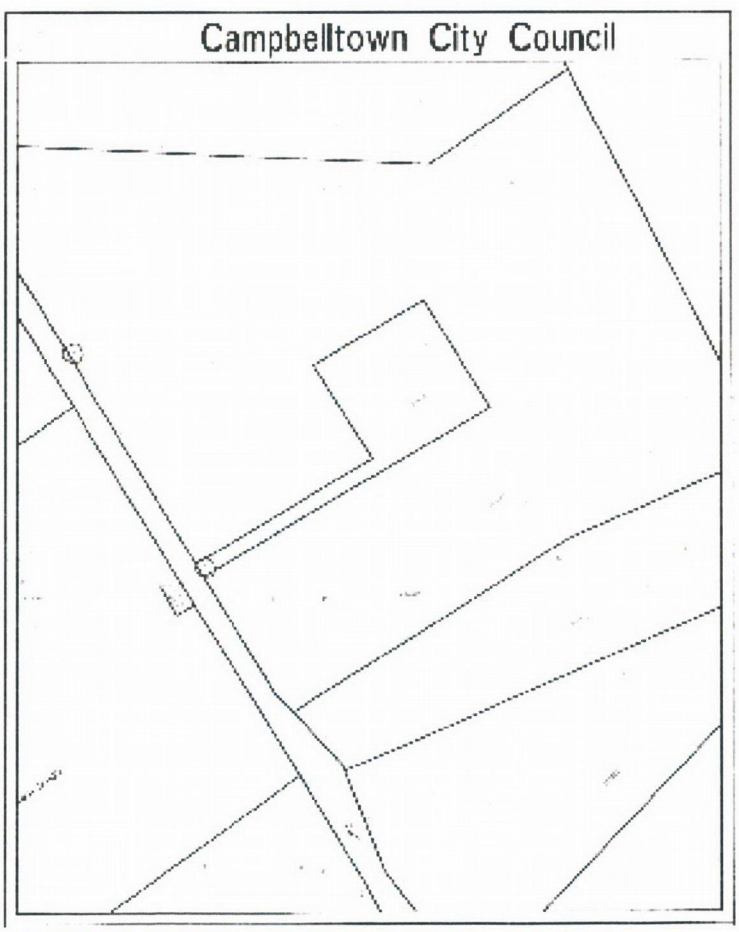

Figure 3.2. Right. The heritage curtilage of Varroville as currently recorded on the State Heritage Register, redrawn by Campbelltown City Council.

Figure 3.3. The heritage curtilage of Varroville as currently recorded by Campbelltown City Council. This curtilage includes additional heritage items south of the homestead but does not extend to the surrounding grazing land including the site of the proposed truck rest area.

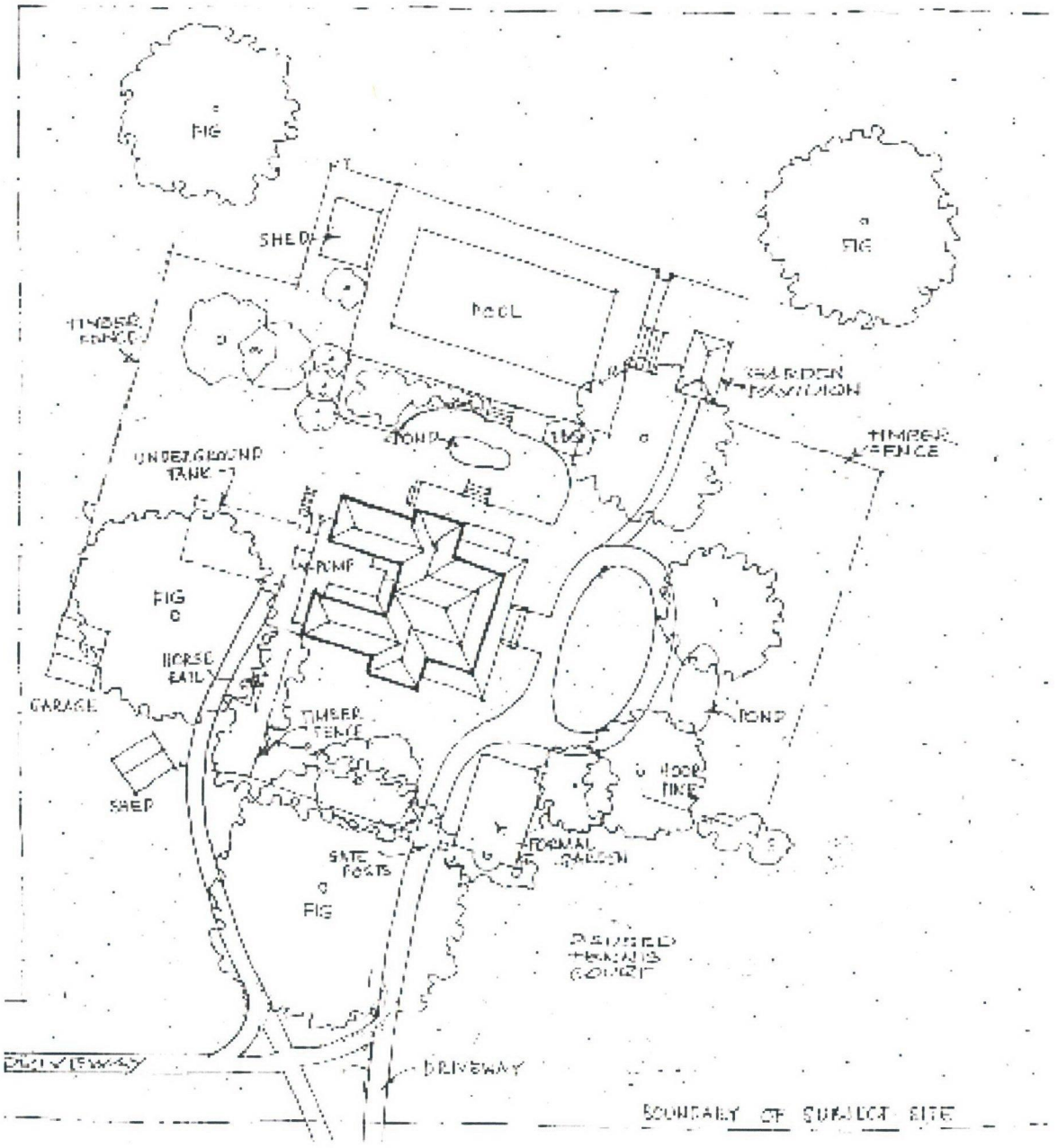

Figure 3.4. A site plan of Varroville showing the focus of the Conservation Management Plan (1992). Note: "Boundary of Subject Site". In Orwell and Peter Phillips Architects, *Conservation Policy Plan. Varro Ville. St Andrews Road, Varroville*, 1992. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. Site Plan p.17.

4. HISTORICAL CONTEXT.

This chapter is a brief history of Varroville. It describes the historical context of former features and/or items once located within the wider setting of the Varroville landholding. It outlines the sequence of historical developments and identifies the underlying historical and cultural influences which have shaped the study area. This work provides an important framework with which to predict areas of potential archaeological sensitivity and facilitates the interpretation and assessment of relics and associated structures that may be impacted by the proposed works.

4.1. Early Varroville and Dr. Robert Townson.

In August 1809 James Meehan surveyed land at 'Bunbury Curran' in the Parish of Minto. He described the hill of Bunbury Curran, a range, a creek, flats and hollows, hills and dales, ponds and ironbark trees. A road was to be reserved on the southeast side.[8] Dr. Robert Townson was granted 1000 acres (404.7 ha) at Bunbury Curran in 1810 and had already acquired another grant from William Paterson of the New South Wales Corps of 1 605 acres in the parish of St. George (including the present suburbs of Penshurst and Mortdale).[9] These grants were soon re-confirmed by Governor Lachlan Macquarie in May 1811 and backdated to the 1st of January 1810 following his re-assessment of land grants in New South Wales.

Townson immediately occupied the land and 'employed a great deal of labour, and expended a great deal of money' in building a horse yard, cultivating a large garden, clearing and fencing paddocks and making roads.[10] He named his property *Varro Ville* after the Roman agriculturalist and author, Marcus Terentius Varro (116-37 BC).[11] Townson was intent on making Varroville an exemplar of agricultural pursuit.

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[8] State Heritage Inventory, Database No.5045252 Varroville. On-line database accessed August 2009. (File s90/00579/3).

[9] *Australian Dictionary of Biography* 1788-1850 Vol.2 pp.537-538.

[10] Fowler, Verlie. p.68. In State Heritage Inventory, Database No.5045252 Varroville. On-line database accessed August 2009. (File s90/00579/3).

[11] Campbelltown City Council. 2009. Varroville. Lot 21 DP564065 St Andrew's Road, Varroville. Local Council listing.
McGill, Jeff, Fowler, Verlie, and Richardson, Keith. 1995. *History of Varroville. "Campbelltown's Streets and Suburbs - How and why they got their names"*. Campbelltown and Airds Historical Society.

Dr. Robert Townson was born in Shropshire in 1763. He was a Doctor of Civil Laws, a scientist and an early settler, having arrived in the Colony on the 7th of July 1807 onboard the Young William.[12] His interests lay with mineralogy and natural sciences extending to chemistry, botany, rural economy, technology, politics and ethics.[13] Townson had been elected a fellow of the Royal Society of Edinburgh in 1791. The following year he contributed a paper to the Linnaean Society of London on the 'Perceptivity of Plants' and in 1798 published on 'The Philosophy of Mineralogy'.[14] He was often at the home of eminent botanist Sir Joseph Banks and was also proficient in Latin, Greek, German and French.[15]

Robert Townson chose to settle in the Colony of NSW and approached the British government. He was promised land and given 100 pounds to buy books and a laboratory for the Colony.[16] By January 1808 Townson had grown irritated by Governor Bligh's delay over the granting of land. He emerged as an opponent of Bligh during the Rum Rebellion. Indeed, it was Townson who signed the requisition to Johnston to depose Bligh on the 26th of January in 1808 - the eve of the trial of John Macarthur which precipitated the revolt. Townson was one of the principal six 'who previously concerted together with Major Johnston the arrest and imprisonment of the Governor'. Still refused his choice of land by the rebel administration, Townson continued to complain against

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Kirkby, Jacqui. 2009. 'Varroville in the Scenic Hills'. In *Branch Cuttings*. Newsletter of the Sydney & Northern New South Wales branch of the Australian Garden History Society. Issue 28, February 2009. p.7.

[12] *Australian Dictionary of Biography* 1788-1850 Vol.2 pp.537-538.

Kirkby, Jacqui. 2009. 'Varroville in the Scenic Hills'. In *Branch Cuttings*. Newsletter of the Sydney & Northern New South Wales branch of the Australian Garden History Society. Issue 28, February 2009. p.7.

[13] State Heritage Inventory, Database No.5045252 Varroville. On-line database accessed August 2009. (File s90/00579/3).

Havard, Olive. 2005. 'Townson of Varroville'. *Journal of the Royal Australian Historical Society*. Vol.91. Pt.II. p.186.

[14] *Australian Dictionary of Biography* 1788-1850 Vol.2 pp.537-538;

Olive Harvard (JRAHS 2005:part II p.186) in State Heritage Inventory, Database No.5045252 Varroville. On-line database accessed August 2009. (File s90/00579/3).

[15] McGill, Jeff, Fowler, Verlie, and Richardson, Keith. 1995. *History of Varroville. "Campbelltown's Streets and Suburbs - How and why they got their names"*. Campbelltown and Airds Historical Society.

[16] *Australian Dictionary of Biography* 1788-1850 Vol.2 pp.537-538.

after McGill, Jeff, Fowler, Verlie, and Richardson, Keith. 1995. *History of Varroville. "Campbelltown's Streets and Suburbs - How and why they got their names"*. Campbelltown and Airds Historical Society.

Bligh's supplanters.[17] For some years Robert Townson then preferred solitude to society life and concentrated on the development of his farm.

It appears that Townson may have initially built and lived in a small house on his land grant prior to 1812 – in a position considered to be unfavourable by Macquarie.[18] The proposed construction of a public road had become an issue of contention between he and Governor Macquarie. In March 1812 Townson wrote:

> This state of uncertainty over the route of a public road [St Andrews road, linking the Liverpool-Campbelltown Road with Cowpasture Road] has prevented me from going on with my plans and I am still living, when at Bunbury Curran, in a very uncomfortable manner, as on this road depends where I shall place my house and make my enclosures.[19]

Until c.1813 Townson continued to reside mostly at his small grant of 77 acres at Towweery (Tom Ugly's) on George's River. The first permanent residence on the property was constructed around this time and by 1817 Townson's farm was well established. That year he received a licence to establish a slaughterhouse on the estate, though according to Havard, Townson already supplied of meat to the Sydney, Liverpool and Parramatta stores.[20] By 1818, Townson had 214 head of horned cattle and 1961 sheep, 22 acres under wheat, 8 in maize, 4 in barley, 2 in potatoes and 2 in garden and orchard.[21]

However, by October 1820, Townson intended to return to England and advertised Varroville for sale. The advertisement read:

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[17] *Australian Dictionary of Biography* 1788-1850 Vol.2 pp.537-538.
McGill, Jeff, Fowler, Verlie, and Richardson, Keith. 1995. *History of Varroville. "Campbelltown's Streets and Suburbs - How and why they got their names"*. Campbelltown and Airds Historical Society.

[18] Thorp, Wendy. 1992. *Historical Context "Varro Ville"*. For Orwell and Peter Phillips Architects. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. Section 2.1.

[19] Fowler p. 70. In State Heritage Inventory, Database No.5045252 Varroville. On-line database accessed August 2009. (File s90/00579/3).

[20] Thorp, Wendy. 1992. *Historical Context "Varro Ville"*. For Orwell and Peter Phillips Architects. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. Section 2.1.
Havard, Olive. 2005. 'Townson of Varroville'. *Journal of the Royal Australian Historical Society*. Vol.91. Pt.II. p.188.

[21] Havard, Olive. 2005. 'Townson of Varroville'. *Journal of the Royal Australian Historical Society*. Vol.91. Pt.II. p.188.

> "... 1000 acres of land at Bunbury Curran with a good House and offices and one of the best gardens in the Colony. A great part is fenced in and divided into paddocks ... To prevent unnecessary explanations [of] Bunbury Curran Estate, the prime ewe flock and about 40 head of horned cattle will not be sold until the other Lots are disposed of ..."[22]

Townson remained in the Colony and the sale did not proceed. By 1822 he had 20 acres under wheat, 5 of barley, 6 acres of garden/orchard and held a total of 2680 acres (also owning land at Tiranna in Goulburn) with 3 horses, 400 head of cattle, 3350 sheep and 24 hogs.[23] Townson's sheep, wool, and cattle were sought for their quality.[24] Indeed, it was the view of his contemporaries that 'no single man had accomplished more in the rearing of stock'.[25] His orchard was considered one of the finest in the Colony, as was his vineyard, being second only to that of Gregory Blaxland at Brush Farm in Ryde.[26] On dining at Nash's Inn in Parramatta in 1823, members of the NSW Royal Agricultural Society were served with a desert contributed from Townson's gardens (as well as from those of Captain Piper). The desert consisted of,

> ... no fewer than 18 kinds of fresh fruit, and 4 of dried; among which were the banana, the Orlean plum, the green gage, the real peach, the cat-head apple, and a peculiarly fine sort of musk melon.[27]

Townson had become a foundation member of the NSW Royal Agricultural Society in the early 1820s and was appointed a magistrate in 1826. He also helped to establish the Sydney Dispensary which gave free medical attention to poor people.[28] Townson died unmarried on the 27th of June 1827 aged 65 and was buried in St. John's cemetery in

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[22] Thorp, Wendy. 1992. *Historical Context "Varro Ville"*. For Orwell and Peter Phillips Architects. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. Section 2.1.

[23] Morris, Colleen and Britton, Geoffrey. 2000. Varroville in *Colonial Landscapes of the Cumberland Plain and Camden NSW*. For the National Trust of Australia (NSW). p.96.

[24] Campbelltown City Council. 2009. Varroville. Lot 21 DP564065 St Andrew's Road, Varroville. Local Council listing.

[25] *Australian Dictionary of Biography* 1788-1850 Vol.2 pp.537-538.

[26] Everett (2004) in State Heritage Inventory, Database No.5045252 Varroville. On-line database accessed August 2009. (File s90/00579/3).

[27] Fowler p. 72. In State Heritage Inventory, Database No.5045252 Varroville. On-line database accessed August 2009. (File s90/00579/3).

[28] McGill, Jeff, Fowler, Verlie, and Richardson, Keith. 1995. *History of Varroville. "Campbelltown's Streets and Suburbs - How and why they got their names"*. Campbelltown and Airds Historical Society.

Parramatta.[29] The property was left to his brother Captain John Townson of Van Dieman's Land and to a nephew and two nieces living in England.[30]

4.2. Captain Charles Sturt.

Varroville was purchased by Thomas Spencer Wills Esq.in 1829.[31] Wills died in 1836 at the age of only 36.[32] He was the first Australian born Justice of the Peace and a founder of the Bank of New South Wales. One of his sisters married Dr William Redfern of nearby Campbellfield, a major landowner in the area, while another married Henry Colden Antill of Jarvisfield, Picton.

Captain Charles Sturt, the early Australian explorer, purchased the property in 1836 for the sum of 2500 pounds.[33] Sturt maintained the thriving kitchen garden, orchard and vineyard and took a keen interest in the birdlife at Varroville. At Varroville in 1838 he was visited by the bird-artist, John Gould, who greatly admired Sturt's large original collection of Australian Psittacidae [parrots] in water-colour. Sturt was devoted to ornithology and had collected rare specimens. It was unfortunately later stolen.

Sturt also established dams and modified watercourses. He sank dams in every paddock.[34] In a speech on the 10th of January 1840, Sturt claimed that,

> 'On my farm at Varroville, ... every paddock had its proper water-hole. In a severe drought [1839] I not only fed 180 head of stock on 1,000 acres (of

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[29] *Australian Dictionary of Biography* 1788-1850 Vol.2 pp.537-538.

[30] Thorp, Wendy. 1992. *Historical Context "Varro Ville"*. For Orwell and Peter Phillips Architects. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. Section 2.1.

[31] Morris, Colleen and Britton, Geoffrey. 2000. Varroville in *Colonial Landscapes of the Cumberland Plain and Camden NSW*. For the National Trust of Australia (NSW). p.96.

[32] Campbelltown City Council. 2009. Varroville. Lot 21 DP564065 St Andrew's Road, Varroville. Local Council listing.

[33] Thorp, Wendy. 1992. *Historical Context "Varro Ville"*. For Orwell and Peter Phillips Architects. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. Section 2.1.

[34] Kirkby, Jacqui. 2009. 'Varroville in the Scenic Hills'. In *Branch Cuttings*. Newsletter of the Sydney & Northern New South Wales branch of the Australian Garden History Society. Issue 28, February 2009. p.7.

Morris, Colleen and Britton, Geoffrey. 2000. Varroville in *Colonial Landscapes of the Cumberland Plain and Camden NSW*. For the National Trust of Australia (NSW). p.96.

> which 350 was under cultivation), but I permitted 19 families to supply themselves from my tanks.[35]

Sturt and his family lived at Varroville for only three years, then moving to South Australia where Sturt was to take up the position of Surveyor-General.[36] In 1839, the sale notice for the property appeared in *The Australian* and read:

> ... It contains 1000 acres, 600 of which are cleared and 25 under cultivation a considerable portion being in Lucerne. The farm has an abundant supply of the purest water in several tanks of great depth and is laid out into numerous paddocks. The cottage is convenient and an excellent kitchen and wash house have been added to it. The outhouses consist of stables, coach house, verandah, dairy, store, barn etc. and there is a well stocked garden and vineyard.[37]

4.3. Postmaster General James Raymond.

In November 1839, Varroville was bought by James Raymond for 3100 pounds.[38] Raymond was the first Postmaster General of the Colony of New South Wales.[39] He also introduced the world's first pre-paid postage in 1838, anticipating the British penny postage in 1840.[40] Raymond was a keen follower of horse-racing. Varroville became his country retreat where he bred and trained horses.[41] An oil portrait of one of his several

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[35] Mrs Napier Sturt (p.193) in State Heritage Inventory, Database No.5045252 Varroville. On-line database accessed August 2009. (File s90/00579/3).

[36] McGill, Jeff, Fowler, Verlie, and Richardson, Keith. 1995. *History of Varroville. "Campbelltown's Streets and Suburbs - How and why they got their names"*. Campbelltown and Airds Historical Society.

[37] Morris, Colleen and Britton, Geoffrey. 2000. Varroville in *Colonial Landscapes of the Cumberland Plain and Camden NSW*. For the National Trust of Australia (NSW). p.96.
Thorp, Wendy. 1992. *Historical Context "Varro Ville"*. For Orwell and Peter Phillips Architects. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. Section 2.2.

[38] Campbelltown City Council. 2009. Varroville. Lot 21 DP564065 St Andrew's Road, Varroville. Local Council listing.
Thorp, Wendy. 1992. *Historical Context "Varro Ville"*. For Orwell and Peter Phillips Architects. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. Section 2.2.

[39] Kirkby, Jacqui. 2009. 'Varroville in the Scenic Hills'. In *Branch Cuttings*. Newsletter of the Sydney & Northern New South Wales branch of the Australian Garden History Society. Issue 28, February 2009. p.7.
Morris, Colleen and Britton, Geoffrey. 2000. Varroville in *Colonial Landscapes of the Cumberland Plain and Camden NSW*. For the National Trust of Australia (NSW). p.96.

[40] *Australian Dictionary of Biography* 1788-1850 Vol.2.

[41] Kirkby, Jacqui. 2009. 'Varroville in the Scenic Hills'. In *Branch Cuttings*. Newsletter of the Sydney & Northern New South Wales branch of the Australian Garden History Society. Issue 28, February 2009. p.7.

horses, 'Nazeer Farrib', was painted by Edward Winstanley. The painting is titled: 'A High Caste Arab, the property of James Raymond Esq of Varroville'.[42]

Raymond died at Darlinghurst on the 29th of May 1851 aged 65. The estate passed to his five sons – James, Samuel, John, William and Robert.[43] However, for the next seven years his daughter Aphrasia Kemmis and her family lived rent-free at Varroville according to the terms of Raymond's will.[44] Then, following the death of James junior, in 1858, Raymond's sons sold the property to George Taylor Rowe. Rowe soon mortgaged Varroville to H.H. Browne.[45] The same month on the 27th of April 1858, tenders were called in the Sydney Morning Herald for masons to lay the foundations of a house at 'Varro Ville'. The architects for the project were Weaver and Kemp of Pitt Street Sydney.[46] The new house was reportedly built on the site of or close to the previous house. It survives today as a substantial single-storey rendered brick house on a stone footing with service wings enclosing a rear courtyard.[47] From the earlier residence, a stone chimneypiece (with evidence of a former kitchen crane) and a hearthstone from the previous house were retained.[48]

In 1859 Rowe defaulted on his mortgage and Brown claimed possession of the house. The same year, Brown sold the estate to Alfred Cheeke for 4500 pounds.[49] It may be that Cheeke then completed the house at Varroville.

Morris, Colleen and Britton, Geoffrey. 2000. Varroville in *Colonial Landscapes of the Cumberland Plain and Camden NSW*. For the National Trust of Australia (NSW). p.96.

[42] State Library of NSW collection (ML282).

[43] Thorp, Wendy. 1992. *Historical Context "Varro Ville"*. For Orwell and Peter Phillips Architects. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. Section 2.2.

[44] Fowler, (p.85), in State Heritage Inventory, Database No.5045252 Varroville. On-line database accessed August 2009. (File s90/00579/3).

[45] Thorp, Wendy. 1992. *Historical Context "Varro Ville"*. For Orwell and Peter Phillips Architects. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. Section 2.3.

[46] Thorp, Wendy. 1992. *Historical Context "Varro Ville"*. For Orwell and Peter Phillips Architects. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. Section 2.3.

[47] Kirkby, Jacqui. 2009. 'Varroville in the Scenic Hills'. In *Branch Cuttings*. Newsletter of the Sydney & Northern New South Wales branch of the Australian Garden History Society. Issue 28, February 2009. p.7.

[48] State Heritage Inventory, Database No.5045252 Varroville. On-line database accessed August 2009. (File s90/00579/3).

[49] Thorp, Wendy. 1992. *Historical Context "Varro Ville"*. For Orwell and Peter Phillips Architects. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. Section 2.3.

4.4. Justice Alfred Cheeke.

Like Raymond before him, Justice Alfred Cheeke bred and trained horses at Varroville.[50] As described by Kirkby and Thorp, he established a private race course on the flats below the house now adjacent to the M5.[51] Bred and trained at Varroville, his horse *Clove* won the historic first Australian Jockey Club Derby on the 2nd of September 1865.[52] The same year Cheeke was elevated to the Supreme Court of New South Wales.

Justice Cheeke died in 1876. This year his estate was advertised for sale. The property description read:

> Varroville House is a commodious family residence, recently erected by the late proprietor. It is built of brick and stone, is nearly surrounded by verandahs and contains the following accommodation: hall, 8 feet wide: drawing and dining rooms each 20 x 16: 6 bedrooms, two of which are 20 x 15: dressing room with well arranged superior bath: patent closet: stove, kitchen with oven, servants hall, wine cellar, laundry with copper, larder, pantry, china closet, etc.
>
> There is an additional residence of six apartments a few yards from the above. Both are surrounded by tastefully laid out gardens and shrubbery, are erected on a beautiful elevation, and approached by a fine carriage drive from the main road.
>
> An abundant supply of water is obtained from an immense underground reservoir, which receives the roof water. A pump forces the water on to the premises, supplying the bathroom, etc.

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[50] after Kirkby, Jacqui. 2009. 'Varroville in the Scenic Hills'. In *Branch Cuttings*. Newsletter of the Sydney & Northern New South Wales branch of the Australian Garden History Society. Issue 28, February 2009. p.7.

[51] Kirkby, Jacqui. 2009. 'Varroville in the Scenic Hills'. In *Branch Cuttings*. Newsletter of the Sydney & Northern New South Wales branch of the Australian Garden History Society. Issue 28, February 2009. p.7.

Thorp, Wendy. 1992. *Historical Context "Varro Ville"*. For Orwell and Peter Phillips Architects. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. Section 2.3.

[52] Kirkby, Jacqui. 2009. 'Varroville in the Scenic Hills'. In *Branch Cuttings*. Newsletter of the Sydney & Northern New South Wales branch of the Australian Garden History Society. Issue 28, February 2009. p.7.

Scenic Hills Riding Ranch. 2009. *Varro Ville. The now Scenic Hills*. Brochure.

Morris, Colleen and Britton, Geoffrey. 2000. Varroville in *Colonial Landscapes of the Cumberland Plain and Camden NSW*. For the National Trust of Australia (NSW). p.97.

> The out-buildings are very numerous and comprise gardener's house, barn, cow-houses, calf-pens, dairy, piggery with coppers, stock and drafting yards, complete ranges of stabling, including a number of well-finished spacious loose boxes for blood stock.[53]

The property was purchased by grazier M. Suttor for 8500 pounds.[54] He then mortgaged the property almost immediately to W.F. Jones for 5000 pounds. Suttor remained in possession until 1885 at which time he sold Varroville to Sydney solicitor, Thomas Salter. Soon after, by the 1890s, the property appears to have been reduced in size.[55] Salter leased Varroville to H. Pockley for the purposed of dairying. By the turn of the twentieth century the estate was one of the region's leading dairy farms.[56]

4.5. Varroville and the Twentieth Century.

In 1906 Thomas Salter sold Varroville to Reginald Thomas. Thomas soon sold the estate in 1912 to William Henry Staniforth, a dairyman from St Andrews.[57] The role of Varroville as a commercial dairy was continued when, in 1923, Staniforth leased the property to three brothers - Percy, Austin and Arthur Smith. These dairymen were the 'Smith Brothers' of Concord. Their lease continued until 1929 at which time George Smith purchased Varroville.[58] The Smith family also bred Champion Ayrshire Cattle taking many prizes from the Sydney Royal Easter Show.[59]

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[53] Sydney Morning Herald, 15 April 1876.

[54] Thorp, Wendy. 1992. *Historical Context "Varro Ville"*. For Orwell and Peter Phillips Architects. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. Section 2.3.

[55] Thorp, Wendy. 1992. *Historical Context "Varro Ville"*. For Orwell and Peter Phillips Architects. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. Section 2.3.

[56] McGill, Jeff, Fowler, Verlie, and Richardson, Keith. 1995. *History of Varroville. "Campbelltown's Streets and Suburbs - How and why they got their names"*. Campbelltown and Airds Historical Society. Morris, Colleen and Britton, Geoffrey. 2000. Varroville in *Colonial Landscapes of the Cumberland Plain and Camden NSW*. For the National Trust of Australia (NSW). p.97.

[57] Thorp, Wendy. 1992. *Historical Context "Varro Ville"*. For Orwell and Peter Phillips Architects. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. Section 2.3.

[58] Thorp, Wendy. 1992. *Historical Context "Varro Ville"*. For Orwell and Peter Phillips Architects. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. Section 2.4.

[59] Scenic Hills Riding Ranch. 2009. *Varro Ville. The now Scenic Hills*. Brochure.

By the 1930s or 40s Varroville appears to have been owned by Robert Stanley Thompson. In 1950 Thompson sold the property to William Forest Ross, a grazier. That year that property was subdivided and Ross sold 250 acres of the Varroville estate to Alfred L. Morris Jackaman and Cherry Jackaman.[60] The Sweeney family purchased a further 650 acres and continued dairying until 1977 at what is now the Scenic Hills Riding Ranch.[61]

Changes made by the Jackamans included installing a fountain and swimming pool, change rooms, and a gazebo, enlarging the drawing room and additional structural changes to the house and planting a new garden. The rear drive from St Andrew's Road became the principal entrance to Varroville.

In the 1970s the house was subdivided onto 3.1 hectares. Although separated from its wider original landscape, in April 1972, the wider area became part of the Central Hills Scenic Protection Lands (The Scenic Hills).[62] Then, in the 1980s, land was resumed for construction of the M5 freeway (F5 Hume Highway).

In 1990 Cherry Jackaman presented Varroville homestead upon its remaining 3.1 hectares of land to the National Trust of Australia (NSW).[63] Before long, in 1992, the National Trust of Australia (NSW) sold Varroville to architects Keith and Virginia Pearson-Smith. The Pearson-Smiths carried out extensive restoration works over a nine year period before auctioning the property on the 20th of March 2002.[64] The property was purchased at auction by John Moutsopoulos and Vanessa Seary. Varroville was then purchased by its current owners Jacqui Kirkby and Peter Gibbs in 2006.[65]

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[60] Thorp, Wendy. 1992. *Historical Context "Varro Ville"*. For Orwell and Peter Phillips Architects. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. Section 2.4.

[61] Scenic Hills Riding Ranch. 2009. *Varro Ville. The now Scenic Hills*. Brochure.

[62] McGill, Jeff, Fowler, Verlie, and Richardson, Keith. 1995. *History of Varroville. "Campbelltown's Streets and Suburbs - How and why they got their names"*. Campbelltown and Airds Historical Society.

[63] after Scenic Hills Riding Ranch. 2009. *Varro Ville. The now Scenic Hills*. Brochure.
Morris, Colleen and Britton, Geoffrey. 2000. Varroville in *Colonial Landscapes of the Cumberland Plain and Camden NSW*. For the National Trust of Australia (NSW). p.97.
after Thorp, Wendy. 1992. *Historical Context "Varro Ville"*. For Orwell and Peter Phillips Architects. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. Section 2.6.

[64] Thorp, Wendy. 1992. *Archaeological Assessment "Varro Ville"*. For Orwell and Peter Phillips Architects. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. Section 2.1.6.

[65] State Heritage Inventory, Database No.5045252 Varroville. On-line database accessed August 2009. (File s90/00579/3).

4.6. Historical Themes.

The following themes have emerged from the history of Varroville discussed at national, state and local levels:

•1. National Themes: Peopling Australia.
State Themes: Settlers.
Local Themes: The early settlement of Campbelltown.
Land grants.

•2 National Themes: Developing local, regional and national economies.
State Themes: Agriculture.
Local Themes: Land-use at Varroville.
Clearing land for farming
Establishing vineyards
Framing wheat and other grains
Pastoralism

•3 National Themes: Developing local, regional and national economies.
State Themes: Commerce.
Local Themes: The establishment of a slaughterhouse.

•4 National Themes: Developing local, regional and national economies.
State Themes: Science.
Local Themes: Researching agricultural techniques, mineralogy and horticulture.

•5 National Themes: Developing local, regional and national economies.
State Themes: Events.
Local Themes: Horse winner - first Australian Jockey Club Derby.

•6 National Themes: Developing local, regional and national economies.
State Themes: Environment.

Local Themes: Landscapes of food production.
Rural landscapes of scenic charm.

•7 National Themes: Building settlements, towns and cities.
State Themes: Towns, suburbs and villages.
Local Themes: Establishing Varroville.

•8 National Themes: Building settlements, towns and cities.
State Themes: Accommodation.
Local Themes: Housing farming families.
Country villas.

•8 National Themes: Building settlements, towns and cities.
State Themes: Land tenure.
Local Themes: Granting crown lands for private farming.
Changing land uses.
Subdivision of large estates.

•9 National Themes: Developing Australia's cultural life.
State Themes: Sport.
Local Themes: Establishing Varroville's horse training and stud facilities.

•10 National Themes: Marking the phases of life.
State Themes: Persons.
Local Themes: Robert Townson.
Charles Sturt
James Raymond
Alfred Cheeke

4.7. Historic Plans and Photographs.

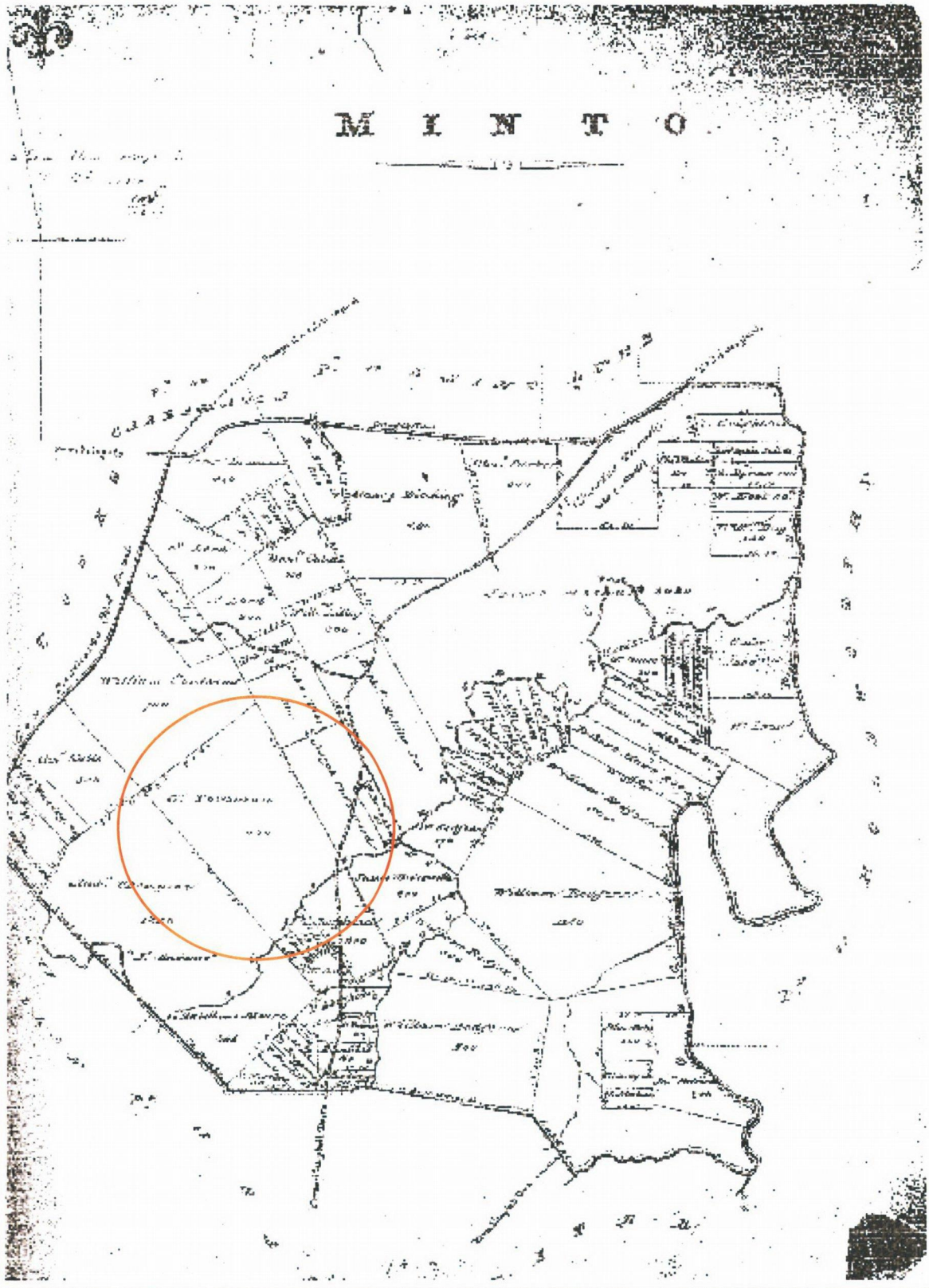

Figure 2.1. Parish of Minto, c.1835(?). State Records. In Morris, Colleen and Britton, Geoffrey. 2000. Varroville in *Colonial Landscapes of the Cumberland Plain and Camden NSW.* For the National Trust of Australia (NSW). Figure 4.27.1.

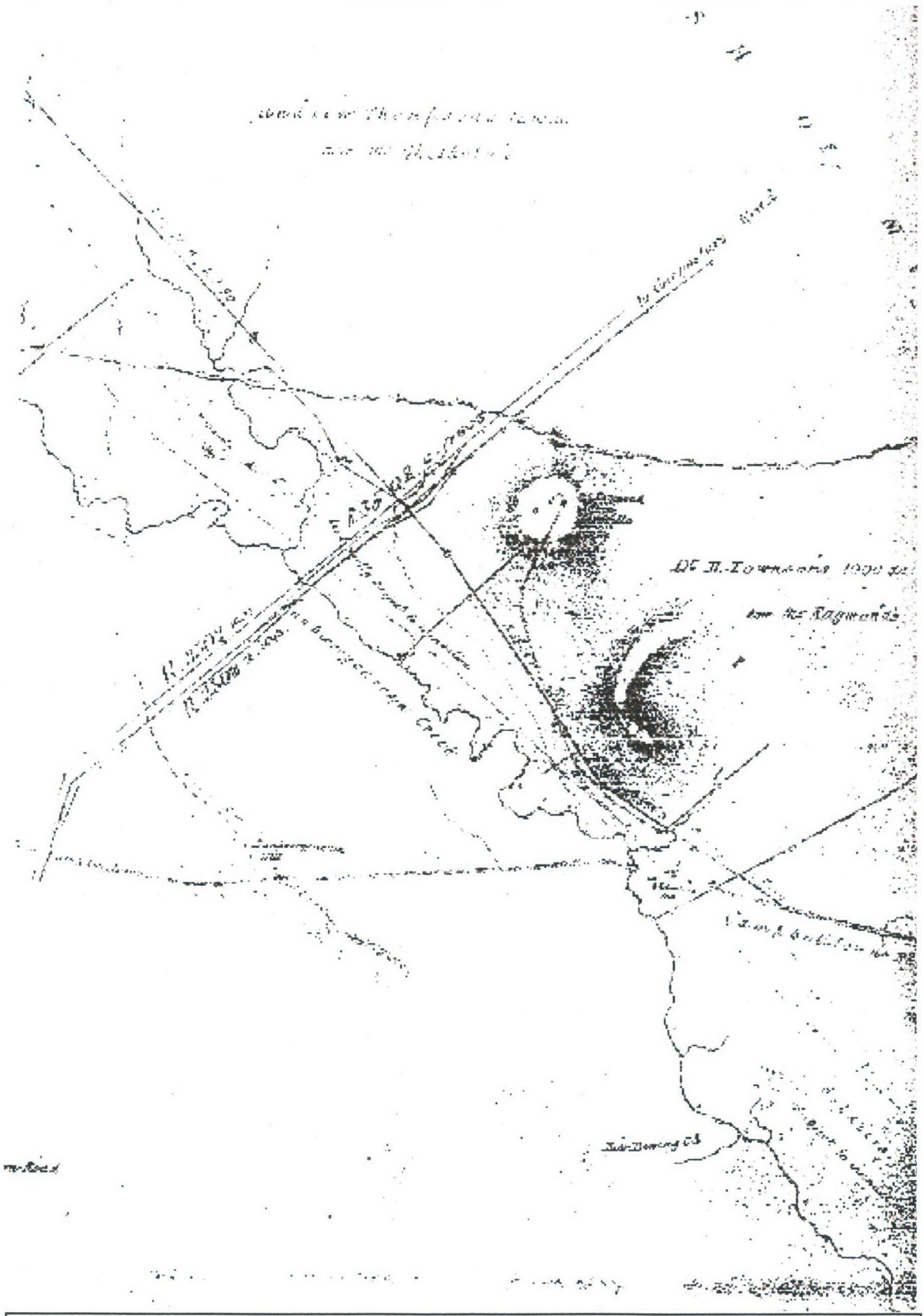

Figure 2.2. Detail view of Dr. Townson's land in the Parish of Minto, c.1839-1858. In Morris, Colleen and Britton, Geoffrey. 2000. Varroville in *Colonial Landscapes of the Cumberland Plain and Camden NSW.* For the National Trust of Australia (NSW). Figure 4.27.2.

Figure 2.3. William Henry Wells, *A Map of the County of Cumberland in the Colony of New South Wales. 1848.* (Source: National Library of Australia, Map f104e).

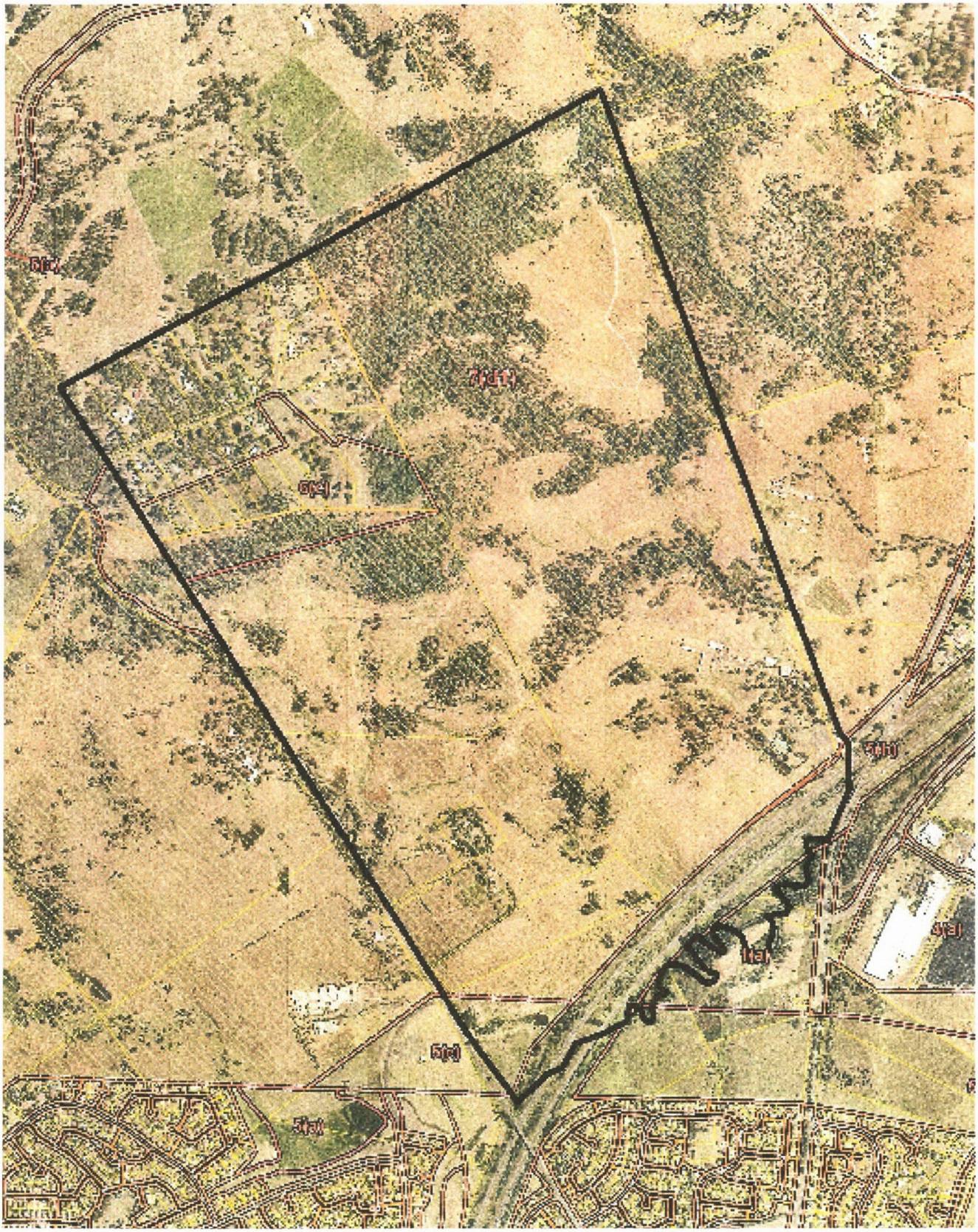

Figure 2.4. Approximate extent of Robert Townson's original Varroville land grant of 1000 acres. Courtesy of Campbelltown City Council, 2009.

5. *ARCHAEOLOGICAL ASSESSMENT.*

Site inspection of the subject site was carried out by Dr. Louise Steding and Mr Gerald Steding of Stedinger Associates on the 10th of August 2009. The site was examined for evidence of surviving surface features, potential archaeological deposits and relics, the extent of existing disturbance and to establish the context of the proposed works.

5.1. Archaeological Potential of the Proposed Truck Rest Area.

The subject site is unlikely to contain substantial and/or significant archaeological remains that may inform on the history and development of the Campbelltown area or that of New South Wales. Although the main accessway to Varroville was from Campbelltown Road, a major travel route, houses, outbuildings or other occupied structures are not anticipated within the subject location. The site itself is located in a flood area where occupied buildings, stores or shelters are unlikely to have been erected. No occupation deposits are anticipated. A recent satellite image of the area (see Image 5.13) shows no evidence of any structures or features having been built within the specified area.

Similarly, a recent survey of the site did not identify any surface or potential subsurface archaeological resources within the boundary of the proposed truck rest area. No potential heritage items were identified like refuse pits, privies, wells, artefact scatters, nineteenth century demolition rubble or exotic vegetation that may indicate a former house site. Typically, such buildings have been positioned on the hill top allowing views over the surrounding vineyards, orchards, pasture land and entrance road leading from Campbelltown Road. Within the Varroville homestead precinct, exotic tree species include Moreton Bay Figs (Ficus macrophylla), Hoop Pines (Araucaria cunninghamii) and Pepper Trees (Schinus molle var.areira).

During the recent site survey by Stedinger Associates, twentieth century demolition rubble was noted at the base of trees near the centre of the site. Materials included plastic, machine bricks, concrete, besser blocks, star pickets, corrugated iron and carpet. Early fence posts have also been dumped at this site.

Flood areas are characteristically of more use for less tangible farming activities such as grazing. Further, the position of the proposed truck rest area within a flood area suggests disturbance of upper deposits to some extent (refer to Section 5.4). Over the years, the impact of several floods is likely to have removed traces of less tangible farming activities, though remnant fence posts may survive. Such areas were the focus of sparse activity not likely to reveal occupational deposits rich in artefacts. Instead, as mentioned, the homestead precinct and slopes fronting the farm complex are a likely areas of surviving subsurface evidence of nineteenth century occupational activity. These areas lie outside the study area and proposed truck rest site.

Image 5.1. View from the survey area to the Varroville homestead complex. Facing northwest. Stedinger Associates, 2009. Images 5220 and 5221.

Image 5.2. View across the survey area beside the Hume Highway (F5). Facing northeast. Stedinger Associates, 2009. Images 5222 and 5223.

Image 5.3. View across the proposed site of the F5 Truck Rest Area. Facing southwest. Stedinger Associates, 2009. Image 5237.

Image 5.4. The Hume Highway is shown on the right side of the survey area. Facing northeast. Stedinger Associates, 2009. Image 5233.

Image 5.5. Rubbish has been dumped within the survey area. It includes modern fabric. Facing east. Stedinger Associates, 2009. Image 5227.

Image 5.6. View across the proposed Truck Rest Area. Facing northeast. Stedinger Associates, 2009. Image 5241.

Image 5.7. More mature trees located at the northern perimeter of the survey area. Facing north. Stedinger Associates, 2009. Image 5239.

Image 5.8. Clear visibility on the exposed surfaces beneath the trees. Facing north. Stedinger Associates, 2009. Image 5231.

Image 5.9. View towards Scenic Hills. Facing north. Stedinger Associates, 2009. Image 5240.

5.2. Archaeological Potential in the Vicinity.

In the immediate vicinity of the proposed Truck Rest Area, a number of remnant features were noted during the survey and/or from the recent satellite image (Image 5.13). These features include evidence of an early entrance road leading to the historic Varroville homestead, two remnant fence posts indicating an old fence line and possible terracing.

5.2.1. Early Access Road.

Initially, on this property an access road would have been required for land clearance as early as 1810. Britton notes that during James Raymond's ownership of Varroville (post 1839), a road survey plan shows a driveway leading from Campbelltown Road through the property to Varroville homestead.[66] In a site plan, he suggests that this accessway may date back to 1810 (Figure 5.1). Certainly a roadway is clearly visible in a recent satellite image of the area (Image 5.13). It enters the property from the Hume Highway immediately north of the survey area. It curves southwest then west ascending to Varroville Homestead. As described by Kirkby, this:

[66] Morris, Colleen and Britton, Geoffrey. 2000. Varroville in *Colonial Landscapes of the Cumberland Plain and Camden NSW*. For the National Trust of Australia (NSW). p.96.

> ... gravelled driveway ... meanders through clumps of 19th century Cumberland Plain woodland, early vineyard terracing and dams, ending in a southerly approach to the front of the house.[67]

The former entrance to the internal roadway now lies beneath the Hume Highway (H5). As such, the visible roadway is a continuation of the early driveway west of the former entrance. The fabric of the road is likely to have been sandstone rubble (or gravel as referred to above by Kirkby). The fabric, camber, width and associated infrastructure of the early road may be confirmed through archaeological excavation.

It is possible that this alignment of road was created by Robert Townson soon after receiving his land grant in 1810. Predating 1839, alternatively the road may have been laid by Sturt during his time at Varroville. Physically, the roadway is related to the early nineteenth century outbuildings grouped on the ridge to the southern side of the house. A gravelled carriage drive in front of the later house is likely to date to 1858-9.

For many years the internal road continued to be used. However, in the 1950s, the approach to Varroville was moved to St Andrews Road.[68] Here, a new access road entered the property a short distance to the northeast from St Andrews Road to the homestead.

5.2.2. Fences.

In his site plan, Britton suggests old fencelines are "at times evident" (Figure 5.1). During the present investigation two fence posts were noted outside the survey area to the northeast. These posts represent part of a line of older split post and rail fencing near the location of the proposed truck rest area. It may have been associated with the early access road at this location. However, sections of the former fence will have been replaced over the years. Even the surviving timber posts are likely replacements of earlier posts. They appear to date to the late nineteenth century and clearly mark long

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[67] Kirkby, Jacqui. 2009. 'Varroville in the Scenic Hills'. In *Branch Cuttings*. Newsletter of the Sydney & Northern New South Wales branch of the Australian Garden History Society. Issue 28, February 2009. p.8.

[68] Morris, Colleen and Britton, Geoffrey. 2000. Varroville in *Colonial Landscapes of the Cumberland Plain and Camden NSW*. For the National Trust of Australia (NSW). p.96.

term boundaries on the property – in this instance, a paddock fence along the driveway. As noted by Thorp, cultivated land arranged in fenced paddocks was often commented on in descriptions of Varroville. Other fences in the vicinity and bordering the proposed Truck Rest Area are split post and wire. They appear to date to the early twentieth century.

Image 5.10. More recent split post and wire fences at the northeast end of the survey area. Facing northeast. Stedinger Associates, 2009. Image 5235.

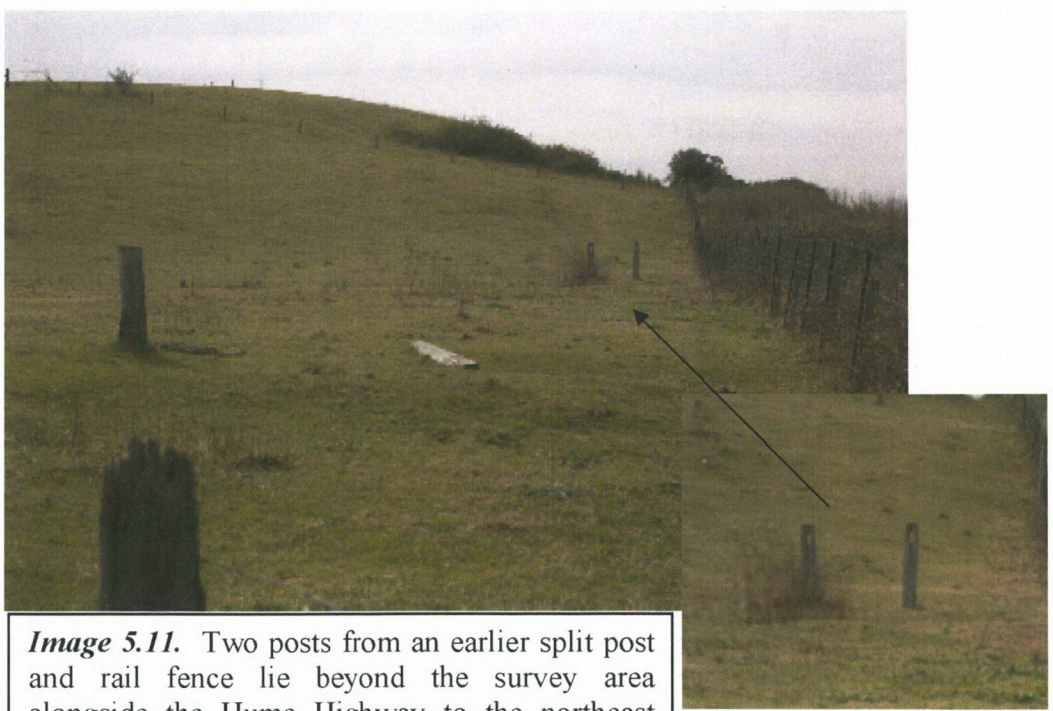

Image 5.11. Two posts from an earlier split post and rail fence lie beyond the survey area alongside the Hume Highway to the northeast end. Facing northeast. Stedinger Associates, 2009. Image 5236.

5.2.3. Possible Terracing / Furrows.

Marks in the landscape southwest of the proposed Truck Rest Area are visible in a satellite image of the area (Image 5.13). These marks may possibly be evidence of terracing from earlier farming activities. Certainly, vineyards are discussed throughout the early literature on Varroville and physical evidence of terracing survives on the north and west sides of the residence. These terraces Britton suggests are from "old vineyards" that wrap around the hillslopes near the homestead complex. They may remain from farming activities dating back to c.1820 by which time Varroville had been established as a working farm. Located on the hillside, these terraces have not been impacted by floods.

The markings shown in the recent satellite image, however, occur as straight lines forming a chequered pattern. They extend almost to the site of the proposed Truck Rest Area. In particular, the area in which these marks are contained is defined by a more recent subdivision boundary separating Lot 1 DP218016 from Lot 4 DP239557 (in which the marks occur). This suggests that the markings are more recent in their origin.

Image 5.12. View across lower slopes to Varroville. Furrows or terraces appear in this landscape which are visible in satellite images. Facing northeast. Stedinger Associates, 2009. Image 5219.

5.2.4. Race Track.

Both Kirkby and Thorp suggest the existence of the race track on the low-lying or flat land southeast of the house precinct.[69] However, no evidence was found of an early race track at the subject land, either during survey or from satellite images. This does not mean that such a track did not exist. Indeed, the flat land would have been ideal for such a use and two of the former owners, Raymond and Cheeke, are known to have had interests in horse breeding and racing. Horses were trained at Varroville. However, the size of a race track would extend beyond the flat land remaining northwest of the Hume Highway. It is more likely to have been located beneath this major highway perhaps extending into or near the subject survey area. Its location to the northeast would have been limited by the driveway and to the southwest by the existence of a watercourse.

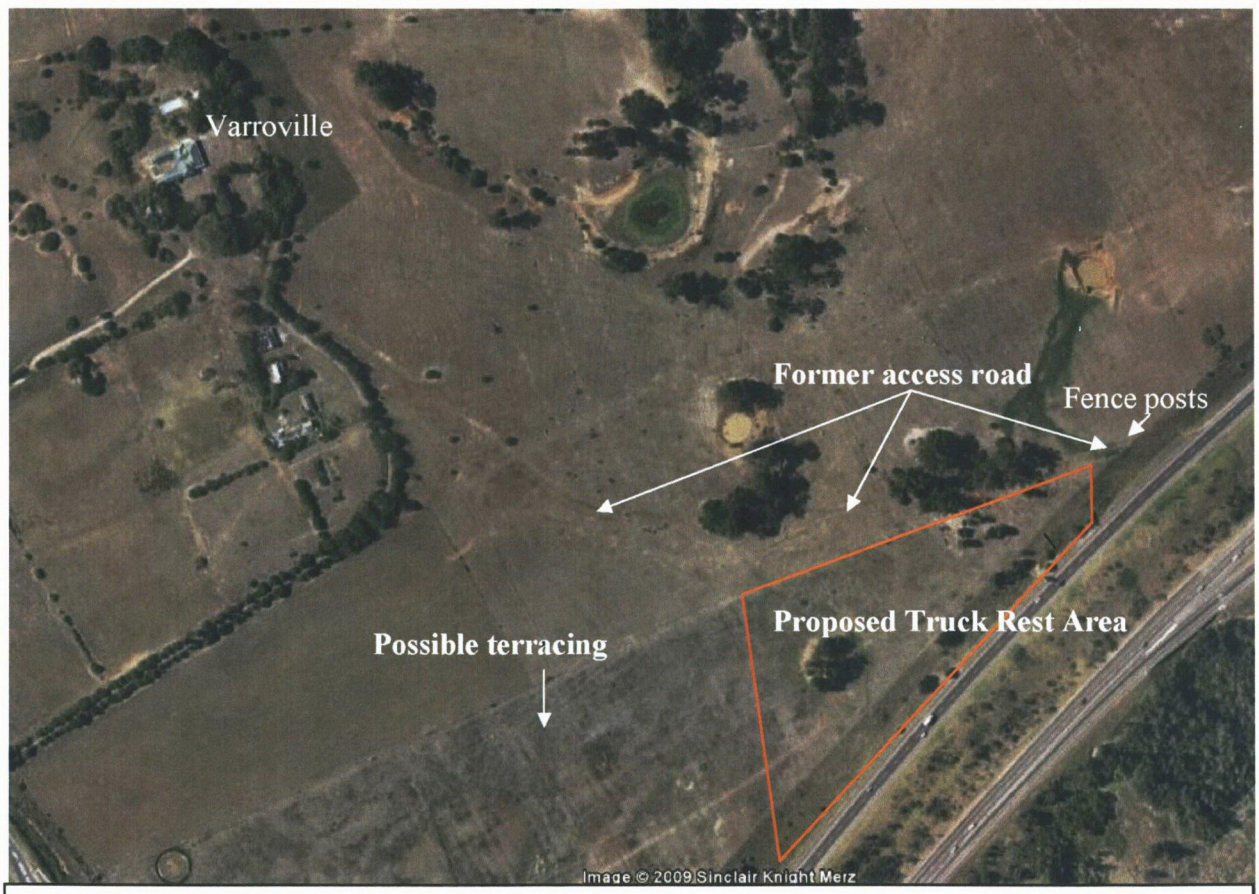

Image 5.13. Satellite image showing former access road to Varroville, fenceposts and possible terracing. Google Earth. Sinclair Knight Mertz, 2009.

[69] Kirkby, Jacqui. 2009. 'Varroville in the Scenic Hills'. In *Branch Cuttings*. Newsletter of the Sydney & Northern New South Wales branch of the Australian Garden History Society. Issue 28, February 2009. p.7.
Thorp, Wendy. 1992. *Historical Context "Varro Ville"*. For Orwell and Peter Phillips Architects. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. Section 2.3.

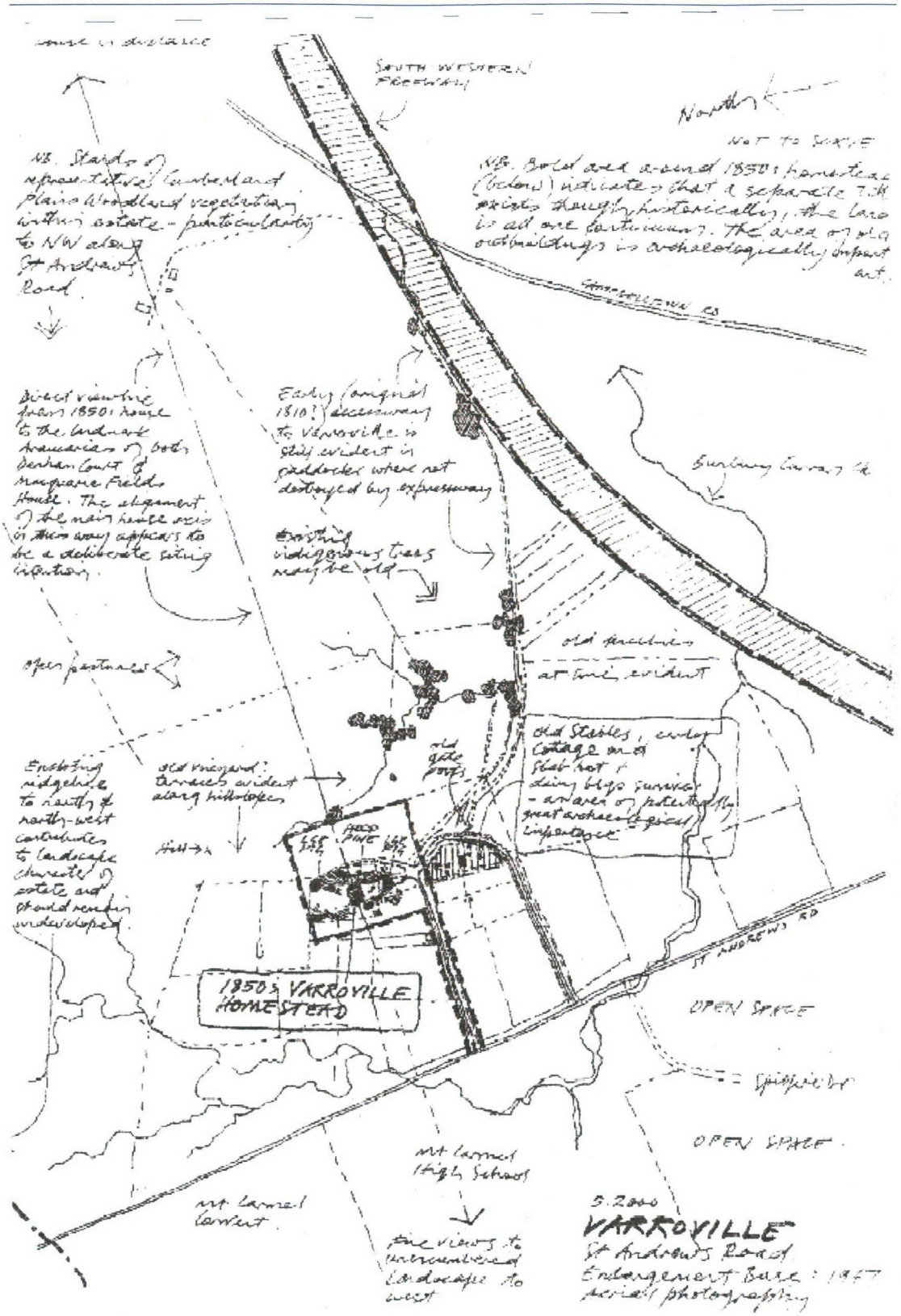

Figure 5.1. Site plan showing the location of existing structures and features within the wider Varroville landscape. In Morris, Colleen and Britton, Geoffrey. 2000. Varroville in *Colonial Landscapes of the Cumberland Plain and Camden NSW.* For the National Trust of Australia (NSW).

5.3. Varroville Homestead Precinct.

Northwest of the survey area, Varroville includes a variety of structures and features. In particular, the farm precinct contains Varroville homestead and associated outbuildings, stables, an early cottage, a slab hut, gardens, post and rail fences and other features in the landscape which date from the nineteenth century. Here, Thorpe notes a high potential for a unique and intact archaeological resource that would offer new and significant evidence on the development or management of the place.[70] The diverse archaeological resource at the house site may include tanks, refuse pits, wells, artefact bearing deposits associated the first and second residences, stables, and outbuildings from the early periods of occupation.

Image 5.14. Varroville Homestead, c.1930. Photograph by William Bayley. Courtesy of the Campbelltown & Airds Historical Society, Local Studies Collection, Campbelltown City Library. File 002\002324.

[70] Thorp, Wendy. 1992. *Archaeological Assessment "Varro Ville"*. For Orwell and Peter Phillips Architects. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. 2.3 and 2.4.

Image 5.15. Varroville Homestead, c.1974. Photograph by William Bayley. Courtesy of the William Bayley Collection, Local Studies Collection, Campbelltown City Library. File 002\002991.

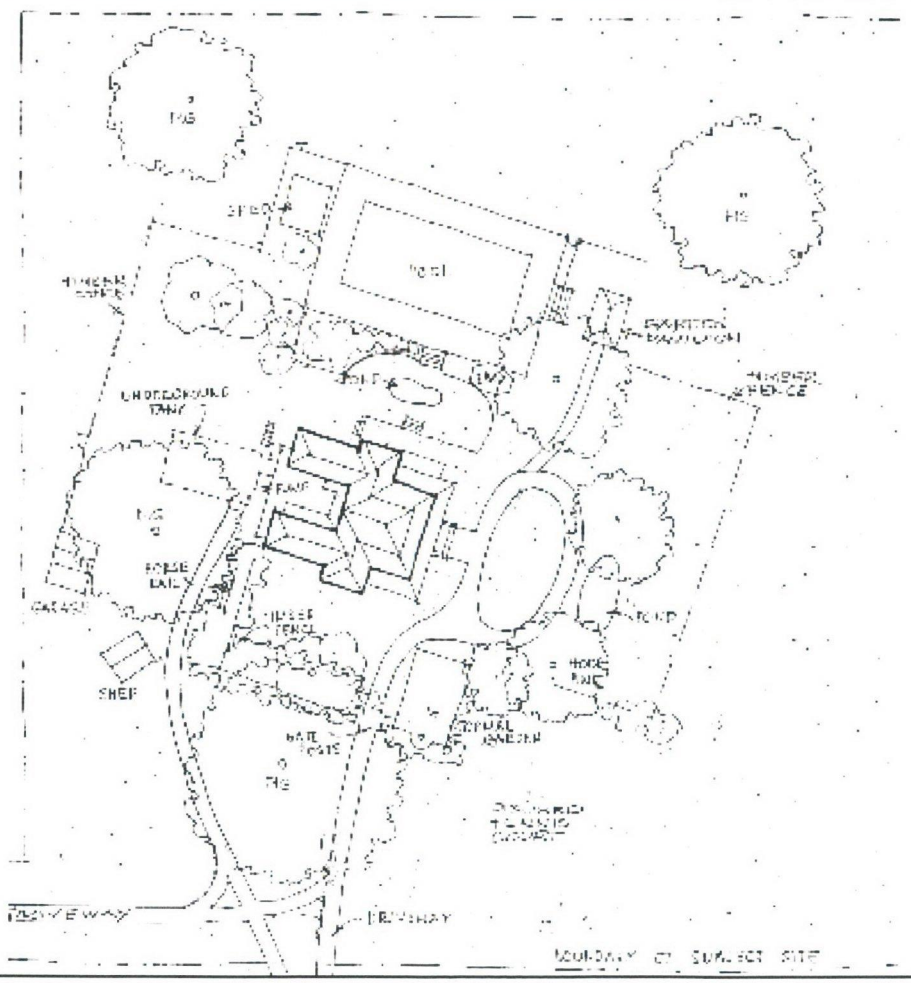

Figure 5.2. Site Plan of Varroville Homestead Precinct. In Orwell and Peter Phillips Architects, *Conservation Policy Plan. Varro Ville. St Andrews Road, Varroville* (1992). Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999.

5.4. *Site Disturbance.*

The entire historic area of Varroville, including the surrounding scenic hills, survives remarkably undisturbed. Thorp notes the relative lack of disturbance within the homestead precinct and the scenic hills themselves remain undeveloped. The proposed location of the truck rest area has been subject to some disturbance from flooding as well as the construction of the Hume Highway (H5). Even here, however, surviving fence posts and terracing in the vicinity of the proposed truck rest area indicates that disturbance has been limited and mostly confined to the line of highway. Where subsurface remains survive at Varroville or its surrounding lands, including the proposed truck rest area, such remains are likely to survive intact and in suit.

5.5. *Archaeological Research Potential.*

The subject study area, the proposed Varroville F5 Truck Rest Area, has a low-moderate potential to contain subsurface remains that may inform on major themes in Varroville's history or that of New South Wales. Historical sources do not indicate that intense occupation of this part of the property took place. Rather, the area was used as farm land associated with pastures and horse breeding. Little disturbance has occurred despite the construction of the highway and seasonal flooding. In the immediate vicinity, two features associated with more intact cultural deposits were identified. They include an early access road and two fence posts. It is not considered likely that the 'possible terracing' dates to the nineteenth century. It is also not considered likely that remains of a race track, if existing within the subject survey area, will contribute significant or substantial information to research themes.

The archaeological research value for the subject survey area beside the Hume Highway is limited to:

1) identifying the fabric and form of an early driveway in the immediate vicinity which may date to c.1810; and

2) identifying remnant fencelines to reveal further information on landscape arrangement and use.

6. ARCHAEOLOGICAL SIGNIFICANCE.

6.1. Significance Assessment.

The following assessment investigates the archaeological significance of land reserved for the F5 Truck Rest Area (referred to as 'the subject land' in the vicinity of historic Varroville.

Historical (a) ***(course or pattern) (Applicable)***

- The subject land was once part of the original Varroville Estate established on land granted in 1810.

Historical (b) ***(associated) (Applicable)***

- The site of the proposed Truck Rest Area is associated with Dr. Robert Townson, Captain Charles Sturt the explorer, James Raymond the first Postmaster General and Justice Alfred Cheeke.
- The survey area may be considered significant for its association with the wider Varroville Estate. This adjoining farm complex contains a restored Georgian Regency style house which was built on land in c.1858. It also contains the remains of earlier buildings and features dating back to c.1810.

Aesthetic (c) ***(Not Applicable)***

- No substantial archaeological remains are anticipated within the subject survey area.

  Note: Although outside the survey area, the original access road occurs in the immediate vicinity of the proposed Truck Rest Area. The original access road surface and alignment is clearly visible in a recent satellite image. This feature is considered to be of high significance and contributes to the visual interpretation of the wider landscape.

Social (d) ***(Applicable)***

- The present and earlier owners of Varroville, as well as the Campbelltown and

Airds Historical Society and others from the local community are likely to value the local scenic landscape for its associations with historic Varroville and would be interested in any additional information that the potential archaeological resource may contribute to the historic farm complex.

Scientific (e) ***(Not Applicable)***

- No significant or substantial archaeological resource is likely to exist at the land reserved for the proposed truck rest area.

Note. Features associated with the development of Varroville or phases of use throughout its history as a working farm lie just beyond the boundary of the survey area. They include an early access road and two early fence posts which date to the nineteenth century. Such features contribute to the significance of the 'place' as a whole.

Rarity (f) ***(Not Applicable)***

- Potential subsurface remains at the specific site of the proposed Truck Rest Area are considered to be unlikely. The site of the proposed truck rest area itself is considered unlikely to contain substantial and/or significant archaeological remains that may inform on the history and development of New South Wales.

Note. Features in the landscape in the immediate vicinity of the proposed Truck Rest Area are considered to be rare and appear to be associated the early to late nineteenth century occupation and use of the 'place'. These features are visible in a recent satellite image and/or on-site. They include and early entrance road leading to Varroville homestead and two fence posts near the former entrance. Such archaeological remains would represent a physical reminder of rural life in the early Campbelltown area and would have the potential to contribute to our understanding of early farming life and settlement in colonial Australia.

Representative (g) ***(Not Applicable)***

- No substantial or significant subsurface remains are anticipated within the subject survey area.

Note. The archaeological resource near the subject land may be representative of early-mid nineteenth century farming practices in New South Wales.

Integrity.

- Little disturbance appears to have occurred across the subject survey area and indeed the wider Varroville Estate. Where extant, archaeological deposits are likely to be largely intact and in situ.

Note. As shown in a satellite image, the former access road survives intact and in situ leading from the Hume Highway near the subject survey area to Varroville homestead. In the 1992 Conservation Management Plan, such landscape features have been ranked at Level A, representing "exceptional significance" and being of State significance and worthy of preservation.[71]
According to Orwell and Phillips: "... the boundary of the site, by excluding the original driveway, outbuildings and rural setting of the main house, can be seen as compromising its primary significance".[72]

Varroville Homestead, in the vicinity of the proposed Truck Rest Area (475 metres to the northwest), is an early farm estate dating from 1810. It is one of the few larger estate landscapes remaining in the Campbelltown area where the form of the original grant and the former agricultural use of the estate and its rural landscape character can be interpreted. The access road and possibly associated fence posts are a part of this interpretive value.

6.2. Statement of Archaeological Significance.

The subject survey area and location of the proposed Truck Rest Area is considered to have no archaeological potential or archaeological significance. It is considered to be historically significant for its association with the wider Varroville Estate which dates back to 1810 and for its association with several prominent figures of New South Wales

[71] Orwell and Peter Phillips Architects. 1992. Conservation Policy Plan. Varro Ville. St Andrews Road, Varroville. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. p.10.
[72] Orwell and Peter Phillips Architects. 1992. Conservation Policy Plan. Varro Ville. St Andrews Road, Varroville. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. p.8.

including Dr. Robert Townson, Captain Charles Sturt the explorer, James Raymond the first Postmaster General and Justice Alfred Cheeke.

Note. In the immediate vicinity of the proposed Truck Rest Area, archaeological features are present that are considered to be of Local and potentially State significance – the early access road and possibly associated fencing.

7. IMPACT OF THE PROPOSED WORKS.

7.1. Impact.

1. The specific site of the proposed Truck Rest Area has been found to have no archaeological significance. Within the confinement of the designated Truck Rest Area the proposed works will have no impact on a potential archaeological resource, given that:

1) historical research indicates that European heritage sites are unlikely to have occurred within the subject development area; and

2) should the remnants of a race track have been located within the subject site, then this feature will have been largely disturbed during the construction of the Hume Highway (F5).

2. Features are present in the immediate vicinity which might be impacted by the proposed works. These are: the early access road (c.1810) and the two nearby fence posts (19thC).

- Just beyond the designated site, there may be a minor risk that work may spill out of the designated boundary causing damage or disturbance to these features.
- The context of the access road and fence posts will be changed with the raising of land a short distance from their location at the F5 Truck Rest Area.

7.2. Mitigating Measures

1. Precautions should be taken to protect the access road (1810) and nearby fence posts during construction activities at the site. These items should not be covered or physically damaged by the proposed works. Protective measures may include temporary fencing and briefing all persons engaged on the proposed works.

2. The access road (1810) and nearby fence posts are a part of the heritage landscape and should be preserved in accordance with the recommendations of the Conservation Management Plan.[73]

3. The context of the access road (1810) and nearby fence posts should be photographed within the landscape prior to its alteration due to the construction of the F5 Varroville Truck Rest Area. Photographic recording of the features will provide a visual reference and record of the heritage resource in the vicinity of the F5 Varroville Truck Rest Area that may be used to aid further inquiries about the Varroville Estate.

4. Vegetation screening may be used to soften the presence of the raised F5 Truck Rest Area in relation to heritage items in the landscape, including Varroville itself.

5. Monitoring works by an archaeologist is not considered to be necessary during the proposed works.

6. Interpretive signage has been considered, however, the site is to be reserved for truck drivers as opposed to the wider public. Because of this, interpretive signage is not considered to be necessary.

[73] Orwell and Peter Phillips Architects. 1992. Conservation Policy Plan. Varro Ville. St Andrews Road, Varroville. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. p.8.

8. *RECOMMENDATIONS.*

The following recommendations are based on historical research, site survey, and an assessment of archaeological significance. It is recommended that:

1. The applicant should apply for an excavation permit exception under 1(A) and 1(C) of the Schedule of Exceptions to Section 139(1) & (2) of the NSW Heritage Act (1977) made under Section 139(4), for the proposed construction of the F5 Varroville Truck Rest Area.

2. The site of the proposed F5 Varroville Truck Rest Area is considered to be of low archaeological potential and significance. It is not reasonably expected to reveal significant or substantial relics that may contribute to our knowledge of the settlement in New South Wales. As such, this area does not require further archaeological investigation. Monitoring works by an archaeologist is not considered to be necessary during the proposed works.

3. The access road (1810) and nearby fence posts are a part of the heritage landscape and should be retained and preserved in accordance with the recommendations of the Conservation Management Plan.[74]

4. The proposed F5 Varroville Truck Rest Area will be a new item in the landscape. In accordance with the recommendations of the Conservation Management Plan, "where new elements (such as car parks) are introduced, some screening may be required to minimise their impact". [75] Vegetation screening should be used to soften the presence of the raised F5 Truck Rest Area in relation to heritage items in the landscape, including Varroville itself.

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[74] Orwell and Peter Phillips Architects. 1992. Conservation Policy Plan. Varro Ville. St Andrews Road, Varroville. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. p.14.

[75] Orwell and Peter Phillips Architects. 1992. Conservation Policy Plan. Varro Ville. St Andrews Road, Varroville. Revised and Updated by Pearson-Smith & Associates Pty Ltd, 1999. p.15.

5. The context of the access road (1810) and nearby fence posts should be photographed within the landscape prior to its alteration due to the construction of the F5 Varroville Truck Rest Area.

6. Site management staff, project managers and other personnel participating in the works should be briefed by an RTA representative or heritage consultant on the significance of the former access road (c.1810) and the nearby fence posts (19thC). At this briefing the requirement to preserve these heritage items should be discussed. They are not to be damaged or covered during the proposed works.

7. The NSW Roads and Traffic Authority may consider temporarily fencing the heritage items for their protection during construction works.

8. In accordance with Section 146 of the NSW Heritage Act 1977 the accidental discovery of relics, other than those discussed in this report, will be reported immediately to the NSW Department of Planning (Heritage Branch) (Heritage Act 1977, section 146).

9. Should any Aboriginal objects be discovered during the proposed works, or otherwise, then their accidental discovery should be reported to the Director General of the NSW Department of Environment and Climate Change (National Parks & Wildlife Service) and the relevant permits should be obtained under section 91 of the National Parks and Wildlife Act 1974.

10. Copies to of this report should be forwarded to: the NSW Department of Planning (Heritage Branch), Campbelltown City Council and the Campbelltown Local Studies Library.

REFERENCES.

NOTES AND INVENTORIES.

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Appendix E

Indigenous heritage assessment

Archaeological Assessment
for a proposed dedicated heavy vehicle rest area on the F5 at Varroville, NSW

August 2009

Jo McDonald Cultural Heritage Management Pty Ltd
77 Justin Street, Lilyfield NSW 2040 P 02 9555 6022

Report to GHD on behalf of the RTA

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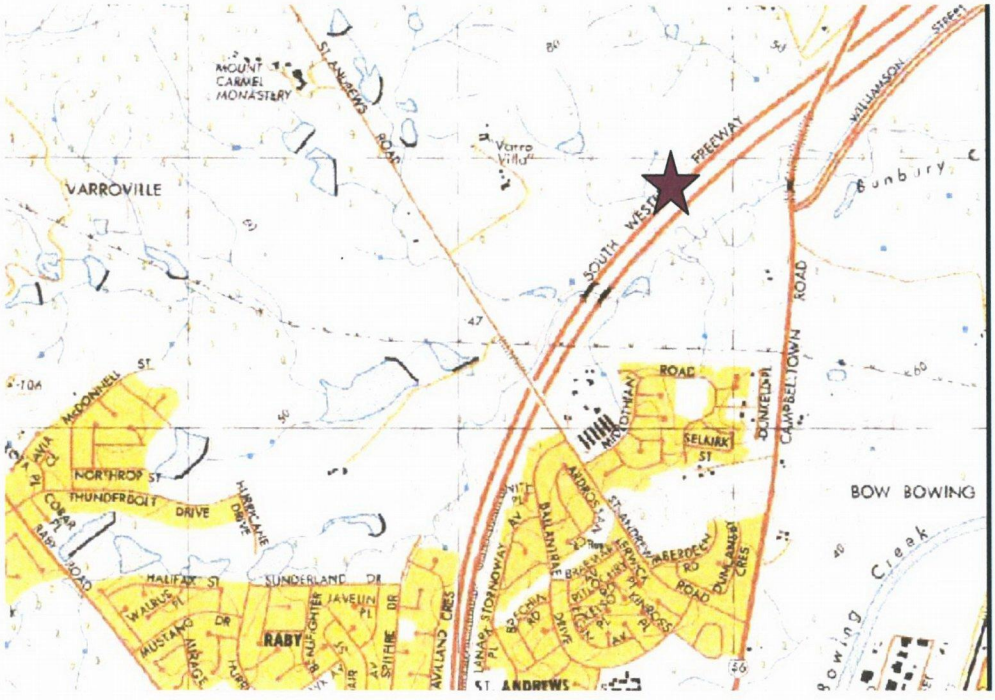
1.INTRODUCTION AND BACKGROUND

1.1 Background

Jo McDonald Cultural Heritage Management (JMcD CHM) was commissioned by GHD to conduct an assessment of the Aboriginal heritage at the site of a proposed dedicated heavy vehicle rest area on the northbound carriageway of the F5 freeway at Varroville in the Campbelltown Local Government Area (LGA).

Figure 1:The study area in a local context (location marked with purple star) (Campbelltown 1:25k).



1.2 The study area

The study area consists of a 41130sqm area along the northbound carriageway of the F5 freeway at Varroville between St Andrews Road and Campbelltown Road. At its narrowest point the study area is 6m wide and 302m at its widest (see Figure 2).

The site currently consists of an existing freeway shoulder (road reserve) and grazing land (paddock section).

Topographically, the study area comprises of relatively low lying land, surrounded by low hills. Small tributaries and farming dams surround the site and Bunbury Curran Creek crosses it at the southern end.

Vegetation coverage is extensive, and includes high grass and nettles/weeds.

1.3 Proposed development

The proposed development incorporates the construction of:

- paved parking spaces;
- landscaping;
- shelter tables;
- toilet facilities block;
- new bridge or culvert over Bunbury Curran Creek;
- storm water management system; and
- acceleration and deceleration lanes for entering and exiting the rest area, 6m to 7.2m wide (including lane and shoulder) and 1,570m long.

The impact of the combined developments would result in the destruction of any existing archaeological deposits.

1.4 Summary of findings and recommendations

This study found that:

1. No Aboriginal objects were identified within the study area;
2. There are no Zone 1 (high archaeological potential) lands within the study area, therefore no areas affected by this development proposal warrant conservation;
3. The study area is assessed as Zone 3/4 (low-no archaeological potential) and should be considered developable without archaeological constraint.

It is therefore recommended that:

1. There is no requirement for further archaeological investigation within the study area;
2. Tharawal Local Aboriginal Land Council and other relevant Aboriginal groups should determine any cultural significance.

1.5 Aboriginal stakeholder consultation

An assessment of cultural significance by Aboriginal stakeholder groups was not undertaken as a part of this study because the RTA had advised that they would liaise with the Aboriginal community in regards to the proposed development project. It is understood that consultation with the Aboriginal community will be carried out in accordance with the DECC Community Consultation guidelines.

The study area falls within the boundaries of the Tharawal Local Aboriginal Land Council (TLALC) and is within the area of interest of a number of other groups. Cubbitch Barta Native Title Claimants Aboriginal Corporation, Korewal Elouera Jerrungurah Tribal Elders Council, Ilawarra Aboriginal Corporation, Wadi Wadi Coomaditchie Aboriginal Corporation, Wodi Wodi Elders Corporation, Woronora

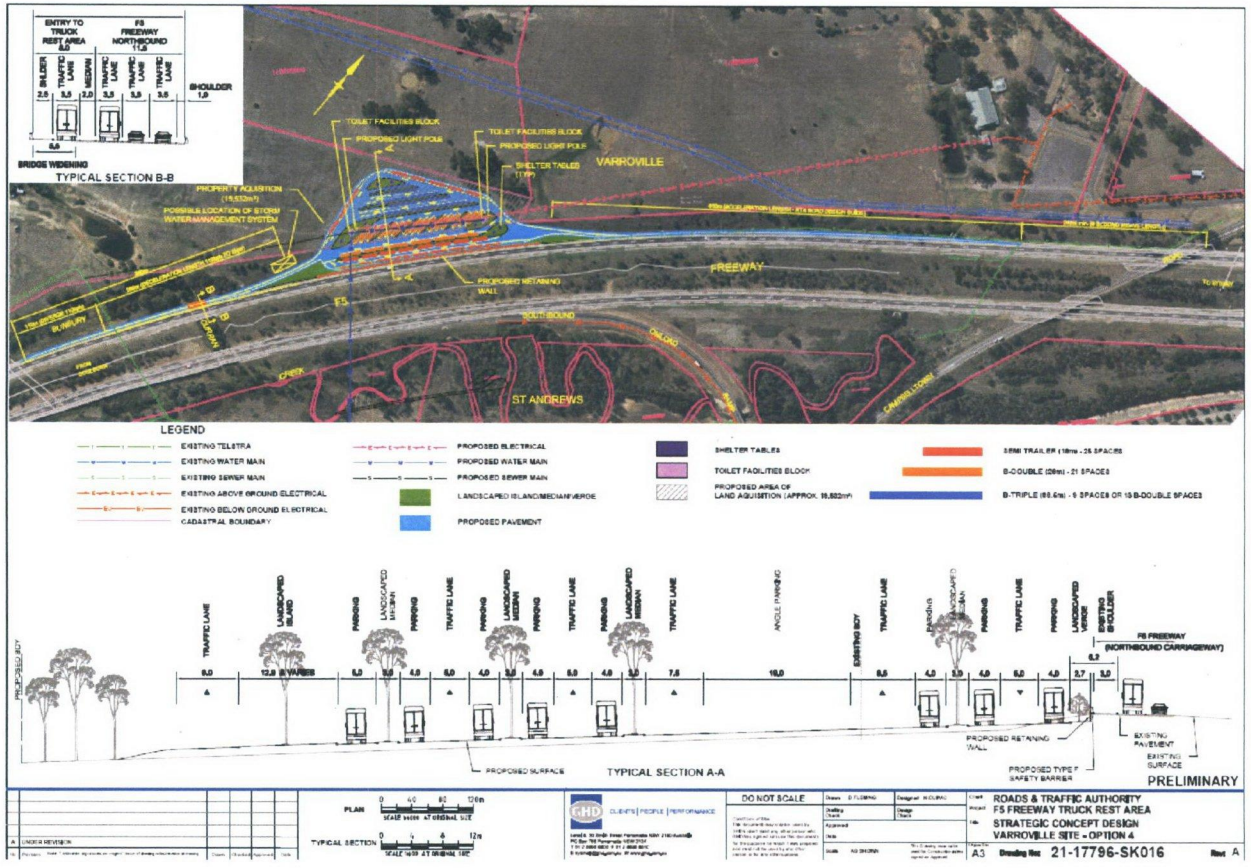
Plateau Gundungara, Wulunguu Elders Council, Coomaditchie United Aboriginal Corporation, Darug Tribal Aboriginal Corporation and the D'harawal Knowledge Holders have all registered an interest in the Campbelltown LGA with the Department of Environment and Climate Change (DECC). Most of these registrations are in response to the Community Consultation Guidelines which were developed by the Growth Centre Commission. DECC guidelines do not stipulate that consultation with all listed groups is mandatory (outside the South-Western Growth Centre), although their registrations of interest should be noted.

A search of the National Native Title Tribunal website found the following list of pending and dismissed claimants for the Campbelltown LGA. Although there are presently no successful native title claimants for the area, Cubbitch Barta has a long association with the management of cultural heritage in this area and should continue to be consulted as a stakeholder within the Campbelltown LGA.

Table 1: Native Title Claimants for the Campbelltown LGA –(www.nntt.gov.au).

Date Filed	Application Name	Status	Tribunal File No.	Federal Court File No.
30/04/1999	Kim Moran #3	Finalised - Dismissed	NC99/3	NSD6006/99
04/08/1998	Cubbitch Barta Clan of the Dharawal People #1	Finilised - Discontinued	NC98/20	NSD6108/98
12/05/1997	Darug Tribal Aboriginal Corporation	Active- Boundaries of claim under consideration	NC97/8	NSD6061/98
26/06/1996	Gundungura	Finalised - Rejected	NC96/21	
23/04/1996	Wadi Wadi #2	Finalised - Discontinued	NC96/12	NSD6031/98
12/11/1994	Dominic Kanak	Finalised - Rejected	NC94/8	

Figure 2:Proposed development at the study area.



1.6 Report authorship

This report was written by Samantha Higgs with management input from Jo McDonald.

2. ENVIRONMENT AND CONTEXT

2.1 Vegetation

Originally, the Cumberland Plain contained a complex of woodland and forest associations adapted to the mostly clayey soils. Post-contact land uses (both pastoral and recreational) have impacted heavily on the indigenous vegetation across the Cumberland Plain, including the study area.

At the time of the field inspection the road reserve section of the study area was heavily vegetated with introduced grasses and weeds. The paddock area was less heavily vegetated with native and introduced grasses as well as stands of Eucalypts.

2.2 Geology

The study area is underlain by sandstone and shale of the Wianamatta Group (1:500,000 Sydney Basin geological map sheet, Geological survey of NSW).

The main geoarchaeologial consequences of the underlying Wianamatta geology are:

- Low relief landforms with well developed and quite high density drainage networks. Water sources are relatively easily found, with both ephemeral and permanent streams and ponds forming significant elements in the prehistoric landscape.
- Poor soils have precluded significant intensive agricultural use of the area. This naturally low fertility has assisted in the preservation of natural woodland, promoted pastoral land-use and minimised the effects of land disturbance from clearance and agriculture in some areas. There is thus a higher potential for *in situ* undisturbed preservation of archaeological sites.

2.3 Hydrology and stream order

McDonald and Mitchell (1994) first used stream order as part of their predictive model for Aboriginal site location. This method identifies the smallest tributary streams as first order streams and the classification continues stepwise downstream. Two first order streams join at a first order node to form a second order stream; two second order streams join at a second order node to form a third order stream and so on.

The logic behind the stream order model is that in any particular climate and landscape a threshold catchment area is probably necessary to allow permanent stream flow or the establishment of waterholes with extended longevity (i.e. months to years). In the context of the Cumberland Plain with an average annual rainfall of between 700 and 900mm, the critical point where these conditions are met appears to be at the junction of two second or third order streams (second and third order nodes).

The study area crosses Bunbury Curran Creek approximately midway along the deceleration lane, south of the current rest stop area (see Figure 2). Bunbury Curran Creek is a 2nd order stream where it passes through the study area.

2.5 European land use

The study area is a part of a 1000 acre (400ha) land grant made by Governor Macquarie in 1809 to Dr Robert Townsend. Initial landuse included construction of a homestead (*Varro Ville*), a vineyard and sheep and cattle farming (www.campbelltown.nsw.gov.au).

More recent land use has included construction of the F5 freeway which borders the eastern edge of the study area. The eastern part of the study area consists of the freeway shoulder and road reserve. The rest of the study area is still in use as grazing land.

3.ARCHAEOLOGICAL CONTEXT

According to early mapping of tribal boundaries by Tindale (1974), the Campbelltown region was occupied by the Dharawal language group, their land extending south of Botany Bay to the Shoalhaven River and inland to Camden. The Dharug language group occupied country to the north of Camden and covered the south west part of the County of Cumberland. The Gundangara language group occupied country to the south and south-west.

More recent linguistic mapping and research has suggested a wide variation on the geographical boundaries of these languages and dialects, though it is likely that there were enough common words between them that the groups could communicate without too much difficulty.

The geographical boundaries of language groups and territories are only indicative. The issue is subject to significant debate and the interpretation of extremely limited historical documentation. Moreover, such boundaries may not have been well-defined or obviously delineated across the landscape. Despite the lack of certainty in regard to tribal boundaries,

What is apparent from the ethnographic record is that the region was within the frequented territory of a number of separate and often conflicting Aboriginal groups. It does appear likely that the area was close to the boundary between the Darug, Dharawal and Gundangara dialects.

3.1 Ethnohistorical evidence for the Cumberland Plain

On 22nd April 1788, Governor Phillip ordered the first major inland expedition crossed the Cumberland Plain. At this time, evidence of Aboriginal people was seen 'everywhere' in the form of huts, camp fires, burning trees and partially eaten food (Flannery 1996:91). Barrallier, in his expedition through *Darug* and *Gandangara* territory in the early 19th century, describes the swamps in the Nepean River area as being excellent sources of fish, shellfish and 'enormous' eels. He states that:

> the people from this area usually fed upon opossum and squirrels, which are abundant in that country, and also upon kangaroo rats and kangaroo, but

> they can only catch this last one with the greatest trouble, and they are obliged to unite in great numbers to hunt it (Barrallier 1802 [1975]: 2-3).

Such a kangaroo hunt, with a large group using fire, spears and 'tomhawks' was described near Menangle Swamp. The participants were spaced at '30 paces ... [and] formed a circle which contain[ed] an area of 1 or 2 miles' (Barrallier 1802[1975]: 3). Based on this description, in the order of 100 people may have been involved in this hunt, suggesting that such activities may have involved co-operation between several bands.

Lizards and grubs, 'particularly those which are found in the trunks of trees' were also documented as part of the diet (Barrallier 1802[1975]: 6, Collins 1798[1975]:462). For the purpose of collecting these grubs (*Cahbrogal*) a specific utensil was used, this being described as:

> a switch about twelve inches long and the thickness of a fowl's feather ... One of the extremities of this stick is provided with a hook. ... [which is used upon finding evidence of these grubs in the bark of trees having] widen[ed] the hole ... with their axe ... dip their switch into the hole, and, by means of the hook, draw it out, and eat it greedily. (Barrallier 1802 [1975]: 6).

Other specialized, inland, adaptations to localized resources include the 'squirrel traps' in hollow trees and 'decoys for the purpose of ensnaring birds' (Tench 1793[1961]: 154-5). These decoys were assessed as having great utility as they were full of quail feathers. The accounts described these structures as complex (see also Phillip in *HAR*, 1:156 and Collins 1798[1975]: 462) and that they were made of reeds and 'underwood'. They were described as being 'long and narrow, shaped like a mound raised over a grave; with a small aperture at one end for admission of the prey; and a grate made of sticks at the other' (Tench 1793[1961]: 154-5). One such structure described by Collins 'was between 40-50 feet long' (1798[1975]: 462). He also describes animal and bird traps near inland lagoons as consisting of holes with camouflaged tops (*ibid.*).

Early accounts remarked on the facility with which men of the inland tribes climbed trees (Hunter 1793, Tench 1793, Collins 1798, Barrallier 1802). This was done for the purpose of obtaining possums (usually with assistance of smoke) and was achieved by cutting notches for toeholds 'with a stone hatchet' (Hunter 1793[1968]: 430; Tench 1793[1961]: 233). Possums and other tree dwelling animals were indeed the staple of the woodland tribes and that edge-ground hatchets were identified as the dominant subsistence item in the inland toolkit.

At the time of contact, Aboriginal camp sites on the Cumberland Plain were described (Collins 1798[1975]: 460) as being made of the bark of a single tree, bent in the middle and placed on its two ends on the ground 'exactly resembling two cards, set up to form as acute angle' (Tench 1793[1961]: 154; and see Philip 1789[1970]: 55-77) and 'affording shelter to only one miserable tenant (Collins 1798[1975]: 460). These shelters (*gunyahs*) would be grouped together, up to a total of nine (Barrington 1802: 20).

It is not clear from the early accounts what sort of family or social groupings might have been expected in these camps, nor the spatial arrangement of these. It is also unclear for how long such camps would have been occupied, whether these were base or transient camps.

3.2 Archaeology in the Sydney region

The first human colonisation of the Australian continent is generally accepted as happening *c.* 43-45ka (O'Connell & Allen 2004). Evidence from archaeological excavations has demonstrated that the Sydney region has been populated for the last 30,000 years. Early excavations from the Blue Mountains and south coast gave initial occupation dates of *c.* 22,000 BP (Kings Tableland, Blue Mountains) and *c.* 20,000 BP (Burrell Lake, South Coast) respectively (Stockton 1993; Lampert 1971). More recent work in Parramatta has increased the antiquity of occupation in the Sydney Region to 30,000 BP (JMcD CHM 2005). Although the Cumberland Plain has been inhabited for *c.* 30,000 years, evidence shows that the region was most intensively occupied in the last 3,000 years (Attenbrow 1981, 1987; Kohen 1986; McDonald 1986; Smith 1987).

Many of the earliest excavations in this region were of rockshelters in the sandstone country surrounding the Cumberland Plain (e.g. Attenbrow 2002, 2004; McDonald 1994; Nanson *et al.* 1987). Much of our information about the original inhabitants of the locality came from these. Development pressures in Western Sydney over the last decades have led to the increased excavation of open sites in the Cumberland Plain. This ongoing work, combined with other archaeological investigations over the past twenty years has provided substantial evidence for Aboriginal occupation, settlement patterns and resource use in this region. Archaeologically, the Cumberland Plain is now one of the most extensively investigated regions in Australia.

McCarthy first proposed the Eastern Regional Sequence (ERS) in the 1940's and further developed it through to the 1960's (1948, 1964) as a framework for understanding changes in lithic technologies in the Sydney region from the late Pleistocene through to the Holocene. Subsequent archaeological work in this region has further refined this (Attenbrow 1997, 2002, 2004; Hiscock and Attenbrow 1998, 2005; McDonald 1994). Looking at the sequence of technological changes provides a context from which we can assess and comprehend changes in occupation patterns and resource exploitation in this region. The ERS is a regional variant of the Core Tool and Scraper Tradition changing to the Small Tool Tradition and consists of 4 phases: Pre-Bondaian; Early Bondaian; Middle Bondaian; Late Bondaian (see Table 2)

Table 2: The Eastern Regional Sequence (recent dates from JMcD CHM 2005).

Period	Age	Description
Pre-Bondaian	30,000-9,000 BP	Preference for the use of silicified tuff unless at an extreme distance from sources. This is augmented with quartz or other local materials, also grainy stone raw materials. Cores and tools vary widely in size, some quite large. No backed artefacts, elouera or ground stone. The predominant technique is unifacial flaking. Bipolar flakes are rare. The 30,000BP date possibly indicates the earliest time frame for this phase
Early Bondaian	9,000-4,000 BP	The use of silicified tuff declines, more use is made of local stone materials, especially at sites occupied for the first time. Backed artefacts appear sporadically. Bipolar flaking is widely in use but only rarely at individual sites. Bifacial flaking probably continues as predominant technique

Middle Bondaian	4,000-1,000 BP	The use of different raw material types varies between and within sites over time. Main phase of backed artefact. Introduction of asymmetric alternating flaking. Substantially smaller cores and tools. Increase in bipolar flaking. Ground stone artefacts appear, though infrequently and present at fewer than half the dated sites. Elouera appear but are rare
Late Bondaian	1,000 BP to European Contact	The use of different raw material types continues to vary. Backed artefacts become rare or absent from most sites. Bipolar cores make up 2% or more at most sites. Ground stone found at most dates sites but usually <2% of assemblages. Elouera remain rare.

The change from Pre-Bondaian to Bondaian is characterised by a major shift in raw material use and a later predominance of smaller implements. Phases within the Bondaian are characterised by the introduction and subsequent decline of the backed artefact, the increasing dominance of bipolar flaking and a change in proportions of raw material.

The following is a summary of the findings of previous archaeological work on the Cumberland Plain:

In general:

- The complexity of the Cumberland Plain's archaeological record is far greater than was previously identified on the basis of surface recording and more limited test excavation. Similarly, the time span of Aboriginal occupation has been demonstrated to be far greater than was originally thought (e.g. by Kohen 1986);
- Gross patterning is identifiable on the basis of environmental factors: archaeological landscapes on permanent water are more complex than sites on ephemeral or temporary water lines (McDonald 1996: 115). This has now been documented broadly across the Cumberland Plain with excavations in the RHDA, at the former ADI Site (ADI-EP1; Xavier College), on the Parramatta River (sites CG1 and RTA-G1) and at Greystanes Estate (Site PH2+3).

Specifically:

- Most sites encountered will be of mid- to late Holocene age. Specific geomorphic conditions (e.g. deep sand bodies) for the preservation of Pleistocene–aged assemblages do occur but are not common on the Cumberland Plain;
- Where sandstone features occur (e.g. overhangs and platforms) they may have been used for habitation, processing basalt ground-edged axes or the production of art;
- Most areas, even those with sparse or no surface manifestations, contain some sub-surface archaeological deposits;
- Where lithic concentrations are found in aggrading or stable landscapes, they are largely intact and have the potential for internal structural integrity. Sites in alluvium possess potential for stratification;

- The density and diversity of implements and *debitage* is conditioned by permanence of water (stream order), landscape unit and distance to lithic source;
- Where silcrete outcrops occur naturally there will be evidence for quarrying and likely some reduction activity in the vicinity; and
- Contrary to earlier models for the region (e.g. Kohen 1986, Smith 1989) many areas contain extremely high artefact densities, with variability appearing to depend on the range of lithic activities present. Densities in excess of 400/600 artefacts per metre square are not uncommon in the RHDA on knapping concentrations.

3.3 Previously recorded sites

A search of the Aboriginal Heritage Management System (AHIMS) database was conducted for a 2km radius and 5km radius of the study area. The search found 4 sites are registered within a 2km radius of the study area and 70 within a 5km radius. No sites are registered within the current study area.

The most common site type present within the search area are surface scatters of stone artefacts (open artefact scatters) followed by isolated finds of stone artefacts. Scarred trees, axe grinding grooves and rock shelters with deposit and/or art are also present in the area.

Table 3: Sites within a 2km radius of the study area.

Site Type	Number of Sites
Open Artefact Scatter	1
Isolated Find	3
Total	**4**

Table 4: Sites within a 5km radius of the study area.

Site Type	Number of Sites
Open Artefact Scatter	38
Isolated Find	11
Scarred Tree	10
Grinding Grooves	3
Rock Shelter with Deposit	3
Rock Shelter with Art	5
Total	**70**

While the southern Cumberland Plain has not had as much archaeological investigation as the northern portion there have been several large archaeological surveys in the region in the past few years at Oran Park and Turner Road in the south-west Growth Centre (JMcD CHM 2006, 2007a,b,c,d,e, 2008) and Harrington Park (AMBS 2006). These surveys found widespread areas of surface artefact scatters and areas of Potential Archaeological Deposits (PADs) and led to archaeological excavations of subsurface deposits (HLA ENSR 2008, ENSR/AECOM 2009, KN Consult 2008).

Menangle Park (to the west of the current study area) and the immediate surrounds have also been the focus of extensive archaeological work over recent decades (eg. McDonald and Brayshaw 1983, Byrne 1994 Jo McDonald CHM 1996, Baker 1999, HLA 2004). A 2004 study predicted a higher likelyhood of site preservation for this region in areas of extremely low relief slope (HLA 2004: 90-93).

3.4 Predictive model

Based on previous work in this region, the following predictions were made for the current study area:

- There may be evidence of repeated occupation by small groups, knapping floors (possibly used and re-used) and/or evidence of more concentrated activities in the current study area;
- Occupation dates may include the pre-Bondaian, but are more likely to date to the Bondaian;
- The site types most likely to be encountered are stone artefact scatters or isolated stone artefacts.
- Scarred trees may be present within the study area.

3.5 Land use impact assessment

Land use impact assessment allows the quantification of known disturbances and impacts. As a result of the land use impact assessment, areas of archaeological sensitivity can be identified. Previous impacts are divided into the following categories:

High disturbance – Severe disturbance to the soil. Buildings, houses, reservoirs, suburbs, roads, market gardens, poultry farms, BMX tracks, rubbish tips, formed tracks, dams, drains and other excavations.

Moderate disturbance – Cleared of trees at some time, cultivates or extensive soil disturbance probable, caused by machinery or extended periods of trampling. Moderate disturbance also results from agricultural pursuits such as orchards and pasture improvement.

Low disturbance – Partly cleared and grazed at some time (particularly on shale geology), but apparently never subject to extreme soil disturbance. Heavily vegetated areas (particularly on sandstone geology) may currently be weed infested in places.

On the basis of air photo interpretation and ground truthing during the field inspection, it had been identified that there has been moderate to high disturbance across the study area.

Sources of disturbances here include:

- Road construction;
- Existing sewer lines; and
- Farming, including tree clearing, grazing and possible vineyards.

Figure 3: Land use mapping within the study area (outlined in yellow), showing disturbance zones, based on pre-survey assessment. The red area represents areas of high disturbance and the blue areas of moderate disturbance.

4. SURVEY RESULTS

4.1 Fieldwork methodology

The pedestrian survey of the study area took place on Monday the 25th of May 2009 by Samantha Higgs (JMcD CHM). Also present was Katrina Smallwood (GHD), Rebecca Murray (RTA) and Barry Gunther (Aboriginal Liaison Officer, RTA).

The entire area of impact was traversed on foot. Ground surface visibility was extremely low over the majority of the study area, particularly the road reserve, so particular attention was paid to areas of exposure found predominantly within the paddock area. Several mature trees located just outside of the boundary of the truck rest stop area were examined for possible cultural scarring.

4.2 Survey results

No Aboriginal objects were identified within the study area.

Two black glass "flaked" fragments were found within the study area. Analysis by lithics expert Beth White concluded that it was unlikely that the glass had been flaked deliberately by Aboriginal people (Appendix 1).

The area (including the acceleration and deceleration lanes and the existing sewer line) within 10m of the F5 freeway (the freeway shoulder) now mostly consists of introduced fill and has been highly disturbed by the road construction (see the red area in Figure 3). The area of high disturbance includes the portion of Bunbury Curran Creek to be impacted by the proposed development. This portion of creek has previously been impacted by construction of a bridge and concrete walkway.

The paddock area (see the blue area in Figure 3) has been moderately disturbed by tree clearing and other farming practises. Some areas of recent ground excavation are evident, see Figure 7). This area includes the proposed designated heavy vehicle rest and the possible location of the storm water management system (see Figure 2).

Figure 4: Ground truthed archaeological sensitivity mapping. The blue area represents Zone 3 lands and the red area represents Zone 4.

Figure 5: Views of the area immediately adjacent to the F5 freeway, including the freeway shoulder.

Figure 6: Bunbury Curran Creek and existing bridge and walkway.

Figure 7: Views of the proposed designated heavy vehicle rest area.

4.3 Effective survey coverage

Effective survey coverage of the study area was significantly hampered by the poor ground surface visibility over the majority of the study area, particularly the road reserve. This lack of visibility was due to dense grass coverage across the site. Small areas of good visibility were provided by exposures created by tracks and erosion, particularly within the paddock area.

5. DISCUSSION

5.1 Archaeological sensitivity

In order to appropriately manage the Aboriginal heritage values of the study area, its archaeological significance and/or potential needs to be assessed. This assessment includes the identification of lands with the greatest potential to contain intact archaeological deposit (i.e. only minimally disturbed by previous land use impact) and those which are locally and regionally threatened by urban development. These two factors affect the assessment of conservation potential.

An archaeological sensitivity map has been created for this site on the basis of prior land use impacts and the results of the survey. Four zones of archaeological sensitivity are commonly identified for this purpose, although only one is found within the current study area.

- Zone 1 – High archaeological potential
- Zone 2 – Moderate archaeological potential
- Zone 3 – Low archaeological potential
- Zone 4 – No archaeological potential

These zones are used to assist in the assessment of the sites and landscapes within the study area.

The study area is designated as Zone 3/4 and is assessed as having minimal or no archaeological potential. There is no further archaeological constraint to development in Zone 3/4 areas. Further archaeological works are therefore not required within the study area in relation to Aboriginal cultural heritage.

Cultural significance

Cultural significance usually refers to the importance of a site or feature to the local Aboriginal community. Certain sites, items and landscapes may have traditional significance or contemporary importance to the community. This importance may involve both traditional links with specific areas, as well as an overall concern by Indigenous people for continued protection of their sites in general. Cultural significance must be assessed by the relevant Aboriginal community. The RTA has advised that they will liaise with the Aboriginal community regarding the proposed designated heavy vehicle rest area development.

Scientific significance

One of the aims of cultural heritage management is to preserve a representative sample of the archaeological resource for the benefit of future scientific researchers and the general public. Assessment of scientific significance involves placing a site or heritage item within a broader regional framework, as well as assessing the site's individual merits in light of current archaeological discourse. This usually includes an assessment of a site's potential to answer current archaeological research questions. Assessment is also based on the condition (integrity), content, and representativeness of a site, e.g. is it representative of a certain site type? Is it a rare or exceptional example? Can it contribute information that no other site can?

On the basis of the field inspection of the study area and the intactness/integrity of archaeological deposits in surrounding areas, it is highly unlikely that this site retains significant intact archaeological deposit. Previous land use within the current study area includes clearing and the road construction, which has had a substantial impact on sub-surface deposits. Therefore this site is assessed as having ***low scientific significance***.

Public significance

This usually refers to a site's potential to educate the general public about Aboriginal culture, but can have a broader definition. Increasing public awareness and understanding about a site's Indigenous and scientific values may spare other sites from inadvertent or intentional destruction. Educating the public to appreciate the past may increase the chances of archaeological resources surviving into the future.

Public significance may also include the different community values placed on a site or heritage place. These may include its importance to local residents or the wider community: e.g. aesthetic values, recreational values, links with local European history and local identity.

Development in the area has significantly changed the nature of the environs of this site. The study area has therefore been assessed as having ***low public significance***.

Management Principles

The following general management principles apply for sites and landscapes with Aboriginal heritage values which occur within the study area. These principles are predicated on the assessment of archaeological sensitivity based on previous levels of land-use disturbance.

- Sites and/or landscapes with high archaeological potential or Aboriginal significance (particularly in threatened landscape) should be identified as worthy of conservation, and development impacts ion these should be avoided.
- Sites and/or landscapes with good archaeological potential or Aboriginal significance (particularly in threatened landscapes) should be avoided if possible by development proposals. If impacts are unavoidable then these features should be subject of further investigation to ensure that information is retrieved prior to their destruction. Selection of salvage areas should be made on the basis of a 'whole of development' approach and be landscape based;
- Sites and/or landscapes with moderate archaeological potential or Aboriginal significance should be managed on the basis of their assessed significance. These areas would only require sub-surface investigation if they provided landscape parameters which are poorly understood in the local and regional context; and
- Sites and/or landscapes of low or no archaeological potential or Aboriginal significance do not require planning consideration or further archaeological investigation in relation to the proposed development.

Managing identified sites/landscapes

The proposed management strategy for the study area is predicated on a landscape-based philosophy. Rather than targeting only surface sites of known extent or known significance (e.g. by surface manifestation or through sub-surface investigation), zones based on landscape parameters have been defined. These areas should be managed on the basis of their archaeological sensitivity.

- No land within the current study area has been identified as worthy of conservation (i.e. Zone 1);
- All of the current study area has been assessed as Zone 3/4, having low - no archaeological potential;

Land in Zone 3/4 poses no constraint to development. Further archaeological works will not be required within the current study area.

7. RECOMMENDATIONS

The following findings and recommendations are based on consideration of:

- Legal requirements under the terms of the *National Parks and Wildlife Act* (1974) (as amended) which states that it is illegal to damage, deface or destroy an Aboriginal object or place without first obtaining the written consent of the Director-General, Department of Environment & Climate Change, NSW;
- The management zones based on archaeological sensitivity identified across the study area;
- The results of the survey and assessment of the Indigenous heritage in the study area;
- The interests of Tharawal Local Aboriginal Land Council and any other relevant Aboriginal groups (in the context of RTA consultations with the Aboriginal community); and
- The likely impacts of the proposed development.

This study found that:

1. No Aboriginal objects were identified within the study area;
2. There are no Zone 1 (high archaeological potential) lands within the study area, therefore no areas affected by this development proposal warrant conservation;
3. The study area is assessed as Zone 3/4 (low-no archaeological potential) and should be considered developable without archaeological constraint.

It is therefore recommended that:

1. There is no requirement for further archaeological investigation within the study area;
2. Tharawal Local Aboriginal Land Council and any other relevant Aboriginal groups should determine any cultural significance. A copy of this report should be sent to each group.
3. Two hard copies and an electronic copy of this report should be sent to:

Ms Lou Ewins
Metropolitan Branch
Planning and Aboriginal Heritage
Environment Protection and Regulation Group
Department of Environment and Climate Change
PO Box 668
Parramatta NSW 2150

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APPENDIX 1: ASSESSMENT OF BLACK GLASS FRAGMENTS

1. Background

This report considers whether two items of black glass collected from the Varroville area may have been Aboriginal flaked artefacts dating to the early historic period. This assessment has been made by Beth White (archaeologist and lithic specialist). It can be noted that the period of initial Aboriginal – European contact is poorly represented in the archaeological record of the South-West the Sydney region. Any sites dating to this period could be of considerable significance, due both to their rarity in this region and because of their association with what could arguably be one of the most significant periods of Aboriginal occupation of this country.

The identification of fractured glass as Aboriginal artefacts can be based on two important types of information: context and technology (Gibbs and Harrison 2008). Here I consider the regional historical context, technical attributes of flaking in general, the nature of scars present on the glass fragments, and relevant technical information relating to the production of glass. It is concluded that the glass fragments are unlikely to have resulted from deliberate Aboriginal flaking.

2. Historical context and implications

At the time of European contact, Aboriginal people in the Sydney region lived in band or clan territories. The Varroville area may have fallen within the area held by the Cabrogal or Muringong. These groups were distinguished from other groups who occupied the areas around Sydney and Parramatta (Kohen and Lampert 1987). The Aboriginal people of South-West Sydney would not have had direct contact with the European settlements at Sydney and Parramatta in 1788. Goods (glass, metal, fabrics) could have been obtained either when individuals made special trips to these townships, or via exchange from Aboriginal people living in direct contact with the Europeans. As Aboriginal people lacked transport technology any European items that made their way into South-West Sydney had to be carried by people so only a few light-weight items could have been carried during each trip (Mulvaney 1975). Theory relating to lithic raw material conservation (e.g. Byrne 1980; Morwood and L'Oste-Brown 1995; Newman 1994) would suggest that any European materials transported to this region in the initial period of indirect contact would probably have been prepared for transport. This means that pieces of glass that were considered desirable, rather than whole bottles, may have been exchanged from Port Jackson into the South-West. It should also be noted that the supply

of glass and other items in Sydney and Parramatta would have been limited to those items brought to Australia in the First Fleet, initially, then subsequent Fleets; and further reduced by European re-use of these items (Boow 1991:24).

In April 1789 an epidemic, considered at the time to have been smallpox, broke out amongst the Aboriginal population around Sydney. In just over a year half the original inhabitants of Sydney had died. There is evidence that this disease spread beyond the area inhabited by Europeans, and many people beyond Sydney would also have died (Attenbrow 2002:21-22). The effects on Aboriginal people of South-West Sydney are not known but it could be expected that there would have been adverse effects on social life and arrangements, and possibly on traditional camping and settlement practices. The discard patterns of traditional lithic items, as well as European materials, may have been effected by changes in settlement organisation. In this early period relatively few items of European materials may have made their way into South-West Sydney and been incorporated into the traditional toolkit.

In 1788 cattle escaped from the European colony at Sydney Cove and disappeared into the bush. They made their way into South-West Sydney where they were seen by Aborigines – evidenced by a drawing of a bull at Bull Cave near Campbelltown. A number of reports were made that the cattle were under the care of "natives" beyond the western settlements. In 1795 two emancipated convicts were sent to find the cattle, which they did at the "Cowpastures" (Liston 1988). The area was visited by Europeans several times over the next few years, including Governor Hunter in 1795 and 1796, Ensign Barrallier in 1802, Governor King in 1803 and George Caley in 1804. It was decreed that the cattle herd should be preserved and a hut was built near the Nepean River at what is now Elderslie in 1805. Macarthur was also granted "Camden Park" in 1805 (Liston 1988; JMcD CHM 2007).

The establishment of these settlements would have increased the supply of European items in South-West Sydney. The numbers (and possibly the variety) of European items available for Aboriginal people to acquire would have increased, and those items could have been subject to less preparation when distributed from the new, more local, sources. Aboriginal people in the region may have been able to acquire whole bottles rather than just bottle pieces. By this time the Aboriginal population may also have begun to recover from the smallpox epidemic. Overall, larger numbers of Aboriginal people may have been able to access larger quantities of European materials, so the numbers of European items discarded on traditional sites may have increased after 1805.

From 1805 the region south-west of Liverpool was targeted by the European authorities for food production, particularly Airds and Appin (as this area was then known) where the flooding

risk was considered lower than on the Hawkesbury. Some larger land grants were allocated before 1810 and many new smaller grants were subsequently made by Governor Macquarie. By 1817 all of the available land in the Minto and Upper Minto Districts had been granted (Heritage Office Regional History nd:24; Casey and Lowe 2003:16). In 1809 Macquarie granted 1,000 acres (400 ha) to Dr Townson which he named *Varro Ville*. Dr Townson constructed dwellings on this land and farmed it. By 1827 he had establishing a "thriving" vineyard and a sheep/cattle farm (McGill *et al.* 1995).

Direct contact between Aborigines and Europeans is thought to have been initially peaceful, but more intensive European settlement of the Cowpastures and a serious drought from 1812, put significant strain on local resources, both for Aborigines and European settlers. Conflict occurred as a series of events from 1814 with Aboriginal people from beyond the local area instigating violence. Conflict culminated in 1816 with the Appin massacre. After 1816 relations between Aborigines and European settlers in the Cowpastures were relatively quiet. There are limited records from this time, of Aboriginal people inhabiting South-West Sydney, but there is evidence that Aboriginal people were employed as guides, farm hands, trackers and policemen. In 1826 up to 200 Aboriginal people worked at Denbigh during burning-off periods. A permanent camping place remained on Camden Park until the late 19th Century, with corroborees held in 1839, 1846 and 1850. Corroborees were also held at Denbigh (JMcD CHM 2007:20-22).

In the period from 1805 to c.1810 the availability of European items suitable for Aboriginal use would have increased. There would have been more items available and available at more locations in the region. At the same time, however, the land available for Aboriginal people to occupy in a traditional manner would have declined as more land was alienated by grants to European farmers. The process of alienation may have continued rapidly after 1810 and by 1820 it could be expected that few areas of land would have been available for Aboriginal people to utilise for traditional hunting and gathering. Many traditional campsites would no longer have been available for Aboriginal occupation.

In the 17 years or so leading up to 1805 Aboriginal people in South-West Sydney who survived the 1789 smallpox epidemic may have had some opportunity to obtain small supplies of glass for flaking, discarding a few items in traditionally-occupied camp sites. Between 1805 and 1810 the Aboriginal population may have begun to increase with recovery from the smallpox epidemic, and the supply of European items in the region may also have increased. However, this five-year period is short in archaeological time. After 1810 the supply of European items would have continued to increase but land in the region would have become increasingly alienated from

traditional Aboriginal use. By 1820 there may have been few traditional sites available for Aboriginal people to camp on even if they were still utilising flaking technology.

3. The glass items from the F5 at Varroville

The two glass pieces are of black glass; that is, very dark glass that appears black and is dark green when held up to the light. One piece is a fragment from the neck of a bottle and the other is from a fairly thick section of a bottle wall; they are probably both from the same bottle. Both items show negative partial and/or complete "flake" scars. The neck fragment measures 25 x 15 x 8.5 mm, and the wall fragment measures 23 x 20 x 7.5 mm.

Plate 1: View showing outer surfaces of glass

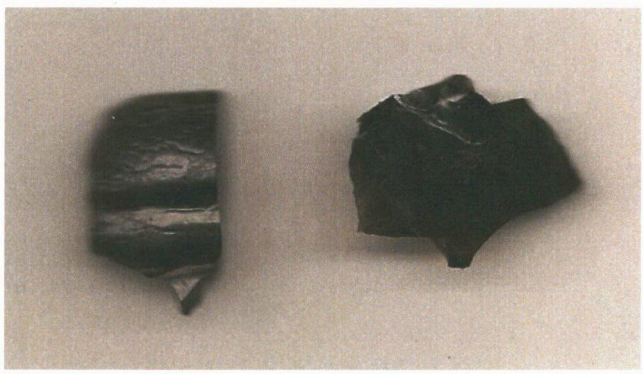


Plate 2: View showing inner and fractured surfaces of glass

3.1 Technical attributes of flaking

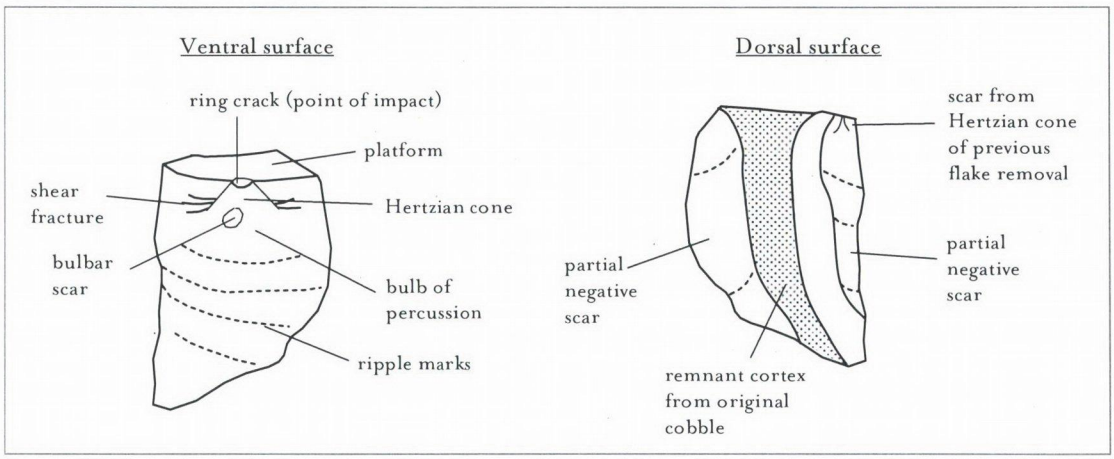
A flake is a piece of stone which was struck from a larger rock (called a core). The most common form of flaking stone in South-West Sydney prior to European contact was freehand direct hard hammer percussion (after Holdaway and Stern 2004:11). With this technique a core was held in

one hand and hit with a hammer stone held in the other hand. The angle between the top of the core (its striking platform) and the side from which flakes were to be struck was usually less than 90° (Wright 1983:120).

Flakes show specific technical features (Figure 1). Essentially, a flake must have a platform, a point of impact (force application), a Hertzian cone, and a bulb of percussion. Flakes may also show lines resulting from shear fracture, a bulbar scar (also called erraillure scar) and ripple marks (Speth 1972:35). The dorsal surface may show negative scars from previous flake removals, or remnant cortex which may have occurred on the outer surface of the original cobble. These features may be more or less pronounced, depending on the quality of the stone material, the hardness of the hammer relative to the stone, and whether an anvil was used and the manner of its use.

Glass is a highly siliceous brittle material and should also show such technical features if it was flaked. However, glass is also so brittle that accidental fracture and breakage can mimic deliberate flaking.

Figure 1: General features of a flake (after Speth 1972)



3.2 Flake scars on the glass items from Varroville

The neck fragment was broken longitudinally with a bending scar. The opposite side has a partial negative scar, intercepted by a break ending in a step fracture. Limited crushing is evident on the sharp distal tip. The fracture surfaces appear to be simple breaks, apart from the partial negative scar. Limited post-breakage damage occurs on some edges.

The wall fragment has three short (<9mm) negative scars that removed part of the outer surface of the bottle wall, and in effect looks live the dorsal surface of a cortical flake. When turned over crushing and an "eraillure scar" occur on the inner edge of what might have been thought to be the bulb of the flake. However, other small crushing scars occur with the "eraillure scar" and these actually occur on a concave curving remnant surface which is the inner surface of the bottle, not a bulb of percussion of a flake. Most of the remainder of the inner surface of this glass fragment consists of two partial negative scars. These scars were initiated from different points of force application which were located well beyond the periphery of this fragment; they indicate that this item was a piece of a larger broken fragment. Three smaller negative scars are present along one edge, sharing a common "platform" and mimicking the production of small (≤11 mm long) thin skewed blades. Another edge has faceting scars that mimic a partially worked edge. If this glass fragment was a flaked artefact the only practical explanation that could account for the pattern of partial and complete negative scars would be its use as a thin prepared core, used to produce very small thin blades with little practical application. It would have been a poor example of this type (cf. Hiscock 1993).

3.3 Technical attributes relating to glass production

The neck fragment in particular retains technical traits relating to manufacture of the original glass bottle. It retains an applied tapering collar. This shows shallow irregular, sometimes parallel lines which are present both inside and outside of the bottle (see Plates 1 and 2); these are probably turn marks (after Boow 1991:8,10). Turn marks formed on the surface of traditionally blown glassware when there was movement between the glass and the surface of the former or mould (Boow 1991:8). The presence of numerous tiny indented dots on the outer surface of the wall fragment may have resulted from the bottle being made within a mould.

In traditional glass blowing the neck of the bottle was cracked off from the blow-pipe, forming a sharp lip. Up to about 1790 a single collar was applied to the top of the bottle (Figure 2). In wine bottles the need to reinforce the lip was recognised by about 1790 to 1820, when additional glass was applied as a collar around the lip of the bottle. From about 1820 to 1830 the depth of glass reinforcing and protecting the cracked-off lip was gradually increased, to a maximum of 25mm by 1860 (Boow 1991:60-64). As the collar on the current fragment is 21mm deep, it is likely that the bottle was made after about 1820. Further, the turn marks indicate that the bottle was finished with a finishing tool. Finishing tools were in use by 1828 and in common use from 1844 (Boow 1991:10, 64-65). It is possible, therefore, that the neck fragment may have derived from a bottle dating 1828 or later.

Figure 2: Changes in collars applied to black glass bottles (from Boow 1991:63,64)

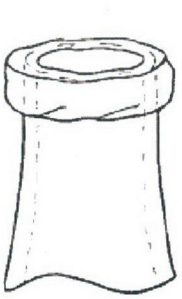


Figure 56. Broader and higher single collars c. 1710-c. 1790.

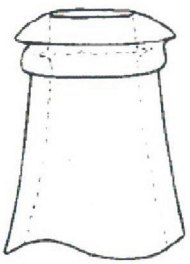


Figure 58. Double reinforcing and anchoring collars found in wine bottles c. 1790-c. 1820.

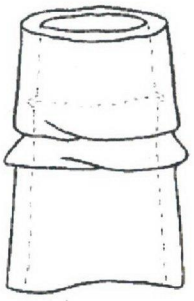


Figure 59. Increased depth of reinforcing collar in wine bottles c. 1820-c. 1860.

4. Conclusion

Technical aspects of glass production indicate that the fragment of bottle neck was probably manufactured after 1820, possibly after 1830. The wall fragment was probably a piece of the same bottle. A review of available historical information suggests that Aboriginal people in South-West Sydney may no longer have been able to practice a traditional Aboriginal foraging and camping lifestyle in the Varroville area by this time; particularly as the *Varro Ville* property had been occupied by 1810, and was very well established by 1827. Technical features of the nature of the fractures on the two glass pieces do not point conclusively towards them being flaked artefacts. The neck fragment could have resulted from accidental breakage of a glass bottle; it shows only one partial negative scar. The wall fragment appears initially to have been a flake but closer inspection does not reveal the critical technical features enabling this identification. It shows some features reminiscent of having been a core (a piece from which flakes were removed), but if so it would have been a poor example of this artefact type, and the blades struck from it would not have been of practical use. The overall balance of evidence indicates that the two glass fragments are unlikely to have been Aboriginal flaked artefacts.

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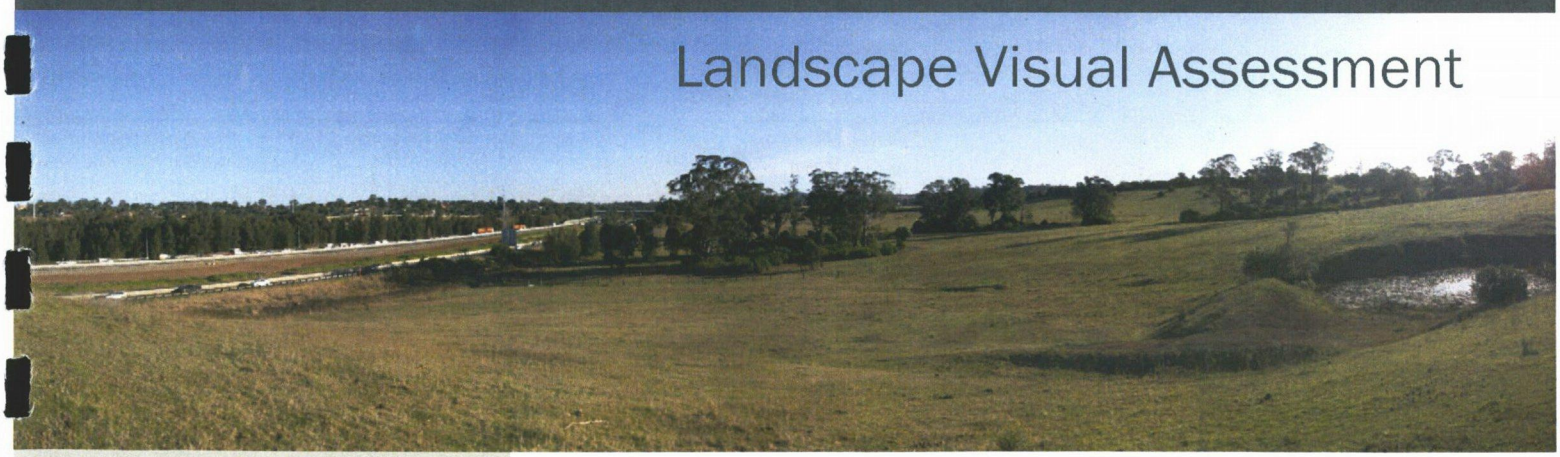
Appendix F

Visual assessment

KLAH
infranet

VARROVILLE REST AREA

Landscape Visual Assessment



Prepared for:

RTA

SEPTEMBER
2009

This report has been prepared:

FOR:

RTA

BY:

KIAH INFRANET PTY LTD

Level 3, Studio 3
"The Cooperage"
56 Bowman Street
PYRMONT NSW 2009

t. +61 29571 7900
f. +61 29571 7600

email: mw@kiahinfranet.com

Contact: Miguel Wustemann

SEPTEMBER 2009

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01 INTRODUCTION

1.1 Background

Due to the F5 northbound widening between Brooks Rd and the M5/M7 interchange, which was completed in August 2008, an existing informal northbound truck rest stop has been removed near the Camden Valley Way exit ramp. The facility serviced approximately 15 trucks.

As a result and in conjunction with the National Road Transport Heavy Vehicle Driver Fatigue Strategy, the RTA combined with representatives of the trucking industry has identified the need for the provision of a formal truck rest area to increase capacity on the southern gateway to Sydney which will improve road safety and facilitate more efficient terminal access and logistics management.

A study was undertaken by the RTA to investigate options and identify locations for these facilities in the southern approach to Sydney. These investigations identified the proposed facility at Varroville as the preferred option.

Consultation was undertaken with Campbelltown City Council and the trucking industry in selecting the preferred sites.

1.2 The Project

The project comprises the construction of a northbound truck only rest area on the F5 located approximately 7km south of the M5/M7 interchange (see Figure 1). The project is part of the overall widening of the F5 and is located within the freeway reserve.

Key features of the proposal include:

- Parking for approximately 60 trucks including allowance for future use by B-triple vehicles.
- 360m deceleration lane with an additional single lane bridge over Bunbury Curran Creek;
- 810m acceleration lane;
- toilet, wash basin and sheltered tables; and
- parking area lighting and security lighting to amenities.

Figure 1: Site Design Concept: The proposed rest area in its context.

1.3 Purpose of this Report

Kiah Infranet Pty Ltd has been commissioned by the RTA to prepare a Visual Impact Assessment to identify the potential visual impacts that the proposed project would have on the surrounding project area, identify strategies to improve the design and propose mitigation measures of the identified impacts.

In addition, this report would inform the project approval authority, other agencies and the community about the visual impact of the proposal and what mitigation strategies have been considered. The results of this assessment provide an indication of impacts expected and guide the further development of the concept design.

The preparation of this report has involved both a desk-top analysis and a site visit and is consistent with RTA guidelines.

02 EXISTING LANDSCAPE CHARACTER ASSESSMENT

The study area is situated approximately 40km south west of Sydney in the vicinity of Campbelltown (see Figure 2). The general landscape is strongly undulating and contrasting in land use. Key elements include:

- The M5 South Western Highway;
- the scenic rural land to the north west;
- the residential area of St Andrews; and
- the open space within the lower lying landscape of Bunbury Curran Creek.

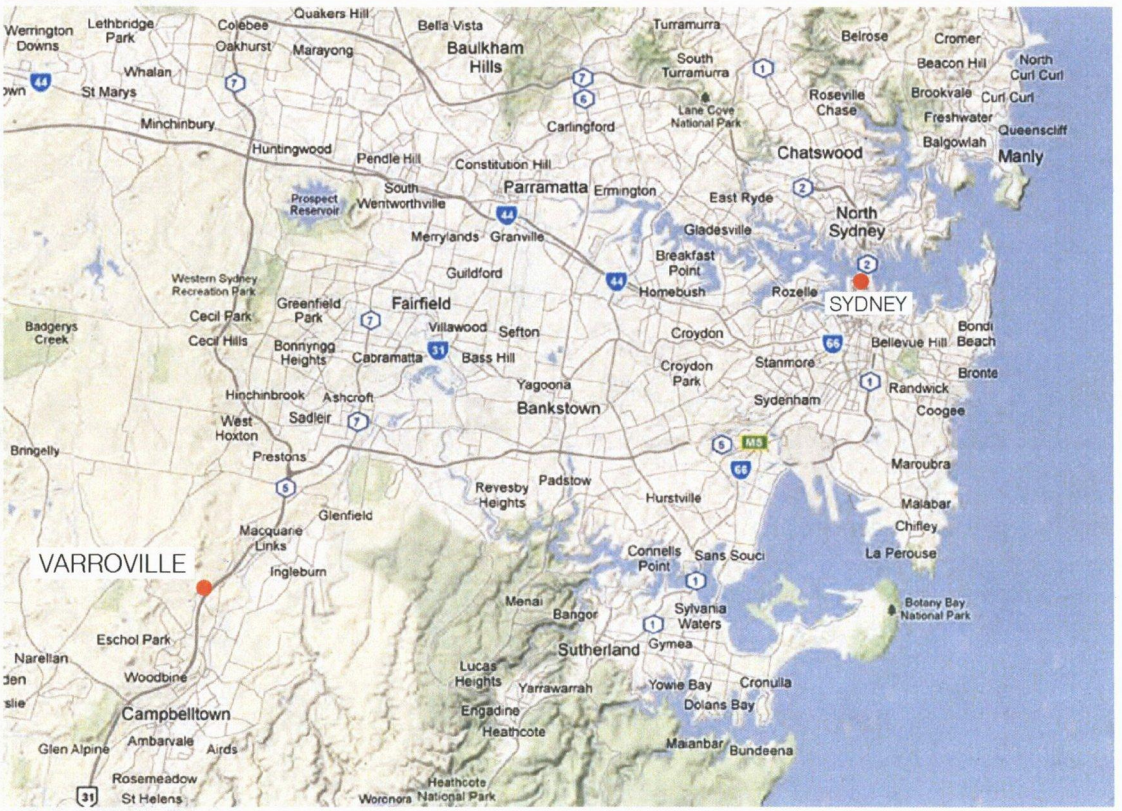


Figure 2: Location Map

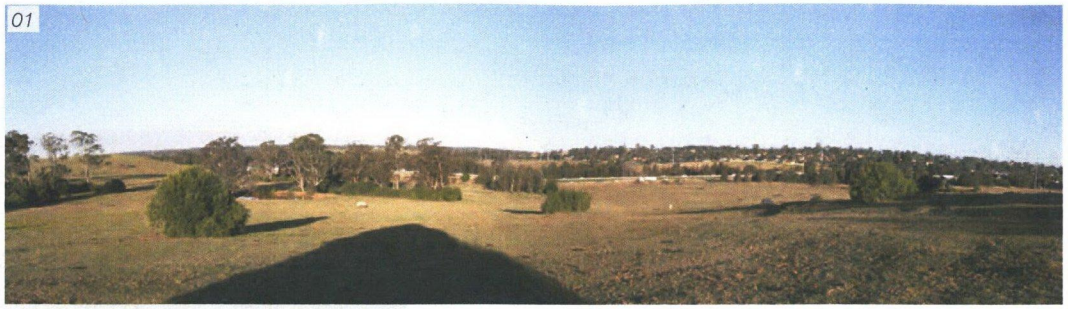


Figure 3: View from an elevated position near the Varroville Residence looking southeast towards St Andrews.

Figure 4: The strong pockets of vegetation surrounding the site add scenic value to the landscape and would provide some visual screening of the project site.

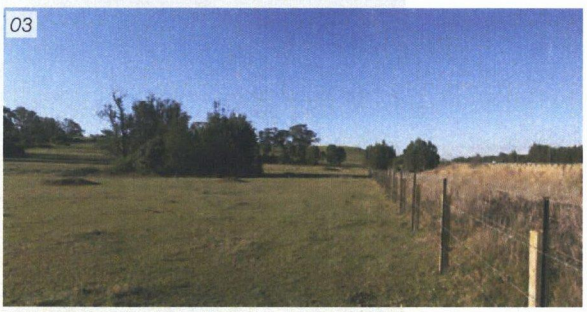


Figure 5: Site location; the vegetation in the centre left of the photograph would be removed under the proposal and replaced with new planting.

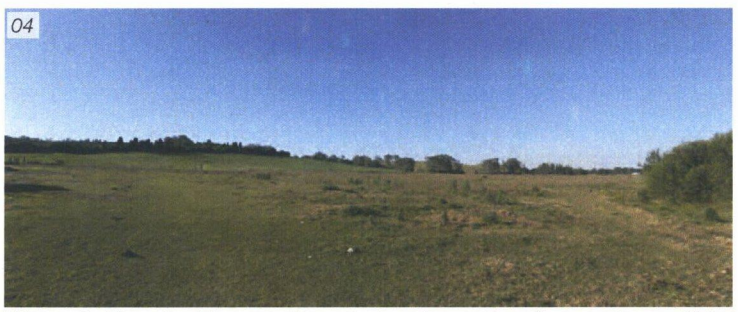


Figure 6: View looking northwest showing extensive pasture within the lowlands.

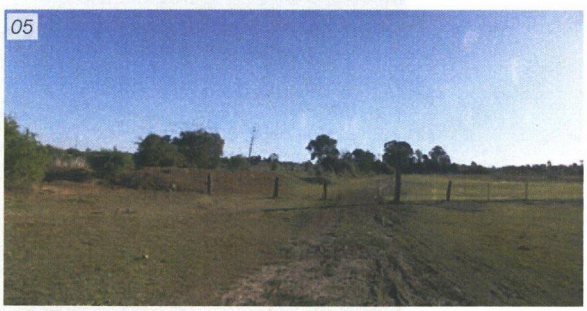


Figure 7: View along the highway corridor towards the riparian vegetation of Bunbury Curran Creek.

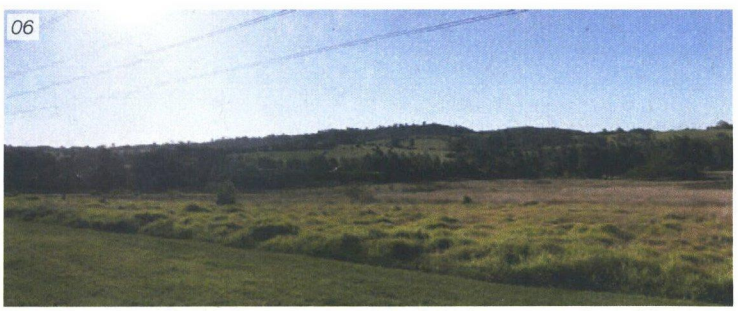


Figure 8: The site appears less exposed when seen from lower areas to the south.

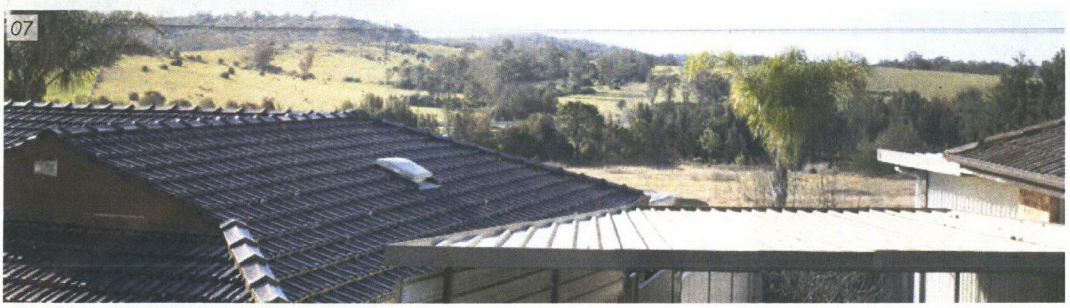


Figure 9: Views to the site from St Andrews residences somewhat screened by highway corridor vegetation.

Figure 10: Existing Landscape Character Assessment Viewpoints.

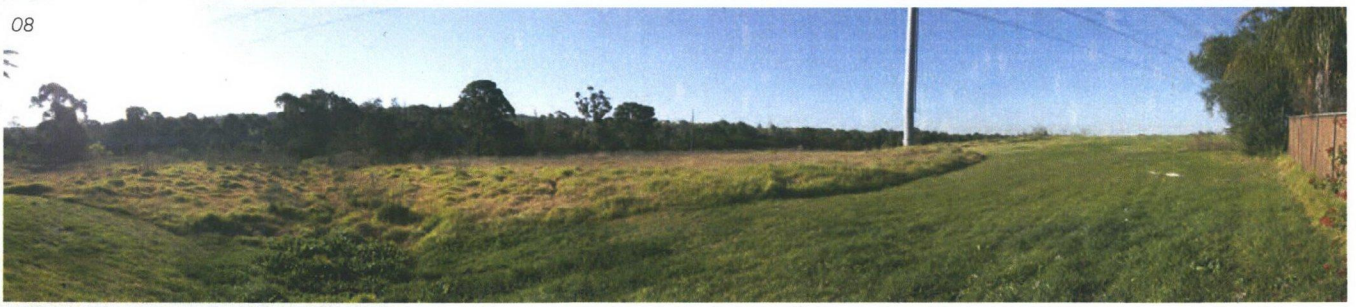


Figure 11: Views to the site largely blocked by mature vegetation along highway corridor.

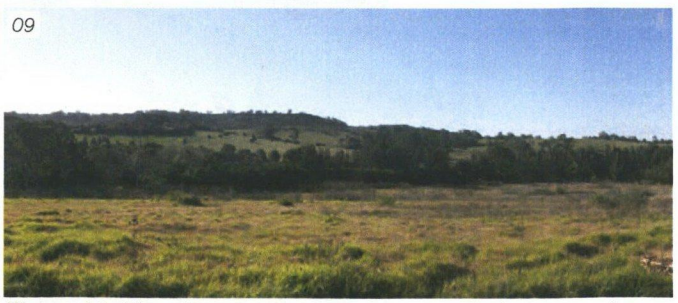


Figure 12: The site appears more exposed when seen from higher areas to the south.

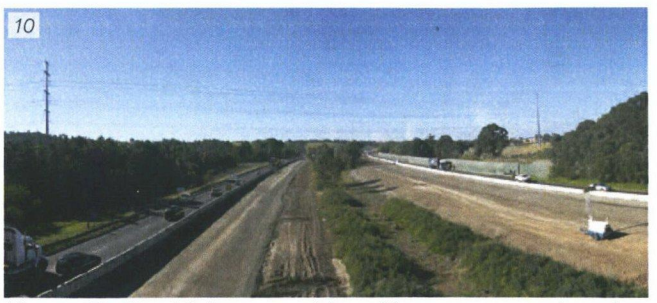


Figure 13: The highway corridor with some screening of the site provided by vegetation (on the left).

2.1 Topography (See figure 2)

The site itself is located within the low lying area of the Bunbury Curran Creek on the northbound verge of the highway. To the north and west the land steeply rises creating a strong visual backdrop that is considered high in visual and scenic amenity (see Figure 14).

To the south-east, the topography also rises, allowing views of the surrounding landscape from an elevated position.

The low lying flats directly adjacent to Bunbury Curran Creek are strongly vegetated (Casuarina dominant) defining the low points of the valley. This vegetation assists in visually integrating the highway through vegetated screening. The remaining low lying flats are grassing land and visually exposed.

Spatially, the site is strongly contained by the enclosing Varroville ridges to the north and west whilst the elevated suburban residences of St Andrews spatially define the eastern edge.

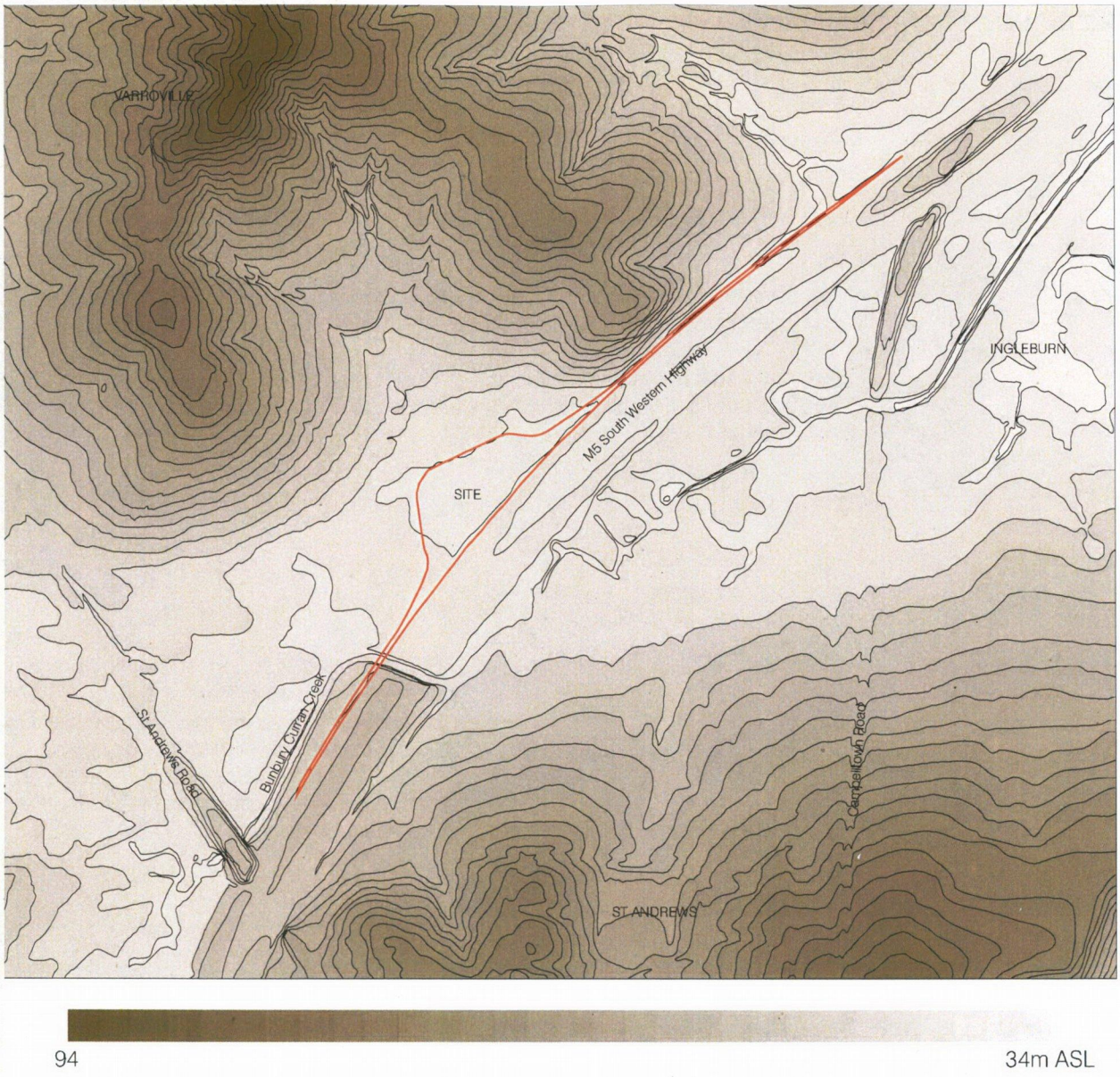


Figure 14: Topography: Contour map of the site and its immediate surrounds (contour interval = 2m).

2.2 Land Use Character

The land surrounding the site is of high visual quality and has been registered under the Environmental Protection in the LEP 7(d1) as scenic with a special provision identified as Escarpment Preservation

The dominant urban development in the area is St Andrews. This is partly due to its visual exposure on an elevated position but also due to the contrast between the surrounding open grasslands and the built form elements of the neighbourhood. The built form is comprised of single and double storey houses and typical for a suburban neighbourhood.

The slopes directly to the north of the proposed site are used for recreational purposes (horseback riding) and as a result provide a significant amenity.

Key visual detractors are the F5 Freeway, a major overhead power line and large scale industrial buildings in the nearby distance east of the proposed site (see Figures 15-18)

Figure 15: The rolling hills to the north of the site have significant scenic quality and have associated amenity value, especially due to their use for horse-back riding. These scenic qualities are compromised by the South Western Highway and other infrastructure.

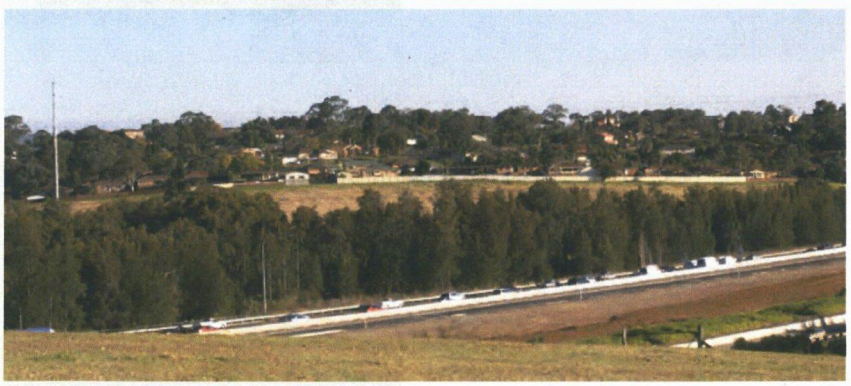
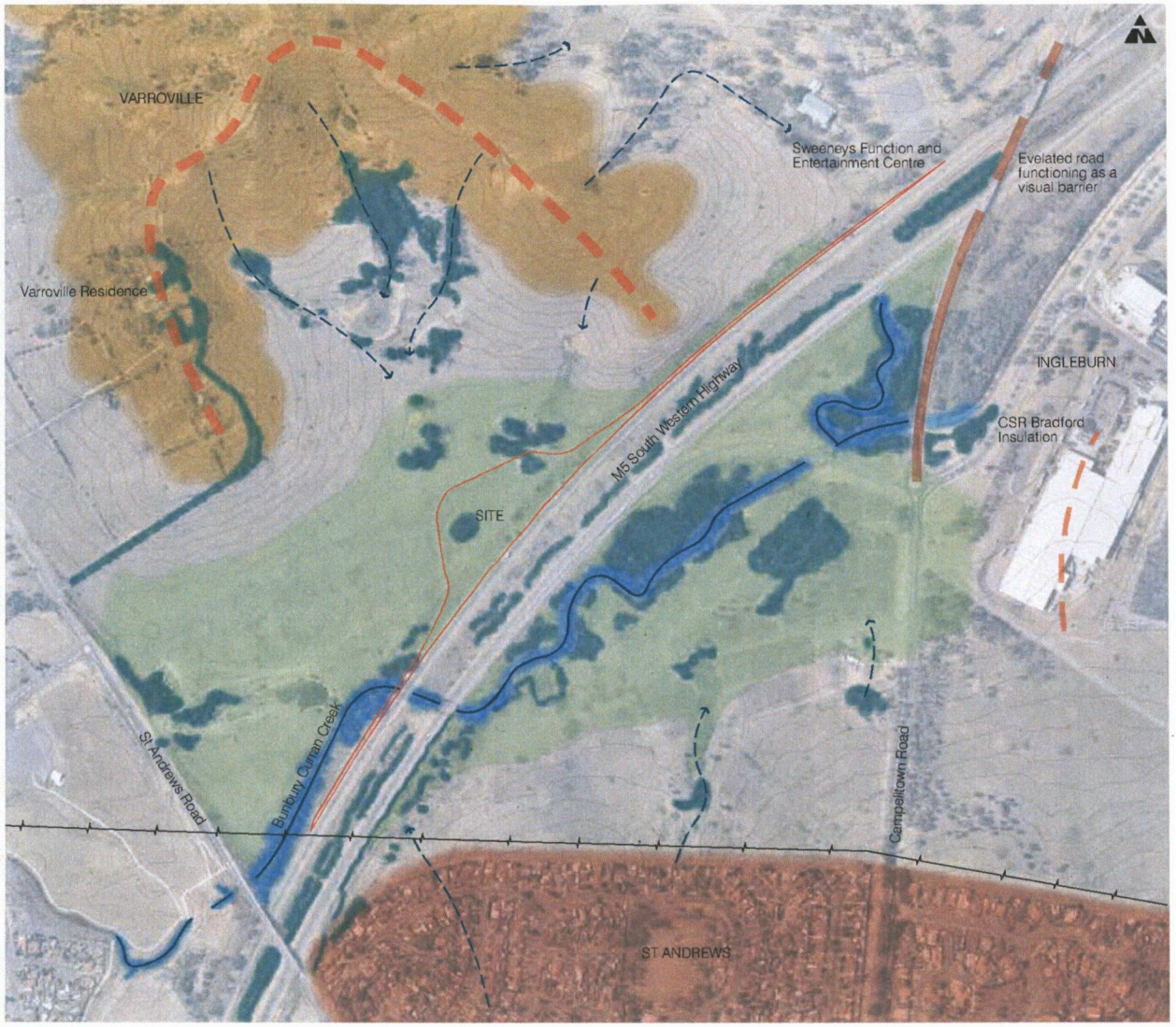


Figure 16: The most significant area of housing within the immediate vicinity of the site is situated on the north facing slopes of St Andrews. The views from these residences are to a large extent screened by significant stands of mature vegetation.

Figure 17: The slopes of St Andrews have filtered views of the site through vegetation located in the creek corridor.



Legend

- area of highest elevation (dominant landscape backdrop)
- housing elevated above site with filtered views to site
- low lying predominantly cleared valley form - high visual exposure
- screening vegetation
- creek with screening vegetation (Casuarina dominant)
- major skyline ridge
- minor ridge
- drainage lines
- major overhead powerline

Figure 18: Landscape Elements.

2.3 Varroville House

Varroville Residence is of particular interest as it is listed in the Campbelltown Local Environmental Plan—District 8 (Central Hills Lands)

"Varro Ville", lot 21, DP 564065

2.4 Character Zones

Seven character zones have been identified in the general area surrounding the site (see Figure 19):

Zone A – Northern Low Lying Flats
Low Lying Flats comprised predominantly of open grazed land with the predominant vegetation running along Bunbury Curran Creek. The highway forms the south eastern boundary to this zone .

Zone B – Southern Low Lying Flats
Low Lying Flats comprised partly of open grassed land with the densest vegetation running along Bunbury Curran Creek (Casuarina dominant) with patches of scattered vegetation elsewhere. Campbelltown Road runs through this zone and the highway defines the boundary to the north-west.

Zone C – Northern Mid-slopes
Mid-slopes comprised of grassed land with pockets of mature vegetation (Eucalypt dominant) along drainage lines and within valley forms on the northern side of the site.

Zone D – Southern Mid-slopes
This zone is characterised by open grassed Mid-slopes with pockets of scattered vegetation (Eucalypt dominant). Campbelltown Road bisects the zone.

Zone E – Industrial Area
This zone is characterised by large scale industrial buildings with little if any visual exposure to the proposed site.

Zone F – Upper Slopes
Varroville upper slopes defined by skyline ridges comprised of grassed land with pockets of vegetation along drainage lines/valley forms and the Varroville Residence, a heritage listed property situated in a dominant position. This zone is visually prominent and highly exposed.

Zone G - St Andrews Residential Area
St Andrews residential area, located on the opposite side of the highway, a suburban residential neighbourhood located in a raised position with numerous residences enjoying panoramic views towards the upper Varroville slopes and the low lying pasture land along Bunbury Curran Creek.

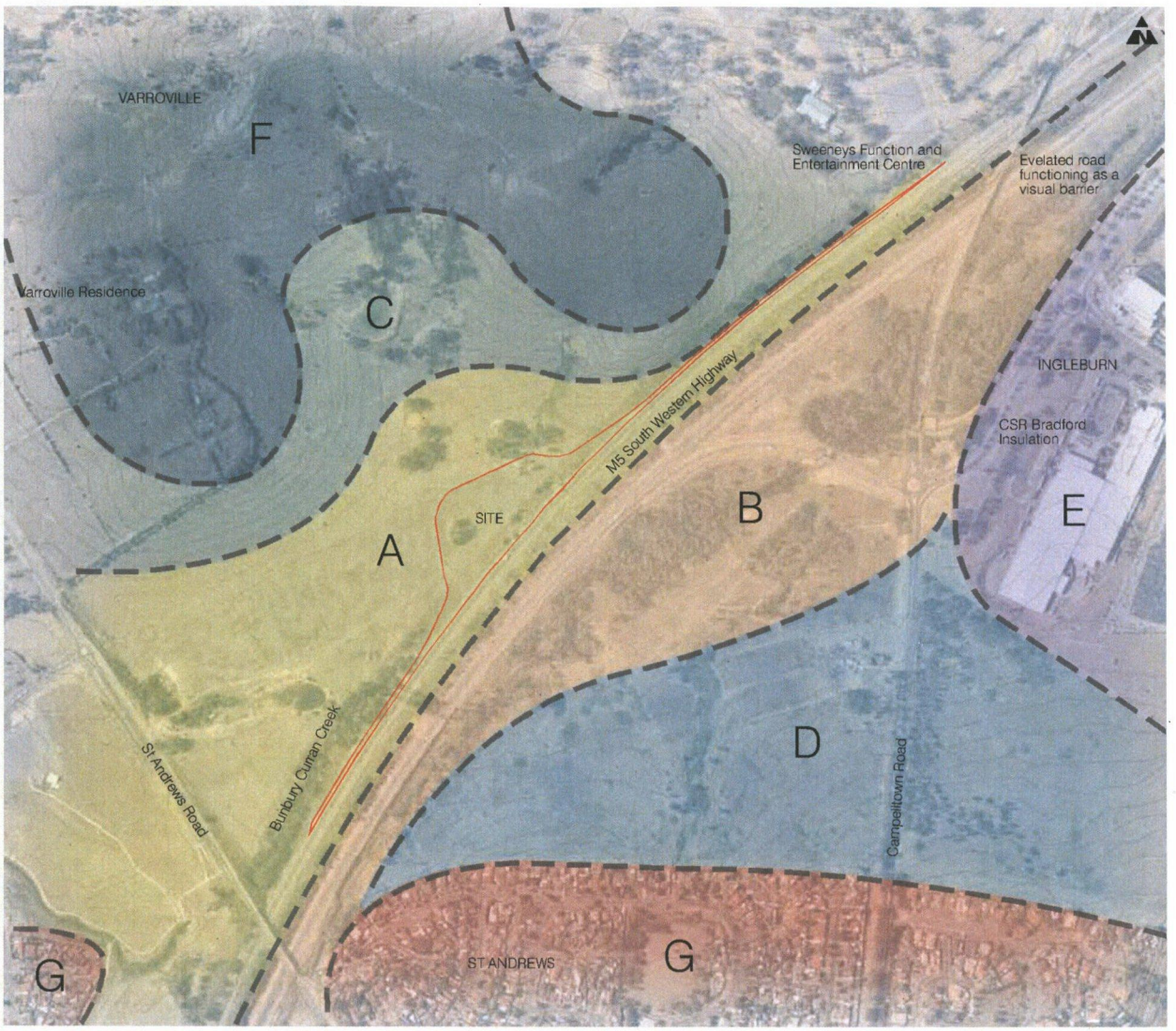


Figure 19: Landscape Character Areas.

2.5 Visual Exposure

Figure 20 illustrates the extent that the project would be visible from the surrounding landscape.

Within Zone A the visual exposure is high except for some small areas where mature vegetation screens the views onto the project site. Within the highway corridor the views towards the site are limited due either to topographical features or dense vegetation screening along the northern verge of the highway, southwest of the site.

In Zone B there is limited visual exposure to the project site due to the existing vegetation screening along the southern side of the highway corridor.

Within the Mid-slopes of Zone C the visual exposure is substantial and only pockets of vegetation limit the visibility of the site.

The partially dense vegetation along Bunbury Curran Creek strongly limits the visual exposure of the site from Mid-Slopes of Zone D.

The low lying industrial sites within Zone E combined with the road elevation of Campbelltown Road and the vegetation screening along Bunbury Curran Creek strongly limit the visual exposure.

The upper slopes of Varroville (Zone F) are only partially exposed to the site due to the undulating topography. Within the exposed areas the visual exposure is substantial except for where mature pockets of vegetation provide some screening. Within this zone however, it is worth mentioning that the grounds of the Varroville residence have a very limited exposure due to the strong vegetated cordon around the property.

The site is partially exposed to Zone G - St Andrews residential area due to its elevated position. However, the existing vegetation along Bunbury Curran Creek provides significant screening to the site. Distances form the project site range from 500 to 700 metres.

Overall, it is considered that the highest visual exposure occurs within the lower, mid and high grassing slopes directly north / northwest of the site.

The level of visual modification of the project is based on the visual interaction and level of visual contrast between the proposed project and the existing visual environment.

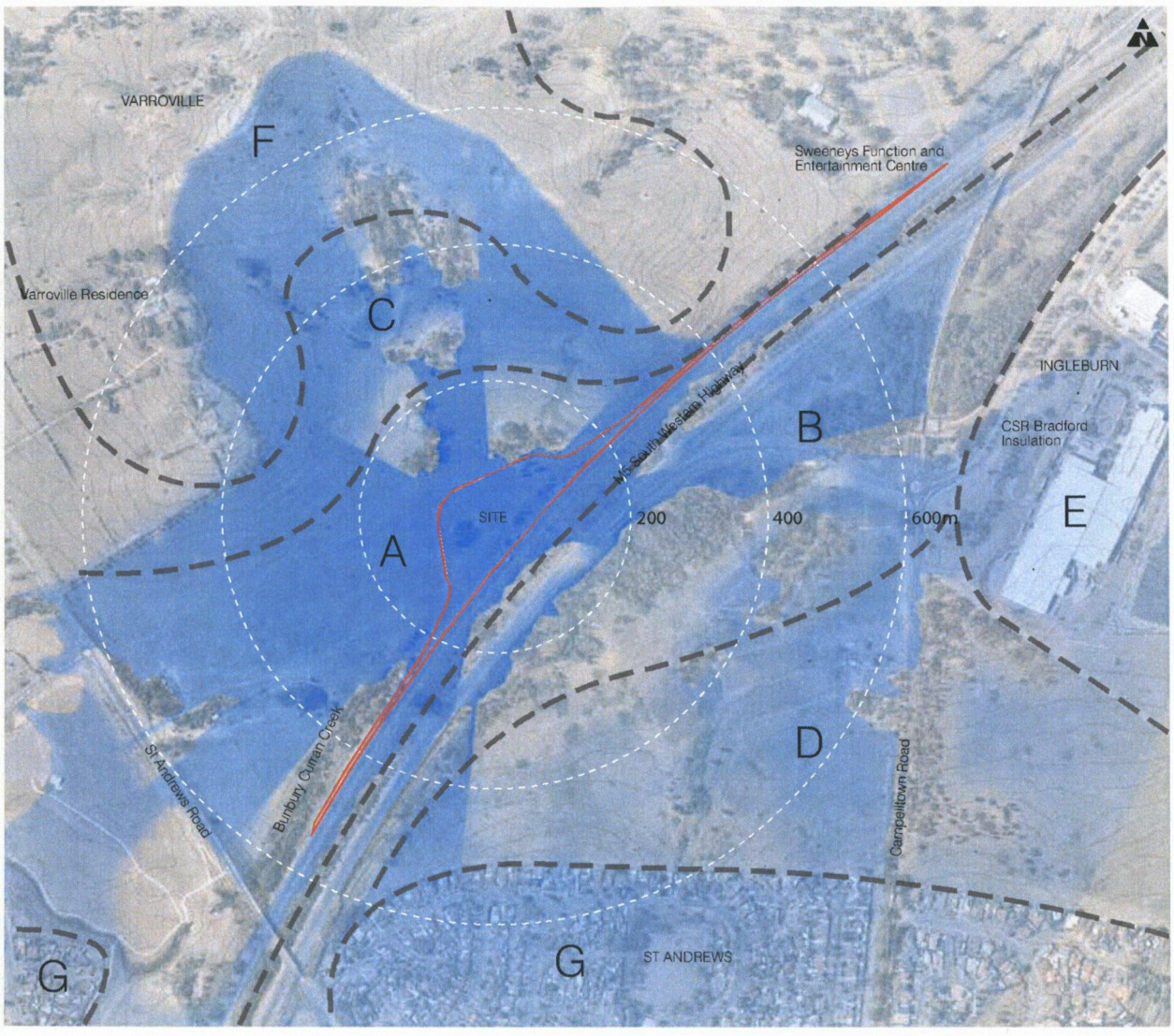


Figure 20: Visibility Analysis.

2.6 Visual Magnitude

Key elements that have been identified which would greatly influence the magnitude of the proposed visual modification include:

- Overall scale of the development;
- the requirement of 'raising' the perimeter of the rest area by approximately 1 to 2 metres from existing ground level; and
- night time lighting

The visual magnitude depends on the scale and contrast of the proposal and its visual integration of form, line, shape, pattern, colour and texture.

The overall scale of the project is considered moderate when taking into consideration the overall landscape setting and its sense of scale. This is reinforced by the fact that as only limited built form will be incorporated into the project some visual fluidity with minimal view blockage will occur. However, when taking into consideration the vehicles (as stationary elements) the visual contrast would increase substantially. Overall as a result, the visual magnitude is considered high to moderate. It is worth noting that the proposed rest area is situated directly adjacent to the highway, thus visually consolidating the two paved areas and therefore reducing visual contrast.

The 'raising' of the rest area's perimeter by approximately 1 to 2 metres above the existing levels would visually reinforce the project as a 'foreign' element within the greater landscape. This visual effect is generally considered of a moderate magnitude as the immediate surrounding landform of the project along the highway is already raised above the natural landscape and the proposed project would form an at - grade extension from the existing freeway corridor which is currently being upgraded from 4 to 8 lanes.

Night time lighting is considered to provide a moderate effect. Whilst no direct 'light spill' would occur some 'light pollution' in the sense of a 'glowing effect' would be perceived from many viewpoints. It should be noted that the contrast of this effect is considered moderate in conjunction with the light spill created by the moving traffic of the highway.

Visual magnitude according to character zones are considered below:

Zone A - Northern Low Lying Flats
The overall visual effect is considered high along the northern verges of the highway due to its proximity and visual exposure whilst moderate to low along the highway itself.

Zone B - Southern Low Lying Flats
The areas along the southern verge of the highway are considered to have a low visual effect due to the strong vegetation screening along the creek. Overall this zone would be categorised in the moderate to low range.

Zone C – Northern Mid-Slopes
The visual effect could be considered high due to its proximity to the project area and visual contrast. However, it should be taken into account that the existing freeway is being expanded from 4 to 8 lanes, making the upgraded highway a visually dominating element that visually would overpower the proposed project. This effect assists in reducing the overall effect or contrast of the proposed rest area within its surroundings. As a result, the overall visual effect is considered high to moderate.

Zone D – Southern Mid-Slopes
The overall visual effect is considered moderate due to the limited visual exposure to the site.

Zone E – Industrial Area
The overall visual effect is considered low due to its very limited visual exposure and distance to the project area.

Zone F – Upper Slopes
The visual effect could be considered high to moderate from the visually exposed areas within this zone due to the visual contrast of the proposed project. However, taking into consideration the current expansion of the highway, this visual contrast and apparent scale of the project would be somewhat reduced. This combined with the overall limited visual exposure of the site within this character zone is considered to produce an overall moderate impact.

Zone G - St Andrews Residential Area
The overall visual effect is considered moderate due to its distance to the project and limited visual exposure to the project area.

2.7 Visual Sensitivity

The visual sensitivity is based on how sensitive the character of the setting is to the proposed change. In this regard, an industrial site will be less sensitive to change than a residential neighbourhood or a pristine natural environment. Table 2 summarises the Visual Sensitivity and Visual Magnitude for each zone).

Zone A - Northern Low Lying Flats
The sensitivity of the landscape within this zone is considered high to moderate as it is adjacent to the highway and acts to some degree as a buffer zone in relation to the project's site location.

Zone B - Southern Low Lying Flats
Within this zone the sensitivity of the landscape is considered high to moderate. High for the visual significance of the Bunbury Curran Creek whilst moderate due to its fragmented character 'wedged' between the residential zone and the highway.

Zone C – Northern Mid-Slopes
The Mid-Slopes to the north of the site are considered highly sensitive due to the scenic nature and high visual quality of the landscape in combination with its proximity to the project site.

Zone D – Southern Mid-Slopes
This zone is considered moderate in sensitivity. Its visual quality is moderate and its use as grassland/open space is of limited significance as it is 'wedged' between a residential zone with extensive landscape character modifications and the highway.

Zone E – Industrial Area
The visual sensitivity of this zone is considered low as it is highly modified and the nature of its land use is not sensitive to change.

Zone F – Upper Slopes
The upper Varroville slopes are considered highly sensitive due to the scenic nature and high visual quality of the landscape combined with the general proximity of the project site.

Zone G - St Andrews Residential Area
This zone is considered high to moderate in sensitivity predominantly due to the nature of its users. Views from numerous residences are achieved to the site, however these views are from a moderate distance.

2.8 Landscape Character Impact

The combination of the visual sensitivity and magnitude will provide the rating of the landscape character impact. It is based on the table shown below.

Sensitivity \ Magnitude	High	High to Moderate	Moderate	Moderate to low	Low	Negligible
High	High Impact	High Impact	Moderate-high	Moderate-high	Moderate	Negligible
High to Moderate	High Impact	Moderate-high	Moderate-high	Moderate	Moderate	Negligible
Moderate	Moderate-high	Moderate-high	Moderate	Moderate	Moderate-Low	Negligible
Moderate to low	Moderate-high	Moderate	Moderate	Moderate-Low	Moderate-Low	Negligible
Low	Moderate	Moderate	Moderate-Low	Moderate-Low	Low Impact	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Table 1: Landscape Character Impacts Rating Table.

ZONE	VISUAL SENSITIVITY	VISUAL MAGNITUDE	VISUAL IMPACT
A	High - Moderate	High	High
B	High - Moderate	Low	Moderate
C	High	High - Moderate	High
D	Moderate	Moderate	Moderate
E	Low	Low	Low
F	High	Moderate	Moderate-high
G	High - Moderate	Moderate	Moderate-high

Table 2: Landscape Character Impacts Table by Zone.

From the above table, it can be concluded that the landscape to the north and northwest of the highway would be most affected by the proposed development. This is predominantly due to its proximity to the high visual and scenic quality of the surrounding setting.

03 MITIGATING STRATEGIES INCORPORATED IN THE DESIGN

Key strategies considered in the design include:

Perimeter planting of informal mix of evergreen native trees and shrubs. This will greatly assist in screening the proposed site from the north and northwest. It is expected that a certain amount of visibility into the site would still be achieved from the elevated positions surrounding the site. However, the screen planting will contribute in reducing any visual impacts to the landscape character of the area.

Since the site can be viewed from various elevated position it is considered important to provide effective vegetation screening all year around. This in combination with the existing pockets of vegetation directly adjacent to the site would provide a strong buffer.

Provision of low shrubs and ground covers along the verge between the highway and the site. This will introduce further greening to the site but also provide a vegetated layered effect from various viewpoints helping to integrate the proposal with the site (see figure 21).

Provision of rows of deciduous trees within the site , whilst adding some autumn colour/variety to the site's visual palette, would also actually draw attention to the site visually. For this not to be of concern as a visual issue, it would be necessary to ensure the native trees surrounding them are actually of higher proportion. The purpose of the deciduous trees is to allow sun penetration into the site during the winter months.

Regarding night time glare, the design proposes pole type lighting with flat screens to minimise any light spillage. The minimum number of fixtures (25) on 15 poles would be proposed to meet the minimum standard (see figure 22).

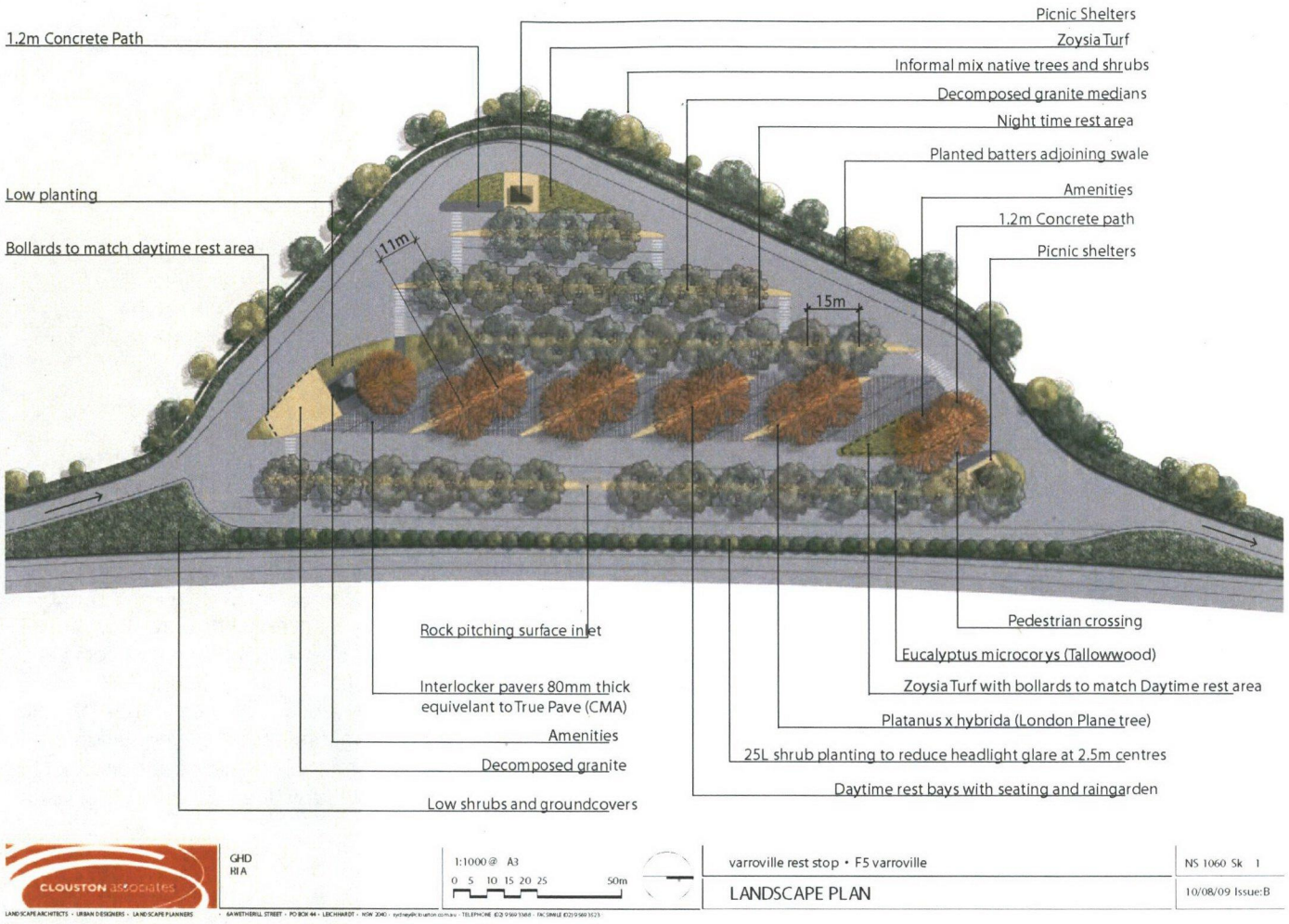


Figure 21: Landscape Concept Plan.

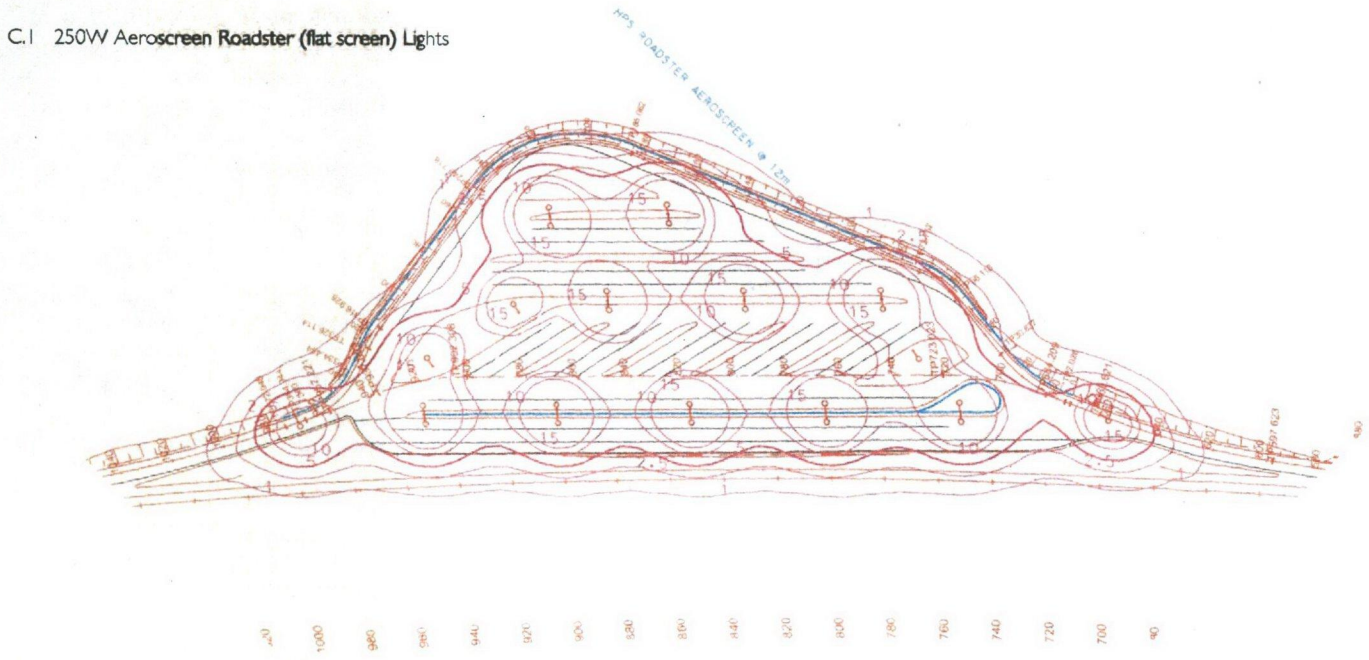


Figure 22: Lighting Layout Concept Plan.

04 VISUAL IMPACT ASSESSMENT FROM KEY VIEWPOINTS

The following key viewpoints have been identified from the surrounding areas of the site. The viewpoints are assessed on the visual sensitivity levels which consider the nature of the viewer's location and its sensitivity to change; and the visual effects/magnitude based on the scale and proximity of the project site in relation to the viewer's position.

Figure 23: View from the Varroville Residence facing east.

01 Varroville Residence
The visual sensitivity of the Varroville Residence is considered high as a result of its heritage significance and commanding position atop the knoll.

The visual effect is considered low to negligible as the property is strongly screened by vegetation around the property boundary. As a result no views towards the project site are attained except for small pockets from transient viewpoints. The main residence faces away from the site and a secondary residence partially facing the site is strongly screened by vegetation. Further, screening vegetation towards the bottom of the slope in front of the site provides a further partial visual curtilage.

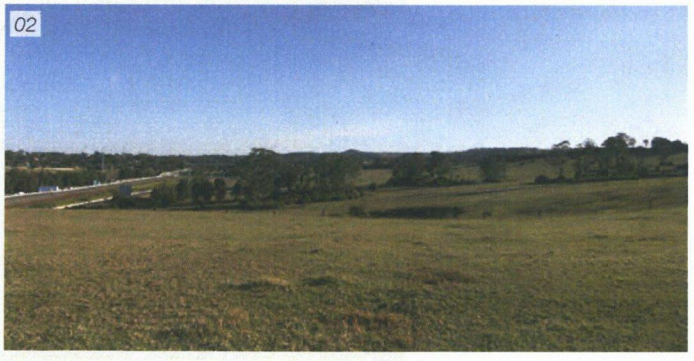


Figure 24: View south-west from the slopes north of the site.

02 Northern Slopes
This location could considered high to moderate in visual sensitivity predominantly due to its scenic quality. However, the backdrop of these views includes strong elements of a highly modified landscape hence reducing its sensitivity. The transient nature of viewers (horse-back riders) is considered moderate in sensitivity. Overall, visual sensitivity is considered moderate.

The site would be partially exposed and its distance within 400 metres makes it visually prominent. However, its visual consolidation with other detracting elements such as the highway assists in visually reducing the overall effect on the landscape setting. Nevertheless, the visual effect is considered high to moderate.

Figure 25: Visual Impacts Assessment from Key Viewpoints.

Figure 26: View from the slopes immediately below St Andrews residences facing north.

03 St Andrews Residences
This viewpoint is common to a number of residences along the neighbourhood's edge which look onto the northern / north western slopes. The nature of these viewpoints is considered high in sensitivity due to their static nature and sensitivity to change.

The visual effect is considered moderate to low due to the distance to the site in excess of 500 metres and the scale of the visual exposure of the site. Taking into account the various mitigation strategies, the site would have a limited exposure. Regarding night time lighting, this viewpoint is considered the most sensitive due to the nature of the viewer. No direct light spillage is expected due to the distance of the viewpoint to the site. However, indirect light spillage in the form of a night-time glow is expected and is considered to have a moderate to low impact when taking into consideration that a major highway is positioned between the viewer's position and the site. The existing impact of headlight glare from westbound traffic is considered to overpower any light spillage from the project site. As a result, the overall visual effect is considered moderate to low.

It should be noted that the visual impact will be higher directly after construction as some of the vegetation screening from the project site would not have matured yet.

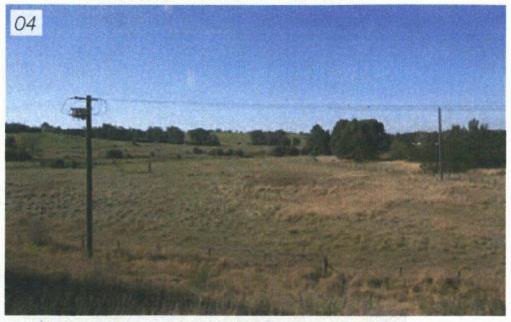


Figure 27: View from St Andrews Road facing north-east.

04 St Andrews Road
This location is considered moderate to low in visual sensitivity. Moderate due to the nature of the scenic views achieve and its sensitivity to change and low due to its transient nature.

The partial visual exposure of the site particularly taking into account parked vehicles makes this location moderate in its visual effect.

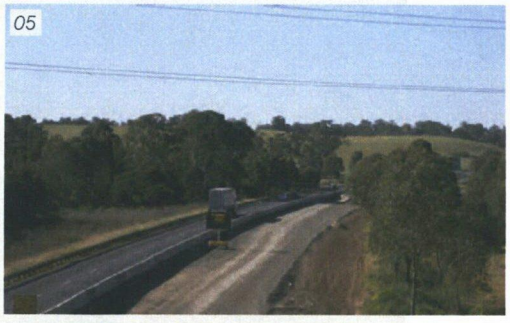


Figure 28: View north-east from the St Andrews Road Over bridge.

05 St Andrews Road Overpass
The visual sensitivity of this location is considered negligible as the nature of this locality is transient in character and its sensitivity to change directly adjacent to the highway is considered negligible.

The visual effect of the proposed site is also considered negligible as the distance to the site exceeds 600 metres and vegetation screening would limit the exposure of the site.

VIEWPOINT	SENSITIVITY	MAGNITUDE	IMPACT
01	High	Low - Negligible	Moderate
02	Moderate	High - Moderate	Moderate-high
03	High	Moderate - Low	Moderate-high
04	Moderate - Low	Moderate	Moderate
05	Negligible	Negligible	Negligible

Table 3: Visual Impacts Table by Viewpoint.

05 RECOMMENDATION OF MITIGATION STRATEGIES FOR CONSIDERATION IN THE DETAILED DESIGN PHASE

A number of measures that could be taken during the detailed design phase of the project in order to mitigate the adverse visual and landscape impacts of the proposed development on the surrounding landscape are outlined below:

The layout of planting within the site will have an impact on its effectiveness as a means of mitigation. Ensuring that the planting of evergreen trees along the perimeter is done in an informal fashion would improve the effect of integration. This would be achieved by planting trees on batters with an irregular spacing, allowing tree planting to be broken into groups to break down any continuous linear character. Reflecting the vegetation pattern in the surrounding landscape is also critical to the overall integration of the site. The grouping should be bold rather than small clusters to create the desired effect.

In order to create a less formal edge treatment to further improve the site's mitigation with the surrounding landscape, batters could be varied rather than keeping them with a constant slope along the proposal's perimeter. This would help to visually 'blend' the proposed project with the surrounding landscape. This strategy is considered effective since most of the adjacent land is grazing land which is not greatly susceptible to a minor change in landform/slopes and hence not requiring any property acquisition.

The opportunity exists to further screen the site from the residential properties at St Andrews by introducing vegetation screening within the highway's median. This would be also beneficial to further mitigate night-time lighting.

Introducing tree planting within the wider portions of the median between the off-load ramp and the highway would further 'settle' the proposed project within the landscape and visually screen the site from the St Andrews residences. This would require careful examination of sight lines to ensure safety is not compromised. The introduction of large trees with clear trunks would allow views under the canopies ensuring that the site is not visually isolated from the freeway.

Ensuring that built form elements such as facility block, picnic shelters etc use low reflective materials and dark colours would reduce their general visibility.

Reducing the luminance of the site by consolidating night time lighting to the centre of the site (diagonal parking area) and allowing only shadowed lighting within the minimum required levels along the perimeter.

06 CONCLUDING COMMENTS

It appears that the proposed project would have a stronger impact on the general landscape character as opposed to the visual impact as seen from specific viewpoints. This result reflects the sensitivity of the landscape and underlines the fact that the land surrounding the site on three sides has been identified as scenic under the current LEP.

Key aspects that mitigate the overall impact on the landscape character are the fact that the proposed site is situated directly adjacent to the freeway, hence consolidating it with other modified elements. Also the current expansion of the freeway would visually reduce the apparent scale of the proposed development.

In addition, existing mature vegetation screening and the fact that the site is located in the low lands helps reduce its overall prominence.

Regarding particular visual impacts, the result is strongly related to either the distance and/or vegetation screening that visually moderate any impacts. As a result, the strongest visual impacts are from transient locations with lower viewpoint sensitivity which explains why the landscape character impacts are considered higher rather than specific visual impacts.

Modifying the design based on the recommendations outlined in section 5 of this report would greatly assist in further reducing the assessed impacts. In particular the proposed measures would provide considerable benefit to the residents of St Andrews, the Southern Mid-Slopes and the Southern Low Lying Flats. Also the northern slopes would benefit by this measures, however to a lesser extent. It should be mentioned that the proposed development would retain the existing character and views towards the scenic qualities of the mid and upper slopes.

Finally, it should be considered that the visual quality of the general setting provides a valuable function for the user group of the proposed site. A rest area's function of providing respite to drivers within a scenic setting will promote its usage, hence supporting the safety of our roads.

Appendix G

Consideration of the Clause 228 factors and matters of national environmental significance

Clause 228(2) Factors (NSW Legislation)

The factors which need to be taken into account when considering the environmental impact of an activity are listed in Clause 228(2) of the *Environmental Planning and Assessment Regulation, 2000*. Those factors have been addressed in the table below to ensure that the likely impacts of the proposed activities on the natural and built environment are fully considered.

Compliance with Clause 228(2) of the EP&A Regulation 2000.

Clause 228(2) Factors	Impact
(a) Any environmental impact on a community?	
The Proposal would result in traffic disruptions in the vicinity of the site and an increase in noise and vibration during the construction phase. These impacts would be minimised through the implementation of the safeguards described in Table 7.1.	Short term: Negative
In the long term the Proposal would be beneficial for motorist on the wider road network, as it would provide a safe location for heavy vehicles drivers to rest, therefore reducing the risk of driver fatigue related accidents.	Long term: Positive
(b) Any transformation of a locality?	
The Proposal would result in the transformation of the locality, as the site is currently cleared pastoral land. The impacts of this transformation would be minimised through the implementation of the safeguards described in Table 7.1.	Negative
(c) Any environmental impact on the ecosystem of the locality?	
The Proposal does involve the removal of some vegetation including degraded/modified endangered ecological communities. The vegetation to be removed has been assessed and would only have minor impacts on the ecosystems of the locality. The Proposal would also involve works in the vicinity of Bunbury Curran Creek. Construction of the bridge of the creek would have minimal impacts on the ecosystems in the vicinity of the creek due to the modified state of the creek at this location.	Negative
(d) Any reduction of the aesthetics, recreational, scientific or other environmental quality or value of a locality?	
The Proposal would result in short term reduction in the visual amenity in the vicinity of the works as a result of construction activities.	Short term: Negative
In the long term the Proposal would result in a reduction the visual amenity area as the Proposal involves the construction of a large hardstand area which is currently cleared pasture. These impacts would be minimised through the implementation of the safeguards described in Table 7.1.	Long term: Negative
(e) Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present generations?	
The Proposal would not result in any impacts to Indigenous or non-Indigenous heritage.	Nil

Clause 228(2) Factors	Impact
(f) Any impact on habitat of any protected fauna (within the meaning of the *National Parks and Wildlife Act 1974*)?	
The Proposal requires the removal of vegetation, which has the potential to be habitat for protected fauna. Due to the amount of other suitable vegetation in the surrounding area and the relatively small amount to be removed these impacts are considered minimal. Safeguards described in Table 7.1 would be implementation to minimise any impacts	Negative
(g) Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air?	
The Proposal is unlikely to endanger any species of animal, plant or other form of life.	Nil
(h) Any long-term effects on the environment?	
In the long term the Proposal would have a positive effect on road safety by providing heavy vehicle drivers a safe location to rest.	Positive
(i) Any degradation of the quality of the environment?	
There is potential for short term degradation of the environment during construction such as air, noise and potential water quality impacts. These impacts would be minimised with the implementation of safeguards described in Table 7.1.	Short term: Negative
There would be no long term impacts of the Proposal on the quality of the environment.	Long term: Positive
(j) Any risk to the safety of the environment?	
During the construction there is a risk to safety of the environment as a result of potential impacts on water quality through erosion and sedimentation of waterways or risk of spills. Safeguards provided in Table 7.1 would minimise the potential risk to the safety of the environment.	Short term: Potential Negative
During operation there is a risk to safety of the environment as result of potential impacts on water quality through the potential risk of spills occurring on site.	Long term: Potential Negative
(k) Any reduction in the range of beneficial uses of the environment?	
The Proposal would not result in any reduction in the range of the beneficial uses of the environment.	Nil
(l) Any pollution of the environment?	
The Proposal has the potential to cause air, noise, water and visual pollution to the environment in the short term, but any impacts would be minimised by the implementation of safeguards outlined in Table 7.1.	Short term: Negative
The Proposal would not result in any long term pollution of the environment.	Long term: Nil
(m) Any environmental problems associated with the disposal of waste?	
There would be no problems associated with the disposal of waste.	Nil
(n) Any increased demands on resources, natural or otherwise which are, or	

Clause 228(2) Factors	Impact
are likely to become, in short supply?	
The Proposal would not increase the demand on any resources that are or are likely to become in short supply.	Nil
(o) Any cumulative environmental effect with other existing or likely future activities?	
In the short term, construction activities being undertaken at the same time as this Proposal, in the vicinity of the work, may contribute to traffic, noise and air quality impacts.	Short term: Negative
The Proposal would result in a safer road network in the future.	Long term: Positive

EPBC Act 1999 Factors (Commonwealth Legislation)

The EPBC Act requires that the following matters of National Environmental Significance (NES) be considered.

Compliance with Commonwealth EPBC Act requirements

EPBC Act Factors	Impact
Any environmental impact on World Heritage property?	
The Proposal would have no impact on a World Heritage property.	Nil
Any environmental impact on National Heritage places?	
The Proposal would have no impact on a National Heritage Place.	Nil
Any environmental impact on wetlands of international importance?	
The Proposal is located over 30 kilometres west of Towra Point Nature Reserve which is the nearest wetland in international importance. The Proposal will not impact on this wetland of international importance.	Nil
Any environmental impact on Commonwealth listed threatened species or ecological communities?	
The proposed would require the removal of one Commonwealth listed ecological community (Cumberland Plain Woodland). Assessment of the significance of this vegetation under the EPBC Act is located in Section 6.3.2. In summary the impact on this community are not considered significant.	Minor negative
Any environmental impact on Commonwealth listed migratory species?	
Although 14 Migratory species are likely to ocur within a 1 kilometres radius of the Proposal, the Proposal would not impact on these species due to the minor nature of the works.	Nil
Does any part of the Proposal involve nuclear action?	
The Proposal does not involve a nuclear action.	Nil
Any environmental impact on a Commonwealth Marine area?	
The Proposal would have no impact on a Commonwealth Marine Area.	Nil
Any impact on Commonwealth Land?	
The Proposal would not impact on any Commonwealth Land.	Nil

GHD

133 Castlereagh St Sydney NSW 2000

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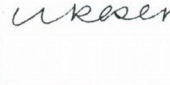
T: 2 9239 7100 F: 2 9239 7199 E: sydmail@ghd.com.au

Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	B James	K Smallwood		M Roser		21.01.10