RailCorp Rolling Stock PPP

Project Contract No. C01645

Exhibit 15

Planning Approval and REF

RailCorp Rolling Stock PPP

Project Contract No. C01645

Exhibit 15

Planning Approval and REF

.....

RailCorp's signatory

.....

PPP Co's signatory

REVIEW OF ENVIRONMENTAL FACTORS
DETERMINATION

RailCorp

Product Development
Level 2, 18 Lee Street,
Chippendale NSW 2008
Phone: 8202 3334
Fax: 8202 2930

PROJECT NAME: Proposed Maintenance Facility at Auburn

PROJECT DESCRIPTION: The proposal involves the construction and operation of a fleet servicing and maintenance facility for new rollingstock, and associated works to the MainTrain facilities and the Down Relief Line, at the Clyde Marshalling Yards, Auburn.

In my opinion the Proposed Maintenance Facility at Auburn Review of Environmental Factors (the REF) addresses the requirements of Section 111 of the *Environmental Planning and Assessment Act 1979.*

In considering the Proposed Maintenance Facility at Auburn, an examination and assessment has been undertaken to take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity, as addressed in the REF.

The likely significance of the environmental impacts of the activity have been independently assessed in accordance with the Department of Urban Affairs and Planning (Department of Planning) best practice guideline *Is an EIS Required?*

An independent assessment of the impacts of the activity on critical habitat and on threatened species, populations or ecological communities or their habitats, for both terrestrial and aquatic species has been undertaken. The activity described in the REF will not significantly affect threatened or endangered species, populations or ecological communities or their habitats. Therefore, no Species Impact Statement is required.

The activity described in the REF will have some environmental impacts, which can be satisfactorily ameliorated. These impacts are unlikely to be significant and therefore, no Environmental Impact Statement is required.

I approve of this activity being undertaken as described in the REF, subject to the following conditions:

- Any approvals required under relevant environmental legislation be obtained and the conditions therein diligently implemented.

- Construction and Environmental Management Plans, including a Soil and Water Management Plan (SWMP), are prepared to the satisfaction of RailCorp, to ensure that appropriate environmental mitigation measures relating to noise, dust, sedimentation, erosion, light spill, traffic, heritage, remediation / waste management and stormwater are addressed and implemented.

- A Remedial Action Plan (RAP) is to be developed for the site to the satisfaction of RailCorp. This RAP is to outline all remediation works to be undertaken prior to construction, and any additional investigations that are to be undertaken. Special emphasis should be placed on the sites of the lead and benzo(a)pyrene hotspots, and areas identified as containing asbestos.

- All environmental mitigation safeguards and requirements contained in the REF and the Construction/Environmental Management Plan be diligently implemented and reported.

- A Heritage study should be undertaken, mapping all heritage items on the affected parts of the worksite, and identified items should be recorded to NSW Heritage Office standards. Recommendations should be made as to the relocation of any affected heritage items to either another location onsite or to a railway heritage centre.

- Construction work will be limited to the hours of 7am to 6pm Monday to Friday, and 8am to 1pm Saturdays. No work is to be undertaken on Sundays and Public Holidays.

- Should work be required to be undertaken outside of the normal working hours (above), the PPP company is to seek approval from RailCorp, and public notification, in the form of a letter box drop, should be undertaken at least seven (7) days prior to the works taking place.

- A Communications Plan is to be developed to the satisfaction of RailCorp accounting for the length of the construction period. Signs are to be placed on the Private Road fence identifying a Hotline to be established to manage community questions and complaints.

- The pedestrian link between Clyde Station and the Maintenance Facility / Clyde Marshalling Yards is to be retained.

- Should the shift arrangements, and total number of employees on site per day, increase from that assessed by the Traffic and Transport Assessment (section 5.1), further assessment of the traffic implications must be undertaken.

- Should the Tadgell's Bluebell (*Wahlenbergia multicaulis*) be found on the site in the future its identification will be addressed by onsite documentation and, if appropriate, conservation measures developed through discussions between RailCorp (including the Safety and Environment Division), the PPP contractor and qualified botanists taking into account any applicable Recovery Plan.

The responsibility for ensuring that the conditions above and in the REF are implemented falls to the Project Director for the Rolling Stock PPP Project.

This Determination is to supersede the previous REF Determinations for this project dated 2 September 2005, 1 February 2006 and 31 July 2006.

Rodd Staples
A/General Manager Network Development
Product Development, RailCorp
Date: 30/11/06.

CLIENTS | PEOPLE | PERFORMANCE

RailCorp

Proposed Maintenance Facility at Auburn

Review of Environmental Factors

November 2006

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

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1. Preliminaries

1.1 Introduction

GHD Pty Ltd (GHD) has been engaged by Rail Corporation New South Wales (RailCorp) to conduct environmental investigations as part of RailCorp's proposal to expand the existing maintenance facilities at Auburn. The expansion will provide new facilities for the maintenance of RailCorp rolling stock and other engineering aspects of fleet servicing programs, including testing and commissioning on the site and minor works associated with finalising the build of new rolling stock prior to entry into service. The expansion also involves upgrading the existing Down Relief line for a distance of approximately 2 km. These works, which are described as 'the proposed development' for the purpose of this REF, are described in Section 2.

It is proposed that a contractor as part of a Public Private Partnership (PPP) will build and operate the new facility adjacent to the MainTrain site on behalf of RailCorp.

In August 2005, GHD prepared a Review of Environmental Factors (REF) for the project. This REF was determined on 2 September 2005.

Since that time, minor modifications have been made to the project in relation to the number of workshops on the site, location of access to the site, and location and number of car parking spaces and a further REF was determined on 31 July 2006.

Further minor modifications in relation to the upgrade of the Down Relief line, design issues and operational activities have been incorporated into the project, which are the subject of this assessment.

This REF, which supersedes the previous REFs, has been prepared to assess the environmental impacts of the proposed new maintenance facility, including the associated Down Relief upgrade works at Auburn in accordance with the amended project layout.

1.2 Location

The study area (site and surrounds) is located approximately 20 kilometres west of the Sydney Central Business District (CBD) and forms part of the larger area known as the Clyde Marshalling Yards (see Figure 1).

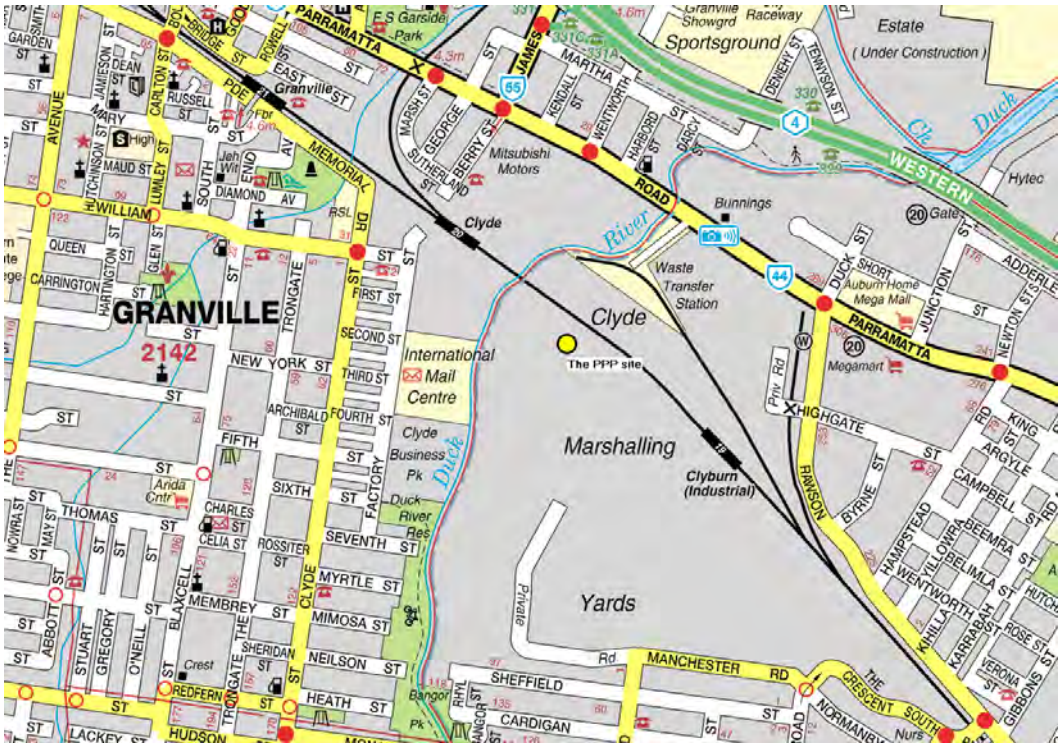


Figure 1 Regional Location

1.3 Description of the existing environment

1.3.1 Regional context

The site is located in the Auburn Local Government Area (LGA). The surrounding LGAs include Parramatta to the north and west, Bankstown to the south, Canada Bay to the northeast and Strathfield to the east.

Major employment areas and development hubs within the region include Parramatta CBD, Strathfield and the Sydney Olympic Park precinct (Homebush Bay).

The adjacent rail network has three main lines

- North shore and western line – this line travels between Berowra via Sydney's north shore to Parramatta and onto Emu Plains and Richmond.
- South line – this line travels from the City Circle to Campbelltown via Liverpool and vice versa.
- Blue Mountains line – this line travels between Central Station past the Blue Mountains to Lithgow.

Major surrounding road transport infrastructure includes Parramatta Road, which is a major arterial road servicing transport needs between Parramatta CBD and Sydney CBD. Parramatta Road also services the regional population by providing access to a large range of goods and services located in warehouse development. The M4 Motorway is located further north of Parramatta Road, linking the region with Penrith and the Blue Mountains. The M4 also integrates with the Westlink M7 providing a

linkage to Newcastle and Canberra. A network of local and sub-arterial roads supports the surrounding arterial roads and surrounding area.

Land uses in the region include a mixture of residential housing, industry and business development and open parkland adjacent to Duck River. The nearest business centres are Auburn to the east and Granville to the west. The residential profile of the study area is characterised by a diverse range of nationalities and cultures, many of which have a non-English speaking background.

1.3.2 The site

For the purpose of this REF, 'the site' is referred to as the area where construction and operation works associated with the proposed development is to be undertaken. This includes the MainTrain work area, proposed maintenance centre (PPP) work area and the Down Relief upgrade area. The MainTrain and PPP areas are where the proposed development is predominantly located.

The MainTrain area covers most of the existing maintenance facilities. The PPP area extends from the main suburban tracks to the northern end of a Private Road owned by RailCorp and currently encompassing currently vacant land, the RailCorp Central Warehouse and the existing tracks outside of the MainTrain area. The layout of the components of the MainTrain and PPP area is shown in Figure 2.

The Down Relief upgrade area involves upgrade works on and in the immediate vicinity of the existing Down Relief line which is an existing section of railway track within the southern side of the rail corridor between Auburn and Granville stations adjacent to the North Shore and Western Line, South Line and Blue Mountains Line. Parts of this track are currently out of service. The area of the line that would be subject to upgrading extends for approximately 2 km from the existing tracks near the rail entrance to the Main Train area towards Granville. The upgrading works would bring back into service those sections of the Down Relief Line that are currently not operational. These works are shown in Figure 3.

1.3.3 Existing site operations

The MainTrain maintenance facility involves a variety of functions with the purpose of servicing existing rail related rolling stock. Existing operations include:

- Construction and engineering of rolling stock components;
- Workshops for maintenance and upgrades of rolling stock;
- Workshops for visual presentation of rolling stock, which includes painting and repair works to carriages;
- Storage of rolling stock components and related machinery;
- Rail lines for train and carriage interchanges;
- Ancillary land uses including administrative office space and car parking; and
- Train traffic movement between the Auburn maintenance facility to and from the existing rail corridor.

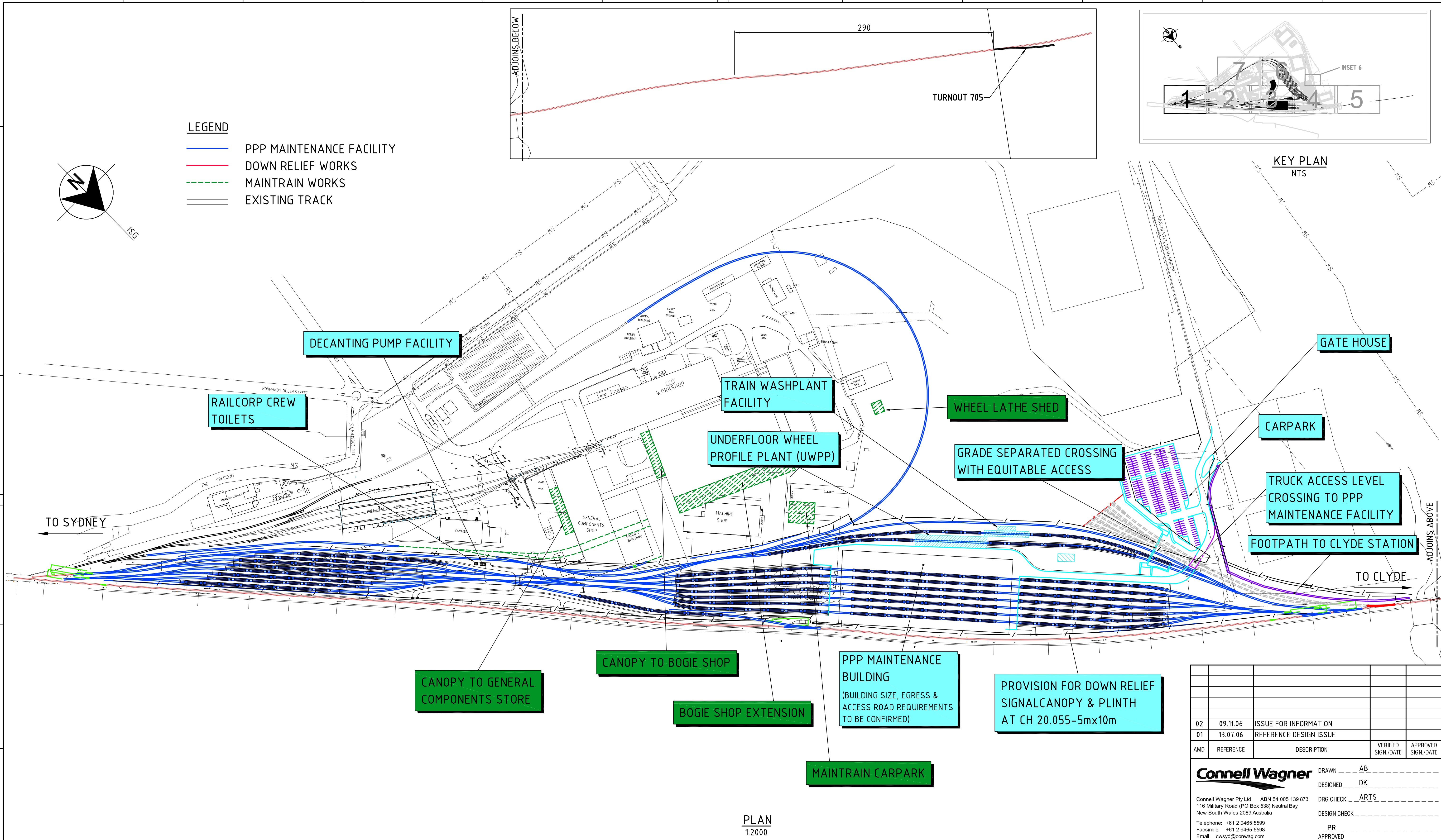
Date: 5 August 2005

Location Map

File Name: 2212269_LTN_03.cdr

Proposed Fleet Service Centre, Auburn, NSW

Figure 2



PLAN
1:2000

NOTE:

1. DEVELOPMENT TO BE CONNECTED TO AUTHORITY SERVICES.

SCALE 1:2000

AMD	REFERENCE	DESCRIPTION	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
02	09.11.06	ISSUE FOR INFORMATION		
01	13.07.06	REFERENCE DESIGN ISSUE		

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DRAWN AB
DESIGNED DK
DRG CHECK ARTS
DESIGN CHECK
APPROVED PR

RailCorp Design accepted for use by RailCorp

ROLLING STOCK PPP PROJECT

PROPOSED AUBURN DEPOT
INDICATIVE LAYOUT
GENERAL ARRANGEMENT

FILE No. 17261 | SHEET 1 OF 1 | A1

STATUS: REF ISSUE

RA-003 | 02

1.3.4 Site history

The Clyde Marshalling Yards has been a focus for rail maintenance and rail related works for nearly 115 years. The area's first building was constructed in 1891 to house workers constructing the Clyde rail yards, which opened in 1892. The site operated as a marshalling point for rail locomotives and rolling stock over many years and included the main rolling stock repair works depot.

The area is listed under the Auburn Local Environment Plan (LEP) 2000 as an item of environmental heritage, that is likely to contain archaeological deposits and artefacts of rail related items. This is detailed further in Section 3.8.

1.3.5 Surrounding land use

The land uses surrounding the site include a mixture of residential and industrial land use.

The Clyde Marshalling Yards, on the northern side of the rail line, comprises significant industrial land use. Uses include intermodal freight distribution terminals, warehousing and manufacturing based trade.

To the east of the site is a mixture of industrial and residential land uses. These uses are located some distance from the main operational areas of the site.

To the south, immediately adjacent to the site, along the northern side of RailCorp's Private Road, is the logistical and storage of bulk goods of Carlton United Breweries and Smorgon Steel metal distribution centre

Residential uses are located further to the south of the site, along the southern side of Manchester Road and RailCorp's Private Road.

To the west is the existing RailCorp Central Warehouse and other RailCorp facilities, all of which are accessed via the private road. Further west is Duck River.

Industrial uses and arterial traffic movement along Parramatta Road dominate Land uses near the rail corridor towards Granville. In addition, residential and open space recreational uses (swimming pool and bowling club) are located south of the existing rail line between the stations of Clyde and Granville.

1.4 Consultation

A meeting was held with the General Manager and Director of Planning of Auburn Council on 18 May 2005. At this meeting, the project was outlined to the council officers, including the key planning and environmental issues being addressed in the REF.

The main issues raised by Council officers were as follows:

- There was a proposal to rezone the Smorgon and Carlton United Breweries site to residential, which was rejected. Council asked RailCorp to provide a letter advising that it is intended to use the site for rail-related purposes in the longer term;

- Whether there will be an increase in truck movements – see Section 3.15 and Appendix B;
- Whether there will be an increase in train movements – there would be some increase in train movements, although these would be on electric lines, and there would be no need to use additional diesel tractors.

The recent modifications to the project layout do not alter the issues raised by Council nor the responses to those issues.

Consultation has been carried out by RailCorp with Parramatta City Council in regards to relevant issues with the Down Relief works located within Parramatta LGA. Issues raised by Parramatta Council include tree and vegetation removal and the construction of a retaining wall on the southern DN side of Granville Station. Approval was gained in principle from Parramatta Council for these works.

1.5 Statutory requirements

1.5.1 Approval process

The proposed development will be assessed in accordance with the provisions of the *Environmental Planning & Assessment Act 1979* (EP&A Act) and *Environmental Planning and Assessment Regulation 2000* (EP&A Regs).

The EP&A Act forms the statutory framework for planning and environmental assessment in New South Wales. Relevant statutory functions and powers are exercised under the EP&A Act by the Minister for Planning, the NSW Department of Planning, relevant State statutory authorities and local Councils.

The EP&A Act contains three parts relevant to planning approvals and environmental assessment:

- Part 3A provides for control of 'major infrastructure or other projects' that require approval from the Minister for Planning;
- Part 4 generally provides for the control of 'local development' that requires development consent from the local Council; and
- Part 5 provides for the control of 'activities' that do not require development consent and are undertaken or approved by a determining authority.

The need or otherwise for development consent is set out in environmental planning instruments (EPIs) which are defined to include State Environmental Planning Policies (SEPP), Regional Environmental Plans (REP) or Local Environmental Plans (LEP).

Development requiring approval under Part 5 that is likely to significantly impact the environment, therefore requiring an environmental impact statement, now by Order of the Minister falls under Part 3A of the EP&A Act. The Minister for Planning is the approval authority for these activities.

As outlined in this Chapter, the proposed maintenance facility does not require development consent and is unlikely to significantly impact the environment, and is therefore an activity under Part 5 of the EP&A Act.

Considerations under Part 5

RailCorp is the proponent and the determining authority for the proposed development. It is proposed that the PPP contractor will carry out the activity described in this REF on behalf of RailCorp.

Section 111 of the EP&A Act identifies the duty of determining authorities in considering the environmental impacts of an activity. When considering an activity, the determining authority is required to 'examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment'.

Section 112 of the EP&A Act requires the determining authority to consider whether the proposal is 'likely to significantly affect the environment' (including critical habitat or threatened species, populations or ecological communities, or their habitats). If the determining authority decides the proposed development would be likely to significantly affect the environment and that an environmental impact statement (EIS) is required, then by reason of an Order issued by the Minister for Planning on 29 July 2005, the proposed development would need to be assessed under Part 3A of the EP&A Act. Further, if the proposed development would be carried out on land that is critical habitat, or if the determining authority decides the proposed development would be likely to significantly affect a threatened species, population, an ecological community or its habitat then it must obtain and consider a Species Impact Statement (SIS).

GHD have reviewed the likely impacts of the proposed development and are of the opinion that it is unlikely that there will be any significant impact. However, RailCorp will consider this REF and its recommendations, and decide whether or not the proposed development is likely to significantly affect the environment and therefore whether an EIS and /or an SIS are required.

Factors which need to be taken into account when considering the likely impact of an activity on the environment are outlined in Clause 228 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation). These matters are summarised in Appendix A. An assessment of the proposal against the best practice guideline 'Is an EIS Required' is also contained in Appendix A. Chapter 3 provides a detailed assessment of how the proposed development is likely to impact on these factors.

1.5.2 Zoning

The proposed development is located within the Auburn Council and Parramatta Council Local Government Area (LGA) and falls under the control of the Auburn 2000 and Parramatta City Council LEP 2001. The site is zoned Special Uses 5(a) (Railway) under Auburn LEP 2000 and Zone 5 (Special Uses) under Parramatta LEP 2001.

Permissibility of development

Auburn LEP 2000

Clause 26 of the LEP provides the objectives and permissible development (with or without consent) in the 5(a) zone.

The objectives of the 5(a) zone are:

(a) *'to facilitate certain development on land which is or is proposed to be used by public authorities to provide services, utilities and public infrastructure that are compatible with the locality;*

(b) *to allow ancillary development which is incidental to the primary use specified on the map;*

(c) *to allow surplus public land to be used for purposes that are compatible with uses permitted in an adjoining zone.'*

The proposed development is best defined as a 'utility undertaking', which means:

'…any of the following undertakings carried on or permitted or suffered to be carried on by, or by authority of, any government department or under the authority of, or in pursuance of, any Commonwealth or State Act:

(a) railway,

(b) road transport,

(c) water transport,

(d) air transport,

(e) wharf or river undertakings,

(f) undertakings for the supply of water,

(g) hydraulic power,

(h) electricity or gas or the provision of sewerage or drainage services,

and a reference to a person carrying on a public utility undertaking is to be construed as including a reference to a council, county council, government department, corporation, firm or authority carrying on the undertaking'.

In accordance with Clause 26, a utility undertaking is permissible with development consent in the 5(a) zone.

However, Clause 58 of the LEP reads:

'(1) Nothing in this plan is to be construed as restricting or prohibiting, or enabling the consent authority to restrict or prohibit, the carrying out of an activity of any description specified in Schedule 3 by a public authority or a corporation that was a public authority but has been privatised.

(2) Nothing in this plan is to be construed as removing the requirement of determining authorities to consider the impact on the environment of an activity in accordance with Part 5 of the Environmental Planning and Assessment Act 1979.'

Clause 1(a) of Schedule 3 relates to railway undertakings and states:

'*The carrying out by persons carrying on railway undertakings on land comprised in their undertakings of:*

(a) any development required in connection with movement of traffic by rail, including the construction, reconstruction, alteration, maintenance and repair of ways, works and plant, or

(b) the erection within the limits of a railway station of buildings for any purpose,

but excluding:

(c) the construction of new railways, railway stations and bridges over roads, and

(d) the erection, reconstruction and alteration of buildings for purposes other than railway purposes outside the limits of a railway station and the reconstruction or alteration, so as materially to affect their design, of railway stations or bridges, and

(e) the formation or alteration of any means of access to a road, and the erection, reconstruction and alteration of buildings for purposes other than railway purposes where such buildings have direct access to a public place; and

(f) the erection, reconstruction and alteration of buildings for purposes other than railway purposes where such buildings have direct access to a public place.'

The combined effect of Clause 58 and of Clause 1 Schedule 3 is that the Auburn LEP cannot restrict or prohibit the development controlled by Clause 1 Schedule 3.

The proposed development is considered to fall within the classification of 'any development required in connection with movement of traffic by rail, including the construction, reconstruction, alteration, maintenance and repair of ways, works and plant'.

Although the proposed development involves upgrading an existing rail line, it does not include the construction of new railways, railway stations or bridges over roads, and does not include the erection, reconstruction or alteration of buildings for purposes other than railway purposes. As such, exclusions (c), (d) and (f) as stated above do not apply.

The proposed development does involve alterations to an existing private road, however it does not involve the formation of any means of access to a public road. As such, exclusion (e) also does not apply.

Therefore, as a result of the operation of Clause 58 and Schedule 1, development consent is not required for the proposed development. As such, the proposed development is to be assessed in accordance with Part 5 of the EP&A Act 1979.

Other considerations

Clause 31 of the LEP places certain restrictions on development in the 5(a) zone, where development consent is required:

'Consent may be granted to development on land zoned 5 (a) or 5 (b) only if it would be compatible with the existing and likely future character and amenity of the surrounding area in terms of:

(a) its scale, bulk, design, height, siting and landscaping, and

(b) its operation, and

(c) traffic generation and car parking, and

(d) noise, light, dust and odour nuisance, and

(e) privacy, and

(f) stormwater drainage, and

(g) hours of operation, and

(h) overshadowing.'

Notwithstanding that development consent is not required, the relevant matters are addressed in Section 3.

Schedule 2 of the LEP indicates that the area known as the Clyde Marshalling Yards (which includes the proposed development site) is an item of environmental heritage, with identified potential archaeological significance. The impact of the proposed development on this heritage item is discussed in Section 3.8.

Parramatta LEP 2001

The objectives of development in Zone 5 (Special Uses Zone) are:

(a) to facilitate certain development on land which is, or is proposed to be, used by public authorities, institutions or organisations, including the Council, to provide community facilities, services, utilities and transport facilities, and

(b) to allow other ancillary land uses that are incidental to that primary use of land within the zone, and

(c) to provide flexibility in the development of sites identified for special uses by allowing development which is permissible in an adjacent zone.

Clause 11 of the Parramatta LEP 2001 adopts clause 35 of the Environmental Planning and Assessment Model Provisions.

Clause 35 of the Model provisions states:

Nothing in the local environmental plan shall be construed as restricting or prohibiting or enabling the consent authority to restrict or prohibit:

(a) the carrying out of development of any description specified in Schedule 1

Schedule 1 (1) states:

The carrying out by persons carrying on railway undertakings on land comprised in their undertakings of:

(a) any development required in connection with the movement of traffic by rail, including the construction, reconstruction, alteration, maintenance and repair of ways, works and plant, and

(b) the erection within the limits of a railway station of buildings for any purpose,

but excluding:

(c) the construction of new railways, railway stations and bridges over roads,

(d) the erection, reconstruction and alteration of buildings for purposes other than railway undertaking purposes outside the limits of a railway station and the reconstruction or alteration so as materially to affect the design thereof of railway stations or bridges,

(e) the formation or alteration of any means of access to a road, and

(f) the erection, reconstruction and alteration of buildings for purposes other than railway purposes where such buildings have direct access to a public place.

Therefore, as a result of the operation of Clause 11 of the Parramatta LEP 2001, and the reasons outlined above under 'Auburn LEP 2000', development consent is not required for the proposed development. As such, the proposed development is to be assessed in accordance with Part 5 of the EP&A Act 1979.

1.5.3 Auburn development control plans

Development Control Plan 2000 - Exempt and Complying Development Control Plan

This plan lists minor developments that can be carried out as 'Exempt Development'. Exempt development means development of a minor nature that may be carried out without the need for a complying development certificate or development consent (i.e. without any approval).

The plan also lists Complying Development. Complying development means development that may be carried out with development consent, in the form of a complying development certificate, obtained from either Council or an Accredited Certifier. This type of development is termed complying as it complies with a preordained set of guidelines.

Upon examination of the Auburn Development Control Plan 2000 - Exempt and Complying Development Control Plan (DCP), no works as proposed fall under or are consistent with the exempt criteria provisions of the DCP.

Development Control Plan 2000 – Car Parking and Loading Development Control Plan

The objective of this plan is to ensure that an acceptable level of parking is provided on-site to minimise the unreasonable overflow of parking onto surrounding streets and

to provide for the reasonable parking needs of business and industry to support their viability, but discourage unnecessary or excessive parking.

The plan further aims to increase opportunities for choice in mode of transport and to assist in facilitating cost effective and energy efficient public transport services that are acceptable and convenient to the community.

Upon examination of the Auburn Development Control Plan 2000 – Car Parking and Loading Development Control Plan (DCP), design guidelines for car parks include car parking spaces and areas to be designed to comply with AS 2890 – 1993 (Parts 1 to 5) Parking Facilities.

As discussed in Section 3.15, the PPP companies will be required to provide car parking in accordance with the Car Parking and Loading Development Control Plan.

1.5.4 Parramatta Development Control Plans

No Parramatta City Council Development Control Plans were identified as being relevant to the proposed development.

1.5.5 State Environmental Planning Policies and Regional Environment Plans

State Environmental Planning Policy No 55 – Remediation of Land

SEPP 55 aims to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment. The SEPP applies to the whole of the State.

Clause 7 of SEPP 55 provides that a consent authority must not consent to carrying out of any development on land unless:

- It has considered whether the land is contaminated;
- If the land is contaminated, it is satisfied that the land is suitable in its current or remediated state for the proposed development; and
- If the land requires remediation, it is satisfied that the land will be remediated before the land is used for the proposed development.

Under Clause 8 of the SEPP, development consent is generally not required for remediation, unless the remediation work is defined as Category 1 remediation work.

As detailed in this chapter, development consent is not required for the proposed development. However, contamination issues have been considered in detail in Section 3.1, as summarised below.

A contamination assessment of the site has been undertaken by GHD (GHD 2005a, GHD 2005b). The assessment concludes that the site is not subject to widespread contamination that would preclude the use of the site for its proposed redevelopment for rail related purposes. However, fill material on the site appeared to be subject to relatively high levels of contamination (in the form of lead) at three sampling locations and to a lesser extent benzo(a)pyrene at one location. The reported lead and benzo(a)pyrene concentrations would likely necessitate remediation, to permit the sites

use for commercial or industrial purposes. In addition, asbestos was reported within one sample of near-surface fill submitted for analysis, and occasional fragments of fibro were identified scattered across the surface of various parts of the site.

The presence of a possible hydrocarbon odour and potentially a liquid petroleum product was also detected at one sampling location. Results from this location indicate that concentrations of total petroleum hydrocarbons (TPH) were below the relevant criteria.

In order for the site to be considered suitable (from a soil contamination perspective) for its proposed use, remediation of the apparent lead and / or benzo(a)pyrene 'hotspot' areas should be undertaken. The most practical remediation option for the lead and benzo(a)pyrene impacted fill material would likely be the excavation and removal of the impacted fill material from the site and subsequent validation of surrounding soils. Furthermore, some supplementary validation works are likely to be necessary to ensure no widespread contaminant 'hotspots' remain elsewhere across the site.

It is also recommended that additional investigations be undertaken in the area of possible TPH contamination in order to determine whether an underground tank or other hydrocarbon source may be present in this area.

It is also recommended that a Remedial Action Plan (RAP) be developed for the site.

On the basis of this assessment and the above recommendations, it is considered that the site would be suitable for the proposed development following remediation. As the recommended remediation involves excavation and removal of contaminated material, the site will be remediated before being used for the proposed development.

As the site is identified as an item of environmental heritage, the remediation work would be defined as Category 1 remediation work, and development consent from Auburn Council is required for remediation. As discussed in Section 3.1, the PPP contractor (who is carrying out the activity described in this REF by or on behalf of RailCorp) would be required to undertake further investigations in relation to the proposed remediation, including preparation of a remediation action plan, and obtain all relevant approvals prior to remediation work commencing.

The proposed development is therefore considered to be consistent with the provisions of SEPP 55.

Regional environmental plans

There are considered to be no Regional Environmental Plans that apply to the site.

1.5.6 Ecologically sustainable development

Sustainability is defined as meeting the needs of today while conserving the environment for the benefit of future generations. Environmental sustainability seeks to balance ecological principles with economic viability and social wellbeing.

Sustainable development can be categorised into four principles that include:

- The Precautionary Principle;
- Intergenerational Equity;
- Conservation of Biological Diversity and Ecological Integrity; and
- Improved Valuation and Pricing of Environmental Resources.

These principles have been incorporated into the options assessment, concept design and environmental assessment of the proposed development and are discussed below.

Precautionary principle

This principle states that *'if there are threats of serious or irreversible damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation'.*

In other words the principle aims to provide a situation where if a proponent cannot show that their actions will not threaten the environment, even where environmental impacts are uncertain – the proponent's activity or development should not be permitted for approval.

The environmental assessments undertaken for this REF have been consistent with accepted scientific and assessment methodologies and is considered to be consistent with the practical application of the precautionary principle.

The investigations have identified a range of potential impacts and safeguards have been recommended to minimise potential impacts. These safeguards would be implemented during construction and operation of the proposed development. No safeguards have been postponed as a result of lack of scientific certainty.

Intergenerational equity

The principle states, *'the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations'.*

The proposed development would benefit future generations by ensuring that the long term adverse impacts on the environment and potential impacts would be minimised by implementation of appropriate safeguards. This would ensure that the principle of intergenerational equity is not compromised.

Should the proposed development not proceed, the principle of intergenerational equity may be compromised, as future generations would inherit a lower level of service by the public rail transport network.

Conservation of biological diversity and ecological integrity

This principle states that the '*diversity of genes, species, populations and communities, as well as the ecosystems and habitats to which they belong, must be maintained and improved to ensure their survival'*.

The site area has been highly degraded as a result of construction of infrastructure such as roads, railways, industry development and urban settlements. This has

reduced the value of the site from a biological and ecological perspective as the vast majority of native bushland and habitats have been previously cleared. Consequently, the proposed development would not adversely impact any flora and fauna species, or the ecological integrity of the area.

Improved valuation and pricing of environmental resources

This principle requires that '*costs to the environment should be factored into the economic costs of a project'.*

The REF has examined the environmental consequences of the proposed development and identified mitigation measures for activities that have the potential to create adverse environmental impacts. The implementation of these mitigation measures would result in an economic cost to RailCorp and would increase both the capital and operating costs of the project. This signifies that environmental resources have been given appropriate valuation.

In terms of contingent valuation (values that can not be measured in monetary values), the concept design for the proposed development has been developed with an objective of minimising potential impacts on the surrounding environment. This indicates that the concept design has been developed with an environmental objective in mind rather than purely based on financial values.

1.5.7 Protection of the Environment Policies

No Protection of the Environment Policies have been made under the *Protection of the Environment Operations Act 1997*.

1.5.8 Matters of national environmental significance

The (primary) objective of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is to *'provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance.'*

Environmental approvals under the EPBC Act may be required for 'actions' that have, will have or that are likely to have a significant impact on:

- Matters of national environmental significance (known as 'NES matters'); or
- The environment on Commonwealth land (whether or not the action is occurring on Commonwealth land).

Approval for such an action may be required from the Commonwealth Minister for Environment and Heritage.

An 'action' is considered to include a project, development, undertaking, activity or series of activities. NES matters include:

- World Heritage Areas;
- National Heritage Places;
- Ramsar wetlands of international importance;

- Nationally listed threatened species and ecological communities;
- Listed migratory species;
- Nuclear actions; and
- Commonwealth marine areas.

No matters of NES have been identified as being present in the vicinity of the subject site.

There is no Commonwealth land affected by the proposed development.

Therefore the proposed development has not been referred to the Commonwealth Minister for the Environment for approval under the EPBC Act.

1.5.9 Other relevant legislation

Heritage Act 1977

The *Heritage Act 1977* governs the conservation and protection of heritage items in NSW. An item is defined under the Act (Section 4, definitions) as a:

- Place;
- Building;
- Work relic;
- Moveable object; and/or
- Precinct.

State heritage is an item of significance to the state of NSW in terms of the historical, scientific, cultural, social, archaeological, architectural, natural aesthetic value of the item. Local heritage is similarly defined but is of significance in a local context.

The Act is governed and implemented by the NSW Heritage Council. The Heritage Council has the role of maintaining and updating a register of state significant items (State Heritage Register) and in providing protection to items.

Where an item is listed under the State Heritage Register or under an interim heritage order, it is an offence to carry out certain development without an approval under the Act.

There are no known items listed under the State Heritage Register or under an interim heritage order on the site or in the vicinity of the proposed development.

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.

In addition, 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.

As identified in Section 1.5.2, the Clyde Marshalling Yards, of which the site forms part, is listed under the Auburn LEP 2000 as an item of potential archaeological significance. The heritage assessment in Section 3.8 concludes that some archaeological remains are likely to occur in the vicinity of the proposed development.

As such, an excavation permit under Section 140 of the Heritage Act would be required prior to work commencing on the site.

Protection of the Environment Operations Act, 1997

Activities required to obtain a licence under the *Protection of the Environment Operations Act 1997* (POEO Act) are detailed in Schedule 1 to the Act. Schedule 1 includes:

'Railway systems activities

(1) A railway systems activity is any one or more of the following:

- *(a) installation of track,*
- *(b) on-site repair of track,*
- *(c) on-site maintenance of track,*
- *(d) on-site upgrading of track,*
- *(e) construction or significant alteration of any of the following, but only if it is connected with an activity listed in paragraphs (a)–(d):*
  - *(i) over track structures,*
  - *(ii) cuttings,*
  - *(iii) drainage works,*
  - *(iv) track support,*
  - *(v) earthworks,*
  - *(vi) fencing,*
  - *(vii) tunnels,*
  - *(viii) bridges,*
  - *(ix) level crossings,*
- *(f) operation of rolling stock on track.*

(2) The following activities are not railway systems activities:

- *(a) activities in railway workshops (including the use of fuel burning equipment),*

(b) re-fuelling of rolling stock,

(c) activities at railway fuel depots,

(d) repair, maintenance or upgrading of track away from the track site,

(e) activities at railway station buildings (including platforms and offices),

(f) loading of freight into or onto, and unloading of freight from, rolling stock,

(g) activities at freight depots or centres,

(h) operation of signalling, communication or train control systems.

(3) In this clause:

***rolling stock** means:*

(a) rolling stock used or intended to be used to transport passengers or freight for reward, or

(b) rolling stock used or intended to be used to maintain track and equipment (whether or not for reward),

but does not include rolling stock used or intended to be used solely for heritage purposes.

***track** means railway track that forms part of, or consists of, a network of more than 30 kilometres of track and that is not solely used for heritage value rolling stock.'*

The proposed development includes the installation of track that forms part of a network of more than 30 kilometres of track, and would be classed as a scheduled activity. However, RailCorp already holds a licence under the POEO Act for the entire rail network. This licence covers the construction of sidings, loops, refuges and yards, where it can be shown that there would not be a significant noise impact on surrounding residents. As discussed in Section 3.6, the proposed development would not result in significant noise impacts. As such, the proposed works are covered by the existing RailCorp network licence.

The proposed development would fall within the activities outlined in subclause (1) for the Down Relief upgrade works (i.e. 'on-site upgrading of track') or subclause (2), in particular 'activities in railway workshops'. As such, the maintenance facility component of the proposed development would not require a licence under the POEO Act.

The POEO Act also permits (but does not require) a licence to be issued for a non-scheduled activity for the purposes of regulating water pollution. Compliance with the conditions of such a licence provides a defence to the offence of polluting waters under Section 120 of the Act. The PPP contractor may therefore decide to obtain an Environment Protection Licence for construction works under Section 43(d) of the POEO Act.

Other general requirements of the POEO Act that are relevant to the proposed development include:

- Any hazardous waste must be stored in an environmentally safe manner and not come into contact with any incompatible waste;
- Waste must be transported only to a controlled waste facility, or to a waste facility that can lawfully receive waste;
- Transport vehicles must be kept in a clean condition and be constructed and maintained so as to prevent waste spillage;
- Transport vehicles must be covered when loaded so as to prevent spilling and loss of waste and to prevent emission of odours; and
- The waste transporter must have a licence to transport waste.

These requirements would be incorporated into both the Project Environmental Management Plan and the PPP Contractor's Environmental Management Plan that would be prepared once approval to proceed with the proposed development is received.

Rivers and Foreshores Improvement Act 1948

Approval from DIPNR under Part 3A of the *Rivers and Foreshores Improvement Act 1948* is required to:

- Excavate or remove material from the bank, shore or bed of any stream, estuary or lake, or land that is not more than 40m from the top of the bank or shore of protected waters;
- Build erosion control works or other structures in a river, estuary or lake; or
- Place any fill material in a river, estuary or lake.

Works in relation to the connection of new rail tracks to existing tracks will be carried out within 40m of the Duck River. Consequently, it may be necessary for the PPP contractor to obtain an approval under the *Rivers and Foreshores Improvement Act 1948.*

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. A Species Impact Statement is required if there is likely to be a significant impact on a threatened species, population or ecological community or its habitat.

Section 3.3 provides a description of potential ecological issues associated with the proposed development, and mitigation measures including implementation of the draft Recovery Plan for *Wahlenbergia multicaulis*.

1.5.10 Licences and approvals

Table 1 provides a summary of approvals required before works can commence on the site.

Table 1 Summary of approvals required

Legislation	Approval	Agency
Heritage Act 1977	Section 140 Excavation Permit	NSW Heritage Office
State Environmental Planning Policy No. 55 – Remediation of Land	Development Consent for Category 1 remediation work	Auburn Council
Environmental Planning and Assessment Act 1979	Part 5A certificate for Crown building work	Certified by an or behalf of the Crown (RailCorp)
Rivers and Foreshores Improvement Act 1948	Part 3A Permit	Department of Natural Resources
Protection of the Environment Operations Act 1997 (PPP contractor only)	Part 3.2 Licence	Department of Environment and Conservation

As discussed in Section 1.5.9 above, RailCorp holds an Environment Protection Licence (No. 12208) for the rail network. The relevant conditions of this licence, in particular Operating Condition Nos. O1, O2, O3, and O4 must be complied with.

2. The Project

2.1 Strategic context

2.1.1 Relationship to rail network

The Sydney metropolitan rail network transports an estimated 900,000 passengers on a daily basis using a fleet of more than 1,500 carriages. The infrastructure required to operate the network includes:

- Over 2,000 kilometres of rail lines and tracks;
- 304 operating passenger stations and associated infrastructure including waiting rooms and car parking;
- Approximately 2,500 rail signals and switch boxes;
- Stabling yards; and
- Maintenance and carriage upgrade workshops.

2.1.2 Replacement of existing rolling stock

RailCorp's core business is the safe provision of rail services to customers. In order to achieve this it requires an appropriate number of trains of the required standard and reliability to be available to operate the timetabled services. Its electric fleet currently comprises about 1,500 cars including 498 non air-conditioned cars that are between 23 and 32 years old. These 498 cars lack critical customer features, have reducing reliability and are approaching the end of their economic life of around 35 years. RailCorp and the NSW Government have decided to improve the level of service offered to customers by replacing them with modern, reliable, air-conditioned trains.

On 31 August 2004, RailCorp issued an invitation for Expressions of Interest (EOI) from private companies for the replacement of rolling stock. As previously stated, this will be in the form of a public private partnership (PPP). As outlined in the EOI Invitation, the objectives for the PPP are as follows:

- Procure a modern, safe, well maintained, reliable fleet of air-conditioned rolling stock for the CityRail travelling public by the end of 2010;
- Minimise fleet whole of life costs and deliver demonstrable value for money;
- Support a contestable marketplace for the supply, maintenance, modification and refurbishment of electric passenger rolling stock;
- Ensure the PPP is consistent with the provision of secure employment and skills upgrading for current passenger fleet maintenance employees; and
- Deliver the PPP in accordance with applicable standards and procedures, including the ‘Working with Government - Guidelines for Privately Financed Projects’ (Working with Government Guidelines).

The PPP involves:

- The financing, design, manufacture and commissioning of the Cars;
- The financing, design, construction and commissioning of a new Maintenance Facility (the subject of this REF);
- The financing, design, construction and commissioning of new Simulators and training terminals;
- The provision of the Required Availability;
- The provision of Through Life Support for the Cars, the Maintenance Facility and the Simulators;
- The decommissioning and disposal of the Cars (other than Cars in respect of which RailCorp exercises its option to acquire); and
- The handover to RailCorp of the Maintenance Facility and, if RailCorp exercises its option to acquire any Cars, those Cars.

2.1.3 Objectives of the proposed development

The objective of the proposed development is to provide a facility to enable minor assembly finishing of new cars prior to entry into service, and the servicing and maintenance of new and existing rolling stock by the PPP contractor for approximately 30 years. The facility may continue to be used for these purposes beyond the contract with the PPP contractor.

The proposed development will play an important role in ensuring that fleet assembly is finished, that engineering and safety specifications of rolling stock are met and that rolling stock is adequately maintained, cleaned and repaired.

An additional objective of the facility is to enable the facility to enable future upgrades of existing or future rolling stock as required.

The purpose of the upgrade of the Down Relief is to provide access from the running lines to the Manildra and the MainTrain and PPP Maintenance Facilities and to provide a location for some of the testing and commissioning activities for the new rolling stock.

The proposed Auburn Maintenance Facility and upgrade of the Down Relief are therefore a critical part of the wider rail network to ensure the network can operate efficiently to designed capacity and that rolling stock is presented for ready usage.

2.2 Project description

The proposed development forms part of RailCorp's overall strategy to improve fleet servicing facilities through a Design, Build, Maintain and Finance (DBMF) framework. This framework involves active participation of private sector companies (through Public Private Partnerships or PPP) to build and operate part of the development. The privately operated facility will return to RailCorp ownership after the PPP contract expires. The activity described in this REF is proposed to be carried out by the PPP contractor by or on behalf of RailCorp.

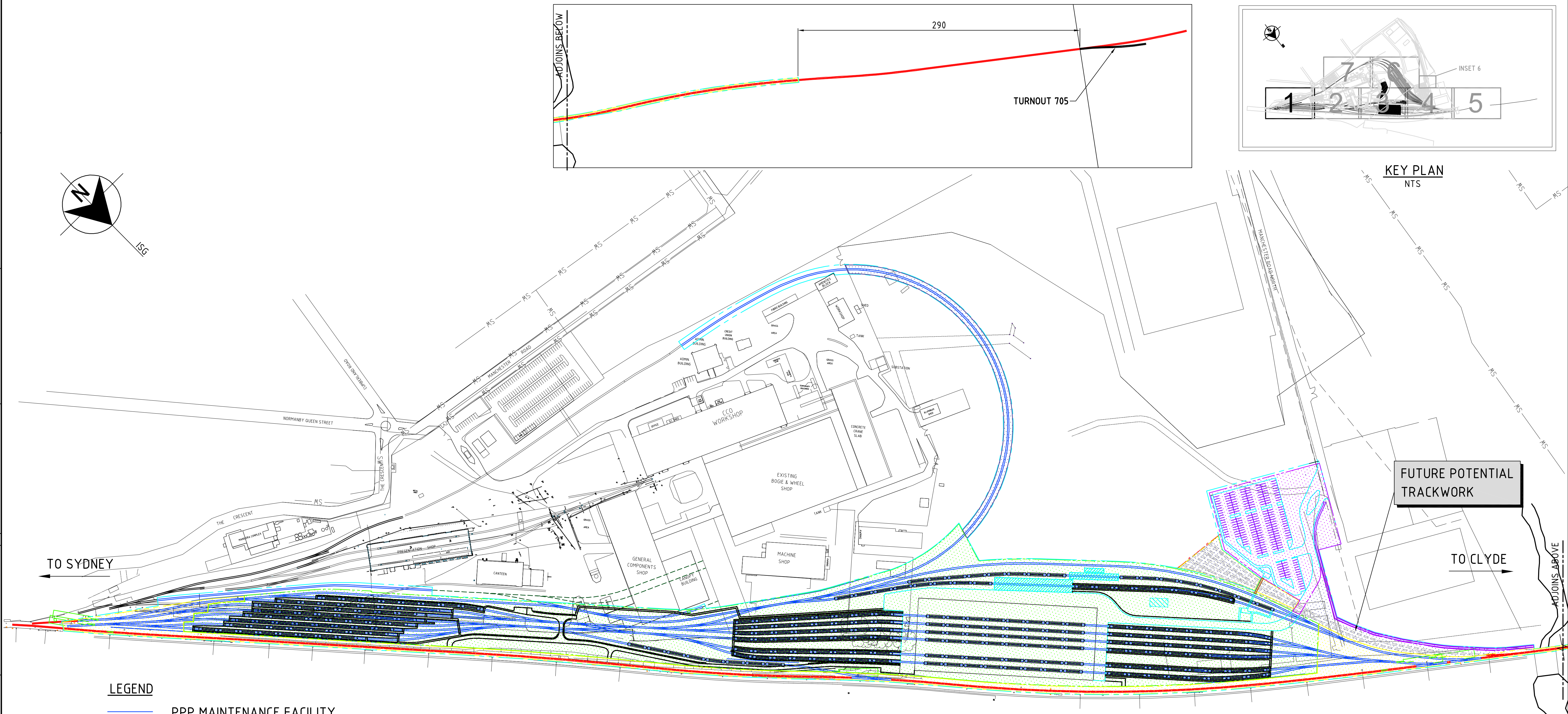
The proposed development that is the subject of this assessment is the construction and operation of a fleet servicing and maintenance facility. The proposed development comprises works within the PPP site, upgrade of the Down Relief line and works within the existing MainTrain site to facilitate handing over part of the site to the PPP project (PPP site). This involves a range of activities including:

- Existing MainTrain area:
  - Demolishing some existing buildings;
  - Constructing an extension and canopy to the existing Bogie Shop, a canopy to the existing General Components Shop, and a new Wheel Lathe Shed to replace those demolished above;
  - Modifying existing rail track alignments; and
- PPP area:
  - Relocating temporary buildings and services, and provision of new services;
  - Modifying existing rail track alignments;
  - Constructing additional rail track alignments and sidings; and
  - Constructing a new fleet servicing building, and associated infrastructure, for use by the PPP contractor;
  - Constructing new servicing building for train wash and wheel profiling to be operated by a PPP contractor to service PPP and RailCorp rolling stock;
  - Provision for an internal access roads, including a road extending off the existing RailCorp Private Road;
  - Internal maintenance and standing rail roads;
  - Provision for car parking and staff access;
  - Operation of a fleet finishing, servicing, maintenance and upgrading facility, including;
    - Minor finishing works of rolling stock;
    - General maintenance works;
    - Testing and commissioning activities; and
    - Current and future rolling stock upgrade works.
  - Down Relief upgrade area:
    - Down relief track upgrade of approximately 2 km in length

Figure 3 illustrates the overall layout of the proposed development for works within the MainTrain, PPP areas and Down Relief upgrade works.

It is also proposed that part of the site comprising the PPP Maintenance Facility would be leased for a period of approximately 30 years and this may require the subdivision of land. The indicative area of land for which the subdivision may be effected is shown on Figure 4 (NB This figure does not illustrate the extent of all works proposed but rather the approximate lease and license boundaries for the proposal). When the precise boundary of the land to be subdivided is known the relevant requirements to effect the proposed subdivision will be undertaken. The subdivision of land is an

‘activity’ under Part 5 of the EP&A Act. The proposed lease of the land and consequential subdivision is ancillary and incidental to the use of the land for the purpose of the Maintenance Facility as assessed in this REF.



PLAN
1:2000

LEGEND

- PPP MAINTENANCE FACILITY
- RAILCORP WORKS
- MAINTRAIN WORKS
- EXISTING TRACK
- CONSTRUCTION BOUNDARY
- LEASE BOUNDARY
- LICENCE BOUNDARY
- LEASE AREA
- CARPARK AREA
- PEDESTRIAN CROSSING AREA
- FUTURE RAILCORP FACILITY AREAS
- MAINTENANCE FACILITY ACCESS AREAS

06

40 20 0 40 80 120 160 200m
SCALE 1:2000

AMD	REFERENCE	DESCRIPTION	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
06	09.11.06	REFERENCE DESIGN REVISION		
05	10.10.06	REFERENCE DESIGN REVISION		
04	09.10.06	REFERENCE DESIGN REVISION		
03	04.10.06	REFERENCE DESIGN REVISION		
02	29.09.06	REFERENCE DESIGN REVISION		
01	24.07.06	REFERENCE DESIGN ISSUE		

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DRAWN AB
DESIGNED DK
DRG CHECK ARTS
DESIGN CHECK
PR
APPROVED

RailCorp Design accepted for use by RailCorp

ROLLING STOCK PPP PROJECT

RAILCORP MAINTENANCE FACILITY
REFERENCE DESIGN

BOUNDARY GENERAL ARANGMENT ©

FILE No. 17261 | SHEET 1 OF 1 | A1

STATUS: REFERENCE DESIGN REVISION

CV0405189 | 06

DF 801*554

Cad File: P:\17261\CAD\Drg\CV\17261-CV0405189.dwg Plot Date: 4/10/2006 11:53:57 AM Name: StephensA Xrefs: x-17261-ci-survey-pl500;x-17261-ut-Syd-Water;x-17261-ra-legend;x-17261-el-

2.2.1 Design parameters

Rail track alignment modifications and extension

The proposed development includes modifications and extensions to the existing rail track alignments on the site. These rail tracks provide access for rolling stock into workshops for maintenance and repairs. The proposed development involves tracks that will be used for shared uses, and tracks that will be used for private use under the PPP arrangement.

The shared use track alignments include new tracks for access into the existing MainTrain site. The shared tracks also include a MainTrain car turning loop and access to the proposed shared workshop for wheel profiling and train wash. A shared use bypass track of the facility is also proposed.

For the PPP Workshop the proposed track alignments include sidings of which are approximately 200m in length and additional alignments for access.

Shared workshop uses

Workshops for train washes and wheel profiling are proposed to be built adjacent to the pedestrian underpass. The workshops are to be operated by the PPP company on the site and will service PPP and RailCorp rolling stock. The construction of these plants may be staged to reflect the demand for the services provided.

PPP workshop

The PPP Workshop is marked 'PPP Maintenance Building' on Figure 3. The facility is to be located on the northern end of the site, and will occupy an area of approximately 1.8 hectares. The workshop can house seven adjacent 8-car trains (a length of approximately 192 metres), associated workshop infrastructure and maintenance roads. The workshop would be approximately 15 metres in height.

A detailed design of workshops along guidelines specified by RailCorp will commence once the tendering stage for the PPP contract has been awarded.

Access and parking

A new access point, including gatehouse, will be constructed off the northern part of the existing RailCorp Private Road, which connects to the public road network at the intersection of Manchester Road and Chisholm Road. This road will provide access to the facility for employees, visitors and deliveries.

All access roads within the site will be sealed.

Pedestrian access to the site will also be available to the site via the existing pedestrian access from Clyde Railway Station.

A car park containing approximately 220 spaces will be constructed adjacent to the access road, providing parking for staff and visitors.

A grade separated pedestrian crossing is proposed to the north of the proposed PPP workshop, to provide safe access for employees from the car park, to and from the workshop.

Down Relief upgrade

The proposed development includes the construction and operation of a Down Relief track of approximately 2 km. The purpose of the works on the Down Relief is to recommission the track, turnouts, overhead power, signalling etc so that this section of the rail network can provide rail access from the main rail lines in the Auburn corridor to the Auburn maintenance facilities and serve as a relief rail line so that trains can be diverted onto this section of track whilst maintenance works in the Auburn to Granville rail corridor are being carried out.

The Down Relief will also provide access to the new PPP Maintenance Facility and act as a commissioning track for some of the testing and commissioning activities for the new PPP rolling stock so that they can be accepted for entry into service (currently anticipated to be between approximately 2009 and 2014).

Utility connections and upgrade

The proposed development requires a need for upgraded and new utility services such as electrical power, water, sewer, gas, telecommunications, etc. The connections and upgrades would ensure that the proposed development has access to basic utility services to operate as intended.

It is anticipated that these may be located within areas surrounding the site and some will be within parts of Private Road owned by RailCorp between Chisholm Road and the site.

Operation

MainTrain facility

The existing MainTrain facility operates up to 24 hours per day, seven days per week. Operating hours at the existing MainTrain facility will not change as a result of the new proposed development.

All of the RailCorp electric fleet and on occasions RailCorp and other operators' diesel locomotive and other carriages access the existing MainTrain site and this will continue.

PPP facility

The PPP facility will operate up to 24 hours per day, seven days per week, consistent with the MainTrain facility. There is a need for facilities such as that proposed to operate at these times in order to meet the demands for reliability and availability of rolling stock.

The PPP facility would provide for minor finishing works such as delivering and installing minor components (e.g. air conditioning and train radio components) and testing and commissioning of new rolling stock prior to entry into service. Finishing

works (including testing and commissioning) are currently anticipated to be undertaken during 2009 – 2014.

The facility would primarily operate as a maintenance facility, ensuring that new and existing rolling stock is ready for operational use on a day-to-day basis.

In addition, if required, the facility would enable future upgrade works on existing rolling stock. Recent examples of similar works include door interlocking upgrades and vigilance control upgrades.

The PPP site may also be accessed for train wash, wheel profiling, maintenance and upgrade works by the other fleets referred to above after the facility is completed in approximately 2009.

2.2.2 Construction activities

To enable the proposed development to be constructed, some works need to be carried out within the existing MainTrain site.

This includes:

- Demolishing some existing buildings and parts of buildings on land currently within the MainTrain lease area that will become part of the PPP site;
- Rearrangement of operations within some buildings affected by the demolition works;
- Constructing new buildings to replace some of those demolished above (new stores building);
- Modifying some existing rail track alignments to accommodate the above works; and
- The works on the Down Relief works, include upgrade of:
  - Earthworks and drainage;
  - Minor civil works (e.g. retaining walls);
  - Track work;
  - Overhead traction electrical work; and
  - Signalling and communications work.

2.2.3 Timing

The program for the PPP works cannot be confirmed until the contracts with the PPP company are executed. The duration of the works will also depend on the design solutions proposed by the PPP company.

However, based on the anticipated design, the MainTrain works are expected to take approximately 18 months, and the PPP works are expected to take approximately 30 months. These works would be undertaken concurrently.

The timing of works for the Down Relief involves a start at the end 2006 with an approximate finish of 2009 when the track is finally commissioned.

2.3 Alternatives

2.3.1 Options considered

The following factors were considered when reviewing alternatives and identifying potential sites:

- The do-nothing option was not considered to be satisfactory as the new rolling stock will require maintaining for the duration of its life;
- As the project will be carried out as a PPP project, a new maintenance centre, to be built and operated by the PPP contractor, is required and a commercial decision was made not to use existing maintenance facilities in the metropolitan area, based on site constraints;
- Sites outside the metropolitan area were excluded due to operational considerations, particularly distances required in transporting rolling stock to the maintenance facility. The additional distance required for carriages requiring maintenance would create issues with the length of time the carriages are out of services, and relating to the scheduling of the transfer of these carriages to the maintenance facilities; and
- The site within the metropolitan area for the proposed development would need to be:
  - Located adjacent to a rail line in a central part of the network (a location on a branch line would not be suitable) in order to facilitate access to the depot, minimise the running of 'ghost trains' on the network, and minimise the length of time carriages are out of service;
  - Preferably not located immediately adjacent to residential and other sensitive land uses;
  - Of adequate size to accommodate the facility;
  - Owned by RailCorp so as to avoid acquisition of a new site; and
  - Readily available.

The proposed Auburn site was the only site that met these criteria and in addition it has also had a long history of rail-related use.

2.3.2 Justification of chosen option

The extent of RailCorp land at the Auburn site is a significant benefit in that acquisition of private and or other public land is not required.

The larger site is also currently used for rail maintenance purposes, ensuring that the proposed new facility will not result in a significant alteration in land use. The site also has a long history of rail-related use.

The site is also not readily suitable for uses other than rail, given the extent of rail-related development nearby, and the rail zoning of the site.

3. Assessment of the Environmental Impacts and Risks

3.1 Landforms, geology and soils

3.1.1 Existing environment

Topography

The topography of the study area is level to hummocky and has been extensively disturbed by human development. The land has been levelled and slopes do not generally exceed more than 3%. However there are areas of cut and fill in which short rises may be steeper (up to 30% +).

Geology

The Geological Survey of NSW, *Sydney 1:100,000 Geological Series Sheet* identifies the geology as follows.

- The north western portion of the PPP work area is reported to be underlain by silty to peaty quartz sand, silt and clay. Ferruginous and humic cementations are noted to occur, and shell layers are also noted to be common. These sediments are associated with the fluvial paleoenvironment of the Duck River.
- The remainder of the PPP work area is underlain by Ashfield Shale, of the Wianamatta Group, which consists of black to dark grey shale and laminite. It is unclear however, how far the fluvial sediment of the Duck River extends. It is likely that the Ashfield Shales would be overlain by fluvial sediment, to varying thicknesses, across most (if not all) of the subject site.

Soils

The Soil Conservation Service of NSW, *Sydney 1: 100, 000 Soil Landscape Series Sheet 9130* indicates that the site is located within a disturbed terrain unit. Soils within the area are reported to be commonly capped with up to 40 cm of sandy loam or up to 60 cm of compacter clay over fill or waste materials.

The site has a long history of rail related uses, and has been extensively filled. Fill material was noted in all sampling locations at depths of up to 5 m below ground surface.

Contamination

A contamination assessment of the PPP work area was conducted by GHD (GHD 2005a, GHD 2005b), to determine the PPP work area's suitability for the proposed development.

The contamination assessment concludes that the site is not subject to widespread contamination that would preclude the use of the site for its proposed redevelopment for rail related purposes. However, fill material on the site appeared to be subject to relatively high levels of contamination (in the form of lead) at three sampling locations

and to a lesser extent benzo(a)pyrene at one location, as shown in Figure 5 and Figure 6. The reported lead and benzo(a)pyrene concentrations would likely necessitate remediation, to permit the sites use for commercial or industrial purposes.

In addition, asbestos was reported within one sample of near-surface fill submitted for analysis, and occasional fragments of fibro were identified scattered across the surface of various parts of the site.

The presence of a possible hydrocarbon odour and potentially a liquid petroleum product was also detected at one sampling location. Results from this location indicate that concentrations of total petroleum hydrocarbons (TPH) were below the relevant criteria.

Hydrogeology

The *Groundwater in New South Wales – Assessment of Pollution Risk, 1: 2 000 000* indicates that the groundwater flowing beneath the site is likely to be found in Ashfield Shale, a consolidated sediment of low permeability. Thus it is anticipated that the groundwater yield from beneath the site will be low. In addition, the principal groundwater flow path through the Ashfield shale is likely to be within cracks and fissures in the rock, and is likely to be characterised by low groundwater velocity. Thus the likelihood for potential migration of contaminants, through the Ashfield Shale underlying the majority of the site, is low. This is supported by the reportedly low number of groundwater bores within the Wianamatta Group.

Whilst the majority of the site is characterised by Ashfield shale, the north western portion is reported to consist of silty to peaty quartz sand, silt and clay. These sediments are of greater permeability than Ashfield shale, and thus groundwater (if any) borne within these sediments is likely to be of increased yield and velocity, in comparison to that borne within Ashfield Shale.

It is believed that while some water will exist within the fill material and above the bedrock this is the result of infiltration only and true groundwater is located below the bedrock. HLA Envirosciences reported (July 2001) that groundwater existed at depths varying from 5m to 8m, however no groundwater was encountered during the recent investigation despite depths of 6.5m being reached.

3.1.2 Impact assessment

Topography

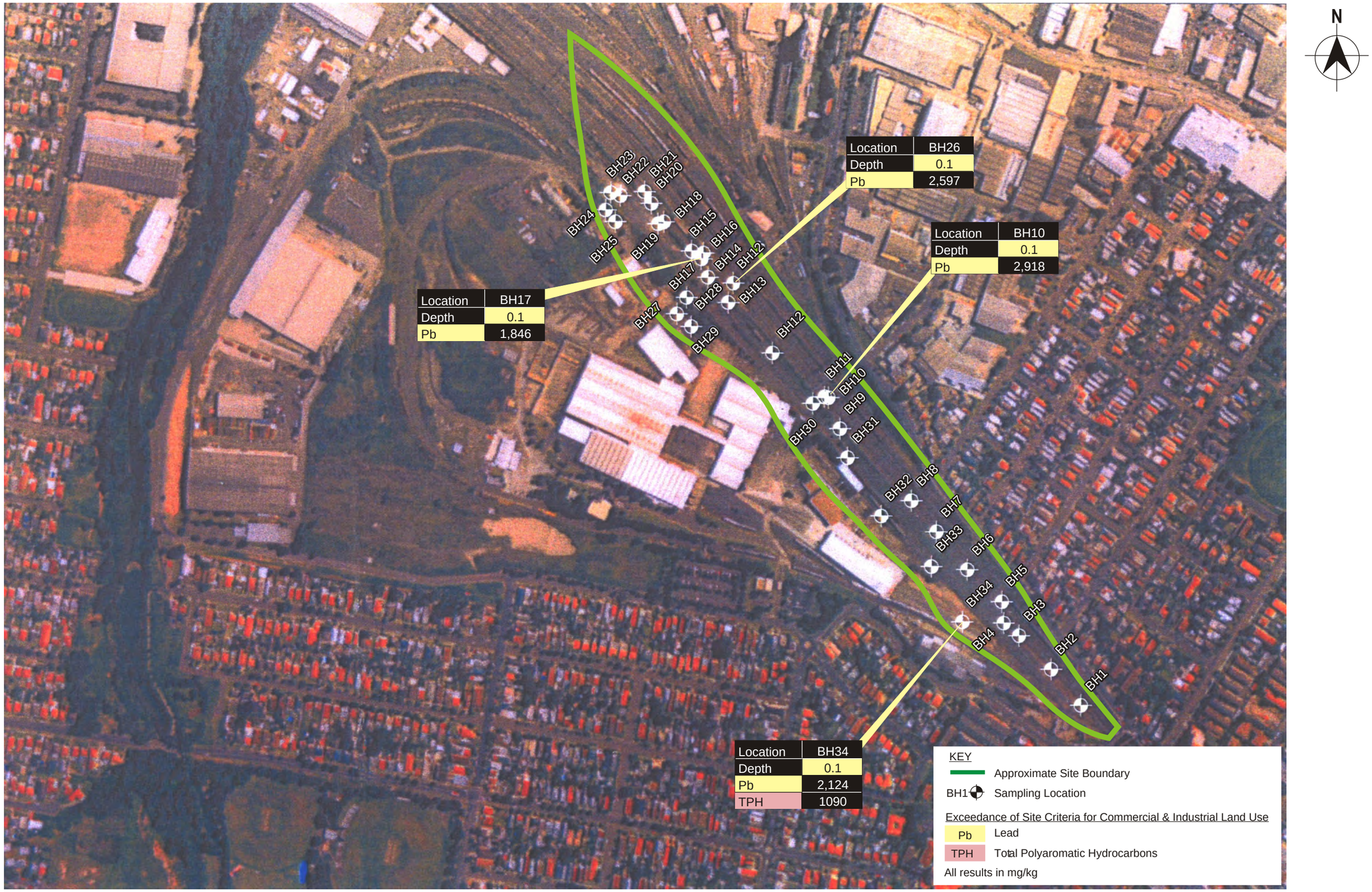
The proposed development involves some excavation to enable the construction of the maintenance facility, as well as the pedestrian tunnel. However, this excavation will not dramatically alter the existing topography of the site.

Geology

The proposed development will not alter the characteristics of the underlying geology of the site. No specific impacts are identified as a result of the underlying geology.

SAMPLING LOCATIONS & EXCEEDANCES

RAILCORP - CLYDE RAIL YARD (OFF MANCHESTER ROAD), CLYDE, NSW



Date : 17 January 2005

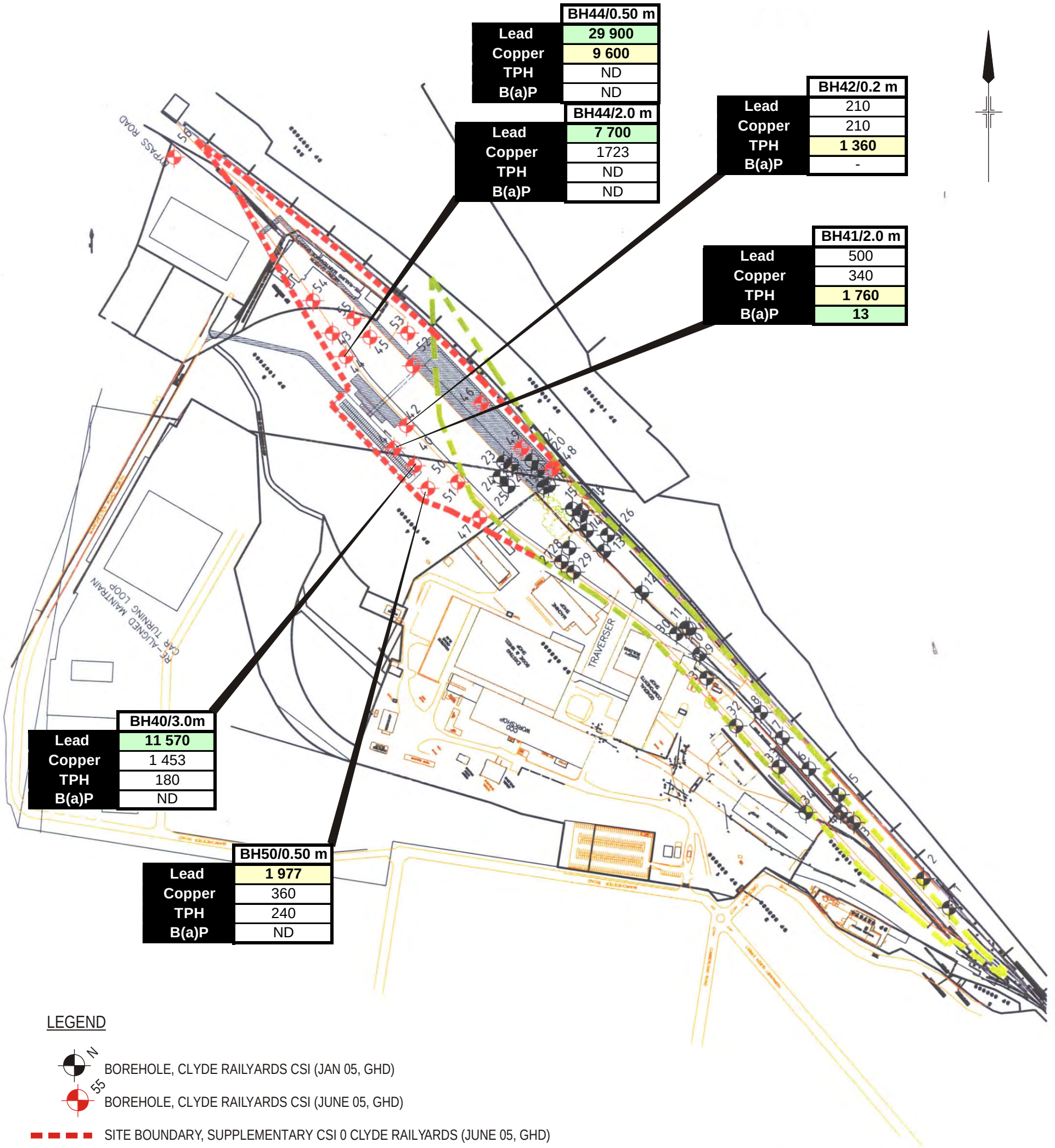
File Name : 2113238_LTN_04.cdr

GHD

Figure 5

SAMPLING LOCATIONS AND EXCEEDANCES

RAILCORP - CLYDE RAIL YARDS
ADDITIONAL INVESTIGATION



LEGEND

- BOREHOLE, CLYDE RAILYARDS CSI (JAN 05, GHD)
- BOREHOLE, CLYDE RAILYARDS CSI (JUNE 05, GHD)
- SITE BOUNDARY, SUPPLEMENTARY CSI 0 CLYDE RAILYARDS (JUNE 05, GHD)
- APPROX SITE BOUNDARY, CLYDE RAILYARDS, (JAN 05, GHD)

	Sample ID
Analyte	Concentration mg/kg
Analyte	**Concentration exceeds the HIL F**
Analyte	**Concentration exceeds the NEPM 250% hospot criteria for the HIL F**
-	Not analysed
ND	Not detected

Date: June 2005

Figure 6

Soils

The land surface would be disturbed during construction activities and this would expose soil to the effects of erosion and sedimentation, which may in turn impact on water quality. Given the relatively small area of land to be disturbed and the limited extent of the earthworks, these impacts are considered to be of minor significance and would be managed by implementation of mitigation measures. The proposed maintenance facility development does not involve any activities in the immediate vicinity of any waterways, however, a minor part of the Down Relief to be upgraded is located on the existing bridge over Duck River. In addition the Down Relief ties into tracks to the new Maintenance Facility. The track ties are within 40m of Duck River. Appropriate mitigation measures are recommended to minimise the potential impact of this work.

Contamination

In order for the site to be considered suitable (from a soil contamination perspective) for its proposed use, remediation of the apparent lead and / or benzo(a)pyrene 'hotspot' areas should be undertaken. The most practical remediation option for the lead and benzo(a)pyrene impacted fill material would likely be the excavation and removal of the impacted fill material from the site and subsequent validation of surrounding soils. Furthermore, some supplementary validation works are likely to be necessary to ensure no widespread contaminant 'hotspots' remain elsewhere across the site.

Hydrogeology

The proposed development would not involve any activities, such as major cut and fill operations that would impact on hydrogeology.

3.1.3 Mitigation measures

General mitigation measures for the proposed development

Soils

- A Soil and Water Management Plan (SWMP) would be prepared as part of the PPP Contractor's Environmental Management Plan (EMP) for the proposed development prior to the commencement of construction. The SWMP would incorporate specifications outlined in the *NSW Erosion and Sediment Control Handbook No. 2*, identify areas requiring management controls, and include inspection and checklist sheets;
- The SWMP would include an Erosion and Sedimentation Control Plan (ESCP) and a maintenance schedule for on-going maintenance of temporary and permanent sedimentation controls;
- Progressive and minimal removal of vegetation would limit the area and duration that soils are exposed. Disturbed areas would be stabilised progressively to ensure that no areas remain unstable for any extended length of time. This would involve seeding, fertilising and mulching of disturbed areas;

- Following earthwork activities, regular inspections of the worksite would be undertaken during construction to ensure that the SWMP was continuing to be implemented properly;
- Environmental audits would be undertaken of the site on a regular basis. The schedule of audits would be specified in the EMP.

Contamination

- The apparent lead and / or benzo(a)pyrene 'hotspot' areas are to be remediated prior to work commencing;
- Additional investigations be undertaken in the area of possible TPH contamination in order to determine whether an underground tank or other hydrocarbon source may be present in this area. Should this be the case, the affected area to be appropriately remediated prior to work commencing;
- As asbestos has been identified, WorkCover 2003 guidelines specify that:
  - A permit must be obtained from WorkCover before any works commence on the site;
  - The works must be supervised by a licensed asbestos removal contractor with an AS1 licence;
  - During redevelopment if contamination is encountered, all workers are to wear additional personal protective equipment comprising a Type 1 or Type 2 mask, and disposable overalls; and
  - Asbestos contaminated soil must be disposed to an appropriately licensed landfill.
- A Remedial Action Plan (RAP) is to be developed for the site, addressing the remediation of the identified contaminated hotspots, potential underground tank, and asbestos;
- As the remediation would be defined as Category 1 remediation work under SEPP 55, development consent for the remediation is to be obtained prior to remediation works commencing;
- In the event that indications of additional contamination are encountered (i.e. odorous or visually contaminated materials) as a result of exposure of sub soils during redevelopment, work in the area should cease until an environmental consultant can advise on the need for remediation or other action, as deemed appropriate;
- If materials are to be stockpiled the following environmental controls must be implemented:
  - If potential contamination is suspected stockpiled materials should be placed on a hard standing or a physical barrier should be placed between the ground surface and the stockpiled materials in order to prevent the underlying soils from becoming impacted via leaching.
  - Dust suppression measures should be implemented (wetting, covering or stabilisation of the stockpile).

- Run off should be controlled (by using hay bales and / or sediment fences).

- Where soil is to be removed from the site, it must be classified for waste disposal purposes, and disposed of in accordance with the requirements of the *Protection of the Environment Operations Act 1997 (POEO Act), the Waste Regulation, 1996 made under the POEO Act, and the NSW EPA Guidelines: Assessment: Classification and Management of Liquid and Non Liquid Wastes*;
- No specific legal requirements exist in relation to sampling and testing of stockpiled materials, however, the NSW EPA recommends a nominal sampling density of one sample per 25 m^3 for stockpile characterisation (NSW EPA, 1994);
- Samples should be analysed for potential contaminants of concern (i.e., asbestos), if the potential contaminant of concern is not known, a broad suite of contaminants should be analysed;
- Depending on the classification of the waste, the generator may need to use a licensed transporter and waste materials must be disposed of an appropriately licensed landfill;
- Appropriate documentation should be maintained.

Mitigation measures specific to the Down Relief works

- Allocate a specific storage site for after hours stabling of plant and equipment with the appropriate level of containment controls for oil leaks and impact on soil contamination due to vandal activities;
- Regularly inspect and maintain containments controls;
- All construction materials including construction waste / surplus project railway infrastructure / ballast to be removed off site for proper disposal, storage and/or recycling; and
- A detailed Re-vegetation / Landscape Plan is to be in place and should include a post planting maintenance phase.

3.2 Climate

3.2.1 Existing environment

The climate of the site is mostly governed by Sydney wide regional climatic influences such as wind speed, cloud cover and precipitation. The climate is also governed by seasonal variances – summer / winter – and diurnal variances – night / day.

The existing built and natural form also influences climate. For example, large exposed concrete areas in contrast to shady natural areas can influence temperature levels. The built form and siting of buildings can also increase wind velocity and reflectivity, while also providing shelter from the climate.

The site consists of a relatively large area of human built form and includes an array maintenance sheds in differing sizes and locations.

3.2.2 Impact assessment

The proposed development is too small to regionally influence the climate directly and no further assessment of such impacts is necessary.

The proposed development would not result in significant wind tunnelling impacts or reflectivity. The siting of maintenance sheds as stand-alone sheds in a relatively open area discounts wind-tunnelling impacts. Materials would be chosen to limit instances of glare.

The proposed development would create positive opportunities for employees to seek cover from harsh climatic elements and events.

Due to the limited ability of the proposed development to influence both the regional and micro climatic environment, there will be limited impact on employee discomfort, wind tunnelling and reflectivity as a result of the proposed development.

3.2.3 Mitigation measures

As impacts are limited, no specific mitigation measures are recommended.

3.3 Flora and fauna

3.3.1 Existing environment

A flora and fauna desktop search of the NSW Department of Environment and Conservation (DEC) and the Commonwealth Department of Environment and Heritage (DEH) was undertaken. This indicated that the following endangered species and communities may occur in the Auburn LGA:

- *Lathamus discolour* (Swift Parrot);
- *Xanthomyza phrygia* (Regent Honeyeater);
- *Dasyurus maculatus* (Spot-tailed Quoll, Spotted-tail Quoll and Tiger Quoll);
- Cumberland Plain Woodland; and
- Shale/Sandstone Transition Forest.

During the preparation of this REF a draft Recovery Plan was provided by DEC that identified the potential habitat for *Wahlenbergia multicaulis* (Tadgell's Bluebell) – an endangered population – along the western boundary area of the Clyde Marshalling Yards abutting Duck River. The information in the draft Recovery Plan was considered insufficient due to a lack of historical records/sightings or reliable survey data to clearly identify whether there were any of the endangered population on the site of the proposed development.

Consequently, an ecological survey with appropriate scientific integrity was undertaken on the site of the proposed development on 21 November 2006 to determine the existence and potential extent of the endangered *Wahlenbergia multicaulis* population within the site. Samples of *Wahlenbergia* species collected during this survey were sent to the Royal Botanic Gardens for verification. Two species of *Wahlenbergia* were

confirmed as being present within the study area (*Wahlenbergia gracilis* and *Wahlenbergia stricta)*. No *Wahlenbergia multicaulis* were found during this survey.

During the above survey, Flying-foxes, which may include the *Pteropus poliocephalus* (Grey-headed Flying-fox) – a threatened species - were sighted roosting in Willows (*Salix* sp) along Duck River, which is outside the area of the proposed development.

The site also has a number of planted mature native and exotic trees including eucalyptus and jacarandas. Other vegetation includes noxious weeds, native bushes and grasses and medium to large shrubs. Although the weeds are dispersed throughout the entire site, the location of trees, bushes and shrubs occur in a concentrated and clustered fashion in the centre of the site. Although highly disturbed, the site offers some ecological value for flora and fauna. Disturbance adaptable bird species, reptiles and small mammals may use the site.

Nearby Duck River has been extensively altered due to the removal of vegetation for residential and industrial land uses, although parts of the river are undergoing rehabilitation by bush regeneration groups. Domestic pets and animals from nearby residential areas may also use the site for foraging.

3.3.2 Impact assessment

No samples of *Wahlenbergia multicaulis* were determined to be present within the site area and, therefore, there will be no significant impact on the threatened population arising from the proposed development.

As a precautionary measure RailCorp has also undertaken further investigations of the area of the Clyde Marshalling Yards outside of the site of the proposed development and abutting Duck River. The purpose of this investigation is to identify the location, if any, of *Wahlenbergia multicaulis* in that area and to provide information to DEC with respect to the draft Recovery Plan.

Notwithstanding there is no indication that *Wahlenbergia multicaulis* is present on the site, any subsequent potential identifications of *Wahlenbergia multicaulis* will be addressed by on site documentation and, if appropriate, conservation measures developed through discussions between RailCorp (including the Safety and Environment Division), the PPP contractor and qualified botanists taking into account any applicable Recovery Plan.

Grey–headed Flying-foxes may be roosting in the Willows along Duck River. Having regard to the highly mobile nature of this species, impacts from the proposed development should be minimal.

In relation to the *Wahlenbergia multicaulis*, it was considered that a test of significance (7 part test) referred to in section 5A of the EPA Act does not need to consider the impact on the *Wahlenbergia multicaulis,* as a detailed survey, including sending samples of related species to the RBG found no evidence of this species occurring on the site. Having regard to the 7 part test in relation to the Grey-headed Flying fox it was determined that the proposed development is not likely to have a significant effect on this threatened species or its habitat.

3.3.3 Mitigation measures

General mitigation measures for the proposed development

- Remove only the trees and vegetation required to complete that stage of the work;
- All pesticides application must be in accordance with RailCorp Guidelines and relevant legislation, and contained within the defined scope of work;
- Monitor the work to ensure compliance with RailCorp Guidelines and relevant legislation; and
- Mitigation measures specific to the Grey-headed Flying foxes:
  - Care shall be exercised in conducting works on site during the breeding season for Grey–headed Flying-foxes. If it appears that breeding females, with dependent young, are roosting in close proximity they should be observed by an appropriately qualified person for the level of disturbance, noting that it is normal for small number of animals to take off, and re-roost a short distance away in response to minor disturbances. In the event that more than a small number of animals are disturbed (about 10) works in the area of the breeding females should cease and only recommence when the animals have settled and if this can be done without triggering further disturbance.

3.4 Water quality and hydrology

3.4.1 Existing environment

The majority of site construction and operation is located approximately 250m from Duck River, a tributary of the Parramatta River, which ultimately discharges into Homebush Bay. However, a minor part of the Down Relief to be upgraded is located on the existing bridge over Duck River. The Down Relief ties into tracks to the new Maintenance Facility, which is within 40m of Duck River.

It is anticipated that surface water runoff from the site (including the bridge over Duck River and the Down Relief) will ultimately discharge into the Duck River. This is due to the nature of the existing Duck River bridge structure for the Down Relief, the works associated with the drainage of the upgraded Down Relief and geology of the site. It is believed that the majority of rainwater will infiltrate the ballast and fill material and surface water runoff will be limited. Mitigation measures, as outlined below, will assist with minimising run off into the river.

Water quality in the Duck River is generally poor to very poor. In 2000, the Sydney Water Annual Environment and Public Health Report rated the Duck River as poor on the environmental value of secondary contact recreation (for example boating), and very poor on the following environmental values:

- Protecting the aquatic system from eutrophication (algal blooms);
- Primary contact recreation (for example swimming); and
- Human consumption of fish, shellfish and crustacea.

In particular, in 2000, the Duck River had median levels of both faecal coliforms and enterococci above the guidelines for primary-contact recreation (swimming) on dry weather days, as well as wet weather days.

Deoxygenation and fish kills are also reported as a problem in the upper estuarine part of the Duck River.

Flooding is known to occur along the Duck River.

3.4.2 Impact assessment

During construction, potential impacts are likely to be focused on erosion and sedimentation as a result of land disturbance. Erosion and sedimentation, if uncontrolled, could potentially have the following effects:

- Fluctuations in the stream flow characteristics;
- Increased sediment load and organic matter as a result of sediment loads and increased organic matter from construction site runoff, resulting in adverse impacts to benthic fauna;
- Reduction in photosynthetic productivity of water bodies from increasing turbidity;
- Reduction in channel habitat from sediment deposition;
- Scour of stream banks due to high discharge velocities and increased flows;
- Gross pollutants entering receiving creeks; and
- Declining water quality from the influx of man-made substances affecting the aquatic ecology.

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

In terms of operation, the proposed development would potentially increase the volume and rate of stormwater runoff due to an increase in paved and impervious areas. However this is not expected to be significant, as substantial areas of pervious surface will remain.

3.4.3 Mitigation measures

General mitigation measures for the proposed development

Potential impacts during construction would be controlled by implementing the following mitigation measures:

- Implementation of the mitigation measures identified in Section 3.1 in relation to erosion and sedimentation;
- Stockpiles would be located at least 50 metres from drainage lines or depressions (which could channel water during rain) and protected;
- The SWMP would address waste water discharge from surface washing, washing vehicles and plant, and washing out concrete mixers and concrete trucks;

- Concrete trucks would be directed to a dedicated area for washing out;
- Contingency plans would be developed to deal with any spills, which might occur during construction;
- Hazardous liquids such as fuels and chemicals are to be stored in secure compounds with an impermeable floor and be appropriately bunded in accordance with DEC requirements;
- Machinery would be checked daily to ensure there are no oil, fuel or other liquids leaking from the machinery;
- Plant including contractor's plant, is to be regularly inspected to ensure compliance with RailCorp Guidelines;
- Final cleanup after the works are complete would include removal of any erosion control devices, removal of any sediment in drainage lines, which has been trapped by erosion control devices, and revegetation of disturbed areas; and
- The environmental management plan is to detail Spill Kits to be kept on site.

Mitigation measures specific to the maintenance facility

During operation, the following mitigation measures would be implemented:

- All surface runoff would be captured and directed through appropriate detention and water quality controls (where necessary) and released in a controlled fashion; and
- Water quality treatment for runoff would include controls such as sedimentation basins (where the space is available) and gross pollutant traps to collect litter, gross pollutants and sediment.

3.5 Air quality

3.5.1 Existing environment

Local air quality is determined by the contributions of pollutants from sources such as emissions from the combustion of wood from domestic heating, from industry, from vehicles and wind blown dust and pollens. The dispersion characteristics are influenced by the topography of the area and the meteorology.

Due to the location of the Auburn maintenance facility there is likely to be a number of major sources of air pollutants that are related to urban development. The main sources of contributing to local pollution include:

- Parramatta Road, the M4 Motorway, St Hillers Road and Rawson Road catering for large volumes of daily traffic flow emitting vehicular pollution; and
- Existing industrial development that releases pollutants.

Although trains do not emit greenhouse gases directly, the combustion of fossil fuels to create electricity to power train transportation contributes to wider source of green house gas emissions.

3.5.2 Impact assessment

Construction

The proposed development has the potential to generate dust during construction. The volume of dust generated would depend on both the type of machinery and construction technique employed. The sources of dust during construction periods include:

- Excavation and filling of land;
- Vegetation and tree removals;
- Stockpiling materials;
- Loading and unloading equipment and construction materials;
- Disturbance to loose soils and materials by vehicles;
- Disturbance to loose soils and materials by wind and erosion; and
- Track works associated with the Down Relief upgrade.

Construction activities would require the use of heavy vehicles such as trucks, graders, excavators and cranes, which emit exhaust emissions. The impact of these emissions would be temporary in nature and limited to the period of construction only.

Operation

Trains are generally electrified and emissions occur at the point of combustion. Hence trains do not themselves emit combustion products. The operational increase in train movement at the site, and therefore the combustion products at power plants, is insignificant in the context of current rail and energy operations.

As the proposed development is generally within an area where there are multiple sources of pollution, cumulative operational emissions from the development are likely to be minimal and regional impacts on current air quality are considered to be unlikely.

3.5.3 Mitigation measures

General mitigation measures for the proposed development

To minimise dust generated during the construction phase of the development, the following mitigation measures are recommended:

- Wetting of construction haul roads during periods of hot dry weather via sprinklers or truck water spray;
- Large trucks to enter a tyre wash bay before entering and when leaving the site;
- Stockpiles to be located in designated areas with wind barriers;
- Moisture levels of stockpiled materials to be maintained during periods of hot dry windy weather; and
- Trucks entering and leaving the site to cover all material loads with an appropriate covering.

Mitigation measures specific to the Maintenance Facility

To minimise pollution from vehicular emissions during the construction and operational period the following mitigation measures are recommended:

- Trucks and vehicles to be switched off when not in use; and
- Operational maintenance machinery and vehicles to be fitted with appropriate emission control devices and regularly serviced.

Mitigation measures specific to the Down Relief Works

- Define traffic access points to reduce the impact on railway station operations and neighbouring industrial sites; and
- Limit vehicle movements and access to only project related activities.

3.6 Noise and vibration

A noise assessment was carried out by GHD. A copy of this assessment is included in Appendix D. This section contains a summary of the noise assessment undertaken for the PPP Maintenance Facility. Noise from the upgrading of the Down Relief will be minimal, and in line with noise from general maintenance and operational activities in rail corridors. It is expected that no significant noise would be produced from this activity.

3.6.1 Existing environment

Long term noise monitoring and attended observations indicate a noise environment that is primarily dominated by traffic noise emanating from the local road network and an underlying urban 'hum'. Background noise levels are relatively high which is indicative of an urban environment with high traffic levels. Highest peaks are recorded during the hours between 7 am and 9:30 am at the commencement of works days.

Nearest residents to the PPP Maintenance Facility are located approximately 350 m across Manchester Road to the south west and are considered to live in an 'urban' area as defined by the DEC Industrial Noise Policy (INP), as it is an area that is dominated by urban 'hum' and industrial noise sources and has through traffic with characteristically heavy and continuous traffic flows during peak periods.

3.6.2 Impact assessment

Construction

Typical noise levels produced by construction plant anticipated to be used on site were sourced from AS 2436 – 1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites and from GHD's internal database. The power levels were then distance attenuated from the proposed construction. Propagation calculations take into account sound intensity losses due to spherical spreading, with additional minor losses such as atmospheric absorption, directivity and ground absorption ignored in the calculations. As a result, predicted received noise levels are expected to slightly overstate actual received levels and thus provide a measure of conservatism.

Received noise at each assessed distance, from each item of plant on site, is added (where appropriate) to determine the total received noise at that distance from construction activities and compared to the criteria.

The construction noise criteria are set for noise levels determined as $L_{10(15min)}$. During a full 15 minute period the machinery items to be used on site will operate at maximum sound power levels for only brief stages. At other times the machinery may produce lower sound levels while carrying out activities not requiring full power.

In addition, mobile machinery will likely move about during the 15 minutes, variously altering the directivity of the noise source with respect to individual receivers.

As it is unlikely construction activities would be for more than 26 consecutive weeks, the construction noise criterion should be considered as being Background + 10 dB(A). As a consequence, in a worst case configuration, exceedances of this criterion could occur. However, it is highly unlikely that all of the machinery would be operating at full power at the same time for an extended period.

The Noise Assessment concluded that construction noise is highly unlikely to exceed project specific noise goals. Construction noise has the potential to exceed noise criteria in a worst-case scenario, however this can be mitigated through the utilisation of best management practices outlined in Section 6.8.3.

The Down Relief upgrade works would involve additional construction noise, however these works are short term and similar to existing track upgrade works commonly associated with general track maintenance. Therefore construction noise emitting from Down Relief are unlikely to significantly affect sensitive residential receivers located nearby the existing rail corridor.

Operation

Estimated noise levels emanating from the PPP Maintenance Facility were modelled using RTA Technologies ENM Noise Prediction Software. The model took into account the sound power levels of the primary noise sources to be used at the facility, which were sourced from a similar maintenance facility located at Hornsby. The noise model undertook a worst-case scenario with all plant items listed operating at their maximum sound power levels.

The Noise Assessment concluded that noise emanating from the proposed PPP Maintenance Facility can meet the DEC INP project specific noise goals.

The proposed development includes a turning loop for rolling stock, with a turning radius of approximately 160m. Carriages would be pulled along the turning loop by track machines at extremely low speeds (approximately 8 km/hour). The tight radius curve of this turning loop is likely to create wheel squeal, which has the potential to impact on residences to the south and south-west of the site.

The Down Relief upgrade operation noise would be minimal as no significant increase in train traffic would be generated (refer to Section 3.15.3). The potential for adverse noise impacts on sensitive receivers is unlikely.

3.6.3 Mitigation measures

General mitigation measures for the proposed development

The following mitigation measures should be implemented during construction:

- To minimise noise emissions construction equipment should be in good condition;
- All combustion engine plant, such as generators, compressors and welders should be checked to ensure they produce minimal noise with particular attention to residential grade exhaust silencers;
- Where practical, machines should be operated at low speed or power and should be switched off when not being used rather than left idling for prolonged periods;
- Machines found to produce excessive noise compared to industry best practice should be removed from the site or stood down until repairs or modifications can be made;
- Impact wrenches should be used sparingly with hand tools or quiet hydraulic torque units preferred; and
- Construction work would be limited to the hours of 7 am to 6 pm Monday to Friday, and 8 am to 1 pm Saturdays. The noisiest activities are to be scheduled during these hours. No work is to be undertaken on Sundays and Public Holidays.

As the noise goals for the proposed development would be met during operation, no specific mitigation measures are recommended.

However, the turning loop would be likely to generate wheel squeal and the following mitigation measures are recommended:

- The turning loop is only to be used between the hours of 7.00 am and 10.00 pm; and
- Post-construction monitoring of the turning loop is to be undertaken in order to assess noise impacts. Should this monitoring indicate that noise levels from the turning exceed recommended noise levels under the Department of Environment and Conservation's *Industrial Noise Policy*, appropriate mitigation in the form of top-of-rail friction modification would be implemented.

Mitigation measures specific to the Down Relief Works

- Maximising the offset distance between noisy plant items and nearby residential receivers;
- Where practicable avoiding the simultaneous operation of two or more noisy plant items in close vicinity and adjacent to residential receivers;
- Should work be required to be undertaken outside of the normal working hours (above), approval from RailCorp is required, and once approved, public notification, in the form of a letter box drop, should be undertaken at least seven (7) days prior to the works taking place;
- A Communications Plan is to be developed to the satisfaction of RailCorp accounting for the length of the construction period. Signs are to be placed in the

vicinity of the works identifying a Hotline to be established to manage community questions and complaints;

- Providing periods of respite (quiet) if activities occur for extended periods during the night;
- Minimising consecutive night time activities in the same locality;
- Orienting equipment away from residential receivers;
- Carrying out loading and unloading away from residential receivers;
- Situating site access points and roads as far as possible away from residential receivers;
- Using structures to shield residential receivers from noise; and
- Planning for and conducting night time activities in ways that eliminate or minimise the need for audible warning alarms.

3.7 Indigenous heritage

Preliminary environmental screening studies for the site showed no items of indigenous heritage or recordings of Indigenous heritage on the site, and identified that the site has been heavily disturbed and modified by previous and current uses. Therefore no further assessment on Indigenous heritage is considered necessary.

In the event that Indigenous objects are detected during construction activities, salvage of those objects and/or continued operation in the area of the finds would only proceed following consultation with DEC and the Local Aboriginal Land Council.

3.8 Non-Indigenous heritage

A Statement of Heritage Impact for the proposed development has been prepared by Historyworks. A copy of the Statement is included in Appendix C. This section summarises this Statement.

3.8.1 Existing environment

The site forms part of the Clyde Marshalling Yards, which is identified as an item of environmental heritage under the Auburn LEP.

The Auburn Heritage Study (Kass, 1996) provides the following Statement of Significance for the site:

> *The Clyde Marshalling Yard is significant in demonstrating the large volume of railway goods traffic generated by the Sydney Metropolitan area, both in historical and current terms. It also demonstrated the close relationship between local industry and rail transport.*

The study concluded that the site was of regional historic and scientific significance. (The 'regional' category is no longer used in the NSW Heritage Office assessment criteria with any such items identified in past studies tending to default to local significance).

The study also recommended that the site be listed on the (then) State Rail Authority Heritage Register under section 170 of the NSW Heritage Act. Whilst this has not occurred, a water column on the site has been listed in a draft RailCorp Section 170 Register. This is a cast iron water column previously used to fill steam locomotive water tanks. The water column is located adjacent to the Down Relief line close to the 19.5 km mark.

Finally, the study also recommended that a Conservation Management Plan be undertaken prior to any upgrade, disturbance or adaptive reuse of the site though it is understood that this was not done when the MainTrain facility was constructed.

In spite of the subsequently disrupted nature of the site, it is concluded that sufficient historical physical (primarily archaeological) evidence of the former use of the site remains to still conclude that the site is of local historical and scientific significance under the NSW Heritage Office assessment criteria.

The site was surveyed in general by archaeologist Edward Higginbotham in 1995 for the Auburn Heritage Study. This survey established that there was then physical evidence of heritage significance. Since that time, the site has been further disrupted and it is obvious that updated heritage mapping and identification is required.

3.8.2 Impact assessment

It is apparent that the proposed development will affect part of the site identified as a heritage item in the Auburn LEP.

The general nature of the plan of the proposed development considered in the report combined with the lack of current mapping of identified heritage elements (overlaid with the new proposed development) preclude detailed consideration of the impact of the development on the heritage item/site. However, it is known that the water column would be affected by the proposed development, as it would need to be removed.

To determine how specific the impact will be requires detailed on-site mapping. In general, however, excavation will be required for trackwork and construction of buildings. This is highly likely to disturb both above-ground and buried archaeological remains.

A major part of the proposed development is located adjacent to the running lines and therefore relatively on the periphery of the site. However, work will be required throughout the site and therefore the development will not be to the benefit of the heritage item and indeed will result in the loss of much of it. To compensate for this, recording would be required to ensure that documentary evidence of the site remains.

Overall, however, the original site is so disturbed that it no longer has sufficient physical integrity for whole-of-site conservation in situ. The heritage outcomes thus may include a combination of conservation in situ where possible, removal of items for conservation off-site and demolition preceded by archival recording to the relevant NSW Heritage Office standards.

3.8.3 Mitigation measures

General mitigation measures for the proposed development

The following measures should be implemented prior to and during development:

- Mapping of surviving heritage elements overlaid with the new development should be undertaken;
- Recording of the site to the relevant NSW Heritage Office standards should be undertaken prior to commencement of work; and
- An excavation permit under section 140 of the NSW Heritage Act should be obtained prior to commencement of work.

Mitigation measures specific to the Maintenance Facility

- RailCorp's Heritage Manager should determine appropriate placement of any heritage elements to be removed as part of the work (e.g. the water column): this may include relocation on site as part of an interpretative display or relocation off-site to a railway heritage centre; and
- An historical interpretative display at the public entrance to the site should be considered.

3.9 Waste

3.9.1 General

As with any infrastructure project and development, there is likely to be a potential to generate a number of different types of waste, which would require appropriate management and disposal in accordance with relevant state legislation and government policies.

The project will require a commitment to the objectives of responsible management of waste and ensure that the development complies with the following pieces of legislation relevant to waste management:

- Protection of the Environment Operations Act 1997;
- Protection of the Environment Operations (Waste) Regulation 1996;
- Protection of the Environment Operations (General) Regulation 1998;
- Environmental Planning and Assessment Act 1979;
- Environmental Planning and Assessment Regulation 2000, Schedule 2;
- Contaminated Land Management Act 1997;
- Road and Rail Transport (Dangerous Goods) Act 1997; and
- Dangerous Goods Act 1975.

3.9.2 Impact assessment

The assessment of impacts with regards to waste covers the construction and operation phases of the proposed development.

During construction

During the construction phase, the proposed development would be expected to generate the following wastes:

- Construction/demolition waste including excavation materials such as rock and topsoil, scrap metals, piping, asphalt, concrete, timber formwork and other construction/demolition materials;
- Demolished waste from buildings, unused and old Down Relief tracks and wooden sleepers;
- Cleared vegetation, trees and landscaping 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 including food scraps, aluminium cans, glass bottles, plastic and paper containers and putrescible waste generated by site construction personnel;
- Ablution waste including waste from toilets and basins; and
- Waste oil and fuels.

During operation

The majority of waste sources would be generated during routine site maintenance activities (e.g. waste generated from garden maintenance) and from waste generated by operational activities (e.g. putrescible and industry waste). The contractor is expected to consider possible avoidance of consumption, potential for reuse/recycling and, as a last resort, the legally appropriate disposal of operational waste.

3.9.3 Mitigation measures

General mitigation measures for the proposed development

To prevent adverse waste generation and impacts, the following measures are recommended:

- Recycling and non-recycling waste disposal facilities would be made available to staff / contractor(s). Recyclable materials would be sent for recycling (not landfill) while other materials would be reused or sent to an appropriate (licensed) landfill;
- Where feasible, suitable waste would be recycled in accordance with the NSW Government's Waste Reduction and Purchasing Policy;
- Surplus soil material (spoil) created as a result of the proposed development would be reused in landscaping and rehabilitation works as a first priority. Any waste material unable to be re-instated would be transported to land that can lawfully receive that waste;

- Trees marked for removal and free of diseases are to be wood chipped and used as mulch;
- Demolition wastes and cleared vegetation would be offered for appropriate recycling, including recycling as firewood and housing structures;
- All site wastewater would be collected and disposed off-site in accordance with the relevant regulations;
- Construction vehicles would be securely covered to prevent spilling and loss of waste during transportation;
- The work site would be left tidy and free of rubbish upon completion of the project; and
- Porta Loos are to be positioned on level ground and regularly serviced.

3.10 Hazard and risk

3.10.1 General

The proposed development would generate a number of potential hazards that are associated with all rail infrastructure development and include:

- Hazard and risk associated with periods of construction activity;
- General accidents during operational phase; and
- The transportation of goods and material along roads during both construction and operation phases.

State Environmental Planning Policy No. 33 - Hazardous and Offensive Development (SEPP 33) is not applicable to this project as the development is defined as a 'public utility undertaking' and not an 'industry' under the *Environmental Planning and Assessment Model Provisions 1980*. Therefore, a risk assessment with reference to SEPP 33 has not been undertaken.

However, the nature of the proposed development results in possible hazards and risks during the construction and operation phases.

The overall risk associated with the project is considered to be low provided that construction crewmembers and operational staff have adequate training in rail safety awareness. The risk to the community is likely to be insignificant due to the remoteness of the site and security measures already in place to keep the public out of the site.

3.10.2 Impact assessment

Hazard and risk during construction

General rail construction activities such as the operation of machinery can be a hazard and a risk to the safety of construction workers, local residents and members of the public as well as to the environment.

The construction activities are likely to be located near rail transportation and train preparation in existing workshops. Hence there exist potential human safety concerns involving accidents between employer and construction crewmembers and rolling stock movement.

Construction activities would also require alterations to the existing site traffic arrangements. This poses risks to both worker and driver safety and may also result in traffic congestion and delays.

The likelihood of an incident occurring during the transportation of construction goods and materials, such as a traffic accident, is dependent on the frequency and percentage of vehicles carrying goods. Hazards associated with a dangerous goods incident or spill include:

- Fire (impact dependant on flammable material);
- Road accident causing death or serious injury;
- The release of toxic gas and liquids; and
- Slippery and unsafe road conditions.

Hazard and risk during operation

Hazards and risks during operational phases are likely to be of a similar nature to construction risks except that construction crewmembers will no longer be on site and there will be far less road –based traffic movements. However once the project is completed there is likely to be increased rolling stock and train preparation movement.

The likelihood of an accident in the site depends on several factors, which include:

- Upgraded infrastructure (result in improvement of pedestrian and employer conditions);
- Weather and general operational conditions;
- Education and safety awareness level of employers and OH&S policies in place;
- Proximity of nearby industry and residential premises.

Workshop specific operational hazards and risks are likely to involve handling of and management of dangerous goods and operational procedures in place.

3.10.3 Mitigation measures

General mitigation measures for the proposed development

To minimise the hazards and risks associated with the project, the following mitigation measures are recommended:

- Construction crewmembers and operational staff to hold a RailCorp approved Rail Safety Induction Certificate;
- Appropriate Protection Officers are to be on site during construction;
- Fencing and signage be installed around the temporary construction site compound to prevent members of the public from entering;

- General site and traffic safety conditions be managed through a detailed Traffic Management Plan covering all stages of work, which the construction contractor would be required to submit prior to commencement of work; and
- The successful construction contractor would be required to prepare emergency response plans and be required to keep appropriate spill and first aid kits on site.

3.11 Visual aesthetics

3.11.1 Existing environment

The visual character of the site is dominated by the industrial and railway activities, particularly when viewed from the railway line. In this context, the existing visual character is not considered to be significant.

At the interface with the residential development, the visual character of the site is improved through the provision of screen planting, particularly at the eastern end. At the western end, the visual character is dominated by the adjoining industrial development.

There is a small stand of mature native and exotic trees located adjacent to the Main Western Line.

3.11.2 Impact assessment

The development is likely to include a visual impact during construction stages and operational phases. These impacts are likely to involve:

- Construction activities, materials and infrastructure; and
- Expansions to the facility resulting in an increased number of industry buildings.

The construction visual impacts are not considered to be significant, due to the short-term nature of construction activities. In addition, most construction activities would occur well within the MainTrain and PPP area, where views of construction activities from outside would be limited.

Visual impacts of the Down Relief upgrade works are unlikely to be significant because the works are similar to track upgrade works regularly carried out along the existing rail corridor.

The operational visual impacts are not considered significant. The existing site and surrounding land uses are predominantly industry related, hence, the proposed buildings (bulky in nature and approximately 15 metres in height) are likely to fit into the overall visual character of the site and surrounding area.

Operational work associated with the Down Relief upgrade is consistent with the existing land use as a rail corridor. Hence the proposed development does not introduce any new visual elements to the landscape in this region.

The existing mature trees located adjacent to the Main Western Line would be removed as part of the proposed development. The removal of these trees is unlikely

to create any significant visual impacts, as the broader visual context of the site is of an industrial and rail transport corridor nature.

3.11.3 Mitigation measures

Specific mitigation measures for the Maintenance Facility

Detailed site design principles and site operations are to be included in the specifications prior to awarding of the winning tenderer(s) and before construction of the facilities. These specifications involve detailed planning principles in relation to:

- Scale, bulk, height and siting of the workshops – these specifications will aim to appropriately integrate and locate the workshops in regard to existing site infrastructure;
- Landscaping principles – this includes provision of planting where necessary and specifications to ensure security and water efficiency through appropriate planting densities, height and species type;
- Materials – this includes selecting appropriate materials to ensure minimisation of glare and reflection, noise acoustics and, harmonious integration with existing workshops; and
- Privacy – this involves adequate wall spacings and screening between designated staff rooms, refreshment rooms and main workshop space.

Specific mitigation measures for the Down Relief Works

- Project scope to include revegetation of embankment above proposed retaining wall near Granville Station, to remove noxious weeds and replace with suitable species in accordance with a revegetation plan; and
- Desirable to provide signage to advise commuters of what work is being undertaken with end benefit to commuters.

3.12 Land use

3.12.1 Existing environment

The site has been historically associated with rail related development since the early 1890s.

Outside of the precinct, land use is characterised by industrial development in warehousing and retail-related trade. Residential land uses are located to the south and southwest.

3.12.2 Impact assessment

In the context of the existing land uses, the proposed development will not have an adverse impact as the proposed development:

- Reflects the character of industry related development in the area through the use of large structures similar to that of the existing facilities managed under Maintrain;

- Materials and architectural standards will be similar to existing industrial buildings in the area including the of use of large galvanised steel structures;
- Track works, including the Down Relief upgrade, are of a similar land use with the existing suburban rail corridor land uses; and
- The proposed development is consistent with the historical land use context of the site and immediate surrounding area.

3.12.3 Mitigation measures

As there will be no adverse land use impacts, no specific mitigation measures are recommended. However, the mitigation measures recommended in Section 3.11 in relation to visual impact should be implemented to ensure that there are no adverse land use impacts.

3.13 Socio-economic impacts

3.13.1 Impact assessment

During construction, the proposed development is likely to have positive socio-economic impacts on the locality due to creation of jobs and utilisation of contractors, which may be based or operate in the locality.

Some short-term adverse impacts may also occur as a result of impacts on the amenity of surrounding residents due to increased traffic, noise and other construction impacts, however these impacts are not considered to be significant, particularly when appropriate mitigation measures are implemented.

In the longer term, during operation of the proposed development, a positive socio-economic impact would result due to the creation of an additional 400 jobs in total on the site.

3.14 Property effects

No properties require acquisition. RaiCorp owns the site and the proposed development is entirely within the boundaries of RailCorp. The proposed development would not result in property damage during construction or operation as the works are located a sufficient distance from adjoining property boundaries.

As property effects are not considered to be significant, no specific mitigation measures are recommended.

3.15 Traffic and access

A Traffic and Transport Assessment has been carried out by GHD. A copy of this assessment is included in Appendix B. This section contains a summary.

Development within the MainTrain site comprises demolition of some buildings and replacement of these facilities/operations and will not generate additional operational

traffic on the site. The remainder of this section deals with the proposed new PPP maintenance facility.

3.15.1 Existing road network and traffic characteristics

Road network

- Manchester Road

Manchester Road runs west-east and is located south of the south west portion of the precinct. Manchester Road performs the role of a collector road with connection to Chisholm Road and a Private Road (access road to the south western section of the industrial precinct) at its western end and access to The Crescent South, Normanby Road and Cumberland Road at its eastern end. Manchester Road is sealed carriageway comprising two wide travel lanes, one in each direction, and sufficient width to accommodate kerbside parking lanes. It is likely that the majority of vehicles wanting to gain access to the entrance/ exit driveway of the subject site will travel via this road.

- Chisholm Road

Chisholm Road runs north-south and is located south of the proposed development site. Chisholm Road performs the role of a collector road with connection to Manchester Road at its northern end and Regents Park industrial area at its southern end. Chisholm Road, in the vicinity of Manchester Road, is a sealed carriageway comprising two wide travel lanes, one in each direction, and sufficient width to accommodate kerbside parking lanes.

- Private Road

Private Road runs east - west and runs along the southern boundary of the industrial precinct before travelling north towards the proposed site. Private Road performs the role of an industrial access road with connection to Manchester Road and Chisholm Road at its eastern end and Clyde Marshalling Yards at its northern end. Private Road, in the vicinity of Manchester Road, is a sealed carriageway comprising two wide travel lanes, one in each direction.

The Private Road is a wide road with low traffic volumes that is suitable to accommodate heavy vehicle traffic. The route it is currently used by heavy vehicle traffic accessing sites within the industrial precinct. Residences are located along the southern side of the Private Road, a number of which have driveway access across RailCorp land to their properties, which may result in minor conflict for the heavy vehicles accessing the precinct.

Traffic management

The existing road network near the vicinity of the development site comprises the following important traffic management features.

- Stop Control:
  - On the Manchester Road (east) approach to Chisholm Road.

- On the Private Road approach to Chisholm Road.

- Roundabout Control:
  - At the intersection of Manchester Road/ Cumberland Road/ Normanby Road/ The Crescent South.
- Sign-Posted Speed Limits:
  - 60 km/h along Manchester Road and Chisholm Road; and
  - 20km/h along the Private Road, west of Chisholm Road.

Traffic volumes

Traffic conditions along the roads in the vicinity of the subject site was obtained by undertaking automatic traffic counts in June 2005 along Manchester Road, Chisholm Road and the Private Road, as detailed in Appendix B.

It is evident from the traffic counts that the traffic volumes on Chisholm Road and Manchester Road are within the acceptable traffic volumes for collector roads and are operating below their design capacity. The traffic volumes on Private Road (west of Manchester Road) are within the acceptable traffic volumes for a local road and is operating below the design capacity. The Private Road currently accommodates a high proportion of heavy vehicle usage.

Peak period intersection counts were also undertaken, which revealed that:

- Two-way traffic flows on Manchester Road during the morning peak period (8.00 am – 9.00 am) are in the order of 330 vehicles per hour with eastbound traffic flows predominating (236 vph).
- Two-way traffic flows on Manchester Road during the evening peak period (4.15 pm – 5.15 pm) are in the order of 271 vehicles per hour with eastbound traffic flows predominating (141 vph).
- Two-way traffic flows on Chisholm Road during the morning peak period (8.00 am – 9.00 am) are in the order of 354 vehicles per hour with northbound traffic flows predominating (273 vph).
- Two-way traffic flows on Chisholm Road during the evening peak period (4.15 pm – 5.15 pm) are in the order of 277 vehicles per hour with southbound traffic flows predominating (149 vph).
- Two-way traffic flows on the Private Road during the morning peak period 8.00 am – 9.00 am) are in the order of 128 vehicles per hour with westbound traffic flows predominating (89 vph).
- Two-way traffic flows on the Private Road during the evening peak period (4.15 pm – 5.15 pm) are in the order of 64 vehicles per hour with eastbound traffic flows predominating (48 vph).

Intersection performance

The intersection of Manchester Road and Chisholm Road and the intersection of Manchester Road, The Crescent South and Cumberland Road both operate at a good level of service during AM and PM critical peak periods.

3.15.2 Impact assessment

The Traffic and Transport Assessment makes the following conclusions in relation to impacts:

- The existing road conditions along Manchester Road, Chisholm Road and the Private Road are generally considered satisfactory to accommodate the additional number and type of vehicles likely to be generated by the construction and operation of proposed development, based on a worst case assessment.
- The worst-case assessment of the additional traffic demand on Manchester Road, Chisholm Road and the Private Road as a consequence of the construction and operation of the proposed development concluded that it had minimal impact the current network operations and is considered acceptable.
- The worst case assessment also concluded that increases in traffic generated by during the construction period and by the proposed development would be modest when distributed on the surrounding road network, and would not result in any adverse effects on the operational performance of key intersections.
- Additional traffic demand on Manchester Road and Chisholm Road as a consequence of the construction and operation of the proposed development is considered acceptable and does not increase the level of traffic activity on these roads to an unacceptable level. The projected traffic demand on these roads, due to construction and operation of the proposed development, is within the limits specified by the RTA Guidelines for collector roads.
- The post development peak hour traffic volumes on the Private Road (west of Manchester Road) exceeds the acceptable traffic volume for a local road, and exceeds the environmental capacity in the AM peak period. However, the Private Road does not readily meet the functional classification of a local road, as its primary purpose is to provide vehicular access to industrial and rail-related activities. There are only limited access points to the Private Road, and the small number of residential property accesses would appear to traverse RailCorp-owned land, and as such, may not be legal accesses. It is considered that any potential impacts as a result of exceeding the environmental or design capacities would be isolated to the Private Road only and are not likely to significantly impact on the surrounding road network.
- Future traffic levels along the road network in the vicinity of the site, which includes travel levels during the operational and construction stages of the proposed development on both Manchester Road and Chisholm Road during the peak periods are within an acceptable range with regard to environmental capacity.
- Additional traffic demand on Manchester Road and Chisholm Road as a consequence of the proposed development is not likely to have a significant impact on the pedestrian and cyclist facilities or public transport services.
- The percentage increase in heavy vehicles on the public road network as a result of the development is 3.2% along Chisholm Road and 4.7% along Manchester Road during the construction stage and 0.2% along both Manchester and Chisholm

Roads during the operational stage. This is only a minor increase in the percentage of heavy vehicles along Manchester and Chisholm Roads.

- During construction, the percentage increase in heavy vehicles on the Private Road is 10%, while during operation, the overall percentage of heavy vehicles using the Private Road actually decreases by 2% as a result of the increase in light vehicles using the Private Road.

3.15.3 Train traffic

Currently the access to Manildra and MainTrain is from a portion of the Auburn end of the Down Relief that is still in use. This access will continue during and after the Down Relief upgrade works.

When fully operational and after the testing and commissioning of PPP sets is completed in about 2014, the extent of use of the Down Relief is anticipated to be up to approximately 74 train movements (37 movements each way) per day accessing the PPP Maintenance Facility, MainTrain and Manildra. Prior to this during the testing and commissioning period for the PPP sets it is unlikely the train wash and underfloor wheel profiling facilities will be fully utilised and therefore it is unlikely the above usage of the Down Relief will be exceeded.

The existing Auburn corridor currently has approximately 974 RailCorp train movements per weekday plus freight train movements.

Of the above train movements on the Down Relief approximately 50% are anticipated to be movements already occurring on the Auburn to Granville rail corridor to access MainTrain and Manildra or being diverted into the PPP Maintenance Facility for train washing etc as part of their normal operation.

Therefore, it is anticipated that the PPP Maintenance Facility will generate approximately 37 new train movements per day on the Down Relief after the testing and commissioning phase. This represents approximately 4% of the current usage of the Auburn to Granville rail corridor. Therefore operational train movements associated with the proposal is unlikely to significantly affect the Auburn to Granville rail corridor.

3.15.4 Mitigation measures

General mitigation measures for the proposed development

As the expected road and rail traffic impacts are not considered to be significant on Chisholm and Manchester Roads, or the Auburn to Granville rail corridor, no specific mitigation measures are recommended.

The impacts on Private Road are specific to just that road, and as there will be minimal impact on neighbouring properties and businesses, no specific mitigation measures are recommended.

However, the following general road traffic mitigation measure will be implemented:

- Adopt, maintain and monitor an appropriate Traffic Management Plan to accommodate pedestrians and motor vehicles, particularly focusing on commuter dropoff and pickup points.

3.16 Light spill

3.16.1 Impact assessment

The proposed development does not involve any external light towers to light the site. External lighting is limited to that which is required for security and safety purposes only and would meet the requirements of Australian Standard AS 4282 – 1997 *Control of the obtrusive effects of outdoor lighting*. Furthermore, the relative distance of sensitive receivers, such as residential properties from the proposed development's external lighting area significantly reduce any potential adverse light spill impacts. Residents are also screened by commercial uses on Private Road and by trees and landscaping.

The proposed development is also located within an industrial setting. Existing industrial works operate 24 hrs a day and require security and safety lighting. The proposed development would therefore not introduce any new lighting impact compared to that already experienced.

3.16.2 Mitigation measures

Specific mitigation measures for the Maintenance Facility

- All outdoor lighting is to be designed in accordance with the requirements of Australian Standard AS 4282 – 1997 *Control of the obtrusive effects of outdoor lighting*.

3.17 Demand on resources

3.17.1 Impact assessment

The proposed development is likely to result in direct use of utility resources such as:

- Potable water;
- Electricity;
- Sewerage; and
- Stormwater.

No estimation of approximate yearly demand on these resources has been provided. However any demand is expected to be minor compared to that in demand city-wide. It is expected that RailCorp, during detailed design, will require the use of water efficient technology, lighting fixtures and sustainable design initiatives, such as drought tolerant gardens or use of natural ventilation, where practicable.

3.17.2 Mitigation measures

Specific mitigation measures for the Maintenance Facility

- The detailed design of the proposed development is to include provision for the use of water efficient technology, lighting fixtures and sustainable design, where practicable.

3.18 Cumulative environmental effects

The consequences that may arise from the effects of incremental development are usually described as 'cumulative environmental impacts'. In accordance with Clause 228(2) of the EP&A Regulation 2000, any cumulative environmental effects of the proposed development with other existing and likely future activities must be taken into account in assessing the potential environmental impacts of the proposed development.

Cumulative impacts have the potential to arise from the following:

- The interaction of individual elements within the proposed development; and
- The additive effects of the proposed development with other external projects;

The proposed development can have both positive and negative cumulative impacts. Judging wether a project has a positive or negative cumulative impact is often determined through individual and community standing on environmental knowledge and values. Such knowledge and values vary dramatically within diverse societies according to lifestyle situations, personal philosophies and accessibility to quality information about the proposed development and the subsequent impacts.

3.18.1 Positive cumulative effects

The proposed development would have positive cumulative impacts as it would be consistent with the aims of the NSW Government's integrated transport strategies as outlined in the *Planning for a Better Future – Metropolitan Strategy Discussion Paper*, and is considered to result in positive cumulative impacts on the biophysical, social and economic environment in the area. This would be achieved by:

- Increasing the use of public transport infrastructure by providing a platform for sound service delivery;
- Improving the level of service of rail infrastructure through well maintained rolling stock;
- Providing consistent investment in public transport rail infrastructure and allows for investment into transit orientated development;
- Increasing efficiency of maintenance of public transport rolling stock;
- Improving the standard of rail maintenance facilities;
- Increasing the level of amenity of the site by providing landscaping and urban design improvements that would be designed to integrate into both the natural and built environment;

- Delivering an acceptable return on infrastructure and land investment;
- Redevelopment allowing greater input into modern urban design that enhances nearby land uses; and
- Generate significant levels of employment as part of construction and operational activities.

3.18.2 Negative cumulative impacts

There is the potential for negative impacts associated with the proposed development that can be experienced in both the short and long term. Short-term impacts would be related to the construction activities while long-term impacts would be due to operational factors. These impacts are described below:

- Minor increase in clearing of vegetation, which has the potential to reduce biodiversity and result in minor water and air quality impacts;
- Increased emissions from construction vehicles, potentially resulting in reduced air quality;
- Increased noise levels;
- Impacts on heritage items within the site causing loss of heritage value of the site;
- Disruption to existing site services during construction phase; and
- An overall decline in the visual quality during construction and establishment of new landscaping.

A number of mitigation measures are recommended to minimise these impacts (as summarised in Table 3 and Table 4).

The use of private automobiles and the damage that they can do to the environment have been well documented. The investment into public transport infrastructure is critical to ensure that the community has a greater incentive to travel on public transport rather than use private automobiles. Hence the benefits of the proposed development indicated above are considered to outweigh the negative impacts that would occur on either a long or short-term basis.

3.19 Clause 228 and the EPBC Act (1999) checklist

Clause 228 of the *Environmental Planning and Assessment Regulation 2000* identifies the factors to need be taken into account that the approval authority need to consider as to the likely impact of an activity on the environment. These factors are listed in Appendix A.

This chapter has described the likely environmental impacts of the proposed development and where appropriate, mitigation measures that aim to prevent adverse environmental damage are recommended.

An assessment of the proposed development against the Clause 228 matters for consideration is contained in Appendix A.

3.20 EPBC factors (Commonwealth legislation)

Table 2 EPBC checklist

FACTOR	IMPACT
(a) Any environmental impact on a World Heritage Property?	
There are no World Heritage Properties located within or near the site.	Nil
(b) Any environmental impact on Wetlands of International Importance?	
The project would not impact on any Wetlands of International Importance as none are located within or near the site.	Nil
(c) Any environmental impact on a National Heritage Place?	
There are no National Heritage Places located within the vicinity of the site.	Nil
(d) Any environmental impact on Commonwealth listed Threatened Species or Ecological Communities?	
No endangered ecological communities or threatened species listed under the EPBC Act were recorded at the site and it is unlikely that they would occur.	Nil
(e) Any environmental impact on Commonwealth listed Migratory Species?	
No migratory species listed under the EPBC Act were recorded at the site and it is unlikely that they would occur.	Nil
(f) Does any part of the proposal involve a Nuclear Action?	
No part of the project involves a nuclear action.	Nil
(g) Any environmental impact on a Commonwealth Marine Area?	
The project would not impact on any Commonwealth Marine Areas.	Nil
(h) Any impact on Commonwealth land?	
There is no Commonwealth land affected by the Project	Nil

3.21 Summary of proposed control measures

Table 3 provides a summary of the mitigation measures required to be implemented for works within both the MainTrain and PPP sites.

Table 4 provides a summary of the mitigation measures required to be specifically implemented for works within the PPP site.

Table 5 provides a summary of the mitigation measures required to be specifically implemented for works within the Down Relief site.

Table 3 Summary of general mitigation measures for the proposed development

Potential impact	Mitigation measures
Soils	◗ A Soil and Water Management Plan (SWMP) would be prepared as part of the PPP Contractor's Environmental Management Plan (EMP) for the proposed development prior to the commencement of construction. The SWMP would incorporate specifications outlined in the *NSW Erosion and Sediment Control Handbook No. 2*, identify areas requiring management controls, and include inspection and checklist sheets; ◗ The SWMP would include an Erosion and Sedimentation Control Plan (ESCP) and a maintenance schedule for on-going maintenance of temporary and permanent sedimentation controls; ◗ Progressive and minimal removal of vegetation would limit the area and duration that soils are exposed. Disturbed areas would be stabilised progressively to ensure that no areas remain unstable for any extended length of time. This would involve seeding, fertilising and mulching of disturbed areas; ◗ Following earthwork activities, regular inspections of the worksite would be undertaken during construction to ensure that the SWMP was continuing to be implemented properly; ◗ Environmental audits would be undertaken of the site on a regular basis. The schedule of audits would be specified in the EMP.
Contamination	◗ The apparent lead and / or benzo(a)pyrene 'hotspot' areas are to be remediated prior to work commencing; ◗ Additional investigations be undertaken in the area of possible TPH contamination in order to determine whether an underground tank or other hydrocarbon source may be present in this area. Should this be the case, the affected area to be appropriately remediated prior to work commencing; ◗ As asbestos has been identified, WorkCover 2003 guidelines specify that: – A permit must be obtained from WorkCover before any works commence on the site; – The works must be supervised by a licensed asbestos removal contractor with an AS1 licence; – During redevelopment if contamination is encountered, all workers are to wear additional personal protective equipment comprising a Type 1 or Type 2 mask, and disposable overalls; and – Asbestos contaminated soil must be disposed to an appropriately licensed landfill. ◗ A Remedial Action Plan (RAP) is to be developed for the site, addressing the remediation of the identified contaminated hotspots, potential underground tank, and asbestos;

Potential impact	Mitigation measures
Contamination	◗ As the remediation would be defined as Category 1 remediation work under SEPP 55, development consent for the remediation is to be obtained prior to remediation works commencing; ◗ In the event that indications of additional contamination are encountered (i.e. odorous or visually contaminated materials) as a result of exposure of sub soils during redevelopment, work in the area should cease until an environmental consultant can advise on the need for remediation or other action, as deemed appropriate; ◗ If materials are to be stockpiled the following environmental controls must be implemented: – If potential contamination is suspected stockpiled materials should be placed on a hard standing or a physical barrier should be placed between the ground surface and the stockpiled materials in order to prevent the underlying soils from becoming impacted via leaching; – Dust suppression measures should be implemented (wetting, covering or stabilisation of the stockpile); and – Run off should be controlled (by using hay bales and / or sediment fences). ◗ Where soil is to be removed from the site, it must be classified for waste disposal purposes, and disposed of in accordance with the requirements of the Protection of the Environment Operations Act 1997 (POEO Act), the Waste Regulation, 1996 made under the POEO Act, and the NSW EPA Guidelines: Assessment: Classification and Management of Liquid and Non Liquid Wastes; ◗ No specific legal requirements exist in relation to sampling and testing of stockpiled materials, however, the NSW EPA recommends a nominal sampling density of one sample per 25 m^3 for stockpile characterisation (NSW EPA, 1994); ◗ Samples should be analysed for potential contaminants of concern (i.e., asbestos), if the potential contaminant of concern is not known, a broad suite of contaminants should be analysed; ◗ Depending on the classification of the waste, the generator may need to use a licensed transporter and waste materials must be disposed of an appropriately licensed landfill; and ◗ Appropriate documentation should be maintained.

Potential impact	Mitigation measures
Flora and Fauna	◗ Remove only the trees and vegetation required to complete that stage of the work; ◗ All pesticides application must be in accordance with RailCorp Guidelines and relevant legislation, and contained within the defined scope of work; ◗ Monitor the work to ensure compliance with RailCorp Guidelines and relevant legislation; and ◗ Mitigation measures specific to the Grey-headed Flying foxes: – Care shall be exercised in conducting works on site during the breeding season for Grey–headed Flying-foxes. If it appears that breeding females, with dependent young, are roosting in close proximity they should be observed by an appropriately qualified person for the level of disturbance, noting that it is normal for small number of animals to take off, and re-roost a short distance away in response to minor disturbances. In the event that more than a small number of animals are disturbed (about 10) works in the area of the breeding females should cease and only recommence when the animals have settled and if this can be done without triggering further disturbance.

Potential impact	Mitigation measures
Drainage and water quality	◗ Implementation of the mitigation measures identified in Section 3.1 in relation to erosion and sedimentation; ◗ Stockpiles would be located at least 50 metres from drainage lines or depressions (which could channel water during rain) and protected; ◗ The SWMP would address waste water discharge from surface washing, washing vehicles and plant, and washing out concrete mixers and concrete trucks; ◗ Concrete trucks would be directed to a dedicated area for washing out; ◗ Contingency plans would be developed to deal with any spills, which might occur during construction; ◗ Hazardous liquids such as fuels and chemicals are to be stored in secure compounds with an impermeable floor and be appropriately bunded in accordance with DEC requirements; ◗ Machinery would be checked daily to ensure there are no oil, fuel or other liquids leaking from the machinery; ◗ Plant including contractor's plant, is to be regularly inspected to ensure compliance with RailCorp Guidelines; ◗ Final cleanup after the works are complete would include removal of any erosion control devices, removal of any sediment in drainage lines, which has been trapped by erosion control devices, and revegetation of disturbed areas; and ◗ The environmental management plan is to detail Spill Kits to be kept on site.
Air quality	◗ Wetting of construction haul roads during periods of hot dry weather via sprinklers or truck water spray; ◗ Large trucks to enter a tyre wash bay before entering and when leaving the site; ◗ Stockpiles to be located in designated areas with wind barriers; ◗ Moisture levels of stockpiled materials to be maintained during periods of hot dry windy weather; and ◗ Trucks entering and leaving the site to cover all material loads with an appropriate covering.

Potential impact	Mitigation measures
Noise and vibration	◗ To minimise noise emissions construction equipment should be in good condition; ◗ All combustion engine plant, such as generators, compressors and welders should be checked to ensure they produce minimal noise with particular attention to residential grade exhaust silencers; ◗ Where practical, machines should be operated at low speed or power and should be switched off when not being used rather than left idling for prolonged periods; ◗ Machines found to produce excessive noise compared to industry best practice should be removed from the site or stood down until repairs or modifications can be made; ◗ Impact wrenches should be used sparingly with hand tools or quiet hydraulic torque units preferred; ◗ Construction work would be limited to the hours of 7 am to 6 pm Monday to Friday, and 8 am to 1 pm Saturdays. The noisiest activities are to be scheduled during these hours. No work is to be undertaken on Sundays and Public Holidays. ◗ The turning loop is only to be used between the hours of 7.00 am and 10.00 pm; and ◗ Post-construction monitoring of the turning loop is to be undertaken in order to assess noise impacts. Should this monitoring indicate that noise levels from the turning exceed recommended noise levels under the Department of Environment and Conservation's Industrial Noise Policy, appropriate mitigation in the form of top-of-rail friction modification would be implemented.
Heritage and archaeology	◗ Mapping of surviving heritage elements overlaid with the new development should be undertaken; ◗ Recording of the site to the relevant NSW Heritage Office standards should be undertaken prior to commencement of work; and ◗ An excavation permit under section 140 of the NSW Heritage Act should be obtained prior to commencement of work.
Waste	◗ Recycling and non-recycling waste disposal facilities would be made available to staff / contractor(s). Recyclable materials would be sent for recycling (not landfill) while other materials would be reused or sent to an appropriate (licensed) landfill; ◗ Where feasible, suitable waste would be recycled in accordance with the NSW Government's Waste Reduction and Purchasing Policy; ◗ Surplus soil material (spoil) created as a result of the proposed development would be reused in landscaping and rehabilitation works as a first priority. Any waste material unable to be re-instated would be transported to land that can lawfully receive that waste; ◗ Trees marked for removal and free of diseases are to be wood chipped and used as mulch; ◗ Demolition wastes and cleared vegetation would be offered for appropriate recycling, including recycling as firewood and housing structures;

Potential impact	Mitigation measures
	◗ All site wastewater would be collected and disposed off-site in accordance with the relevant regulations; ◗ Construction vehicles would be securely covered to prevent spilling and loss of waste during transportation; ◗ The work site would be left tidy and free of rubbish upon completion of the project; and ◗ Porta Loos are to be positioned on level ground and regularly serviced.
Hazard and risk	◗ Construction crewmembers and operational staff to hold a RailCorp approved Rail Safety Induction Certificate; ◗ Appropriate Protection Officers are to be on site during construction; ◗ Fencing and signage be installed around the temporary construction site compound to prevent members of the public from entering; ◗ General site and traffic safety conditions be managed through a detailed Traffic Management Plan covering all stages of work, which the construction contractor would be required to submit prior to commencement of work; and ◗ The successful construction contractor would be required to prepare emergency response plans and be required to keep appropriate spill and first aid kits on site.
Traffic and Access	◗ Adopt, maintain and monitor an appropriate Traffic Management Plan to accommodate pedestrians and motor vehicles, particularly focusing on commuter drop off and pickup points.

Table 4 Summary of mitigation measures for PPP Maintenance Facility work area

Potential impact	Mitigation measures
Drainage and water quality	◗ During operation, all surface runoff would be captured and directed through appropriate detention and water quality controls (where necessary) and released in a controlled fashion; ◗ During operation, water quality treatment for runoff would include controls such as sedimentation basins (where the space is available) and gross pollutant traps to collect litter, gross pollutants and sediment.
Air quality	To minimise pollution from vehicular emissions during the construction and operational period the following mitigation measures are recommended: ◗ Trucks and vehicles to be switched off when not in use; and ◗ Operational maintenance machinery and vehicles to be fitted with appropriate emission control devices and regularly serviced.
Heritage and archaeology	◗ RailCorp's Heritage Manager should determine appropriate placement of any heritage elements to be removed as part of the work (e.g. the water column): this may include relocation on site as part of an interpretative display or relocation off-site to a railway heritage centre; and ◗ An historical interpretative display at the public entrance to the site should be considered.
Visual impact	Detailed site design principles and site operations are to be included in the specifications prior to awarding of the winning tenderer(s) and before construction of the facilities. These specifications involve detailed planning principles in relation to: ◗ Scale, bulk, height and siting of the workshops – these specifications will aim to appropriately integrate and locate the workshops in regard to existing site infrastructure; ◗ Landscaping principles – this includes provision of planting where necessary and specifications to ensure security and water efficiency through appropriate planting densities, height and species type; ◗ Materials – this includes selecting appropriate materials to ensure minimisation of glare and reflection, noise acoustics and, harmonious integration with existing workshops; ◗ Privacy – this involves adequate wall spacings and screening between designated staff rooms, refreshment rooms and main workshop space.

Potential impact	Mitigation measures
Lighting	All outdoor lighting is to be designed in accordance with the requirements of Australian Standard AS 4282 – 1997 *Control of the obtrusive effects of outdoor lighting*.
Resources	The detailed design of the proposed development is to include provision for the use of water efficient technology, lighting fixtures and sustainable design, where practicable.

Table 5 Summary of mitigation measures for Down Relief work area

Potential impact	Mitigation measures
Landforms, Geology and Soils	◗ Allocate a specific storage site for after hours stabling of plant and equipment with the appropriate level of containment controls for oil leaks and impact on soil contamination due to vandal activities; ◗ Regularly inspect and maintain containments controls; ◗ All construction materials including construction waste / surplus project railway infrastructure / ballast to be removed off site for proper disposal, storage and/or recycling; and ◗ A detailed Re-vegetation / Landscape Plan is to be in place and should include a post planting maintenance phase.
Air Quality	◗ Define traffic access points to reduce the impact on railway station operations and neighbouring industrial sites; ◗ Limit vehicle movements and access to only project related activities.

Noise and Vibration Effects	◗ Maximising the offset distance between noisy plant items and nearby residential receivers; ◗ Where practicable avoiding the simultaneous operation of two or more noisy plant items in close vicinity and adjacent to residential receivers; ◗ Should work be required to be undertaken outside of the normal working hours (above), approval from RailCorp is required, and once approved, public notification, in the form of a letter box drop, should be undertaken at least seven (7) days prior to the works taking place; ◗ A Communications Plan is to be developed to the satisfaction of RailCorp accounting for the length of the construction period. Signs are to be placed in the vicinity of the works identifying a Hotline to be established to manage community questions and complaints; ◗ Providing periods of respite (quiet) if activities occur for extended periods during the night; ◗ Minimising consecutive night time activities in the same locality; ◗ Orienting equipment away from residential receivers; ◗ Carrying out loading and unloading away from residential receivers; ◗ Situating site access points and roads as far as possible away from residential receivers; ◗ Using structures to shield residential receivers from noise; and ◗ Planning for and conducting night time activities in ways that eliminate or minimise the need for audible warning alarms.
Visual Aesthetics	◗ Project scope to include revegetation of embankment above proposed retaining wall near Granville Station, to remove noxious weeds and replace with suitable species in accordance with a revegetation plan; and ◗ Desirable to provide signage to advise commuters of what work is being undertaken with end benefit to commuters.

3.22 Implementation process

Environmental Management Plans (EMP) outline the environmental goals of a project, the mitigation measures to be implemented, the timing of implementation and designates responsibilities and management of implementing and reviewing environmental measures. RailCorp, and the PPP awarded contractor, would both prepare a Construction Environment Management Plan (CEMP) and Operational Management Plan (OMP). These plans would:

- Ensure all works are carried out in accordance with statutory requirements and relevant non-statutory requirements;
- Ensure all works are carried out in accordance with the assessments detailed in this REF to mitigate the potential for adverse environmental impacts;
- Ensure contractors and employees engaged to undertake works comply with the conditions detailed in the EMPs, as well as relevant OH&S requirements; and
- Identify management responsibilities and reporting requirements to demonstrate compliance with the EMPs.

The EMPs would be working documents and would be amended should strategies initially implemented be found to be inadequate to manage environmental impacts. The EMPs would typically:

- Establish environmental goals, objectives and outcomes;
- Ensure compliance with any conditions of approval;
- List actions, timing and responsibilities of mitigation measures identified in this REF;
- Detail statutory and licence requirements;
- Provide a reporting framework for any matters on a ongoing basis;
- Detail training requirements for contractors, personnel, staff in environmental awareness, best practice EMS and work safety;
- Outline emergency procedures, including contact names, reporting format corrective procedures;
- Detail monitoring programs and auditing procedures;
- Detail community complaints and complaint handling procedures; and
- Detail quality assurance procedures.

4. Finalisation

4.1 Justification of the project

This REF has assessed the impacts of the proposed development in accordance with Part 5 of the *Environmental Planning and Assessment Act 1979* and Clause 228 of the *Environmental Planning and Assessment Regulation 2000*.

The site location of the proposed works adjacent to an array of existing rail maintenance facilities is an ideal location for the development. The site has been used for rail related purposes for well over 110 years, and this has helped develop the identity and character of the area.

The surrounding land uses comprising of industry development further ensure the site is compatible with existing land uses. The location of Duck River and the existing vacant land, industry land uses, rail line and Maintrain operations indicate that this site is well buffered to prevent adverse impacts on nearby residential development.

The proposed development will provide significant benefits to the rail network of Sydney through ongoing rolling stock maintenance and improvement. The PPP structure will provide positive microeconomic impacts by encouraging efficient competition in the fleet maintenance sector, which is in the interest of all levels of consumers and therefore ultimately the general public.

The introduction of the fleet of new electric rolling stock cars as part of the PPP project will replace 498 existing cars that are reaching the end of their economic life. These new cars will provide a higher level of safety and amenity for passengers and provide a more reliable fleet.

The proposed development will provide the ongoing maintenance support for this new fleet increasing its reliability and availability for RailCorp's passenger services.

The proposed development will also increase the efficiency and operational capacity of the site, by increasing activity on the site, with potential positive employment flow-on effects with construction and operational stages following efficiencies gained and therefore ultimately in the interest of the general public.

This REF provides a true and fair review of the proposed development in relation to its likely 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 proposed development.

While a number of potential negative impacts have been identified, these impacts will be mitigated by the implementation of appropriate measures as outlined in the REF.

Having regard to the assessment contained within this REF, it is concluded that the proposed development is not likely to have a significant impact on the environment, and therefore an EIS is not required.

4.2 Certification of the REF

This REF has assessed the impacts of the proposed development in accordance with Part 5 of the *Environmental Planning and Assessment Act 1979* and Clause 228 of the *Environmental Planning and Assessment Regulation 2000*.

This REF provides a true and fair review of the proposed development in relation to its likely 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 proposed activity and provides sufficient information to determine whether there is likely to be a significant impact on the environment as a result of the Project.

While a number of potential negative impacts have been identified, these impacts will be mitigated by the implementation of appropriate measures as outlined in this REF.

Having regard to the assessment contained within this REF, it is concluded that the proposed development is not likely to have a significant impact on the environment, and therefore an EIS is not required.

On the basis of this REF, it is concluded that, by adopting the measures identified in this assessment, there would be no significant environmental impacts as a result of undertaking the proposed works.

Prepared by Amanda Raleigh

Senior Environmental Planner,

GHD Pty Ltd

Certified by Peter Dolier

Project Manger, Asset Management Division

RailCorp

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5. References

Geological Survey of NSW (1983), *Sydney Geological Series Sheet* 1:100,000, Geological Survey of New South Wales (NSW)

GHD Pty Ltd (2005a), *Combined Preliminary & Detailed Environmental Site Investigation – Clyde Rail Yards, off Manchester Road, Clyde*, Final Report, February 2005

GHD Pty Ltd (2005b), *Clyde Rail Yards, off Manchester Road, Clyde – Additional Soil Investigation (Final)*, July 2005

Kass, Terry (1996), Historical Context Report Auburn Heritage Study, Neustein & Associates.

Appendix A

Clause 228 Matters

Clause 228 of the EP&A Regulation 2000 identifies factors that must be taken into account when consideration is being given to the likely impact of an activity on the environment under Part 5 of the EP&A Act 1979.

(1) For the purposes of Part 5 of the Act, the factors to be taken into account when consideration is being given to the likely impact of an activity on the environment include:

(a) for activities of a kind for which specific guidelines are in force under this clause, the factors referred to in those guidelines, or

(b) for any other kind of activity:

(i) the factors referred to in the general guidelines in force under this clause, or

(ii) if no such guidelines are in force, the factors referred to in subclause (2).

No specific guidelines are in force for the activity proposed. This REF has been prepared in accordance with the requirements of Clause 228.

(2) The factors referred to in subclause (1)(b)(ii) are as follows:

(a) any environmental impact on a community,

Chapter 3 of this REF assesses the environmental impacts on the community. Chapter 8 concludes that the proposed development is not likely to have a significant impact on the environment and hence the community.

(b) any transformation of a locality,

Section 3.12 concludes that the proposed development will be consistent with surrounding development and will not result in transformation of the locality.

(c) any environmental impact on the ecosystems of the locality,

Section 3.4 indicates that, with the implementation of appropriate mitigation measures, which form part of the description of the proposed activity, there will be no adverse impact on water quality and therefore aquatic ecosystems. Section 3.3 indicates that there will be no adverse impact on flora and fauna.

(d) any reduction of the aesthetics, recreational, scientific or other environmental quality or value of a locality,

Chapter 3 provides consideration of all relevant aesthetic, recreational, scientific and environmental qualities and values, and Chapter 4 concludes that there will be no significant impact.

(e) any effect of a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations,

Sections 3.7 and 3.8 addresses the impact of the proposed development on the identified heritage and archaeological values of the site. These sections conclude that the site is highly disturbed and recommends a number of mitigation measures to ensure that the heritage values of the site are retained where possible and, where not possible, relocated and/or recorded.

(f) any impact on the habitat of protected fauna (within the meaning of the National Parks and Wildlife Act 1974),

Section 3.3 indicates that there will be no adverse impact on protected flora and fauna.

(g) any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air,

Section 3.3 indicates that there will be no adverse impact on flora and fauna.

(h) any long-term effects on the environment,

The proposed development will not result in any significant long-term effects on the environment.

(i) any degradation of the quality of the environment,

Subject to implementation of the recommended mitigation measures, which form part of the description of the proposed activity, the proposed development will not result in any degradation to the quality of the environment.

(j) any risk to the safety of the environment,

Implementation of the mitigation measures, which form part of the description of the proposed activity, as summarised in Section 3.21 will ensure that any potential risk to the safety of the environment is minimised.

(k) any reduction in the range of beneficial uses of the environment,

The proposed development is considered to be an appropriate land use for the site, given its zoning and surrounding land uses. The proposed development will not lead to a reduction in the range of beneficial uses of surrounding development.

(l) any pollution of the environment,

Subject to implementation of the recommended mitigation measures, which form part of the description of the proposed activity, the proposed development will not result in pollution of the environment.

(m) any environmental problems associated with the disposal of waste,

Section 3.9 outlines potential waste disposal issues and recommends a number of mitigation measures (which form part of the description of the proposed activity) to minimise impacts.

(n) any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply,

The proposed development will not result in significant additional demands on resources.

(o) any cumulative environmental effect with other existing or likely future activities.

Section 3.18 outlines potential positive and negative cumulative impacts. It is considered that the potential positive impacts of the proposed development outweigh the potential negative impacts.

IS AN EIS REQUIRED CHECKLIST

PRELIMINARY – PREPARED PRIOR TO REF

TABLE 1

IDENTIFY THE ISSUES

Description of proposed activity

Activity: Construction of a Rail Maintenance Facility at Auburn

Objectives:

- Construct rail rolling stock servicing, finishing, maintenance and upgrading facility and stabling yards;
- Upgrade current Down Relief Line;
- Protect RailCorp plant, machinery and rolling stock; and
- Provide a maintenance facility within an existing rail service area (part of the larger Clyde Marshalling Yards).

Major elements including any environmental impact mitigation measures:

- Excavating and filling the building and track area;
- Construction of new stabling tracks;
- Construction of a large service facility shed, with capacity for 5 rails, services and administration area;
- Construction of car parking, pedestrian safety measures, apron and access road around building;
- Upgrading of existing Down Relief Line.

Any ancillary works:

None

Outline of construction methods:

- Site establishment
- Excavation and filling to create level surface;
- Construction of new stabling railways;
- Construction of maintenance facility;
- Construction of associated facilities (car parking, pedestrian access, internal service road);
- Down Relief Line track upgrading;
- Site disestablishment

Outline of operations:

Unknown at this stage. Construction hours would be in accordance with the DEC's Environmental Noise Control Manual Guidelines.

Location(s): Off Manchester Road, Auburn (part of the larger Clyde Marshalling Yards area)

Time Frame: Unknown.

TABLE 1 IDENTIFY THE ISSUES

Characteristics of the activity (during construction & operation)	Potential issues
How is the proposal likely to affect the physical aspects of the environment or introduce pollution or safety risk factors?	
Disturbs the topography or above or below ground features including filling, excavation, dredging, tunnelling: eg. landforming, site preparation, quarrying, reclamation, creation of islands, waterbodies, etc: involves the disposal of large quantities of spoil	The proposed works will involve the excavation of materials and using those materials for fill.
Affects a natural waterbody, wetland or groundwater aquifer or the natural water drainage pattern; affects the quality or quantity of water in the systems	No impact
Uses groundwater or surface water from a natural waterbody; stores water in a dam or artificial waterbody	No impact
Changes the flood or tidal regimes or is affected by flooding or tides	No impact
Uses, stores, disposes or transports hazardous substances (flammable, explosive, toxic, radioactive, carcinogenic or mutagenic substances); uses or generates pesticides, herbicides, fertilisers or other chemicals which may build up residues in the environment	The proposed maintenance facility may use chemicals and materials of this nature, albeit in small quantities.
Generates or disposes of gaseous, liquid or solid waste (industrial, medical or domestic waste, sewage, sludge or effluent, spoil or overburden); generates greenhouse gas emissions or releases chemicals which affect the ozone layer or are precursors to photochemical smog; generates or disposes of hazardous waste	No impact
Emits dust, odours, noise, vibrations, blasts, electromagnetic fields or radiation in the proximity of residential areas or landuses likely to be affected.	Although the facility is located some distance from residential land uses on Manchester Road, it is likely that some noise impacts may be experienced. No significant noise impacts from Down Relief upgrade works are expected.
Any other matters	If no impacts identified this section can be ignored in Tables 2(a) and 2(c).
How is the proposal likely to affect the biological aspects of the environment?	
Clears or modifies (including by modifying the drainage) native vegetation (including trees, shrubs, grasses, herbs or aquatic species)	No impact
Displaces or disturbs fauna (terrestrial or aquatic) or creates a barrier to fauna movement; clears remnant vegetation or wildlife corridors	No impact
Introduces noxious weeks, vermin, feral species or disease or releases genetically modified organisms	No impact

Characteristics of the activity (during construction & operation)	Potential issues
Undertakes activity which affects revegetation or replenishment of native species following a disturbance	No impact
Introduces high bushfire risk factors or changes the fire regime	No impact
Any other issues	If no impacts identified this section can be ignored in Tables 2(a) and 2(c).
How is the proposal likely to affect natural or community resources?	
Uses or results in the use of community services or infrastructure including roads, power, water, drainage, waste management, education, medical or social services.	No impact
Uses or results in the use of natural resources including water (ground or surface), fuels, timber, extractive material, minerals, prime agricultural land, etc	No impact
Affects future potential of commercial deposits of minerals or extractive material or areas important for fishing, agriculture or forestry	No impact
Changes the demographics of an area	No impact
Changes the transport requirements of an area	No impact
Creates a new route alignment for the provision of infrastructure (eg rail, roads, power etc)	The proposed development will involve the upgrading of the existing Down Relief Line and the creation of new stabling tracks and access tracks for the maintenance facility. These will be used in the general day to day marshalling of rolling stock and will not impact upon the general transportation infrastructure
Any other issues	If no impacts identified this section can be ignored in Tables 2(a) and 2(c).
How is the proposal likely to affect the community?	
Generates population movements including influx or departure of the workforce	Some increase in employment could be expected as a result of the proposed development.
Changes the workforce or industry structure of the area/region	No impact
Affects employment opportunities affects areas of high population densities or established development patterns	No impact
Affects access to an area, building or items of aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific, recreational, aesthetic or social significance or other special value for present or future generations	The proposed works are in an area of identified environmental heritage and investigations into the extent of the potential impacts on these areas will need to be carried out. However due to the highly disturbed nature of the site, these impacts are likely to be minimal.
Affects the visual or scenic landscape (including major	No impact

Characteristics of the activity (during construction & operation)	Potential issues
cuts/fills, towers, projects on escarpments, etc)	
Affects sunlight or views of another property	No impact
Affects the amenity of publicly owned land (particularly recreational areas, national parks or reserves)	No impact
Changes surrounding land uses as a direct or indirect result of the activity; forms a barrier to movement within the community or access to existing properties; leads to a loss of housing	No impact
Generates significant volume of traffic (road, rail, air, pedestrian etc)	No impact
Generates nuisance, health or safety risks including air pollution, odour, noise or vibration, blasting, electromagnetic fields or radiation; releases diseases or genetically modified organisms; changes the bush fire regime	Although the facility is located some distance from residential land uses on Manchester Road, it is likely that some noise impacts may be experienced. No significant noise impacts from Down Relief upgrade works are expected.
Any other issues	If no impacts identified this section can be ignored in Tables 2(a) and 2(c).
How is the proposal likely to affect areas sensitive because of physical factors?	
Coastline and dune fields, alpine areas, deserts, caves or other unique landforms	No impact
Land with high agricultural capability	No impact
Natural waterbodies, riparian zones, wetlands, drinking water catchments or flood prone areas	No impact
Groundwater recharge areas or areas with high water table	No impact
Erosion prone areas; areas with slopes of greater than 18 degrees	No impact
Subsidence or slip areas	No impact
Areas with acid sulphate, sodic of highly permeable soils	No impact
Areas with salinity or potential salinity problems	No impact
Areas with degraded air quality	No impact
Areas with degraded or contaminated soil area or degraded or contaminated water (ground or surface)	Contaminated soil may be found on the site
Any other sensitive areas	No impact If no impacts identified this section can be ignored in Tables 2(a) and 2(c).
How is the proposal likely to affect areas sensitive because of biological factors?	
Corals and seagrass beds, wetland communities (coastal, peatlands or inland), native forests, urban	No impact

Characteristics of the activity (during construction & operation)	Potential issues
bushland, arid and semi-arid communities	
Critical habitats or the habitats of threatened fauna or flora species, populations or ecological communities (within the meaning of the TSC Act)	No impact
Habitat of species listed under international agreements including Japan-Australia Migratory Birds Agreement (JAMBA) and China-Australia Migratory Birds Agreement (CAMBA)	No impact
Wildlife corridors and remnant vegetation	No impact
Habitat of protected aquatic species (within the meaning of Fisheries Management (General) Regulation 1994) or of aquatic species having conservation status under Conference on Australian Threatened Fishes	No impact
Fishing grounds and commercial fish breeding or nursery areas	No impact
Bushfire prone areas	No impact
Any other sensitive areas	
	If no impacts identified this section can be ignored in Tables 2(a) and 2(c).
How is the proposal likely to affect areas allocated for conservation purposes?	
National parks and other areas reserved or dedicated under the NP&W Act	No impact
Land reserved or dedicated within the meaning of the Crown Lands Act 1989 for preservation or other environmental protection purposes	No impact
World heritage areas	No impact
Environmental protection zones in environmental planning instruments or lands protected under SEPP14 - Costal Wetlands or SEPP26 - Littoral Rainforests	No impact
Land identified as wilderness under the Wilderness Act 1987 or declared as wilderness under the NP&W Act	No impact
Aquatic reserves dedicated under the Fisheries Management Act 1994	No impact
Wetlands areas dedicated under the Ramsar Wetlands Convention	No impact
Heritage items identified on the Register on the National Estate, under the NSW Heritage Act or an environmental planning instrument	The proposed development may impact upon an area of environmental heritage (Clyde Marshalling Yards) listed under the Auburn LEP. However due to the highly disturbed nature of the site, these impacts are likely to be minimal.
Community land under the Local Government Act (for which a plan of management has been prepared)	No impact

Characteristics of the activity (during construction & operation)	Potential issues
Land subject to a 'conservation agreement' under the NP&W	No impact
Any other areas	If no impacts identified this section can be ignored in Tables 2(a) and 2(c).
How is the proposal likely to affect areas sensitive because of community factors?	
Aboriginal communities or areas subject to land rights claims	No impact
Communities with a strong sense of identity	No impact
Disadvantaged communities (reduced economic, social or cultural indicators)	No impact
Areas with degraded amenity from noise, traffic congestion or odour	No impact
Areas or items of high anthropological, archaeological, architectural, cultural, heritage, historical, recreational or scientific value	The proposed development may impact upon an area of environmental heritage (Clyde Marshalling Yards). However due to the highly disturbed nature of the site, these impacts are likely to be minimal.
Areas or items of high aesthetic or scenic value	No impact
Any other areas	If no impacts identified this section can be ignored in Tables 2(a) and 2(c).

TABLE 2A ANALYSIS OF THE EXTENT OF THE POTENTIAL IMPACTS

Characteristics of potential impacts (adverse and beneficial)	Type of potential impacts	Evaluation criteria		Ranking of potential significance of extent
		Size, scope and intensity	Duration	
Physical or pollution impacts (during operation and construction)				
(a) Air impacts				
Air quality impacts (eg. dust, smoke, grit, odours, precursors to photochemical smog, fumes, toxic or radioactive gaseous emissions) with economic, health, ecosystem or amenity considerations	Dust and sediment transportation	Small scale works	Short-term duration, during construction only	Low
Air impacts with greenhouse or ozone damage considerations	Transport vehicles and plant machinery	Small scale	Short-term duration during construction only	Low
Any other air impacts				
(b) Water impacts				
Impacts from changes in surface or groundwater quantity	No impact			
Impacts from use of water	No impact			
Impacts from changes to natural water bodies, wetlands or runoff patterns	No impact			
Impacts from changes to flooding or tidal regimes	No impact			
Impacts from changes in water quality with economic, health, ecosystem or amenity considerations - eg. salinity, colour, odour, turbidity, temperature, dissolved oxygen, nutrients, pH factors or pollutants (intentional or unintentional releases of oil, fuels, toxins - including heavy metals and anti-foulants, spoil, sediment, sewage or other waste).	Sedimentation, release of oils or fuels from construction equipment and ongoing maintenance activities.	Localised and small scale	Long-term during both construction and operation	Low
Any other impacts on water or from the use or storage of water.				
(c) Soil and stability impacts				
Degradation of soil quality including contamination (intentional or unintentional), salinisation or acidification	No impact			

Characteristics of potential impacts (adverse and beneficial)	Type of potential impacts	Evaluation criteria		Ranking of potential significance of extent
		Size, scope and intensity	Duration	
Loss of soil from wind or water erosion	Exposed fill transported off site	Localised and small scale	Short term duration, during construction only	Low
Loss of structural integrity of soil	No impact			
Increased land instability with high risks from land slides or subsidence	No impact			
Any other soil impacts				
(d) Noise and vibration impacts				
Results in increased noise or vibrations to unacceptable levels for the surrounding communities	Increased noise levels to residential receivers	Potential exceedences of criteria	Long-term potential for construction and operational impacts	Medium (however implementation of mitigation measures would reduce the risk)
Affects sensitive properties (educational, hospitals, residential, heritage)	No impact			
Any other impacts from noise, blasting or vibration				
(e) Any other physical or pollution impacts				
Accumulation of physical or pollution impacts	Dust, sediment, oils	Small scale, localised	Long-term, potential for construction and operational impacts	Low – Medium (however implementation of mitigation measures would reduce the risk)
Biological impacts (during operation and construction)				
(a) Fauna impacts				
Any endangering or displacement of fauna species (including animals, birds, frogs, reptiles, insects, fish or crustaceans)	No impact			
Any reduction of critical habitat of any unique, threatened or endangered fauna (within the meaning of the NP&W Act)	No impact			
Impacts which create significant barriers to fauna movement	No impact			
Any other impacts				

Characteristics of potential impacts (adverse and beneficial)	Type of potential impacts	Evaluation criteria		Ranking of potential significance of extent
		Size, scope and intensity	Duration	
(b) Flora impacts				
Any endangering of flora species (including trees, shrubs, grasses, herbs or aquatic plants)	No impact			
Impacts from the clearing or modifying of extensive areas of relatively undisturbed native vegetation or wetlands	No impact			
Any other impacts				
(c) Ecological impacts				
Any threat to the biological diversity or ecological integrity of species or communities	No impact			
Any barrier to the normal replenishment or revegetation of existing species following disturbance	No impact			
Impacts from the introduction of noxious weeks, vermin, feral species or diseases or releases of genetically modified organisms.	No impact			
Impacts from the uses of pesticides, herbicides, fertilisers or other chemicals which may build up residues in the environment	No impact			
High bushfire risk impacts	No impact			
Any other impacts				
Accumulation of biological impacts	No impact			
Resource use impacts (during operation and construction)				
(a) Community Resources				
Any significant increase in the demand for services and infrastructure resources including roads, power, water supply and drainage, waste (including sewage) management, education, medical and social services	No impact			

Characteristics of potential impacts (adverse and beneficial)	Type of potential impacts	Evaluation criteria		Ranking of potential significance of extent
		Size, scope and intensity	Duration	
Any significant resource recycling or reuse schemes to reduce resource usage	No impact			
Any diversion of resources to the detriment of other communities or natural systems	No impact			
Any degradation of infrastructure such as roads and bridges	No impact			
Any other impacts				
(b) Natural resources				
Any disruption or destruction of natural resource s(eg fish habitat or fish species) with impacts on industries based on these resources	No impact			
Any disruption of existing activities (or reduction of options for future options) because of the natural resource demands of the proposal	No impact			
Any use which results in the wasteful use of large amounts of natural resources	No impact			
Any use which results in the substantial depletion of natural resources	No impact			
Any use which results in the degradation of any area reserved for conservation purposes	No impact			
Any other impacts				
Accumulation of resource use impacts	Neutral impact			
Community impacts (during operation and construction)				
(a) Social factors				
Any impacts which result in a change in the community's demographic structure	No impact			

Characteristics of potential impacts (adverse and beneficial)	Type of potential impacts	Evaluation criteria		Ranking of potential significance of extent
		Size, scope and intensity	Duration	
Any environmental impact that may cause substantial change or disruption to the community (loss of neighbourhood cohesion, access to facilities, links to other communities, community identity or cultural character)	No impact			
Any impacts which result in some individuals or communities being significantly disadvantaged	No impact			
Any impacts on the health, safety, security, privacy or welfare of individuals or communities because of factors such as: ◗ air pollution or odour ◗ noise, vibration, blasting, electromagnetic fields or radiation ◗ release of disease or genetically modified organisms ◗ lighting, overshadowing or visual impacts	Increased noise levels to residential receivers	Potential exceedence of criteria	Long term duration, during construction only	Low – Medium (however implementation of mitigation measures would reduce the risk)
Any impacts that result in a change in the level of demand for community resources (eg. facilities, service sand labour force)	No impact			
Any other social impacts				
(b) Economic factors (including impacts on employment, industry and property value)				
Any impacts which result in a decrease to net economic welfare	No impact			
Any impacts that result in a direct cost to the community or individuals	No impact			
Any impacts that result in a decrease in the community's economic stability	No impact			
Any impacts which result in a change to the public sector revenue or expenditure base	No impact			

Characteristics of potential impacts (adverse and beneficial)	Type of potential impacts	Evaluation criteria		Ranking of potential significance of extent
		Size, scope and intensity	Duration	
Any other economic impacts				
(c) Heritage, aesthetic, cultural impacts Any impacts on a locality, place building or natural landmark having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific, recreational, scenic or social significance or other special value for present or future generations	Heritage and archaeological impacts	Potential destruction or devaluing of potential artefacts	Short term – during construction	Low – Medium (extent of potential artefacts unknown), however the site is highly disturbed (however implementation of mitigation measures would reduce the risk)
Any impacts from new lighting, glare or shadows	No impact			
Any other heritage, aesthetic or cultural impacts	No impact			
(d) Land use impacts Any major changes in land use	No impact			
Any curtailment of other beneficial uses	No impact			
Any property value impacts with land use implications	No impact			
Any other land use impacts				
(e) Transportation impacts (during construction and operation) Substantial impacts on existing transportation systems (rail, water, road, air or pedestrians - both public and private), altering present patterns of circulation, modal split or movement of people and/or goods.	No impact			
Direct or indirectly encouraging additional traffic ◗ during construction ◗ during operation	Additional traffic	Will largely be confined to small increases on site	Short-term	Low
Increased demand for parking (off and on street including residential areas)	Additional demand	Will be confined to site	Short-term	Low

Characteristics of potential impacts (adverse and beneficial)	Type of potential impacts	Evaluation criteria		Ranking of potential significance of extent
		Size, scope and intensity	Duration	
Any other impacts on transport or traffic				
Accumulation of community impacts	Noise, traffic	Localised	Long term, during construction and operation	Medium (however implementation of mitigation measures would reduce the risk)

TABLE 2B ANALYSIS OF THE EXTENT OF THE POTENTIAL ADVERSE IMPACTS IN SENSITIVE LOCATIONS

Characteristics of potential impacts (adverse and beneficial)	Type of potential impacts	Evaluation criteria		Ranking of potential significance of extent
		Size, scope and intensity	Duration	
On areas sensitive because of physical factors				
Coastline and dune fields, alpine areas, deserts, caves or other unique landforms	No impact			
Land with high agricultural capability	No impact			
Natural waterbodies, riparian zones, wetlands, drinking water catchments or flood prone areas	No impact			
Groundwater recharge areas or areas with high water table	No impact			
Erosion prone areas; areas with slopes of greater than 18 degrees	No impact			
Subsidence or slip areas	No impact			
Areas with acid sulphate, sodic or highly permeable soils	No impact			
Areas with salinity or potential salinity problems	No impact			
Areas with degraded air quality	No impact			
Areas with degraded or contaminated soil area or degraded or contaminated water (ground or surface) Any other factors	Disturbance of identified potential contaminated soil	Localised and small scale	Short-term duration during construction only	Low
Accumulation of impacts	Sediment, oils, contamination	Localised and small scale	Short term, during construction	Low – Medium (however implementation of mitigation measures would reduce the risk)
On areas sensitive because of biological factors				
Corals and seagrass beds, wetland communities (coastal, peatlands or inland), native forests, urban bushland, arid and semi-arid communities	No impact			

Characteristics of potential impacts (adverse and beneficial)	Type of potential impacts	Evaluation criteria		Ranking of potential significance of extent
		Size, scope and intensity	Duration	
Critical habitats or the habitats of threatened fauna of flora species, populations or ecological communities (within the meaning of the TSC Act)	No impact			
Habitat of species listed under International agreements including Japan-Australia Migratory Birds Agreement (JAMBA) and China-Australia Migratory Birds Agreement (CAMBA)	No impact			
Wildlife corridors and remnant vegetation	No impact			
Habitat of protected aquatic species (within the meaning of Fisheries Management (General) Regulation 1994) or of aquatic species having conservation status under Conference on Australian Threatened Fishes	No impact			
Fishing grounds and commercial fish breeding or nursery areas	No impact			
Bushfire prone areas	No impact			
Any other sensitive areas				
Accumulation of impacts	No impact			
Sensitive because of conservation factors				
National parks and other areas reserved or dedicated under the NP&W Act	No impact			
Land reserved or dedicated within the meaning of the Crown Lands Act 1989 for preservation or other environmental protection purposes	No impact			
World Heritage areas	No impact			
Environmental protection zones in environmental planning instruments or lands protected under SEPP 14 - Coastal Wetlands or SEPP 26 - Littoral Rainforests	No impact			

Characteristics of potential impacts (adverse and beneficial)	Type of potential impacts	Evaluation criteria		Ranking of potential significance of extent
		Size, scope and intensity	Duration	
Land identified as wilderness under the Wilderness Act 1987 or declared as wilderness under the NP&W Act	No impact			
Aquatic reserves dedicated under the Fisheries Management Act 1994	No impact			
Wetlands areas dedicated under the Ramsar Wetlands Convention	No impact			
Heritage items identified on the Register of the National Estate, under the NSW Heritage Act or an environmental planning instrument	Disturbance or destruction of potential known or unknown heritage items	Unknown	Potential impacts limited to construction only	Low – Medium - generally unknown at this stage, however the site is highly disturbed (however implementation of mitigation measures would reduce the risk)
Community land under the Local Government Act (for which a plan of management has been prepared)	No impact			
Land subject to a 'conservation agreement' under the NP&W Act	No impact			
Any other factors				
Accumulation of impacts	No impact			
Sensitive because of community factors				
Aboriginal communities or areas subject to land rights claims	No impact			
Communities with a strong sense of identity	No impact			
Disadvantaged communities (reduced economic, social or cultural indicators)	No impact			
Areas with degraded amenity from noise, traffic congestion or odour	No impact			
Areas or items of high anthropological, archaeological, architectural, cultural, heritage, historical, recreational or scientific value	Unknown	Unknown	During construction phase only	Unknown until further heritage investigations carried out

Characteristics of potential impacts (adverse and beneficial)	Type of potential impacts	Evaluation criteria		Ranking of potential significance of extent
		Size, scope and intensity	Duration	
Areas or items of high aesthetic of scenic value Any other factors	No impact			
Accumulation of impacts	No impact			

TABLE 2C ANALYSIS OF THE NATURE OF THE POTENTIAL IMPACTS

Characteristics of potential impacts (adverse and beneficial)	Evaluation criteria							Ranking of potential significance
	What is the confidence in predicting impacts?	How resilient is the environment to cope with impacts?	Can the impacts be reversed?	How well can the impacts be mitigated?	Do the impacts comply with plans, policies?	What is the level of public concern?	Are further studies required on impacts or mitigation?	
Physical impacts or pollution impacts (during operation and construction)								
(a) Air impacts								
Air quality impacts (eg. dust, smoke, grit, odours, precursors to photochemical smog, fumes, toxic or radioactive gaseous emissions) with economic, health, ecosystem or amenity considerations	High	Highly disturbed environment, will cope with impacts	No, however impacts cease when construction is complete	Sediment and erosion control, minimisation of sediment transport from vehicles and machinery, operational controls	Yes	Minimal	No	Not significant
Air impacts with greenhouse or ozone damage consideration	High	N/A	No	Minimise works and vehicle transport	Yes	Minimal	No	Not significant
Any other air impacts								
(b) Water impacts								
Impacts from changes in surface or groundwater quantity	No impact							
Impacts from use of water`	No impact							
Impacts from changes to natural waterbodies, wetlands or runoff patterns	No impact							

Characteristics of potential impacts (adverse and beneficial)	Evaluation criteria							Ranking of potential significance
	What is the confidence in predicting impacts?	How resilient is the environment to cope with impacts?	Can the impacts be reversed?	How well can the impacts be mitigated?	Do the impacts comply with plans, policies?	What is the level of public concern?	Are further studies required on impacts or mitigation?	
Impacts from changes to flooding or tidal regimes	No impact							
Impacts from changes in water quality with economic, health, ecosystem or amenity considerations - eg. salinity, colour, odour, turbidity, temperature, dissolved oxygen, nutrients, pH factors or pollutants (intentional or unintentional releases of oil, fuels, toxins (including heavy metals, and antifoulants), spoil, sediment, sewage or other waste	High	Disturbed environment	No	Sediment and erosion control, maintenance practices, spill response	Yes	Low	No	Not significant
Any other impacts on water or from the use or storage of water								
Physical impacts or pollution impacts (during operation and construction)								
(c) Soil and stability impacts								
Degradation of soil quality including contamination (intentional or unintentional), salination or acidification	No impact							
Loss of soil from wind or water erosion	High	Highly disturbed environment, will cope with impact	No	Sediment and erosion control	Yes	Minimal	No	Not significant
Loss of structural integrity of the soil	No impact							
Increased land instability with high risks from land slides or subsidence	No impact							
Any other soil impacts								

Characteristics of potential impacts (adverse and beneficial)	Evaluation criteria							Ranking of potential significance
	What is the confidence in predicting impacts?	**How resilient is the environment to cope with impacts?**	**Can the impacts be reversed?**	**How well can the impacts be mitigated?**	**Do the impacts comply with plans, policies?**	**What is the level of public concern?**	**Are further studies required on impacts or mitigation?**	
(d) Noise and vibration impacts								
Results in increased noise or vibration to unacceptable levels for the surrounding communities	High	Affected by noise already	No	Readily mitigated, especially through hours of operation and selection of quieter machinery	May exceed standard noise criteria during construction	Some concern	No	Low
Affects sensitive properties (educational, hospitals, residential, heritage)	Unknown	Unknown	No	Readily mitigated, especially through hours of operation and selection of quieter machinery	Unknown	Some concern	Yes	Low
Any other impacts from noise, blasting or vibrations								
(e) Any other physical or pollution impacts								
Accumulation of physical or pollution impacts	High	Highly disturbed, will cope with impact	No	Easily mitigated	Yes	Minimal	No	Not significant

Characteristics of potential impacts (adverse and beneficial)	Evaluation criteria							Ranking of potential significance
	What is the confidence in predicting impacts?	How resilient is the environment to cope with impacts?	Can the impacts be reversed?	How well can the impacts be mitigated?	Do the impacts comply with plans, policies?	What is the level of public concern?	Are further studies required on impacts or mitigation?	
Biological impacts (during operation and construction)								
(a) Fauna impacts								
Any endangering or displacement of fauna species (including animals, birds, frogs, reptiles, insects, fish or crustaceans)*	No impact							
Any reduction of critical habitat of any unique, threatened or endangered fauna (within the meaning of the NP&W Act)	No impact							
Impacts which create significant barriers to fauna movement	No impact							
Any other impacts								
(b) Flora impacts								
Any endangering of flora species (including trees, shrubs, grasses, herbs or aquatic plants)	No impact							
Impacts from the clearing of modifying of extensive areas of relatively undisturbed native vegetation or wetlands	No impact							
Any other impacts								
(c) Ecological impacts								
Any threat to the biological diversity or ecological integrity of species or communities	No impact							

Characteristics of potential impacts (adverse and beneficial)	Evaluation criteria							Ranking of potential significance
	What is the confidence in predicting impacts?	How resilient is the environment to cope with impacts?	Can the impacts be reversed?	How well can the impacts be mitigated?	Do the impacts comply with plans, policies?	What is the level of public concern?	Are further studies required on impacts or mitigation?	
Any barrier to the normal replenishment or revegetation of existing species following disturbance	No impact							
Impacts from the introduction of noxious weeks, vermin, feral species or diseases or releases of genetically modified organisms	No impact							
Impacts from the uses of pesticides, herbicides, fertilisers or other chemicals which may build up residue sin the environment	No impact							
High bushfire risk impacts	No impact							
Another impacts								
Accumulation of biological impacts	No impact							
Resource use impacts (during operation and construction)								
(a) Community resources								
Any significant increase in the demand for services and infrastructure resources including roads, power, water supply and drainage, waste (including sewage) management, education, medical and social services	No impact							
Any significant resource recycling or reuse schemes to reduce resource usage	No impact							
Any diversion of resources to the detriment of other communities or natural systems	No impact							

Characteristics of potential impacts (adverse and beneficial)	Evaluation criteria							Ranking of potential significance
	What is the confidence in predicting impacts?	How resilient is the environment to cope with impacts?	Can the impacts be reversed?	How well can the impacts be mitigated?	Do the impacts comply with plans, policies?	What is the level of public concern?	Are further studies required on impacts or mitigation?	
Any degradation of infrastructure such as roads, bridges Any other impacts	No impact							
(b) Natural resources Any disruption or destruction of natural resources (eg fish habitat or fish species) with impacts on industries based on these resources Any disruption of existing activities (or reduction of options for future options) because of the natural resource demands of the proposal Any use which results in the wasteful use of large amounts of natural resources Any use which results in the substantial depletion of natural resources Any use that results in the degradation of any area reserved for conservation purposes Any other impacts	No impact No impact No impact No impact No impact							
Accumulation of resource use impacts	Neutral impact							
Community impacts (during operation and construction) *(a) Social impacts*								

Characteristics of potential impacts (adverse and beneficial)	Evaluation criteria							Ranking of potential significance
	What is the confidence in predicting impacts?	How resilient is the environment to cope with impacts?	Can the impacts be reversed?	How well can the impacts be mitigated?	Do the impacts comply with plans, policies?	What is the level of public concern?	Are further studies required on impacts or mitigation?	
Any impacts which result in a change in the community's demographic structure	No impact							
Any environmental impact that may cause substantial change or disruption to the community (loss of neighbour cohesion, access to facilities, links to other communities, community identity or cultural character)	No impact							
Any impacts which result in some individuals or communities being significantly disadvantaged	No impact							
Any impacts on the health, safety, security, privacy or welfare of individuals or communities because of factors such as								
◗ air pollution or odour noise, ◗ vibration, blasting, electromagnetic fields or radiation ◗ release of disease or genetically modified organisms ◗ lighting, overshadowing or visual impacts	High	Affected by noise already	No	Readily mitigated, especially through hours of construction and operation and choice of machinery	May exceed standard noise criteria during construction	Some concern	No	Low
Any impacts that result in a change in the level of demand for community resource s(eg facilities, services and labour force)	No impact							
Any other social impacts								
(b) Economic factors (including impacts on employment, industry and property value)								

Characteristics of potential impacts (adverse and beneficial)	Evaluation criteria							Ranking of potential significance
	What is the confidence in predicting impacts?	How resilient is the environment to cope with impacts?	Can the impacts be reversed?	How well can the impacts be mitigated?	Do the impacts comply with plans, policies?	What is the level of public concern?	Are further studies required on impacts or mitigation?	
Any impacts which result in a decrease to net economic welfare	No impact							
Any impacts that result in a direct cost to the community or individuals	No impact							
Any impacts that result in a decrease I the community's economic stability	No impact							
Any impacts which result in a change to the public sector revenue or expenditure base	No impact							
Any other economic impacts								
(c) Heritage, aesthetic, cultural impacts								
Any impacts on a locality, place, building or natural landmark having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific, recreational, scenic or social significance or other special value for present or future generations	Medium	Highly disturbed environment, may cope with impact	No	Could be mitigated with appropriate measures taken	Unknown – extent of impacts not fully known, although highly disturbed site	Minimal	Yes – Heritage impact statement	Low – Medium (however implementation of mitigation measures would reduce the risk)
Any impacts from new lighting, glare or shadows	No impact							
Any other heritage, aesthetic, cultural impacts	No impact							
(d) Land use impacts								
Any major changes in land use	No impact							
Any curtailment of other beneficial uses	No impact							

Characteristics of potential impacts (adverse and beneficial)	Evaluation criteria							Ranking of potential significance
	What is the confidence in predicting impacts?	How resilient is the environment to cope with impacts?	Can the impacts be reversed?	How well can the impacts be mitigated?	Do the impacts comply with plans, policies?	What is the level of public concern?	Are further studies required on impacts or mitigation?	
Any property value impacts with land use implications	No impact							
Any other land use impacts	No impact							
(e) Transportation impacts								
Substantial impacts on existing transportation systems (rail, water, road, air or pedestrian - both public and private), altering present patterns of circulation, modal split or movement of people and/or good	No impact							
Directly or indirectly encouraging additional traffic								
◗ during construction ◗ during operation	High	Will cope with impacts, road traffic increase during construction only	No	Restricting traffic	Yes	Minimal	No	Not significant
Increased demand for parking (off and on street including residential areas)	High	Will cope with impacts – site has car parking available	No	Impacts can mitigated easily – car parking to be provided on site, reducing overall impacts on local community	Yes	Some concern	No	Low

Characteristics of potential impacts (adverse and beneficial)	Evaluation criteria							Ranking of potential significance
	What is the confidence in predicting impacts?	How resilient is the environment to cope with impacts?	Can the impacts be reversed?	How well can the impacts be mitigated?	Do the impacts comply with plans, policies?	What is the level of public concern?	Are further studies required on impacts or mitigation?	
Any other impacts on transport or traffic								
Accumulation of community impacts	High	Will cope	No	Impacts can be readily mitigated	Yes	Minimal	No	Low

TABLE 3 EVALUATE THE LIKELY SIGNIFICANCE OF POTENTIAL IMPACTS ON THE ENVIRONMENT

Impacts	Potential significance considering the extent of impacts	Potential significance considering the level of adverse impacts on environmentally sensitive areas	Potential significance considering the nature of the impacts
Physical and pollution ◗ air impacts ◗ water impacts ◗ soil impacts ◗ noise and vibration impacts	Not significant	Not significant	Not significant
Biological ◗ fauna ◗ flora ◗ ecological	Not significant	Not significant	Not significant
Resource use ◗ community resources ◗ natural resources	Not significant	Not significant	Not significant
Community ◗ social impacts ◗ economic impacts ◗ heritage, aesthetic, cultural impacts ◗ land use impacts ◗ transportation impacts	Not significant	Not significant	Not significant
Activity as a whole	Not significant	Not significant	Not significant

The activity is not likely to significantly affect the environment. No EIS is required ☒

or

This activity is likely to significantly affect the environment. An EIS is required. ☐

Appendix B

Traffic and Transport Assessment

CLIENTS | PEOPLE | PERFORMANCE

RailCorp

Proposed Fleet Servicing Centre, Auburn

Traffic and Transport Assessment

July 2006

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

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1. Introduction

RailCorp has commissioned GHD Pty Ltd (GHD) to undertake a traffic and transport assessment for the proposed upgrade of the fleet service centre at Auburn. The construction would provide new facilities for the maintenance of RailCorp rolling stock and other engineering aspects of fleet servicing programs.

The proposed development site is situated within an industrial precinct, which is located in the southern portion of the Clyde Marshalling Yards and is bound by the western rail line, the Crescent south, Manchester Road and Duck Creek.

The Clyde Marshalling Yards is an industrial precinct used for rail-based maintenance, involving heavy engineering, the construction of rolling stock, warehouse distribution and commercial steel uses. The development site is situated north of the Maintrain and Linfox facilities. Access to the proposed development site and other facilities in this section of the industrial precinct would be via Manchester Road and Chisholm Road.

The proposed development at the site involves the following:

» Demolition of some of the existing facilities;

» The modification of existing facilities; and

» The construction of new facilities.

The purpose of the development is to provide a maintenance facility for new rolling stock. The facility will be built and operated by a private sector company (as part of a Public Private Partnerships or PPP with Railcorp). The proposed uses for the development site would be similar to those currently existing on site (i.e. at Maintrain).

This Traffic Impact Statement has been prepared in accordance with the RTA *Guide to Traffic Generating Developments* procedure manual where applicable and should be considered with all other sections of the Review of Environmental Factors (REF) report.

This report discusses the following:

» Existing Conditions – a review of existing road features, adjacent developments, traffic volumes, existing intersections performances, public transport and pedestrian and cyclist facilities; and

» Future Conditions – a review of additional traffic generated during construction and from the future operation of the proposed development, the development daily traffic profile, traffic assignment, assessment of the impact of the construction and the future operation of the proposed development to the road network and intersections performances in the vicinity of the site.

2. Existing Conditions

2.1 Site Description

The proposed development site ("the site") is situated in the southwestern section of an industrial precinct known as Clyde Marshalling Yards. This precinct is bounded by Parramatta Road to the north, Duck River to the west, Rawson Street to the east and Manchester Road to the south. The site is split into two sections by the main Western Rail Line, which runs east west through the precinct. Access to the development site is via a Private Road, west of Manchester Road.

The subject site forms part of the larger area known as the Clyde Marshalling Yards. The study area comprises of:

- Existing RailCorp and Maintrain maintenance facilities, servicing centres and suburban rail lines;
- Vacant land included within RailCorp boundary;
- Adjacent lands which contain natural environmental features;
- Adjacent industry, which includes a Linfox Warehouse distribution centre and a Smorgon Steelmark facility;
- Surrounding residential suburb of Auburn; and
- Transport networks in the surrounding area.

The location of the site is shown in **Figure 1**.

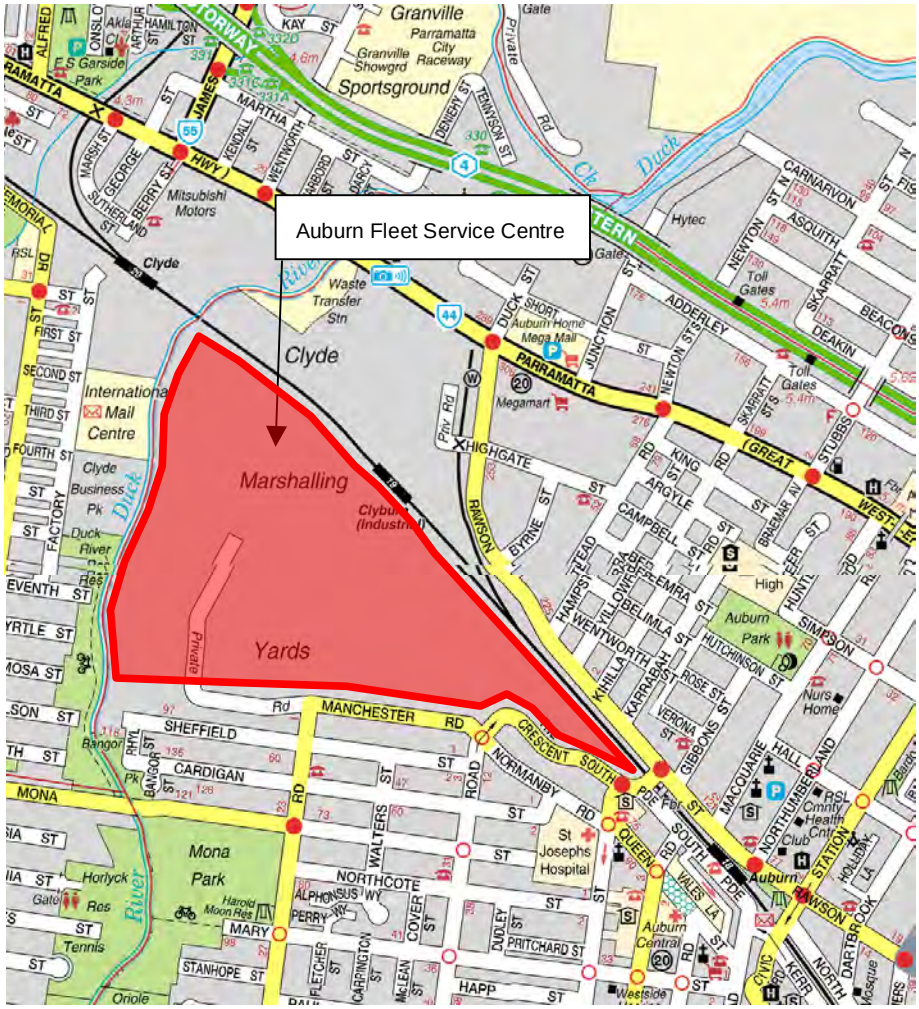


Figure 1 Locality Map[1]

2.2 Existing Operational Characteristics of the Fleet Service Centre

This section describes the existing operational characteristics and traffic generation of land uses within the industrial precinct.

2.2.1 Existing Operations

The existing site is used as a rail based maintenance facility, with a variety of functions associated with the servicing existing rail related rolling stock. Existing operations include:

- Construction and engineering of rolling stock components;
- Workshops and for maintenance of rolling stock;
- Workshops for visual presentation of rolling stock. This includes painting and repair works to carriages;

[1] Map reproduced with permission of UBD. Copyright Universal Press Pty. Ltd.

» Storage of rolling stock components and related machinery;

» Testing tracks and rail lines for train and carriage interchanges; and

» Ancillary land uses including administrative office space and car parking.

2.2.2 Existing Traffic Generation Characteristics

Due to the sensitivity issues associated with this study, data collection was restricted. To compensate for this missing data a number of assumptions have been applied in order to understand the impact from the proposed development.

Employee Traffic Generation

The industrial precinct is currently operating 24 hours a day. The maximum number of employees generated by the precinct is currently unknown. However, it can be assumed that the number of employees accessing the precinct (excluding the proposed PPP development site) would not change due to the proposed development and alterations to the site, thus the traffic data collected from surveys should contain the peak movement generated by the precinct.

Heavy Vehicle Traffic Generation

Based on traffic data collected along the Private Road, it is apparent that heavy vehicle movements are fairly uniformly distributed throughout the week. The daily peak in heavy vehicle movements on the Private Road to the site is between 6.00 am and 2.00 pm, with a maximum of 140 heavy vehicles accessing the site per hour, can be associated with current commercial and industrial uses which is a significant number of heavy vehicles within the precinct. This pattern is likely to continue after the development of the site.

The existing heavy vehicle traffic generation of the precinct along the Private Road is shown in **Table 1** below:

Table 1 Existing Heavy Vehicle Traffic Generation

	AM Peak (vph)	PM peak (vph)	Daily Total (vpd)
No. of heavy vehicles	52	20	516

Based on the existing traffic generation of the precinct, 52 heavy vehicle trips were generated by the south west portion of the precinct during the AM peak period on an average weekday and 20 heavy vehicle trips were generated by the south west portion of the precinct during the PM peak period on an average weekday. A total of 516 heavy vehicle trips were generated by the site on an average weekday. Therefore approximately 10% of the daily vehicles movements to the southwest portion of the precinct occur during the AM and 4% in the PM weekday peak periods.

2.3 Existing Road Network Characteristics

The classification of roads on the existing road network can be used as an indication of the functional role each road plays with respect to the volume of traffic they should appropriately carry. The Roads and Traffic Authority (RTA) have developed a set of road hierarchy classifications detailed in Table 2 indicating typical nominal volumes expressed in terms of average annual daily traffic (AADT) serviced by various classes of roads.

Table 2 Functional Classification of Roads

Type of Road	Traffic Volume (vpd)	Peak Hour Volume (vph)
Arterial Road	>15,000	1,500 – 5,600
Sub-Arterial Road	5,000 – 20,000	500 – 2,000
Collector Road	2,000 – 10,000	200 – 1,000
Local Road	<2,000	0 – 200

2.3.1 Manchester Road

Manchester Road runs west-east and is located south of the site. Manchester Road performs the role of a collector road with connection to Chisholm Road and a Private Road (access road to the south western section of the industrial precinct) at its western end and access to The Crescent South, Normanby Road and Cumberland Road at its eastern end. Manchester Road is sealed carriageway comprising two wide travel lanes, one in each direction, and sufficient width to accommodate kerbside parking lanes. It is likely that the majority of vehicles wanting to gain access to the entrance/ exit driveway of the subject site would travel via this road.

2.3.2 Chisholm Road

Chisholm Road runs north-south and is located south of the proposed development site. Chisholm Road performs the role of a collector road with connection to Manchester Road at its northern end and Regents Park industrial area at its southern end. Chisholm Road, in the vicinity of Manchester Road, is a sealed carriageway comprising two wide travel lanes, one in each direction, and sufficient width to accommodate kerbside parking lanes.

Figure 2 Looking west along Manchester Road to the Maintrain facility, towards the access driveway

2.3.3 Private Road

Private Road runs east - west and runs along the southern boundary of the industrial precinct before travelling north towards the proposed site. Private Road performs the role of an industrial access road with connection to Manchester Road and Chisholm Road at its eastern end and Clyde Marshalling Yards at its northern end. Private Road, in the vicinity of Manchester Road, is a sealed carriageway comprising two wide travel lanes, one in each direction.

The Private Road is a wide road with low traffic volumes that is suitable to accommodate heavy vehicle traffic. The route it is currently used by heavy vehicles and employee traffic accessing sites within the industrial precinct. Residences are located along the southern side of the Private Road, a number of which have driveway access across RailCorp land to their properties, which may result in minor conflict for the heavy vehicles accessing the precinct.

In terms of functional classification, the Private Road most closely represents a local road in terms of existing traffic volumes. However, in terms of its actual use as a privately-owned industrial access road, it does not readily fall within any of the RTA's road hierarchy classifications.

Figure 3 Looking west along the Private Road, located to the west of Manchester Road

2.4 Existing Traffic Management Controls

The existing road network near the vicinity of the development site comprises the following important traffic management features.

Stop Control:

» On the Manchester Road (east) approach to Chisholm Road.

» On the Private Road approach to Chisholm Road.

Roundabout Control:

» At the intersection of Manchester Road/ Cumberland Road/ Normanby Road/ The Crescent South.

Sign-Posted Speed Limits:

» 60 km/h along Manchester Road and Chisholm Road; and

» 20km/h along the Private Road, west of Manchester Road.

Figure 4 **Looking east towards the intersection of Manchester Road and Chisholm Road**

Figure 5 **Looking east along Manchester Road towards the roundabout with Normanby Road, Cumberland Road and the Crescent South**

2.5 Existing Traffic Volumes

A review of existing traffic operating conditions along Manchester Road and Chisholm Road has been undertaken as part of this study. The traffic conditions along the roads in the vicinity of the subject site was obtained by undertaking automatic traffic counts along Manchester Road, Chisholm Road and the Private Road. The traffic counts were completed for a continuous seven-day period starting on 14 June 2005. The average daily traffic (ADT) data for this period is summarised in **Table 3** and in **Appendix A**.

Table 3 Average Daily Flows

Location	Weekday				Weekend			
	Direction one (vpd)	% HV	Direction two (vpd)	% HV	Direction one (vpd)	% HV	Direction two (vpd)	% HV
Chisholm Road (south of Manchester Road)	2650 NB	11.4%	1600 SB	14.0%	1670 NB	3.4%	942 SB	3.5%
Manchester Road (east of Chisholm Road)	2563 EB	11.8%	1533 WB	17.1%	1695 EB	3.1%	975 WB	4.3
Private Road (west of Chisholm Road)	734 EB	37.5%	732 WB	33.0%	124 EB	22.2%	116 WB	15.6%

Notes: NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound, HV = Heavy Vehicles.

It is evident from **Table 3** that the traffic volumes on Chisholm Road and Manchester Road are within the acceptable traffic volumes for collector roads and are operating below their design capacity.

The traffic volumes on Private Road (west of Manchester Road) are within the acceptable traffic volumes for a local road and is operating below the design capacity. However, in terms of its actual use as a privately-owned industrial access road with a high proportion of heavy vehicle usage, Private Road does not readily fall within the RTA's road hierarchy classifications.

2.5.1 Existing Peak Hour Volumes

A review of existing peak hour traffic flows on the roads within the vicinity of the site was conducted to ascertain whether the level of traffic activity on the roads within the study area are carrying acceptable levels of traffic during these peak periods. In addition to the automatic traffic counts, a classification count of both heavy and light vehicles was also undertaken to ascertain the peak movements at the intersection of Chisholm Road/ Manchester Road/ Private Road between 7:00am – 9:00am and 4.00pm – 6:00 pm on Wednesday, 15 June 2005. Refer to **Appendix A** for the peak hour intersection counts.

A summary of the peak hour flows is presented in **Table 4**.

Table 4 Peak Hour Flows

Location	AM Peak (8.00am – 9.00am)		Total	PM Peak (4.15pm – 5.15pm)		Total
	Volume/Direction			Volume/Direction		
Chisholm Road (south of Manchester Road)	273 NB	81 SB	354	128 NB	149 SB	277
Manchester Road (east of Chisholm Road)	94 WB	236 EB	330	130 WB	141 EB	271
Private Road (west of Chisholm Road)	89 WB	39 EB	128	16 WB	48 EB	64

Notes: NB = Northbound; SB = Southbound; EB = Eastbound; WB = Westbound.

The peak period intersection counts revealed that:

- Two-way traffic flows on Manchester Road during the morning peak period (8.00 am – 9.00 am) are in the order of 330 vehicles per hour with eastbound traffic flows predominating (236 vph).
- Two-way traffic flows on Manchester Road during the evening peak period (4.15 pm – 5.15 pm) are in the order of 271 vehicles per hour with eastbound traffic flows predominating (141 vph).
- Two-way traffic flows on Chisholm Road during the morning peak period (8.00 am – 9.00 am) are in the order of 354 vehicles per hour with northbound traffic flows predominating (273 vph).
- Two-way traffic flows on Chisholm Road during the evening peak period (4.15 pm – 5.15 pm) are in the order of 277 vehicles per hour with southbound traffic flows predominating (149 vph).
- Two-way traffic flows on the Private Road during the morning peak period 8.00 am – 9.00 am) are in the order of 128 vehicles per hour with westbound traffic flows predominating (89 vph).
- Two-way traffic flows on the Private Road during the evening peak period (4.15 pm – 5.15 pm) are in the order of 64 vehicles per hour with eastbound traffic flows predominating (48 vph).

It is evident from **Table 4** that the peak hour traffic volumes on Chisholm Road and Manchester Road are within the acceptable traffic volumes for collector roads and are operating below their design capacity.

The peak hour traffic volumes on the Private Road (west of Manchester Road) are within the acceptable traffic volume for a local road and is operating below the design capacity. However, in terms of its actual use as a privately-owned industrial access road with a high proportion of heavy vehicle usage, the Private Road does not readily fall within the RTA's road hierarchy classifications.

2.5.2 Environmental Capacity Performance Standards

The peak hour flow environmental goal for local and collector roads such as the road network in the vicinity of the site is determined by the functional classification of the street and the physical characteristics of the street.

A summary of the environmental performance standards on local residential streets is provided by the RTA Guidelines[2] and is presented in **Table 5**. It is pertinent to note that the environmental performance standards indicated below are typically used for residential streets in urban conditions.

Table 5 Environmental Capacity Performance Standards

Road Class	Maximum Speed (km/h)	Maximum Peak Hour Volume (veh/hr)	Maximum ADT (veh/day)
Local Road	40	200 environmental goal	2,000 environmental goal
		300 maximum	3,000 maximum
Collector Road	50	300 environmental goal	3,000 environmental goal
		500 maximum	5,000 maximum

In **Table 6**, the RTA guidelines have been applied to the existing peak hour flows on the local road network within the study area to determine whether these streets are meeting the environmental capacity.

Table 6 Assessment of Environmental Capacity Performance Standards

Road	Functional Classification	Existing AM average peak hour two-way flows	Existing PM average peak hour two-way flows	Environmental Capacity (two-way flows)	Volume compliance
Chisholm Road (south of Manchester Road)	Collector	354	277	500	Yes
Manchester Road (east of Chisholm Road)	Collector	330	271	500	Yes
Private Road (west of Chisholm Road)	Local *	128	64	300	Yes

Note: * Private Road does not readily fall within the RTA's road hierarchy classifications, due to its use for vehicles accessing industrial sites. Assessment against the local road classification is therefore given for comparison purposes only.

The peak hour flows along Chisholm Road and Manchester Road are below the maximum environmental goal. The Private Road is privately owned and its intended use is for vehicles accessing the industrial site only. Notwithstanding this, the existing peak hour flows along the Private Road are below the maximum environmental goal for a local residential street. The results in **Table 6** indicate that the traffic demands on the road network in the vicinity of the site during the AM And PM peak periods are within an acceptable range with regard to environmental capacity.

[2] Roads and Traffic Authority of NSW "Guide to Traffic Generating Developments" – October, 2002

2.6 Existing Intersection Performances

The performance of the existing road network is largely dependent on the operating performance of key intersections, which are critical capacity control points on the road network. The aaSIDRA[3] traffic model has been used to assess the existing peak hour operating performance of the following intersections:

» Chisholm Road/ Manchester Road/ Private Road; and

» Manchester Road/ The Crescent / Normanby Road/ Cumberland Road.

The criteria for evaluating the operational performance of intersections is provided by the *RTA Guidelines to Traffic Generating Developments* and reproduced in **Table 7**. The criteria for evaluating the operational performance of intersections is based on a qualitative measure (i.e. level of service), which is applied to each average vehicle band.

Table 7 Performance Criteria at Intersections

Level of Service	Average Delay Per Vehicle (secs/vehicle)	Traffic Signals, Roundabout	Give-Way and Stop Signs
A	Less than 14	Good Operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory but accident study required
D	43 to 56	Operating near capacity	Near capacity and other accident study required
E	57 to 70	At capacity; at signals incidents will cause excessive delays	At capacity and requires other control mode
F	Greater than 70	Roundabouts require other control mode	

The performance of the subject intersections during the morning and evening peak periods resulting from the aaSIDRA analysis are presented in **Table 6**.

Table 8 Existing Intersection Performance

Intersection	Peak Period	Average Delay (a)	Level of Service (b)	Degree of Saturation (c)	Comments
Chisholm Road/ Manchester Road/ Private Road	AM	13.5	A	0.13	All movements satisfactory
	PM	14.5	A	0.12	

[3] aaSIDRA2.0 – Computer modelling package which analyses the operation of intersections controlled by traffic signals, priority signs and roundabouts.

Intersection	Peak Period	Average Delay (a)	Level of Service (b)	Degree of Saturation (c)	Comments
Manchester Road/ The Crescent South/ Normanby Road/ Cumberland Road	AM	11.5	A	0.33	All movements satisfactory
	PM	12.9	A	0.43	

Notes:

a) The average delay for sign controlled intersections is selected from the movement with the highest average delay. The average delay for roundabouts is selected from the movement on the approach with the highest average delay.

b) The level of service for sign controlled intersections is based on the highest average delay per vehicle for the most critical movement during peak conditions. The level of service for roundabouts is based on the highest average delay per vehicle for the most critical movement.

c) The Degree of Saturation is defined as the ratio of the arrival flow (demand) to the capacity of each approach.

As summarised in **Table 8**, the intersection of Manchester Road and Chisholm Road and the intersection of Manchester Road, The Crescent South and Cumberland Road both operate at a good level of service during AM and PM critical peak periods.

2.7 Local Transport and Other Transport Issues

2.7.1 Pedestrian and Cyclists

Fairly low pedestrian activity was observed on the road network surrounding the proposed site. A footpath is provided along the southern side of Manchester Road, between Cumberland Road and Chisholm Road and along the northern side of the Private Road, which facilitates movement for pedestrians. There are no cyclist facilities provided in the vicinity of the site.

The main desire line for pedestrian movement in the vicinity of the site is eastbound and westbound along Manchester Road, between the residential suburbs and the train station and town centre.

Existing pedestrian facilities provide adequate linkages to the surrounding area and town centre.

2.7.2 Bus Services

A bus service runs along Chisholm Road and along Mona Street. The bus service along Chisholm Road is provided by Transit First. The bus service provided is Route 917 that operates between Auburn and Guildford, via South Auburn, Botanic Gardens and South Granville.

The operation of route 917 is outlined in **Table 9** shown below:

Table 9 Bus Services on Penshurst Street and Boundary Road

Route No.	Route Description	Weekday operation hours	Weekday peak service frequency	Weekday off-peak service frequency	Weekend operation hours	Weekend service frequency
917	Auburn – Guildford	6.00 – 18.30	30 mins	1 hour	6.00 – 17.30	1 hour

Levels of Services

It can be seen from the above information that only one bus route is located in close proximity to the study area. The routes operate with a moderate level of service, with the frequency during the AM and PM peak periods of 30 minutes for the services to and from Guildford. During weekends and the weekday off-peak, the frequency of the bus services declines, to a 1-hour frequency.

The bus service provided can be used by workers to travel to and from the site. It is unlikely the bus service would be impacted by additional traffic generation during the construction or future operational stages of the site.

2.7.3 Rail Services

The main western rail line is located to the north of the proposed development site. Auburn station is located approximately 1.5 km from the site, along South Parade. The main western line operates between Penrith and Hornsby, via Central. Clyde station is located 0.5 km from the site to the northwest. There is a pedestrian route from Clyde station to the development site.

The operation of the main western line is outlined in **Table 10** shown below:

Table 10 Rail Services on The Main Western Line

Route Description	Weekday operation hours	Weekday peak service frequency	Weekday off-peak service frequency	Weekend operation hours	Weekend service frequency
Penrith - Hornsby	4.30 – 24.00	15 mins	30 mins	5.00 – 0.30	30 mins

Levels of Services

It can be seen from the above information that main western rail line operates with a moderate level of service, with the frequency during the AM and PM peak periods of 15 minutes for the services between Penrith and Hornsby. During weekends and weekday off-peak, the frequency of the rail services declines, to a 30-minute frequency.

The rail service provided can be used by workers to travel to and from the site. The rail service would not be impacted on by the construction or future operation of the site.

3. Proposed Development

3.1 General Description

The expansion would provide new facilities for the maintenance of RailCorp rolling stock and other engineering aspects of fleet servicing programs. The proposed development incorporates both alterations to the existing Maintrain and the building of the proposed PPP facilities. Alterations to the site would incorporate the following features:

- Additional rail track alignments and sidings;
- One new fleet servicing building, and associated infrastructure, for private company use;
- Train wash and wheel profiling facilities;
- New entrance and gatehouse on the Private Road and internal access roads;
- New 220 space car park and gate house with access from the Private Road; and
- Grade separated pedestrian crossing of the new rail lines to provide access from the fleet servicing building to the proposed car park.

It is important to note that the proposed uses are similar to those that the site is currently being used for and include alterations to Maintain and the construction of the proposed PPP operations.

3.2 Access and Internal Traffic Management

The proposed development would be accessed via the Private Road, situated west of the intersection with Manchester Road and along internal access roads. The Private Road is currently utilised by heavy vehicles accessing the adjacent properties and based on its current use is deemed to be suitable to accommodate the heavy vehicles generated by the proposed development.

Access to the proposed car park and the new access road to the PPP Maintenance Facility would be from the proposed gate house located from the existing Private Road. The new access road would be suitable for heavy vehicle traffic.

3.3 Parking

The proposed development would incorporate approximately 220 parking spaces, this is adequate to accommodate the assumed personnel of 218 at the change over of shifts, which is expected to be the maximum number people at the proposed facility at anyone time during a typical weekday.

Table 14 in **Section 5.1** outlines the proposed number of staff and the shift operation.

4. Traffic Impacts During Construction

During the construction period, traffic movements would predominantly be related to the arrival and departure of construction workers and the delivery of material and equipment. Due to the sensitivity of the project the future number of employees and heavy vehicle traffic accessing the site is not available and a number of assumptions have been applied to understand the impact of a worst-case scenario. The construction of the PPP facilities and alteration to Maintrain building at the site are likely to occur consecutively. Therefore the impact from traffic generated by the construction of the proposed facility would be minimal.

The construction works would principally impact on the intersections of Manchester Road and Chisholm Road and Manchester Road, The Crescent South and Cumberland Road. The main traffic impact would essentially be trucks entering and exiting the proposed site on the Private Industrial Access Road.

4.1 Traffic Generation During Construction

4.1.1 Construction Activities

This stage of the proposed development would involve construction of workshops and associated infrastructure and would require a range of activities including:

» Demolition of existing buildings;

» Relocate temporary buildings and services;

» Modifications to existing fleet service facilities;

» Earthworks;

» Remediation of land;

» Modifications to existing rail track alignments;

» Construction of additional rail track alignments and sidings;

» Construction of a new fleet servicing building, and associated infrastructure, for private company use;

» Construction of a fleet servicing building for train wash and wheel profiling;

» Construction of employee and visitor car park; and

» Construction of an access road from the existing Private Road to the PPP Maintenance building.

4.1.2 Proposed Work Hours

The construction period is likely to occur over a 24-month duration. The working hours proposed for the construction period would be as follows:

» Monday to Friday (7:00 am – 6:00 pm);

» Saturday (8:00 am – 1:00 pm); and

» Sunday and public holidays (no work).

Should works be undertaken outside these hours, appropriate approvals would be obtained and residents notified.

4.1.3 Heavy Vehicle Traffic Generation

The construction program and staging is yet to be determined. However it is assumed that the heavy vehicle traffic generation during the construction period would primarily consist of delivery trucks, dump trucks and concrete trucks. To allow a worst case scenario assessment, in terms of traffic generation to be undertaken, the number of heavy vehicles generated has been assumed to be 200 and is based on intensive movement of spoil. Please note it is unknown if this is required as part of the site preparation or construction activity.

Therefore the heavy vehicle traffic generation of the site is likely to be of the order of 200 heavy vehicles accessing the site per day. Based on this worst case, the heavy vehicle traffic generation during the weekday peak periods is of the order of 400 vehicle trips per day, comprising 200 In/ 200 Out. The proportion of these movements occurring during the AM and PM peak periods is conservatively estimated at approximately 10%, with a split between arrivals and departures of 50/ 50. Therefore the heavy vehicle traffic generation during the AM and PM peak periods is 40 vehicle trips per hour, comprising 20 In and 20 Out.

4.1.4 Light Vehicle Traffic Generation

During the construction period it is estimated that there would be a maximum of 60 workers accessing the site daily. Based on the characteristics of the site it has been assumed there would be a typical car driver rate of 100% (i.e. each employee driving a car). Application of this car driver rate to the proposed workforce yields a traffic generation of the order of 120 light vehicle trips per day.

It is assumed the majority of the workforce would arrive between 6:30 am and 7:00 am and depart generally between 5:00 pm and 5:30 pm. The workforce arrival and departure periods represent the peak construction traffic generation periods. It is likely that the construction traffic generation peak periods would occur outside the existing road network AM peak hour but during the PM peak hour.

During the construction traffic peak periods, the workforce traffic movements are likely to be distributed based on a 100/0 split between arrivals and departures during the morning peak period, and the reverse during the evening peak period.

Using these assumptions, the traffic generation during the weekday construction PM peak period is the order of 60 vehicle trips per hour, comprising 0 In/ 60 Out.

4.1.5 Total Construction Period Traffic Generation

A summary of the traffic movements during the construction period is shown in **Table 11** below:

Table 11 Construction Period Traffic Movements

Activity	Daily traffic movements (vtpd)	AM and PM Peak construction traffic movements (vtph)
Heavy Vehicles	400	40
Staff movements	120	60
Total	**520**	**100**

4.1.6 Traffic Assignment during Construction

A number of assumptions have been developed in order to understand the impact from the traffic distribution along the surrounding road network. For the purposes of this assessment the future assignment of traffic generated by the proposed redevelopment has been predicted largely based on the existing directional traffic flows along the local traffic network surrounding the site. The following traffic assignment has been adopted:

» 60% of vehicles approach/ depart the site via Manchester Road (east of Chisholm Road);

» 40% of vehicles approach/ depart the site via Chisholm Road (south of Manchester Road); and

» 100% of vehicles approach/ depart the site via the Private Road (west of Manchester Road).

Given the above assumptions, during the AM and PM construction traffic peak periods the estimated additional traffic demand on the road network serving the site is minor, with the following expected traffic increases:

AM and PM Construction Traffic Peak Periods

» Additional two-way traffic flows on Manchester Road during the morning peak period is in the order of 24 vehicles per hour comprising 0 light vehicles and 24 heavy vehicles per hour;

» Additional two-way traffic flows on Manchester Road during the evening peak period is in the order of 60 vehicles per hour comprising 36 light vehicles and 24 heavy vehicles per hour;

» Additional two-way traffic flows on Chisholm Road (south of Manchester Street) during the morning peak period is in the order of 16 vehicles per hour comprising 0 light vehicles and 16 heavy vehicle per hour.

» Additional two-way traffic flows on Chisholm Road (south of Manchester Street) during the evening peak period is in the order of 40 vehicles per hour comprising 24 light vehicles and 16 heavy vehicles per hour.

» Additional two-way traffic flows on the Private Road (west of Manchester Street) during the AM and PM peak periods is in the order of 100 vehicles per hour comprising 60 light vehicles and 40 heavy vehicles per hour.

Table 12 represents estimated total maximum peak hour traffic volumes after consideration of additional transfer vehicle movements, on the road network surrounding the site during construction.

Table 12 Peak Hour Traffic Volumes (Construction period)

Location	All movements (vph) AM Weekday Peak Period	All movements (vph) PM Weekday Peak Period
Manchester Road	354	331
Chisholm Road	370	317
Private Road	228	164

It is evident from **Table 12** that the construction period peak hour traffic volumes on Chisholm Road and Manchester Road are within the acceptable traffic volumes for collector roads and are operating below their design capacity. The construction period peak hour traffic volumes on the Private Road (west of Manchester Road) are within the acceptable traffic volume for a local road and therefore operates below its road design capacity.

4.2 Construction Period Road Network and Intersection Performance

4.2.1 Environmental Capacity Performance Standards

The RTA guidelines described in **Section 2.5.2**, have been applied to the construction period peak hour flows on the road network surrounding the site to determine whether this street is meeting its environmental capacity, for the post development traffic demands.

The environmental capacity performance of the road network in the vicinity of the site under construction period conditions is shown in **Table 18**.

Table 13 Environmental Capacity Performance Review – Construction

Road	Functional Classification	Proposed AM average peak hour two-way flows	Proposed PM average peak hour two-way flows	Environmental Capacity (two-way) flows)
Chisholm Road (south of Manchester Road)	Collector	370	317	500
Manchester Road (east of Chisholm Road)	Collector	354	331	500
Private Road (west of Chisholm Road)	Local *	228	164	300

Note: * The Private Road does not readily fall within the RTA's road hierarchy classifications, due to its use for vehicles accessing industrial sites. Assessment against the local road classification is therefore given for comparison purposes only.

The results in **Table 12** indicate that the construction periods traffic demands on the road network in the vicinity of the site during the peak periods is within an acceptable range with regard to environmental capacity.

4.2.2 Intersection Performance

The main traffic impact concerns the effect of the additional vehicles on the operational performance of key intersections. The SIDRA model has been used to assess the operational performance of the intersections of

» Chisholm Road/ Manchester Road/ Private Road; and

» Manchester Road/ The Crescent/ Cumberland Road / Normanby Road.

The results of the analysis are contained in **Table 19.**

Table 14 Construction Period Intersection Performances

Intersection	Peak Period	Level of Service (LOS) (b)	Comments
Chisholm Road/ Manchester Road/ Private Road	AM	A	All movements satisfactory
	PM	A	
Manchester Road/ The Crescent/ Cumberland Road / Normanby Road	AM	A	All movements satisfactory
	PM	A	

Notes:

a) The average delay for sign controlled intersections is selected from the movement with the highest average delay. The average delay for roundabouts is selected from the movement on the approach with the highest average delay.

b) The level of service for sign controlled intersections is based on the highest average delay per vehicle for the most critical movement during peak conditions. The level of service for roundabouts is based on the highest average delay per vehicle for the most critical movement.

c) The Degree of Saturation is defined as the ratio of the arrival flow (demand) to the capacity of each approach.

The results of the SIDRA analysis indicate that the subject intersections would operate satisfactorily under the projected construction traffic demand, with a minor increase in delay during the AM and PM peak periods compared to the existing situation. The results revealed that all intersections operate at a Level of Service A during the AM and PM peak periods.

4.3 Local Transport and Other Transport Issues

4.3.1 Pedestrian and Cyclists

The increase in truck movements generated by the construction at the site is not likely to impact on pedestrians and cyclists in the vicinity of the site as the low number of additional vehicles generated are not likely to conflict with the pedestrian desire line along Manchester Road. The pedestrian access to Clyde station would retained and would not be impacted on by the proposed development.

4.3.2 Public Transport

The level of public transport servicing the site is considered adequate and would not be adversely affected by the construction at the site. The proposed development would have satisfactory access to Manchester Road and Chisholm Road which link the site to the bus and rail services.

5. Traffic Impacts Post Development

The projected traffic generation of the proposed development is determined by the car usage rate of employees and the number of heavy vehicles likely to access the site. Due to the sensitivity of the project the future number of employees and heavy vehicle traffic accessing the site is not available and a worst-case scenario has been assumed. This section assesses the traffic generation for the proposed development, under a worst-case scenario with the maximum of additional employees and heavy vehicles accessing the site.

5.1 Future Traffic Generation of the Site

Table 15 outlines the personnel and shift configuration, as provided to GHD by RailCorp.

Table 15 Personnel and Shift Configuration during AM and PM Peak Periods

	Total	**6am Shift**	**8am Shift**	**6pm Shift**	**4:30pm Shift**
PPP Personnel Max No. On-site at one time	**90**	40 in / 40 out	50 in / 50 out	40 in / 40 out	50 in / 50 out
Railcorp Personnel					
Administration	**8**		8 in		8 out
Crew	**60**	30 in			30 out
Total changeover during peak periods		**128 in / 90 out**		**90 in / 128 out**	
		218 Total		**218 Total**	

5.1.1 Future Employee Traffic Generation

Under post development conditions, it is assumed that there would be a maximum of 90 PPP employees on-site at one time, which would arrive and depart at different times during a typical weekday. The assumed typical car driver rate is 100% (i.e. each employee driving a car), which has been used for the purpose of understanding the impacts from a worst-case assessment.

It is assumed the facility would be staffed by shift workers as well as staff working general office hours. It is assumed a total of 8 staff would work during general office hours and approximately 300 (PPP and Railcorp) staff would work on shifts in any one 24 hour period.

The peak traffic generation period would occur during the shift changeover periods, during the arrival of employees commencing a shift and the departure of employees that have finished a shift. To allow a worst-case assessment it has been assumed that this changeover period would occur during the AM and PM peak periods. In addition to the traffic generated by the shift changeover, the arrival and departure of the office workers is likely to occur during the AM and PM peak periods.

The future peak hour employee traffic generation during the weekday peak periods is assumed to be a maximum of 218 vehicle trips per hour comprising 128 In and 90 Out during the AM peak period and 90 In and 128 Out during the PM peak period, based on a 50 / 50 split between arrivals and departures for shift workers during both the AM and PM peak periods and a 100 / 0 split between arrivals and departures for office workers during the AM peak and with the reverse split during the PM peak as outlined in **Table 15**.

5.1.2 Future Heavy Vehicle Traffic Generation of the Site

It is expected that most deliveries would be made by rail and road deliveries by truck would be minimal. Under post development conditions, it is likely that 66 additional (to existing amounts) heavy vehicle movements would be generated by the site per day. This figure of 66 (33 in and 33 out) has been provided by RailCorp and is expected to consist of 8 large trucks and 25 small trucks.

For the purpose of this assessment it has been assumed the 20% of all daily truck movements occur during the morning peak period and evening peak periods. Based on the existing operating conditions, the majority of existing heavy vehicle generation would have an arrival/ departure split of 50/ 50 in the morning peak period and 50/ 50 in the evening peak period. Application of these assumptions yields a traffic generation during the weekday peak period of 6 vehicles per hour, comprised of 3 In / 3 Out during the morning peak period and evening peak periods.

5.1.3 Future Total Traffic Generation

The daily peak hour traffic generation of the site is set out in **Table 16**. The maximum traffic generation due to the future operations is in the order of:

- 224 vehicle trips per hour during AM peak period, comprising 218 employee trips (128 In and 90 Out) and 6 heavy vehicle movements (3 In and 3 Out); and
- 224 vehicle trips per hour during PM peak period, comprising 218 employee trips (90 In and 128 Out) and 6 heavy vehicle movements (3 In and 3 Out).

Table 16 Total Future Traffic Generation

Component	Morning Peak (vtph)	Evening Peak (vtph)
Employee Traffic	218	218
Heavy Vehicle Traffic	6	6
Total	**224**	**224**

5.2 Traffic Assignment

There is no reliable way to assign the projected traffic generation of the proposed development to the existing road network serving the site without accurate and reliable origin-destination information.

For the purposes of this assessment the future assignment of traffic generated by the proposed redevelopment has been predicted largely from the existing directional traffic flows along the local traffic network surrounding the site. The existing traffic assignment is as follows:

» 60% of vehicles approach/ depart the site via Manchester Road (east of Chisholm Road);

» 40% of vehicles approach/ depart the site via Chisholm Road (south of Manchester Road); and

» 100% of vehicles approach/ depart the site via the Private Road (west of Manchester Road).

5.2.1 Future Traffic Flows Post Development

Adopting the existing traffic generation patterns described in **Section 5.2**, the estimated additional daily traffic volumes on the road network post development is as follows:

» Additional two-way traffic flows on Manchester Road during the morning and evening peak periods are in the order of 135 vehicles per hour comprising 131 light vehicles and 4 heavy vehicles per hour;

» Additional two-way traffic flows on Chisholm Road (south of Manchester Road) during the morning and evening peak periods are in the order of 89 vehicles per hour comprising 87 light vehicles and 2 heavy vehicles per hour;

» Additional two-way traffic flows on the Private Road (west of Manchester Road) during the morning and evening peak periods are in the order of 224 vehicles per hour comprising 218 light vehicles and 6 heavy vehicles per hour.

Table 17 represents estimated total maximum peak hour traffic volumes after consideration of additional vehicle movements, on the road network surrounding the site post development.

Table 17 Peak Hour Traffic Volumes (Future Operation)

Location	All movements (vph) AM Weekday Peak Period	All movements (vph) PM Weekday Peak Period	Typical nominal volumes (refer to Table 2)
Manchester Road	465	406	200 – 1,000
Chisholm Road	443	366	200 – 1,000
Private Road	352 *	288	0 – 200

Note: * The Private Road does not readily fall within the RTA's road hierarchy classifications, due to its use for vehicles accessing industrial sites. Assessment against the local road classification is therefore given for comparison purposes only.

It is evident from **Table 17** that the post development peak hour traffic volumes on Chisholm Road and Manchester Road are operating below their design capacity for collector roads.

The post development peak hour traffic volumes on the Private Road (west of Manchester Road) exceed the acceptable traffic volume for a local road (refer **Table 2**). However, the Private Road does not readily meet the functional classification of a local road, as its primary purpose is to provide vehicular access to industrial and rail-related activities. There are only limited access points to the Private Road, and the small number of residential property accesses would appear to traverse RailCorp-owned land, and as such, may not be legal accesses. It is considered that any potential impacts as a result of exceeding the design capacity would be isolated to the Private Road only and are not likely to significantly impact on the surrounding road network, as demonstrated by the fact that Manchester Road and Chisholm Road would operate below their design capacity for collector roads.

5.3 Future Road Network and Intersection Performance

5.3.1 Environmental Capacity Performance Standards

The RTA guidelines described in **Section 2.5.2**, have been applied to the post development peak hour flows on the road network surrounding the site to determine whether this street is meeting its environmental capacity, for the post development traffic demands.

The environmental capacity performance of the road network in the vicinity of the site under post development conditions is shown in **Table 18**.

Table 18 Environmental Capacity Performance Review - Operational

Road	Functional Classification	Proposed AM average peak hour two-way flows	Proposed PM average peak hour two-way flows	Environmental Capacity (two-way) flows)
Chisholm Road (south of Manchester Road)	Collector	443	366	500
Manchester Road (east of Chisholm Road)	Collector	465	406	500
Private Road (west of Chisholm Road) *	Local	352	288	300

Note: * Private Road does not readily fall within the RTA's road hierarchy classifications, due to its use for vehicles accessing industrial sites. Assessment against the local road classification is therefore given for comparison purposes only.

The results in **Table 18** indicate that the post development traffic demands on both Manchester Road and Chisholm Road in the vicinity of the site during the peak periods are within an acceptable range with regard to environmental capacity.

The Private Road exceeds the environmental capacity of a local road in the AM peak period. However, Private Road does not readily meet the functional classification of a local road, as its primary purpose is to provide vehicular access to industrial and rail-related activities. There are only limited access points to the Private Road, and the small number of residential property accesses would appear to traverse RailCorp-

owned land, and as such, may not be legal accesses. It is considered that any potential impacts as a result of exceeding the environmental capacity would be isolated to the Private Road only and are not likely to significantly impact on the surrounding road network, as demonstrated by the fact that traffic flows on Manchester Road and Chisholm Road are within an acceptable range with regard to environmental capacity.

5.3.2 Intersection Performance

The main traffic impact concerns the effect of the additional vehicles on the operational performance of key intersections. The SIDRA model has been used to assess the operational performance of the following intersections:

» Chisholm Road/ Manchester Road/ Private Road; and

» Manchester Road/ The Crescent South/ Cumberland Road.

The results of the analysis are contained in **Table 19.**

Table 19 Post Development Intersection Performances

Intersection	Peak Period	Level of Service (LOS) (b)	Comments
Chisholm Road/ Manchester Road/ Private Road	AM	A	All movements satisfactory
	PM	B	
Manchester Road/ The Crescent South/ Cumberland Road	AM	A	All movements satisfactory
	PM	A	

Notes:

a) The average delay for sign controlled intersections is selected from the movement with the highest average delay. The average delay for roundabouts is selected from the movement on the approach with the highest average delay.

b) The level of service for sign controlled intersections is based on the highest average delay per vehicle for the most critical movement during peak conditions. The level of service for roundabouts is based on the highest average delay per vehicle for the most critical movement.

c) The Degree of Saturation is defined as the ratio of the arrival flow (demand) to the capacity of each approach.

The results of the SIDRA analysis indicate that the intersections of Chisholm Road, Manchester Road and Private Road and the intersection of Manchester Road, The Crescent South and Cumberland Road would both operate at a good level of service under the projected post development traffic demand.

5.3.3 Pedestrian and Cyclists

The increase in truck movements generated by the operation of the site post development is not likely to impact on the pedestrian and cyclist in the vicinity of the site as the low number of additional vehicles generated are not likely to conflict with the pedestrian desire line along Manchester Road.

5.3.4 Public Transport

The level of public transport servicing the site is considered adequate and would not be adversely affected by the operation of the site post development.

There is an existing pathway connecting the Private Road to Clyde Station, and this pathway would be maintained following completion of construction work, therefore providing access to rail services for employees of the maintenance facility. Access to Auburn Station along Manchester Road, The Crescent South and South Parade would also be maintained.

Similarly, there would be no change to access to bus services.

6. Conclusions

The following conclusions are made based on the above investigations:

» The existing road conditions along Manchester Road, Chisholm Road and the Private Road are generally considered satisfactory to accommodate the additional number and type of vehicles likely to be generated by the construction and operation of proposed development, based on a worst case assessment.

» The worst-case assessment of the additional traffic demand on Manchester Road, Chisholm Road and the Private Road as a consequence of the construction and operation of the proposed development concluded that it had minimal impact the current network operations and is considered acceptable.

» The worst case assessment also concluded that increases in traffic generated by during the construction period and by the proposed development would be modest when distributed on the surrounding road network, and would not result in any adverse effects on the operational performance of key intersections.

» Additional traffic demand on Manchester Road and Chisholm Road as a consequence of the construction and operation of the proposed development is considered acceptable and does not increase the level of traffic activity on these roads to an unacceptable level. The projected traffic demand on this road, due to construction and operation of the proposed development, is within the limits specified by the RTA Guidelines for collector roads.

» The post development peak hour traffic volumes on the Private Road (west of Manchester Road) exceeds the acceptable traffic volume for a local road, and exceeds the environmental capacity in the AM peak period. However, the Private Road does not readily meet the functional classification of a local road, as its primary purpose is to provide vehicular access to industrial and rail-related activities. There are only limited access points to the Private Road, and the small number of residential property accesses would appear to traverse RailCorp-owned land, and as such, may not be legal accesses. It is considered that any potential impacts as a result of exceeding the environmental or design capacities would be isolated to the Private Road only and are not likely to significantly impact on the surrounding road network.

» Future traffic levels along the road network in the vicinity of the site, which includes travel levels during the operational and construction stages of the proposed development on both Manchester Road and Chisholm Road during the peak periods are within an acceptable range with regard to environmental capacity.

» Additional traffic demand on Manchester Road and Chisholm Road as a consequence of the proposed development is not likely to have a significant impact on the pedestrian and cyclist facilities or public transport services.

» The percentage increase in heavy vehicles as a result of the development is 3.2% along Chisholm Road and 4.7% along Manchester Road during the construction stage and 0.2% along both Manchester and Chisholm Roads during the operational

stage. This is only a minor increase in the percentage of heavy vehicles along Manchester and Chisholm Roads.

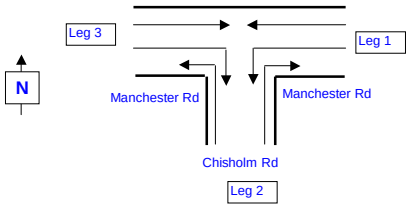
» During construction, the percentage increase in heavy vehicles on the Private Road is 10%, while during operation, the overall percentage of heavy vehicles using the Private Road actually decreases by 2% as a result of the increase in light vehicles using the Private Road.

Appendix A

Traffic Counts

AUSTRALASIAN TRAFFIC SURVEYS

JOB	2275
CLIENT	GHD
LOCATION	Manchester Road and Chisholm Road
SURVEY TYPE	INTERSECTION COUNT
DAY, DATE	WED 22/06/2005



AM

Time Period	VEHICLE MOVEMENT														
	1 to 2		1 to 3		2 to 3		2 to 1		3 to 1		3 to 2		TOTAL		GRAND TOTAL
	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	
7:00 - 7:15	5	0	6	1	19	3	38	3	1	3	4	2	73	12	85
7:15 - 7:30	12	1	3	1	14	2	59	4	3	4	2	1	93	13	106
7:30 - 7:45	13	4	4	1	8	3	45	4	4	7	3	3	77	22	99
7:45 - 8:00	9	3	7	1	10	0	46	3	5	4	2	0	79	11	90
8:00 - 8:15	16	1	7	3	14	2	36	2	2	1	2	1	77	10	87
8:15 - 8:30	13	1	7	3	16	1	47	6	4	6	4	2	91	19	110
8:30 - 8:45	15	1	2	3	13	1	59	7	0	2	1	2	90	16	106
8:45 - 9:00	10	5	6	1	8	2	54	5	2	3	3	4	83	20	103
Σ	93	16	42	14	102	14	384	34	21	30	21	15	663	123	786
	109		56		116		418		51		36		786		

HOURLY FLOWS

Time Period	VEHICLE MOVEMENT															
	1 to 2		1 to 3		2 to 3		2 to 1		3 to 1		3 to 2		TOTAL		GRAND TOTAL	
	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy		
7:00 - 8:00	39	8	20	4	51	8	188	14	13	18	11	6	322	58	380	
7:15 - 8:15	50	9	21	6	46	7	186	13	14	16	9	5	326	56	382	
7:30 - 8:30	51	9	25	8	48	6	174	15	15	18	11	6	324	62	386	
7:45 - 8:45	53	6	23	10	53	4	188	18	11	13	9	5	337	56	393	
8:00 - 9:00	**54**	**8**	**22**	**10**	**51**	**6**	**196**	**20**	**8**	**12**	**10**	**9**	**341**	**65**	**406**	**Peak**

PM

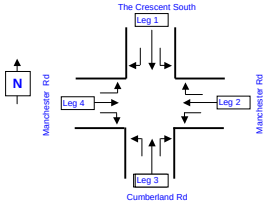
Time Period	VEHICLE MOVEMENT														
	1 to 2		1 to 3		2 to 3		2 to 1		3 to 1		3 to 2		TOTAL		GRAND TOTAL
	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	
16:00 - 16:15	25	2	1	1	1	0	34	2	3	0	5	1	69	6	75
16:15 - 16:30	25	3	2	1	0	0	32	2	3	0	4	0	66	6	72
16:30 - 16:45	27	1	1	1	0	1	27	1	3	2	9	1	67	7	74
16:45 - 17:00	23	1	2	4	0	1	31	0	5	0	12	0	73	6	79
17:00 - 17:15	35	1	1	2	0	0	32	1	1	1	6	1	75	6	81
17:15 - 17:30	21	0	0	1	1	0	26	0	2	0	5	0	55	1	56
17:30 - 17:45	24	1	1	1	0	0	31	1	4	1	8	0	68	4	72
17:45 - 18:00	30	1	0	2	2	0	25	1	3	2	3	0	63	6	69
Σ	210	10	8	13	4	2	238	8	24	6	52	3	536	42	578
	220		21		6		246		30		55		578		

HOURLY FLOWS

Time Period	VEHICLE MOVEMENT															
	1 to 2		1 to 3		2 to 3		2 to 1		3 to 1		3 to 2		TOTAL		GRAND TOTAL	
	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy		
16:00 - 17:00	100	7	6	7	1	2	124	5	14	2	30	2	275	25	300	
16:15 - 17:15	**110**	**6**	**6**	**8**	**0**	**2**	**122**	**4**	**12**	**3**	**31**	**2**	**281**	**25**	**306**	**Peak**
16:30 - 17:30	106	3	4	8	1	2	116	2	11	3	32	2	270	20	290	
16:45 - 17:45	103	3	4	8	1	1	120	2	12	2	31	1	271	17	288	
17:00 - 18:00	110	3	2	6	3	0	114	3	10	4	22	1	261	17	278	

AUSTRALASIAN TRAFFIC SURVEYS

JOB 2275
CLIENT GHD
LOCATION Cumberland Road and Manchester Road
SURVEY TYPE INTERSECTION COUNT
DAY, DATE WED 22/06/2005



AM

Time Period	VEHICLE MOVEMENT																												GRAND TOTAL
	1 to 2		1 to 3		1 to 4		2 to 3		2 to 4		2 to 1		3 to 4		3 to 1		3 to 2		4 to 1		4 to 2		4 to 3		TOTAL		
	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	
7:00 - 7:15	0	1	23	2	12	3	2	0	3	0	0	0	2	0	77	4	15	1	26	4	5	0	0	0	165	15	180
7:15 - 7:30	0	0	23	1	20	2	5	0	1	0	1	0	2	1	76	6	22	0	51	8	7	0	0	0	208	18	226
7:30 - 7:45	0	0	37	0	16	3	6	0	4	0	0	0	2	0	80	2	19	1	43	13	4	0	0	0	211	19	230
7:45 - 8:00	3	0	23	2	18	2	7	0	0	1	0	1	3	0	113	4	15	1	39	5	9	0	0	0	230	16	246
8:00 - 8:15	0	0	35	5	19	2	2	0	0	0	0	0	4	0	98	5	26	2	26	7	10	0	1	1	221	22	243
8:15 - 8:30	0	0	44	3	16	6	4	0	2	0	0	0	0	0	96	1	14	0	40	10	6	1	0	1	222	22	244
8:30 - 8:45	3	0	22	0	12	4	5	0	2	0	0	0	1	0	121	2	37	0	49	9	10	1	0	0	262	16	278
8:45 - 9:00	0	0	38	3	11	4	4	0	0	0	0	0	2	0	80	4	22	0	54	5	4	0	0	0	215	16	231
Σ	6	1	245	16	124	26	35	0	12	1	1	1	16	1	741	28	170	5	328	61	55	2	1	2	1734	144	1878
	7		261		150		35		13		2		17		769		175		389		57		3		1878		

HOURLY FLOWS

Time Period	VEHICLE MOVEMENT																												GRAND TOTAL	
	1 to 2		1 to 3		1 to 4		2 to 3		2 to 4		2 to 1		3 to 4		3 to 1		3 to 2		4 to 1		4 to 2		4 to 3		TOTAL			
	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy		
7:00 - 8:00	3	1	106	5	66	10	20	0	8	1	1	1	9	1	346	16	71	3	159	30	25	0	0	0	814	68	882	
7:15 - 8:15	3	0	118	8	73	9	20	0	5	1	1	1	11	1	367	17	82	4	159	33	30	0	1	1	870	75	945	
7:30 - 8:30	3	0	139	10	69	13	19	0	6	1	0	1	9	0	387	12	74	4	148	35	29	1	1	2	884	79	963	
7:45 - 8:45	**6**	**0**	**124**	**10**	**65**	**14**	**18**	**0**	**4**	**1**	**0**	**1**	**8**	**0**	**428**	**12**	**92**	**3**	**154**	**31**	**35**	**2**	**1**	**2**	**935**	**76**	**1011**	**Peak**
8:00 - 9:00	3	0	139	11	58	16	15	0	4	0	0	0	7	0	395	12	99	2	169	31	30	2	1	2	920	76	996	

PM

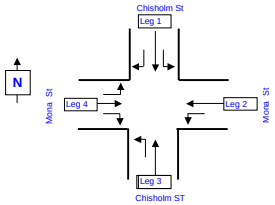
Time Period	VEHICLE MOVEMENT																												GRAND TOTAL
	1 to 2		1 to 3		1 to 4		2 to 3		2 to 4		2 to 1		3 to 4		3 to 1		3 to 2		4 to 1		4 to 2		4 to 3		TOTAL		
	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	
16:00 - 16:15	1	0	126	4	22	3	15	0	3	0	0	0	3	0	36	3	21	0	36	4	5	1	4	0	272	15	287
16:15 - 16:30	2	0	100	5	27	4	9	2	4	0	1	0	0	0	49	3	15	1	30	2	3	0	4	0	244	17	261
16:30 - 16:45	1	0	173	4	19	0	17	0	2	0	2	0	2	0	38	2	5	0	24	2	3	1	3	0	289	9	298
16:45 - 17:00	2	0	125	8	21	2	18	0	5	0	0	0	1	0	44	3	24	0	21	1	8	0	4	0	273	14	287
17:00 - 17:15	2	0	162	2	17	3	17	0	3	0	0	0	1	0	36	3	11	0	22	2	5	0	4	0	280	10	290
17:15 - 17:30	4	0	155	3	17	1	8	0	0	0	0	0	1	0	44	0	18	0	15	1	4	0	3	0	269	5	274
17:30 - 17:45	0	0	129	3	19	2	22	0	4	0	1	0	2	0	47	1	18	1	28	1	2	0	4	0	276	8	284
17:45 - 18:00	0	0	96	2	23	3	12	0	5	0	0	0	0	0	49	0	11	0	18	1	3	0	2	0	219	6	225
Σ	12	0	1066	31	165	18	118	2	26	0	4	0	10	0	343	15	123	2	194	14	33	2	28	0	2122	84	2206
	12		1097		183		120		26		4		10		358		125		208		35		28		2206		

HOURLY FLOWS

Time Period	VEHICLE MOVEMENT																												GRAND TOTAL	
	1 to 2		1 to 3		1 to 4		2 to 3		2 to 4		2 to 1		3 to 4		3 to 1		3 to 2		4 to 1		4 to 2		4 to 3		TOTAL			
	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy		
16:00 - 17:00	6	0	524	21	89	9	59	2	14	0	3	0	6	0	167	11	65	1	111	9	19	2	15	0	1078	55	1133	
16:15 - 17:15	7	0	560	19	84	9	61	2	14	0	3	0	4	0	167	11	55	1	97	7	19	1	15	0	1086	50	1136	
16:30 - 17:30	**9**	**0**	**615**	**17**	**74**	**6**	**60**	**0**	**10**	**0**	**2**	**0**	**5**	**0**	**162**	**8**	**58**	**0**	**82**	**6**	**20**	**1**	**14**	**0**	**1111**	**38**	**1149**	**Peak**
16:45 - 17:45	8	0	571	16	74	8	65	0	12	0	1	0	5	0	171	7	71	1	86	5	19	0	15	0	1098	37	1135	
17:00 - 18:00	6	0	542	10	76	9	59	0	12	0	1	0	4	0	176	4	58	1	83	5	14	0	13	0	1044	29	1073	

AUSTRALASIAN TRAFFIC SURVEYS

JOB 2275
CLIENT GHD
LOCATION Mona Street and Chisholm Street
SURVEY TYPE INTERSECTION COUNT
DAY, DATE WED 22/06/2005



AM

Time Period	VEHICLE MOVEMENT																												
	1 to 2		1 to 3		1 to 4		2 to 3		2 to 4		2 to 1		3 to 4		3 to 1		3 to 2		4 to 1		4 to 2		4 to 3		TOTAL		GRAND TOTAL
	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	
7:00 - 7:15	0	0	5	1	14	1	1	0	31	1			23	2	14	2			44	4	80	3	36	3	248	17	265
7:15 - 7:30	0	0	7	1	9	1	1	0	23	1			32	2	19	5			46	3	103	2	50	4	290	19	309
7:30 - 7:45	0	0	10	5	7	1	2	0	41	0			43	2	19	3			38	4	127	3	59	2	346	20	366
7:45 - 8:00	1	0	12	4	6	3	0	0	43	2			63	5	19	6			38	1	119	3	70	1	371	25	396
8:00 - 8:15	3	0	11	1	5	1	1	0	52	2			52	2	19	2			40	4	124	3	75	4	382	19	401
8:15 - 8:30	0	0	15	5	15	1	2	0	59	1			94	4	20	3			45	2	181	4	100	4	531	24	555
8:30 - 8:45	1	0	20	4	14	1	0	0	73	3			87	2	19	3			60	1	99	2	75	1	448	17	465
8:45 - 9:00	0	0	17	1	24	5	2	0	80	3			133	3	29	6			60	6	218	2	86	1	649	27	676
Σ	5	0	97	22	94	14	9	0	402	13	0	0	527	22	158	30	0	0	371	25	1051	22	551	20	3265	168	3433
	5		119		108		9		415		0		549		188		0		396		1073		571		3433		

HOURLY FLOWS

Time Period	VEHICLE MOVEMENT																												
	1 to 2		1 to 3		1 to 4		2 to 3		2 to 4		2 to 1		3 to 4		3 to 1		3 to 2		4 to 1		4 to 2		4 to 3		TOTAL		GRAND TOTAL	
	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy		
7:00 - 8:00	1	0	34	11	36	6	4	0	138	4	0	0	161	11	71	16	0	0	166	12	429	11	215	10	1255	81	1336	
7:15 - 8:15	4	0	40	11	27	6	4	0	159	5	0	0	190	11	76	16	0	0	162	12	473	11	254	11	1389	83	1472	
7:30 - 8:30	4	0	48	15	33	6	5	0	195	5	0	0	252	13	77	14	0	0	161	11	551	13	304	11	1630	88	1718	
7:45 - 8:45	5	0	58	14	40	6	3	0	227	8	0	0	296	13	77	14	0	0	183	8	523	12	320	10	1732	85	1817	
8:00 - 9:00	**4**	**0**	**63**	**11**	**58**	**8**	**5**	**0**	**264**	**9**	**0**	**0**	**366**	**11**	**87**	**14**	**0**	**0**	**205**	**13**	**622**	**11**	**336**	**10**	**2010**	**87**	**2097**	**Peak**

PM

Time Period	VEHICLE MOVEMENT																												
	1 to 2		1 to 3		1 to 4		2 to 3		2 to 4		2 to 1		3 to 4		3 to 1		3 to 2		4 to 1		4 to 2		4 to 3		TOTAL		GRAND TOTAL	
	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy		
16:00 - 16:15	1	0	18	3	21	0	2	0	143	4			77	4	9	1			21	0	84	1	53	5	429	18	447	
16:15 - 16:30	1	0	13	2	24	1	3	0	141	4			122	5	16	1			27	0	98	2	43	2	488	17	505	
16:30 - 16:45	3	0	16	1	29	2	2	0	164	2			126	3	17	1			28	0	97	2	58	4	540	15	555	
16:45 - 17:00	0	0	15	1	30	0	0	0	158	4			118	5	16	1			31	1	114	5	69	2	551	19	570	
17:00 - 17:15	1	0	20	2	33	0	2	0	182	3			145	3	19	1			24	0	99	3	67	1	592	13	605	
17:15 - 17:30	1	0	12	0	23	1	5	0	162	0			116	3	13	0			12	1	92	0	59	1	495	6	501	
17:30 - 17:45	1	0	19	0	31	1	2	0	174	4			135	6	19	1			30	0	93	3	54	0	558	15	573	
17:45 - 18:00	1	0	16	0	26	0	2	0	147	2			122	4	13	1			25	1	94	2	57	3	503	13	516	
Σ	9	0	129	9	217	5	18	0	1271	23	0	0	961	33	122	7	0	0	198	3	771	18	460	18	4156	116	4272	
	9		138		222		18		1294		0		994		129		0		201		789		478		4272			

HOURLY FLOWS

Time Period	VEHICLE MOVEMENT																												
	1 to 2		1 to 3		1 to 4		2 to 3		2 to 4		2 to 1		3 to 4		3 to 1		3 to 2		4 to 1		4 to 2		4 to 3		TOTAL		GRAND TOTAL	
	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy	Light	Heavy		
16:00 - 17:00	5	0	62	7	104	3	7	0	606	14	0	0	443	17	58	4	0	0	107	1	393	10	223	13	2008	69	2077	
16:15 - 17:15	5	0	64	6	116	3	7	0	645	13	0	0	511	16	68	4	0	0	110	1	408	12	237	9	2171	64	2235	
16:30 - 17:30	5	0	63	4	115	3	9	0	666	9	0	0	505	14	65	3	0	0	95	2	402	10	253	8	2178	53	2231	
16:45 - 17:45	**3**	**0**	**66**	**3**	**117**	**2**	**9**	**0**	**676**	**11**	**0**	**0**	**514**	**17**	**67**	**3**	**0**	**0**	**97**	**2**	**398**	**11**	**249**	**4**	**2196**	**53**	**2249**	**Peak**
17:00 - 18:00	4	0	67	2	113	2	11	0	665	9	0	0	518	16	64	3	0	0	91	2	378	8	237	5	2148	47	2195	

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Traffic Count Summary Report

Count Number	**9144**	Ref : **GHD**	Directory Ref : **UBD 231 L-1**
Street	**MANCHESTER ROAD, AUBURN : From CHISHOLM ROAD to CUMBERLAND ROAD : EAST BOUND**		
Location	West of Cumberland Road, House No.20, ELP PA01818		*Carriageway*

TOTAL COUNT MATRIX

Start Date	14-JUN-05
Start Time	1100
Duration	7 DAYS
Interval	1 HOUR

Weekly 50th Percentile Speed	51
Weekly 85th Percentile Speed	59
Five Day AADT	2563
Seven Day AADT	2315

	MON *20TH*	TUE *14TH / 21ST*	WED *15TH*	THU *16TH*	FRI *17TH*	SAT *18TH*	SUN *19TH*	5 Day Total	5 Day Average	7 Day Total	7 Day Average
Midnight - 1am	11	6	10	8	16	14	21	**51**	**10**	**86**	**12**
1am - 2am	5	4	7	7	6	8	11	**29**	**6**	**48**	**7**
2am - 3am	11	10	4	8	6	4	10	**39**	**8**	**53**	**8**
3am - 4am	9	8	5	8	8	13	8	**38**	**8**	**59**	**8**
4am - 5am	16	14	16	19	13	4	4	**78**	**16**	**86**	**12**
5am - 6am	68	63	56	58	59	33	17	**304**	**61**	**354**	**51**
6am - 7am	**279**	288	**283**	**271**	**300**	132	24	**1421**	**284**	**1577**	**225**
7am - 8am	218	228	252	229	240	68	23	**1167**	**233**	**1258**	**180**
8am - 9am	260	**298**	269	267	270	102	46	**1364**	**273**	**1512**	**216**
9am - 10am	173	166	183	162	187	123	77	**871**	**174**	**1071**	**153**
10am - 11am	158	83	141	192	142	128	89	**716**	**143**	**933**	**133**
11am - Midday	150	163	146	154	154	**170**	**129**	**767**	**153**	**1066**	**152**
Midday - 1pm	163	143	**172**	163	161	**175**	137	**802**	**160**	**1114**	**159**
1pm - 2pm	163	144	162	147	150	**175**	123	**766**	**153**	**1064**	**152**
2pm - 3pm	159	**177**	25	157	**171**	125	122	**689**	**138**	**936**	**134**
3pm - 4pm	**194**	141	0	**212**	165	128	109	**712**	**142**	**949**	**136**
4pm - 5pm	140	154	102	172	170	115	**157**	**738**	**148**	**1010**	**144**
5pm - 6pm	149	134	137	144	147	120	129	**711**	**142**	**960**	**137**
6pm - 7pm	103	93	107	100	112	75	73	**515**	**103**	**663**	**95**
7pm - 8pm	58	57	72	70	80	71	45	**337**	**67**	**453**	**65**
8pm - 9pm	47	58	57	63	45	46	43	**270**	**54**	**359**	**51**
9pm - 10pm	32	47	31	27	39	44	25	**176**	**35**	**245**	**35**
10pm - 11pm	34	32	30	34	35	26	26	**165**	**33**	**217**	**31**
11pm - Midnight	14	14	22	15	23	28	14	**88**	**18**	**130**	**19**
Total	**2614**	**2525**	**2289**	**2687**	**2699**	**1927**	**1462**	**12814**	**2562**	**16203**	**2314**

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Traffic Count Summary Report

Count Number	**9144**	Ref : **GHD**	Directory Ref : **UBD 231 L-1**
Street	**MANCHESTER ROAD, AUBURN : From CUMBERLAND ROAD to CHISHOLM ROAD : WEST BOUND**		
Location	West of Cumberland Road, House No.20, ELP PA01818		*Carriageway*

TOTAL COUNT MATRIX

Start Date	14-JUN-05
Start Time	1100
Duration	7 DAYS
Interval	1 HOUR

Weekly 50th Percentile Speed	50
Weekly 85th Percentile Speed	59
Five Day AADT	1533
Seven Day AADT	1374

	MON *20TH*	TUE *14TH / 21ST*	WED *15TH*	THU *16TH*	FRI *17TH*	SAT *18TH*	SUN *19TH*	5 Day Total	5 Day Average	7 Day Total	7 Day Average
Midnight - 1am	4	12	8	11	9	11	14	**44**	**9**	**69**	**10**
1am - 2am	6	6	5	8	6	10	15	**31**	**6**	**56**	**8**
2am - 3am	7	5	10	6	9	9	8	**37**	**7**	**54**	**8**
3am - 4am	7	11	11	9	11	6	6	**49**	**10**	**61**	**9**
4am - 5am	4	11	12	14	12	3	5	**53**	**11**	**61**	**9**
5am - 6am	21	22	15	17	16	8	7	**91**	**18**	**106**	**15**
6am - 7am	39	41	46	47	55	21	15	**228**	**46**	**264**	**38**
7am - 8am	74	84	70	76	73	23	9	**377**	**75**	**409**	**58**
8am - 9am	93	97	90	82	86	42	23	**448**	**90**	**513**	**73**
9am - 10am	84	76	80	98	95	59	26	**433**	**87**	**518**	**74**
10am - 11am	78	50	92	92	78	71	59	**390**	**78**	**520**	**74**
11am - Midday	**101**	**102**	**103**	**109**	**97**	**89**	**81**	**512**	**102**	**682**	**97**
Midday - 1pm	102	111	**108**	113	103	82	**100**	**537**	**107**	**719**	**103**
1pm - 2pm	128	88	102	111	94	78	69	**523**	**105**	**670**	**96**
2pm - 3pm	**159**	108	24	134	128	**143**	73	**553**	**111**	**769**	**110**
3pm - 4pm	137	**141**	0	**181**	**164**	106	80	**623**	**125**	**809**	**116**
4pm - 5pm	132	111	73	162	122	80	68	**600**	**120**	**748**	**107**
5pm - 6pm	114	117	104	127	133	74	59	**595**	**119**	**728**	**104**
6pm - 7pm	96	78	89	102	102	34	42	**467**	**93**	**543**	**78**
7pm - 8pm	68	66	96	88	53	37	36	**371**	**74**	**444**	**63**
8pm - 9pm	37	51	38	42	43	25	32	**211**	**42**	**268**	**38**
9pm - 10pm	25	30	25	39	26	16	20	**145**	**29**	**181**	**26**
10pm - 11pm	23	9	28	30	30	24	24	**120**	**24**	**168**	**24**
11pm - Midnight	41	49	50	44	44	19	8	**228**	**46**	**255**	**36**
Total	**1580**	**1476**	**1279**	**1742**	**1589**	**1070**	**879**	**7666**	**1533**	**9615**	**1373**

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Traffic Count Summary Report

Count Number	**9145**	Ref : **GHD**	Directory Ref : **UBD 231 K-1**
Street	**CHISHOLM ROAD, AUBURN : From PRINCES ROAD WEST to MANCHESTER STREET : NORTH BOUND**		
Location	South of Manchester Road, House No.8, ELP PA01807		*Carriageway*

TOTAL COUNT MATRIX

Start Date	14-JUN-05
Start Time	1100
Duration	7 DAYS
Interval	1 HOUR

Weekly 50th Percentile Speed	51
Weekly 85th Percentile Speed	59
Five Day AADT	2650
Seven Day AADT	2370

	MON *20TH*	TUE *14TH / 21ST*	WED *15TH*	THU *16TH*	FRI *17TH*	SAT *18TH*	SUN *19TH*	5 Day Total	5 Day Average	7 Day Total	7 Day Average
Midnight - 1am	10	5	11	9	19	16	21	**54**	**11**	**91**	**13**
1am - 2am	6	8	8	7	7	5	10	**36**	**7**	**51**	**7**
2am - 3am	12	9	4	6	8	4	9	**39**	**8**	**52**	**7**
3am - 4am	11	12	9	12	7	11	7	**51**	**10**	**69**	**10**
4am - 5am	27	23	26	26	24	7	4	**126**	**25**	**137**	**20**
5am - 6am	79	89	81	88	78	32	16	**415**	**83**	**463**	**66**
6am - 7am	**292**	**312**	**313**	**299**	**312**	135	23	**1528**	**306**	**1686**	**241**
7am - 8am	242	269	269	252	267	72	20	**1299**	**260**	**1391**	**199**
8am - 9am	280	297	270	277	276	100	41	**1400**	**280**	**1541**	**220**
9am - 10am	173	158	178	167	173	123	72	**849**	**170**	**1044**	**149**
10am - 11am	148	23	134	189	138	132	84	**632**	**126**	**848**	**121**
11am - Midday	148	172	141	154	162	**165**	**127**	**777**	**155**	**1069**	**153**
Midday - 1pm	152	142	162	142	152	**174**	136	**750**	**150**	**1060**	**151**
1pm - 2pm	161	147	155	149	157	172	118	**769**	**154**	**1059**	**151**
2pm - 3pm	144	**169**	144	159	**171**	118	121	**787**	**157**	**1026**	**147**
3pm - 4pm	**170**	136	**178**	**184**	167	126	107	**835**	**167**	**1068**	**153**
4pm - 5pm	132	146	150	145	156	117	**155**	**729**	**146**	**1001**	**143**
5pm - 6pm	134	122	123	139	134	120	122	**652**	**130**	**894**	**128**
6pm - 7pm	107	87	103	97	100	73	64	**494**	**99**	**631**	**90**
7pm - 8pm	53	52	70	71	80	72	48	**326**	**65**	**446**	**64**
8pm - 9pm	44	52	57	59	48	45	42	**260**	**52**	**347**	**50**
9pm - 10pm	33	46	33	35	36	40	28	**183**	**37**	**251**	**36**
10pm - 11pm	36	35	37	39	31	28	32	**178**	**36**	**238**	**34**
11pm - Midnight	11	10	21	14	25	28	17	**81**	**16**	**126**	**18**
Total	**2605**	**2521**	**2677**	**2719**	**2728**	**1915**	**1424**	**13250**	**2650**	**16589**	**2369**

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Traffic Count Summary Report

Count Number 9145 Ref : **GHD** Directory Ref : **UBD 231 K-1**

Street **CHISHOLM ROAD, AUBURN : From MANCHESTER STREET to PRINCES ROAD WEST : SOUTH BOUND**

Location South of Manchester Road, House No.8, ELP PA01807 *Carriageway*

TOTAL COUNT MATRIX

Start Date	14-JUN-05
Start Time	1100
Duration	7 DAYS
Interval	1 HOUR

Weekly 50th Percentile Speed	44
Weekly 85th Percentile Speed	53
Five Day AADT	1600
Seven Day AADT	1412

	MON *20TH*	TUE *14TH / 21ST*	WED *15TH*	THU *16TH*	FRI *17TH*	SAT *18TH*	SUN *19TH*	5 Day Total	5 Day Average	7 Day Total	7 Day Average
Midnight - 1am	7	9	9	8	10	12	12	**43**	**9**	**67**	**10**
1am - 2am	2	4	4	6	5	10	10	**21**	**4**	**41**	**6**
2am - 3am	8	3	7	5	8	10	8	**31**	**6**	**49**	**7**
3am - 4am	5	2	1	3	7	5	5	**18**	**4**	**28**	**4**
4am - 5am	4	8	6	6	6	1	6	**30**	**6**	**37**	**5**
5am - 6am	15	18	16	15	13	10	3	**77**	**15**	**90**	**13**
6am - 7am	34	44	35	50	48	19	14	**211**	**42**	**244**	**35**
7am - 8am	58	79	70	64	66	19	6	**337**	**67**	**362**	**52**
8am - 9am	**99**	88	86	90	86	43	24	**449**	**90**	**516**	**74**
9am - 10am	76	67	75	77	79	63	25	**374**	**75**	**462**	**66**
10am - 11am	77	18	68	85	70	72	50	**318**	**64**	**440**	**63**
11am - Midday	90	**111**	**97**	**112**	**105**	**94**	**82**	**515**	**103**	**691**	**99**
Midday - 1pm	99	109	110	124	112	82	**94**	**554**	**111**	**730**	**104**
1pm - 2pm	112	91	102	102	100	84	74	**507**	**101**	**665**	**95**
2pm - 3pm	146	116	96	134	138	**136**	74	**630**	**126**	**840**	**120**
3pm - 4pm	**157**	**178**	**183**	**199**	**178**	105	79	**895**	**179**	**1079**	**154**
4pm - 5pm	137	133	150	164	143	77	63	**727**	**145**	**867**	**124**
5pm - 6pm	130	132	129	158	144	72	46	**693**	**139**	**811**	**116**
6pm - 7pm	105	76	86	108	106	34	37	**481**	**96**	**552**	**79**
7pm - 8pm	67	74	101	96	58	38	37	**396**	**79**	**471**	**67**
8pm - 9pm	41	46	40	37	45	25	28	**209**	**42**	**262**	**37**
9pm - 10pm	23	25	20	39	24	12	15	**131**	**26**	**158**	**23**
10pm - 11pm	22	9	31	31	22	23	22	**115**	**23**	**160**	**23**
11pm - Midnight	45	46	56	48	42	17	7	**237**	**47**	**261**	**37**
Total	**1559**	**1486**	**1578**	**1761**	**1615**	**1063**	**821**	**7999**	**1599**	**9883**	**1411**

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Traffic Count Summary Report

Count Number	**9146**	Ref : **GHD**	Directory Ref : **UBD 211J-16**
Street	**MANCHESTER ROAD, AUBURN : From CHISHOLM ROAD to CUMBERLAND ROAD : EAST BOUND**		
Location	Private Road west of Chisholm Road at Manchester Road intersection, on NO STANDING sign		*Carriageway*

TOTAL COUNT MATRIX

Start Date	14-JUN-05
Start Time	1200
Duration	7 DAYS
Interval	1 HOUR

Weekly 50th Percentile Speed	44
Weekly 85th Percentile Speed	57
Five Day AADT	734
Seven Day AADT	560

	MON *20TH*	TUE *14TH / 21ST*	WED *15TH*	THU *16TH*	FRI *17TH*	SAT *18TH*	SUN *19TH*	5 Day Total	5 Day Average	7 Day Total	7 Day Average
Midnight - 1am	0	6	5	6	5	1	2	**22**	**4**	**25**	**4**
1am - 2am	6	8	4	1	6	1	2	**25**	**5**	**28**	**4**
2am - 3am	5	3	3	1	6	0	0	**18**	**4**	**18**	**3**
3am - 4am	14	20	15	15	8	0	1	**72**	**14**	**73**	**10**
4am - 5am	15	21	23	24	28	4	0	**111**	**22**	**115**	**16**
5am - 6am	36	50	40	44	35	8	3	**205**	**41**	**216**	**31**
6am - 7am	52	64	67	68	59	12	**8**	**310**	**62**	**330**	**47**
7am - 8am	**82**	**94**	**82**	**90**	**78**	10	3	**426**	**85**	**439**	**63**
8am - 9am	69	83	47	48	57	9	4	**304**	**61**	**317**	**45**
9am - 10am	55	37	59	57	49	7	5	**257**	**51**	**269**	**38**
10am - 11am	39	73	65	57	44	**13**	6	**278**	**56**	**297**	**42**
11am - Midday	62	50	63	50	62	8	6	**287**	**57**	**301**	**43**
Midday - 1pm	50	53	54	51	**55**	8	6	**263**	**53**	**277**	**40**
1pm - 2pm	64	**55**	**59**	**55**	38	6	3	**271**	**54**	**280**	**40**
2pm - 3pm	**66**	48	57	52	54	**10**	9	**277**	**55**	**296**	**42**
3pm - 4pm	31	32	41	46	32	8	9	**182**	**36**	**199**	**28**
4pm - 5pm	27	16	21	28	13	7	10	**105**	**21**	**122**	**17**
5pm - 6pm	15	13	17	13	16	7	3	**74**	**15**	**84**	**12**
6pm - 7pm	5	7	8	6	6	2	5	**32**	**6**	**39**	**6**
7pm - 8pm	6	3	4	2	8	2	2	**23**	**5**	**27**	**4**
8pm - 9pm	4	8	6	6	1	0	7	**25**	**5**	**32**	**5**
9pm - 10pm	6	6	7	10	0	0	9	**29**	**6**	**38**	**5**
10pm - 11pm	17	6	11	13	2	1	**12**	**49**	**10**	**62**	**9**
11pm - Midnight	7	7	6	3	3	1	7	**26**	**5**	**34**	**5**
Total	**733**	**763**	**764**	**746**	**665**	**125**	**122**	**3671**	**734**	**3918**	**559**

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Traffic Count Summary Report

Count Number 9146 Ref : **GHD** Directory Ref : **UBD 211J-16**

Street **MANCHESTER ROAD, AUBURN : From CUMBERLAND ROAD to CHISHOLM ROAD : WEST BOUND**

Location Private Road west of Chisholm Road at Manchester Road intersection, on NO STANDING sign *Carriageway*

TOTAL COUNT MATRIX

Start Date	14-JUN-05
Start Time	1200
Duration	7 DAYS
Interval	1 HOUR

Weekly 50th Percentile Speed	37
Weekly 85th Percentile Speed	49
Five Day AADT	732
Seven Day AADT	556

	MON *20TH*	TUE *14TH / 21ST*	WED *15TH*	THU *16TH*	FRI *17TH*	SAT *18TH*	SUN *19TH*	5 Day Total	5 Day Average	7 Day Total	7 Day Average
Midnight - 1am	3	4	4	1	3	1	1	**15**	**3**	**17**	**2**
1am - 2am	5	2	2	0	3	6	3	**12**	**2**	**21**	**3**
2am - 3am	9	5	5	4	2	0	0	**25**	**5**	**25**	**4**
3am - 4am	8	6	1	5	5	1	1	**25**	**5**	**27**	**4**
4am - 5am	5	11	8	9	9	0	0	**42**	**8**	**42**	**6**
5am - 6am	21	18	23	13	9	5	0	**84**	**17**	**89**	**13**
6am - 7am	23	36	20	33	40	7	**6**	**152**	**30**	**165**	**24**
7am - 8am	40	52	**64**	**62**	40	5	1	**258**	**52**	**264**	**38**
8am - 9am	39	**66**	45	41	44	11	**6**	**235**	**47**	**252**	**36**
9am - 10am	48	35	46	34	47	9	5	**210**	**42**	**224**	**32**
10am - 11am	48	49	50	46	45	9	2	**238**	**48**	**249**	**36**
11am - Midday	**60**	46	61	53	**55**	**12**	4	**275**	**55**	**291**	**42**
Midday - 1pm	62	55	70	79	**66**	**14**	5	**332**	**66**	**351**	**50**
1pm - 2pm	52	56	65	45	47	8	7	**265**	**53**	**280**	**40**
2pm - 3pm	70	65	47	48	61	11	9	**291**	**58**	**311**	**44**
3pm - 4pm	**76**	**77**	**80**	**85**	56	11	**14**	**374**	**75**	**399**	**57**
4pm - 5pm	49	51	61	66	50	8	10	**277**	**55**	**295**	**42**
5pm - 6pm	51	36	55	52	37	3	1	**231**	**46**	**235**	**34**
6pm - 7pm	20	18	17	21	24	8	5	**100**	**20**	**113**	**16**
7pm - 8pm	14	20	12	11	18	1	3	**75**	**15**	**79**	**11**
8pm - 9pm	9	7	7	3	3	1	4	**29**	**6**	**34**	**5**
9pm - 10pm	6	4	5	7	0	0	3	**22**	**4**	**25**	**4**
10pm - 11pm	14	9	11	12	3	3	5	**49**	**10**	**57**	**8**
11pm - Midnight	15	10	11	9	0	0	2	**45**	**9**	**47**	**7**
Total	**747**	**738**	**770**	**739**	**667**	**134**	**97**	**3661**	**732**	**3892**	**556**

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Data displayed has been compiled from pneumatic traffic count processes and is subject to the documented limitations

GHD Pty Ltd ABN 39 008 488 373

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	K McNatty	G Hughes		G Hughes		

Appendix C

Statement of Heritage Impact

STATEMENT OF HERITAGE IMPACT: PROPOSED ROLLING STOCK MAINTENANCE DEPOT AT FORMER CLYDE MARSHALLING YARDS, AUBURN AUGUST 2005

HT 05/013

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GENERAL NOTES FOR CLIENT

This report follows the standard format for heritage impact assessments as outlined in the guideline *Statements of Heritage Impact*, published by the New South Wales Heritage Office as part of the *NSW Heritage Manual*. The general methodology is to:

- examine the significance of the affected heritage item or area;
- outline a brief policy, or general approach, for conservation of the item or area; and
- assess the impact of the proposed development on the item or area, having regard to its significance and the preferred approach to its conservation.

Heritage assessment methodology in Australia generally derives from the *Burra Charter* (as revised 1999) published by Australia ICOMOS. (ICOMOS is the international standard-setting body for heritage.) The following terminology from the *Burra Charter* is commonly used in heritage reports and the definitions of the terms should be noted:

Cultural significance means aesthetic, historic, scientific, social or spiritual value for past, present or future generations. (Article 1.2 of the *Burra Charter*)
Conservation means all the processes of looking after a place so as to retain its *cultural significance*. (Article 1.4)
Maintenance means the continuous protective care of the fabric and setting of a place, and is to be distinguished from repair. Repair involves *restoration* or *reconstruction*. (Article 1.5)
Preservation means maintaining the fabric of a place in its existing state and retarding deterioration. (Article 1.6)
Restoration means returning the existing fabric of a place to a known earlier state by removing accretions or by reassembling existing components without the introduction of new material.(Article 1.7)
Reconstruction means returning a place to a known earlier state and is distinguished from *restoration* by the introduction of new material into the fabric. (Article 1.8)
Adaptation means modifying a place to suit the existing use or a proposed use. (Article 1.9)

The following principles of the *Burra Charter* relating to the process of conservation should be particularly noted:

Change may be necessary to retain *cultural significance*, but is undesirable where it reduces cultural significance. The amount of change to a place should be guided by the *cultural significance* of the place and its appropriate interpretation. (Article 15.1)
Maintenance is fundamental to *conservation* and should be undertaken where fabric is of *cultural significance* and its *maintenance* is necessary to retain that *cultural significance*. (Article 16)
Preservation is appropriate where the existing fabric or its condition constitutes evidence of *cultural significance*, or where insufficient evidence is available to allow other *conservation* processes to be carried out. (Article 17)
Restoration is appropriate only if there is sufficient evidence of an earlier state of the fabric. (Article 19)
Reconstruction is appropriate only where a place is incomplete through damage or alteration, and only where there is sufficient evidence to reproduce an earlier state of the fabric. In rare cases, reconstruction may also be appropriate as part of a use or practice that retains the *cultural significance* of the place. *Reconstruction* should be identifiable on close inspection or through additional interpretation. (Article 20)
Adaptation is acceptable only where the adaptation has minimal impact on the *cultural significance* of the place. *Adaptation* should involve minimal change to significant fabric, achieved only after considering alternatives. (Article 21)
New work such as additions to the place may be acceptable where it does not distort or obscure the *cultural significance* of the place, or detract from its interpretation and appreciation. New work should be readily identifiable as such. (Article 22)

Statement of Heritage Impact for:
Proposed Rolling Stock Maintenance Depot for NSW RailCorp, Clyde

This statement forms part of a Development Application for:
Construction of a rail depot, as shown in sketch numbered TSSPPP-PW-SK009-G, dated 6 April 2005, prepared by Halcrow Pacific Pty. Ltd.

Date:
4 August 2005

Reference to controls:
Municipality of Auburn:
Heritage item (Clyde Marshalling Yards) scheduled under Auburn Local Environmental Plan 2000 (amended 2004).
Auburn Development Control Plans 2000.

Address and Property Description:
Main Western Railway, Clyde
Lot 4, DP 1007656; Lot 1, DP 833989; Lots 1, 2, 3, 5, 6, DP 1007656; Lot 201, DP 1007683; Lot 2, DP 827674.

Prepared by:
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For client:
GHD Pty. Ltd. on behalf of NSW RailCorp

Cover image: The site c1965. From *Robinson's Sydney Street Directory*. 23rd edition.

SUMMARY AND RECOMMENDATIONS

The objective of this Heritage Impact Assessment is to assess the impact of construction of a rolling stock maintenance facility on the former Clyde rail marshalling yards which are listed as a heritage item (archaeological site) on the Auburn Local Environmental Plan. Available information on any archaeological remains on the site is limited due to their inadequate mapping and because some are buried, but overall the site is highly disturbed and lacking its original integrity. The proposed development will have a major impact on the site, but the detailed impacts are difficult to assess at this stage.

On the basis of the site being identified as an item of archaeological significance in the Auburn Local Environmental Plan, it is recommended that mapping and recording of the site be undertaken prior to commencement of work and that relocation of displaced items and an interpretative display be considered in conjunction with the work. In addition, an excavation permit under section 140 of the NSW Heritage Act would be required prior to commencement of any development on the site.

PART A: SIGNIFICANCE OF THE ITEM

Historical and Physical Evidence:

History

The railway line between Sydney and Parramatta opened in 1855, passing through then-rural Auburn and Clyde. The railways rapidly developed into a major industrial enterprise as lines were extended across the Great Dividing Range in the late nineteenth century to service the rural hinterland. Supporting facilities included workshops and marshalling yards such as the subject site which was acquired by the Government for this purpose in 1874. Much of Auburn itself was not developed until after the late nineteenth century. Opening of a railway stop in 1876 led to some slow development, with a Post Office being opened in 1880 and a school in 1886. Industry began to develop along the railway line, including the large Clyde Engineering (formerly Hudson Brothers) works, manufacturers of railway rolling stock, established at Clyde in 1881. A Borough Council was incorporated in 1892. Most suburban development took place from the early twentieth century and at this time a substantial shopping centre developed at Auburn around the railway station that was relocated to its present site in 1909. After 1945, waves of post-war migrants settled in the area and strongly influenced its character.[1]

The Clyde marshalling yards, at the western end of Auburn, were constructed in 1891, with a large camp for the workers nearby. They were opened for operation on 5 July 1892. Locomotives and

[1] *Auburn – 50 years progress 1878-1928*. Auburn Jubilee Celebrations Committee, 1928. Kass, Terry, *Historical Context Report Auburn Heritage Study* Neustein & Associates, 1996. *Liberty Plains: a history of Auburn, N.S.W.* centenary edition. Auburn Municipal Council, 1992. Robert Lee, *The Greatest Public Work: the NSW Railways 1848-1889*. Sydney, Hale & Iremonger, 1988, p. 152.

rolling stock were marshalled at the yards and a wagon works was established as the major repair centre for goods rolling stock. On the running lines adjacent to the site a platform named Clyburn (combining the names of Clyde and Auburn) was opened for works staff in 1948. Various sidings to industrial sites were also opened in the yards between the 1880s and 1930s, as well as a large loop traversing the western end of the site. A goods freight terminal was built in the yards in the 1960s. After the 1970s, with modernisation and rationalisation of freight rolling stock, use of the yard declined and it became a storage area for redundant rolling stock. Subsequently, much of the western part of the site was occupied by a new suburban rolling stock maintenance facility, MainTrain.[2]

The Site and its Context

The site is dominated by the MainTrain facility at its eastern end and other recent non-railway related industrial redevelopment towards the western end. Interspersed with these developments are scattered elements of the former marshalling yard and Clyde Wagon Works, including trackwork, part of a footbridge and remains of structures including an electric-powered water stand. Overall, however, the former integrity of the site has been substantially disrupted but nevertheless some elements remain on a site that is identified as being of heritage significance by Auburn Council.

In a broader context, there has been significant industrial redevelopment in the vicinity since the former Clyde Engineering (on the southern side of the running lines) and Commonwealth Engineering (on the northern side) works have closed. To the immediate west of the site, Clyde railway station still acts as junction station for the Carlingford suburban branch line which opened between 1885 and 1896.

Significance:

The Auburn Heritage Study provides the following Statement of Significance for the site:

> The Clyde Marshalling Yard is significant in demonstrating the large volume of railway goods traffic generated by the Sydney Metropolitan area, both in historical and current terms. It also demonstrated the close relationship between local industry and rail transport.

The study concluded that the site was of regional historic and scientific significance. (The 'regional' category is no longer used in the NSW Heritage Office assessment criteria with any such items identified in past studies tending to default to local significance.) The study also recommended that the site be listed on the (then) State Rail Authority Heritage Register under section 170 of the NSW Heritage Act. The Authority has not taken any action to list the site on its Register, probably because of the tenuous and scattered nature of its remains (although the water stand is listed in a draft RailCorp Section 170 Register). This same factor is likely to be the reason Auburn Council

[2] Schwager Brooks & Partners, *Auburn Heritage Study*: Inventory listing sheet 'Clyde Industrial Estate and Railway Yards'.

has listed the site in its LEP as an archaeological site rather than a built heritage site. Finally, the study also recommended that a Conservation Management Plan be undertaken prior to any upgrade, disturbance or adaptive reuse of the site though it is understood that this was not done when the MainTrain facility was constructed.

In spite of the subsequently disrupted nature of the site, it is concluded that sufficient historical physical (primarily archaelogical) evidence of the former use of the site remains to still conclude that the site is of local historical and scientific significance under the NSW Heritage Office assessment criteria.

PART B: CONSERVATION POLICY

The site was analysed in general by archaeologist Edward Higginbotham in 1995 for the Auburn Heritage Study. This study established that there was then physical evidence of heritage significance. Since that time, the site has been further substantially degraded and it is obvious that updated mapping of remaining evidence is required (although, because of the lack of surviving integrity of the site, not to the extent of a Conservation Management Plan as originally suggested by the Heritage Study). This should be undertaken prior to new development. Appropriate strategies can then be developed that ensure compatibility of new development with the heritage significance of the site. In addition, an excavation permit under section 140 of the NSW Heritage Act would be required prior to commencement of any development on the site. Both the mapping and archaeological requirements can be coordinated through RailCorp's Heritage Manager.

Overall, however, the original site is so disturbed that it no longer has sufficient physical integrity for whole-of-site conservation in situ. The heritage outcomes thus may include a combination of conservation in situ where possible, removal of items for conservation off-site and demolition preceded by archival recording to the relevant NSW Heritage Office standards (see Bibliography).

PART C: IMPACT OF PROPOSAL ON SIGNIFICANCE

Description of the Proposal:

The proposal is for construction of a train commissioning building with associated trackwork, as well as possible future wheel profile machine building and train wash building, all located to the immediate south-west of the running lines and adjacent to Clyburn railway platform. New trackwork would be laid as apart of the proposal. The general nature of the plan of the proposal considered in the report combined with the lack of current mapping of identified heritage elements (overlaid with the new proposal) preclude detailed consideration of the impact of the development on the heritage item/site. However, it is known that the water stand would be affected by the proposal.

Negative impacts of the proposal:

It is apparent that the proposed development will affect part of the site identified as a heritage item in the Auburn LEP. To determine how specific that affect will be requires more detailed on-site mapping. In general, however, excavation will be required for trackwork and construction of buildings. This is highly likely to disturb both above-ground and buried archaeological remains.

Aspects that respect or enhance the significance of the item or area:

A major part of the proposal is located adjacent to the running lines and therefore relatively on the periphery of the site. However, work will be required throughout the site and therefore the development will not be to the benefit of the heritage item and indeed will result in the loss of much of it. To compensate for this, recording would be required to ensure that documentary evidence of the site remains.

Alternatives:

The Review of Environmental Factors examined alternatives for the development and reached the following conclusions:

- The do-nothing option was not considered to be satisfactory, as the new rolling stock will require maintaining for its life. Existing facilities are generally operating at capacity.

- Alternative locations for the proposed maintenance facility are limited, due to the necessity for the facility to be located adjacent to the railway network.

- Alternative sites within the Sydney metropolitan area are generally constrained due to existing operations and lack of available land.

- Other sites outside of the Sydney metropolitan area were also considered. However, locations outside the metropolitan area were not considered to be suitable, given the distances involved in transporting rolling stock solely for the purpose of servicing.

The site is therefore considered to the optimal location for the proposed development.

Measures to mitigate impacts:

The following measures should be implemented prior to and during development:

- mapping of surviving heritage elements overlaid with the new development should be undertaken;
- recording of the site to to the relevant NSW Heritage Office standards should be undertaken prior to commencement of work;
- an excavation permit under section 140 of the NSW Heritage Act should be obtained prior

to commencement of work;

- RailCorp's Heritage Manager should determine appropriate placement of any heritage elements to be removed as part of the work (e.g. the water stand): this may include relocation on site as part of an interpretative display or relocation off-site to a railway heritage centre;
- an historical interpretative display at the public entrance to the site should be considered.

Conclusion:

The site is an archaeological site of local heritage significance - albeit highly disturbed. The absence of detailed and current heritage mapping makes it difficult to conclusively determine the detailed heritage impact of the development but it is known that it will be a major impact overall. Accordingly, it is concluded that updated mapping and recording of the site should be undertaken prior to redevelopment, together with consideration of options for relocation of displaced relics and provision of an interpretative display on site.

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CREDENTIALS OF AUTHOR

Tony Prescott, MA(Hons), DipEd, MPHA

Tony is a qualified professional historian with a Bachelor of Arts (Honours) in History from the University of New South Wales and a Master of Arts (Honours) in History from Sydney University. He has written publications on aspects of Sydney's history and produced multimedia material on history. Tony has extensive conservation knowledge and experience based on over 20 years' work both in policy and in the field - including lecturing to students in the Master of Heritage Conservation course at Sydney University. During 20 years with the NSW Heritage Office, and its predecessor in the State Planning Department, he contributed to development of the Heritage Study Guidelines for local government, the NSW Heritage Manual, and guidelines on Aboriginal heritage and historical research. He was a member of the joint State Rail/Heritage Council Railway Heritage Committee from 1982 to 1992 and its Chair from 1987 to 1992. He was heavily involved in identification and conservation of railway built heritage during those years and in creation of the first State Rail Heritage Register. He also acquired considerable experience and knowledge of the planning system and urban development, as well as being involved in project management of site issues. Tony has since produced numerous heritage reports for his consultancy Historyworks. He is an established author and report writer and, among other work, has written a national history of the Urban Development Institute of Australia (*From the Ground Up*. UDIA 2005).

Appendix D

Noise Assessment

RailCorp

Noise Assessment

Proposed Fleet Service Centre, Auburn

Report

August 2005

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Executive Summary

Noise monitoring and assessment was undertaken on behalf of RailCorp. The assessment was undertaken as part of a Review of Environmental Factors (REF for the proposed Fleet Service Centre located at the Auburn Rail Yard, Auburn (also known as the Clyde Marshalling Yards). The proposed development involved part of an existing rail yard at Auburn as a maintenance/fleet servicing centre. Specifically, it is proposed that the new facility will focus on the maintenance of rolling stock and other engineering related maintenance.

The assessment was undertaken with consideration to the NSW Department of Environment and Conservation (DEC) publications Industrial Noise Policy (INP) and Chapter 171 Construction Site Noise of the Environmental Noise Control Manual (ENCM).

Unattended noise monitoring was undertaken for a period of one (1) week to determine the existing background and ambient noise environment in the vicinity of the proposed development. The noise monitoring locations were located at the boundary of RailCorp land, along Manchester Road (north eastern-most corner and north western boundary of the site) in order to quantify the existing background noise environment.

Based on the findings of this noise study, it is believed that construction and operational noise generated from the proposed fleet service centre at the Clyde Marshalling Yards can meet the relevant noise guidelines.

1. Introduction

The noise monitoring assessment and modelling program was conducted in the vicinity of the proposed Fleet Service Centre located at the Auburn Rail Yard, Auburn. The basis of the assessment was to ascertain whether the proposed facility would have an acoustical effect on the amenity of residences living in close proximity of the site.

1.1 Noise Monitoring Assessment and Modelling Program

GHD was commissioned by RailCorp, as part of the Review of Environmental Factors (REF), to assess the acoustic impact of the proposed development. Unattended noise monitoring took place from 6 May 2005 to 13 May 2005. The scope of works from the noise monitoring assessment and modelling program is outlined below.

1.1.1 Scope of Works

- Review of supplied background data (i.e. conceptual drawings, master plans and aerial photographs);
- Development of sampling methodology and identification of suitable monitoring locations through the background review and consultation with the client;
- Site inspection and noise monitoring assessment. This included:
  - Long-term background noise monitoring at two (2) representative locations of the ambient noise environment for a period of seven (7) days in the vicinity of the proposed development area;
  - Noise levels recorded and assessed against the statistical parameters L_{Amax}, L_{Amin} L_{A10},, L_{A90}, and L_{Aeq}, with consideration to the DEC's guidelines;
  - Based on noise monitoring, establish project specific noise goals; and
  - Noise modelling undertaken for this project to ascertain the acoustic contribution of the development with consideration to project specific noise goals.
- Data Interpretation:
  - Noise data assessed and filtered to remove invalid data due to extraneous noise or adverse weather conditions.
- Preparation of Report with consideration to NSW DEC publications Industrial Noise Policy INP and Environmental Noise Control Manual Chapter 171 Construction site noise, including:
  - A brief description of the project;
  - A brief description of the ambient noise environment;

- Location of the noise monitoring with respect to the proposed development works;
- Charts of the noise parameters including, $L_{A10,T,}$ L_{A90}, and $L_{Aeq,T,}$ for the unattended noise monitoring;
- Based on monitoring results, establish project specific noise goals for the construction of the proposed fleet centre with consideration to the NSW DEC publications Industrial Noise Policy (INP) Environmental Noise Control Manual Chapter 171 Construction site noise;
- Discussion of the noise monitoring and modelling results with relation to project specific noise goals and guidelines; and
- Mentioning possible noise mitigation measures if the noise assessment suggests that project specific noise goals may be exceeded.

1.2 Approach

The following steps were undertaken:

- Compliance criteria for the proposed development were determined;
- Existing ambient noise sources identified and classified as operational (local or tonal), or extraneous;
- Site noise monitoring locations (2) selected for permanent monitoring;
- Site noise monitoring measurements undertaken;
- Assessment of noise measurements made leading to the determination of background and various time related noise levels;
- Evaluation of extraneous noises and constant noise;
- Projection of noise to the residential area;
- Assessment of compliance; and
- Comment on noise control requirements.

1.3 Limitations

This report has been prepared for RailCorp. The purpose of the report is to provide an independent review of the proposed fleet service centre at the existing Auburn rail yard.

The modelling undertaken for this report has assumed that operational activities at the MainTrain site will not change as a result of the proposal and noise generated by these activities would be measured in the background levels as monitored. The operational modelling only takes into account the additional activities for the proposed fleet service centre facility.

It is not the intention of the assessment to cover every element of the acoustical environment, but rather to conduct the assessment with consideration to the prescribed work scope.

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

In conducting this assessment and preparing the report, current guidelines for noise were referred to. This work has been conducted in good faith with GHD's understanding of the client's brief and the generally accepted consulting practice.

No other warranty, expressed or implied, is made as to the information and professional advice included in this report. It is not intended for other parties or other uses.

2. Project Description

The proposed development involves part of an existing rail yard at Auburn (known as the Clyde Marshalling Yards) as a maintenance/fleet-servicing centre. Specifically, it is proposed that the new facility will focus on the maintenance of rolling stock and other engineering related maintenance.

It is understood the site has been used as a rail-based maintenance site, involving heavy engineering, for some time.

2.1 Location

The location of this assessment is at the existing Clyde Marshalling Yards, located off Manchester Road, Auburn approximately 20 km south west of the Sydney CBD. The area is shown in Figure 1.

Date: 16 June 2005

Location Map

File Name: 2212269_LTN_01.cdr

Proposed Fleet Service Centre, Auburn, NSW

Figure 1

3. Noise Monitoring and Results

3.1 Monitoring Locations

Two Acoustic Research Laboratories Pty Ltd Type 1 continuous noise loggers were used to monitor the noise environment at the following locations:

- **Location 1 (referred to as Auburn 1)**: Located along the Manchester Road (southern) boundary of the RailCorp site, approximately 250 m west of the main site entrance.
- **Location 2 (referred to as Auburn 2)**: located along the Manchester Road boundary of the RailCorp site, in the south-western corner of the site.

Noise monitoring locations are shown in Figure 1.

A site inspection was conducted to determine appropriate long term noise monitoring locations for the assessment. Security issues and the risk of theft or vandalism of the noise loggers resulted in the loggers being placed within the RailCorp boundary rather than at the closest residence. Therefore, based on accessibility and security issues, the two locations chosen were deemed to be sites that were indicative and of a similar local ambient noise environment.

Long term noise monitoring took place between 6 and 13 May 2005. The instruments were programmed to accumulate environmental noise data continuously over sampling periods of 15 minutes for the entire monitoring period. Internal software then calculated and stored the Ln percentile noise levels for each sampling period, which was later retrieved for detailed analysis. The instruments were calibrated before and after the logging periods. Table 3.1 provides details of the noise loggers and their locations.

Table 3.1 Continuous Noise Logger Details

Measurement Title	Auburn 1	Auburn 2
Monitoring Location	Manchester Road, southern boundary	Manchester Road, south-western corner of site
Logger Serial No.	193401	194678
Measurement Started at	13:30 May 6 2005	12:30 May 6 2005
Measurement Stopped at	12:30 May 13 2005	12:35 May 6 2005
Pre-measurement Reference	110.0	110.0
Post-measurement Reference	109.8	109.6
Frequency Weighting	A	A
Time Response	Fast	Fast
Engineering Units	dB(A) SPL	dB(A) SPL

3.2 Noise Monitoring Results

Figures 2 and 3 provide a graphical summary of the long term noise monitoring conducted at Auburn 1 and Auburn 2.

Figure 2 15 Minute Statistical Noise Results Auburn 1

Figure 2: 15 Minute Statistical Noise

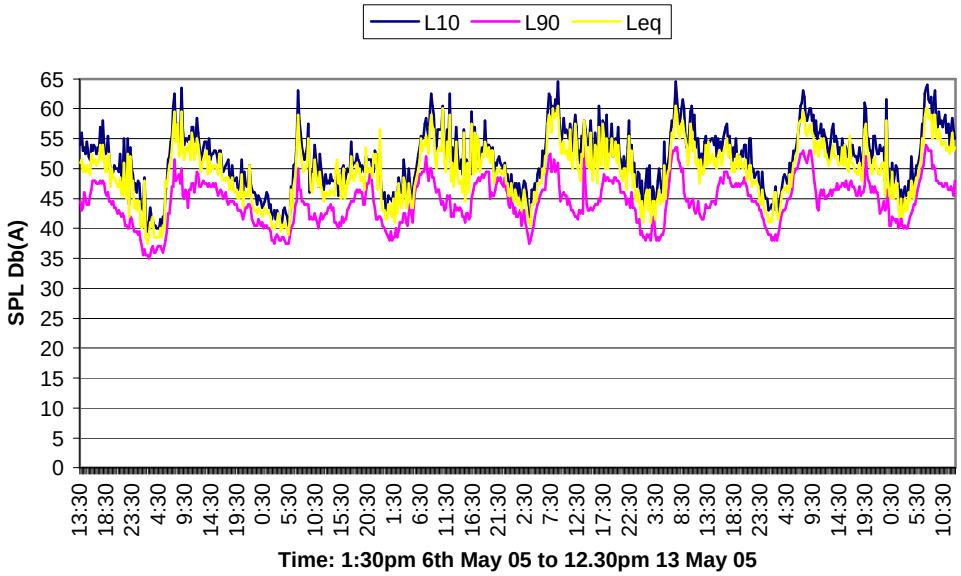
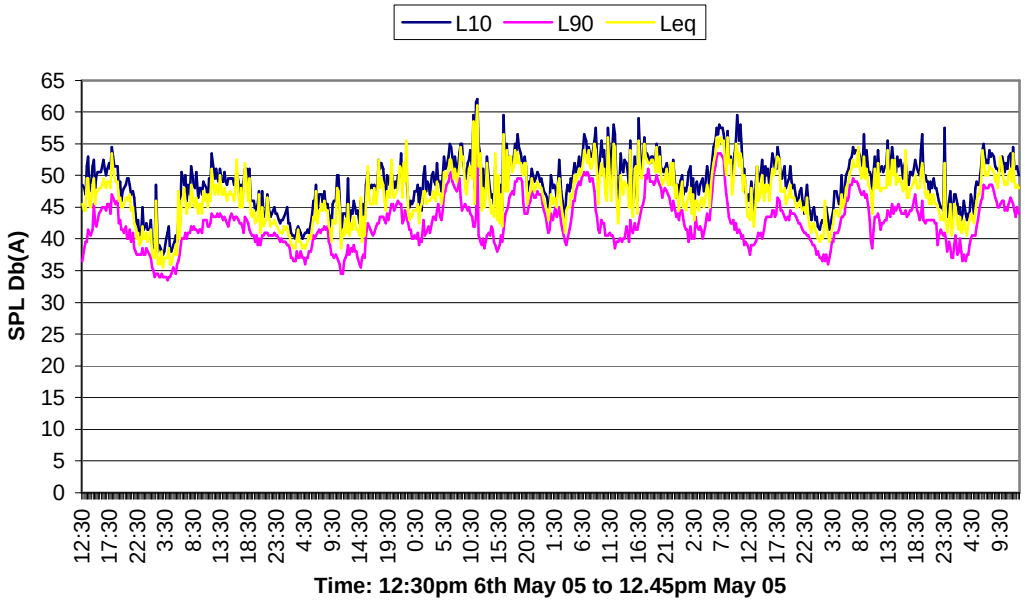


Figure 3 15 Minute Statistical Noise Results Auburn 2

Figure 3: 15 Minute Statistical Noise



Long term noise monitoring and attended observations indicate a noise environment that is primarily dominated by traffic noise emanating from the local road network and an underlying urban 'hum'. Background noise levels are relatively high which is indicative of an urban environment with high traffic levels. Highest peaks are recorded during the hours between 7 am and 9:30 am at the commencement of works days.

Calculated background L_{A90} day, evening, and night, $L_{Aeq(15hr)}$, $L_{Aeq(9hr)}$, and $L_{A10(18hr)}$ for the monitoring period are provided in the following tables.

Table 3.2 Noise Monitoring Results – Background L_{A90} Noise Levels at Auburn 1

Date	Day 7 am to 6 pm	Evening 6 pm to 10 pm	Night 10 pm to 7 am
06/05/05	43.9	42.0	35.5
07/05/05	45.0	42.5	37.7
08/05/05	41.0	43.7	38.5
09/05/05	42.0	45.5	39.5
10/05/05	42.5	45.2	38.2
11/05/05	42.5	45.0	38.7
12/05/05	45.5	45.7	40.2
RBL	**43.0**	**45.0**	**39.0**

Table 3.3 Noise Monitoring Results – Background L_{A90} Noise Levels at Auburn 2

Date	Day 7 am to 6 pm	Evening 6 pm to 10 pm	Night 10 pm to 7 am
06/05/05	40.5	39.0	34.0
07/05/05	41.0	39.2	37.0
08/05/05	36.1	42.7	40.0
09/05/05	39.0	44.0	40.7
10/05/05	39.6	46.7	40.2
11/05/05	39.0	42.2	37.0
12/05/05	42.5	42.5	37.2
RBL	**40.0**	**43.0**	**37.0**

Table 3.4 Noise Monitoring Results – $L_{Aeq(15hr)}$ 7:00 am to 10:00 pm

Date	Auburn 1	Auburn 2
06/05/05	50.4	47.9
07/05/05	52.1	46.9
08/05/05	49.5	46.4
09/05/05	53.3	51.7
10/05/05	54.4	51.3
11/05/05	53.3	50.2
12/05/05	53.9	49.6
Average	**53.0**	**50.0**

Table 3.5 Noise Monitoring Results – $L_{Aeq(9hr)}$ 10:00 pm to 7:00 am

Date	Auburn 1	Auburn 2
06/05/05	46.3	41.5
07/05/05	46.7	41.6
08/05/05	48.4	48.5
09/05/05	49.3	48.3
10/05/05	49.7	49.4
11/05/05	49.1	45.5
12/05/05	51.1	46.4
Average	**49.0**	**47.0**

Table 3.6 Noise Monitoring Results – $L_{A10(18hr)}$ 6:00 am to 12:00 am

Date	Auburn 1	Auburn 2
06/05/05	50.1	49.5
07/05/05	50.7	48.5
08/05/05	49.0	47.9
09/05/05	52.0	53.1
10/05/05	53.2	53.0
11/05/05	52.1	52.4
12/05/05	52.7	51.7
Average	**52.0**	**51.0**

4. Noise Assessment

4.1 Operational Noise

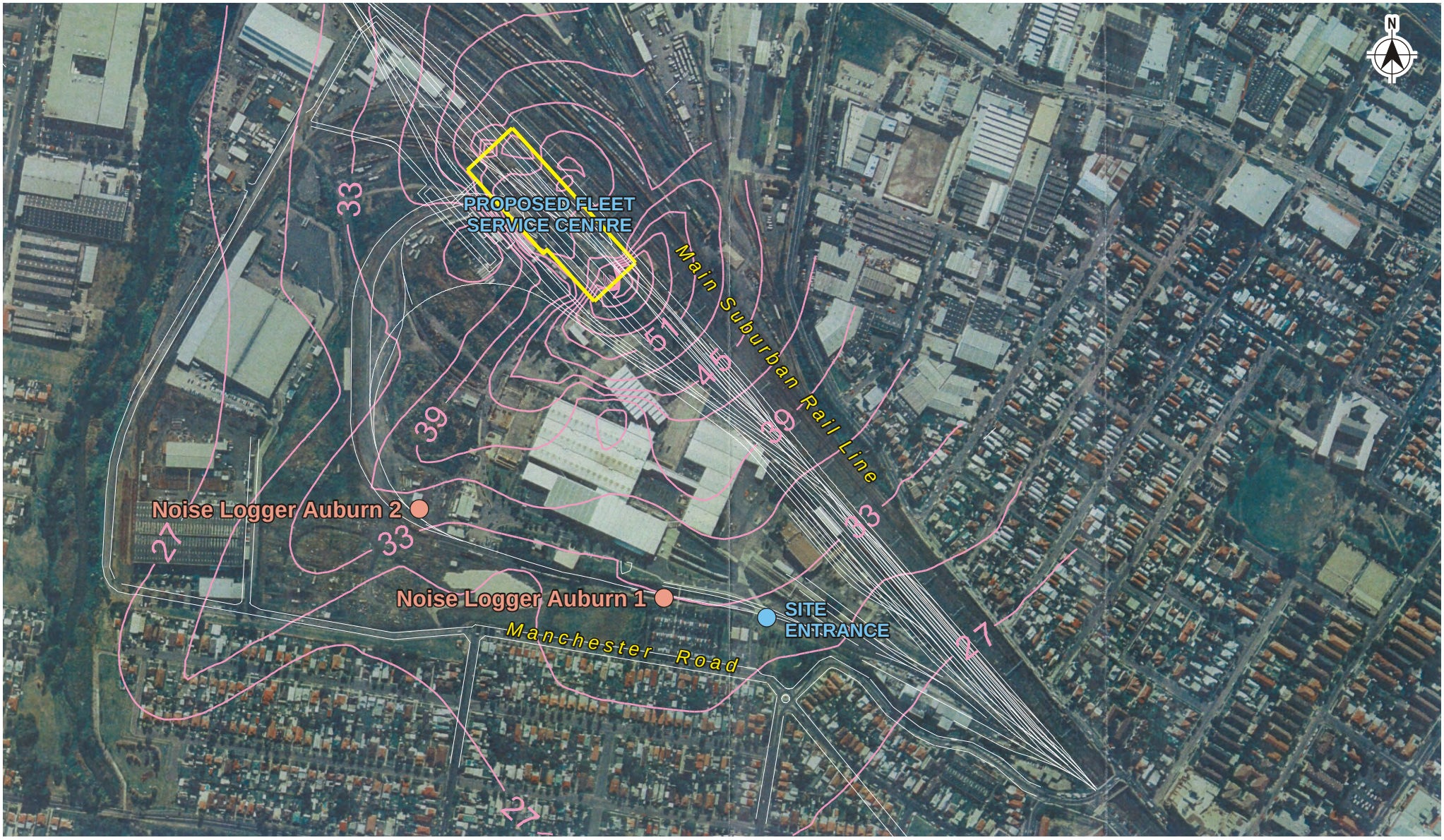
Estimated noise levels emanating from the proposed fleet service centre were modelled using RTA Technologies ENM Noise Prediction Software. The model took into account the sound power levels of the primary noise sources to be used at the facility, which were sourced from a similar maintenance facility located at Hornsby. Estimated power levels for primary noise generating equipment at the fleet centre are provided in Table 4.1:

Table 4.1 Estimated Sound Power Levels for Primary Noise Generating Equipment SWL dB(A)

Item	SWL dB(A)
Shunting Tractor	99.6
5-Tonne Forklift	70.5
K-Set Suburban Train – Alternator at Idle	101.3
3-Tonne Forklift	76.0
Tangara Train – Horn Whistle Test for Town Location	83.8
K-Set Suburban Train – Compressor at Idle	83.0
KONE 15-Tonne Crane during Operation	86.0
DEMAC Overhead Crane 20-Tonne during Operation	70.7
Train Approaching Facility (approximately 20km/h)	64.9

ENM noise prediction software considers topography, weather conditions, site sources and the location of the receiver areas to predicted received noise levels from the fleet service centre. The location of the noise sources within the site was done with reference to site layout plans.

Results of the noise modeling are provided in Figure 5 and are based on a worst-case scenario with all plant items operating at their maximum sound levels.



Date: 22 June 2005

Noise Contours, Proposed Fleet Service Centre

File Name: 2212269_LTN_02.cdr

Proposed Fleet Service Centre, Auburn, NSW

Figure 4

4.2 Construction Noise

Typical noise levels produced by construction plant anticipated to be used on site were sourced from AS 2436 – 1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites and from GHD's internal database. The power levels were then distance attenuated from the proposed construction. Propagation calculations take into account sound intensity losses due to spherical spreading, with additional minor losses such as atmospheric absorption, directivity and ground absorption ignored in the calculations. As a result, predicted received noise levels are expected to slightly overstate actual received levels and thus provide a measure of conservatism. Received noise at each assessed distance, from each item of plant on site, is added (where appropriate) to determine the total received noise at that distance from construction activities and compared to the criteria.

Received noise produced by anticipated activities, during the construction of the fleet service centre is shown in Table 4.2 for a variety of distances to a typical receiver, with no noise barriers or acoustic shielding in place and with each plant item operating at full power.

Table 4.2 Predicted Plant Item Noise Levels, dB(A) L_{10}

Plant Activity SWL dB(A)	20 m	40 m	80 m	160 m	350 m
Crane 110	76	70	64	58	51
Piling Impact Boring 120	86	80	74	68	61
Backhoe 108	74	68	62	56	49
Compressor 100	66	60	54	48	41
Concrete Pump 109	75	69	63	57	50
Dump Truck 108	74	68	62	56	49
Water Tanker 109	75	69	63	57	50
Compactor 110	76	70	64	58	51
Concrete Saw 118	84	78	72	66	59
Paver 113	79	73	67	61	54
Rock Breaker 118	84	78	72	66	59

5. Assessment of Results

5.1 Operational Noise Criteria

The INP provides guidance on the assessment of operational noise impacts. The guidelines include both intrusive and amenity criteria that are designed to protect receivers from noise significantly louder than the background level and to limit the total noise level from all sources near a receiver.

Intrusive noise limits set by the INP control the relative audibility of operational noise compared to the background level. Amenity criteria limit the total level of extraneous noise. Both sets of criteria are calculated and the lowest of the two in each time period normally apply. Table 2.2 in the INP provides modifications to the amenity criteria for existing levels of industrial noise. Attended observations noted that existing levels of industrial noise in the area are not a significant contributor to the existing ambient noise level in the vicinity of the development therefore no Table 2.2 adjustments are necessary for the amenity noise criteria. Intrusive criteria are simply 5 decibels above the measured (or adopted) background level with a minimum of 35 dB(A).

Amenity criteria are determined based on the overall acoustic characteristics of the receiver area and the existing level of noise excluding other noises that are uncharacteristic of the usual noise environment. Residential receiver areas are characterised into ‘urban’, ‘suburban’, ‘rural’ or other categories based on land uses, the existing level of noise from industry, commerce, and road traffic.

Nearest residents to the proposed fleet service centre are located approximately 350 m across Manchester Road to the north west and are considered to live in an ‘urban’ area as it is an area that is dominated by urban ‘hum’ and industrial noise sources and has through traffic with characteristically heavy and continuous traffic flows during peak periods. The INP specifies that an urban area may be located in either a rural, rural-residential, or residential zone, as defined by an LEP or other planning instrument.

The project specific noise levels are provided in Table 5.1.

Table 5.1 Project Specific Noise Levels

	Auburn 1			Auburn 2		
Criterion	**Day 7 am to 6 pm**	**Evening 6 pm to 10 pm**	**Night 10 pm to 7 am**	**Day 7 am to 6 pm**	**Evening 6 pm to 10 pm**	**Night 10 pm to 7 am**
A: Rating Background Level	43 $L_{A90(day)}$	45 $L_{A90(evening)}$	39 $L_{A90(night)}$	40$L_{A90(day)}$	43 $L_{A90(evening)}$	37 $L_{A90(night)}$
B: Intrusiveness Criteria (A + 5dB)	48 $L_{Aeq(15min)}$	50 $L_{Aeq(15min)}$	44 $L_{Aeq(15min)}$	45 $L_{Aeq(15min)}$	48 $L_{Aeq(15min)}$	42 $L_{Aeq(15min)}$
C: Urban Amenity Criteria (Table 2.1 INP)	60 $L_{Aeq(day)}$	50 $L_{Aeq(evening)}$	45 $L_{Aeq(night)}$	60 $L_{Aeq(day)}$	50 $L_{Aeq(evening)}$	45$L_{Aeq(night)}$
D: Amenity Criteria: (INP Table 2.2 Adjusted)	60 $L_{Aeq(day)}$	50 $L_{Aeq(evening)}$	45 $L_{Aeq(night)}$	60 $L_{Aeq(day)}$	50 $L_{Aeq(evening)}$	45 $L_{Aeq(night)}$
E: Project Specific Noise Level (Pg 21 INP)	**48 $L_{Aeq(15min)}$**	**50 $L_{Aeq(15min)}$**	**44 $L_{Aeq(night)}$**	**45 $L_{Aeq(15min)}$**	**48 $L_{Aeq(evening)}$**	**42 $L_{Aeq(night)}$**

5.2 Operational Noise Assessment

The closest residential receptors to the proposed service centre facility are located approximately 350 m to the northwest across Manchester Road. Long-term monitoring was conducted along the Manchester Road boundary of the site to gain a further understanding of the ambient noise environment expected at these receiving locations. Day, evening and background night noise levels were slightly lower at location Auburn 2, located along the northern-most boundary of the site.

Project specific noise levels for both monitoring locations were based on the intrusive noise criteria. Results of the noise modelling as shown in Figure 4 indicate that operational project specific noise goals can be met at the residential properties closest to the proposed service centre facility.

5.3 Construction Noise Criteria

Criteria for the construction phase applied to the assessment were sourced from Section 171 of the DEC's Environmental Noise Control Manual. The criteria was established using the measured background noise levels and applying a conversion factor based on the expected construction period. Construction noise criteria based on Table 5.1 background noise levels are shown in Table 5.2.

Table 5.2 Construction Noise Criteria

Construction Period	Level Restrictions	Auburn 1 L_{A10}	Auburn 2 L_{A10}
Less than 4 weeks	Background + 20dB	63	60
Less than 26 weeks	Background + 10dB	53	50
More than 26 weeks	Background + 5dB	48	45

Normal construction hours are 7 am to 6 pm Monday to Friday, and 8 am to 1 pm Saturday. Construction activity outside those hours is not preferred but can usually occur provided the normal operational noise criteria are met and construction noise is not substantially audible or intrusive inside a dwelling.

5.4 Construction Noise Assessment

The construction noise criteria are set for noise levels determined as $L_{10(15min)}$. During a full 15 minute period the machinery items to be used on site will operate at maximum sound power levels for only brief stages. At other times the machinery may produce lower sound levels while carrying out activities not requiring full power.

In addition, mobile machinery will likely move about during the 15 minutes, variously altering the directivity of the noise source with respect to individual receivers.

As it is unlikely construction activities would be for more than 26 consecutive weeks, the construction noise criterion should be considered as being Background + 10 dB(A). As a consequence, in a worst case configuration, exceedances of this criterion could occur. However, it is highly unlikely that all of the machinery would be operating at full power at the same time for an extended period.

To minimise noise emissions construction equipment should be in good condition. All combustion engine plant, such as generators, compressors and welders should be checked to ensure they produce minimal noise with particular attention to residential grade exhaust silencers. Where practical, machines should be operated at low speed or power and should be switched off when not being used rather than left idling for prolonged periods. Machines found to produce excessive noise compared to industry best practice should be removed from the site or stood down until repairs or modifications can be made. Impact wrenches should be used sparingly with hand tools or quiet hydraulic torque units preferred.

6. Conclusion

Noise monitoring and assessment was undertaken on behalf of RailCorp. The assessment was undertaken as part of an REF to enable the upgrade of the existing Clyde Marshalling Yards located at Auburn, NSW.

The assessment was undertaken with consideration to the NSW DEC Publications Industrial Noise Policy (INP) and Environmental Noise Control Manual Chapter 171-Construction Site Noise.

Attended and unattended noise monitoring was undertaken to determine the existing background and ambient noise environment in the vicinity of the proposed facility, and to provide an estimation of the noise output of the facility. Detailed noise modelling was undertaken based sound powers levels of primary noise sources for the proposed facility, based on similar scenarios at the Hornsby fleet maintenance centre.

The noise model undertook a worst-case scenario with all plant items listed operating at their maximum sound power levels. Results of the noise modelling indicate that noise emanating from the proposed fleet service centre can meet the DEC INP project specific noise goals.

Construction noise is highly unlikely to exceed project specific noise goals. Construction noise has the potential to exceed noise criteria in a worst-case scenario, however this can be mitigated through the utilisation of best management practices outlined in the assessment.

Therefore based on the findings of this acoustical assessment, it is believed that noise generated from the proposed construction and operation of the fleet service centre at the Clyde Marshalling Yards can meet the relevant noise guidelines.

7. References

NSW DEC, Environmental Criteria for Industrial Noise Policy (INP), January 2000.

NSW DEC, Environmental Noise Control Manual, June 1994.

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